IFOAM 2000 – The World Grows Organic

25 to 26 August 2000
Convention Center Basel

Proceedings
6th International Congress on Organic Viticulture

Edited by
Helga Willer and Urs Meier

Stiftung Ökologie & Landbau
IFOAM
FiBL

Helga Willer und Urs Meier (Eds.)
Proceedings 6^{th} International Congress on Organic Viticulture

IFOAM 2000

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Vorwort

Während die Vorbereitungen zum 6. Bioweinbau-Kongress auf Hochtouren laufen, die Posters und Referate zur Länder- und Themenpräsentation den letzten Schliff erhalten und die Telefonleitungen der Organisatoren täglich heiß laufen, kämpft der Weinbauer draußen im Wingert mit ganz anderen Schwierigkeiten.

Gelingt es ihm dieses Jahr besser als 1999, die Peronospora auf den Trauben in Schach zu halten oder muss er die erlaubte Kupfermenge bis zum letzten Gramm strapazieren?

Die Situation ist erneut kritisch. Kann der Betrieb eine zweite Missernte verkraften?
Wann endlich finden die Forscher das wirklich wirksame Biospritzmittel?

In den Regalen der Einkaufszentren stehen Weine mit dem Knospensignet, aus dem Ausland bis hierher gelangt. Sie kosten ein Drittel weniger als sein eigenes Produkt. Dafür wurde dort wo möglich mehr Kupfer eingesetzt.

Dies sind heiße Themen, und es gibt noch einige mehr (wir denken zu Beispiel an die mangelnde gesetzliche Akzeptanz neuer pilzresistenter Sorten im EU-Raum), die alle in den Papers dieses 6. Internationalen Bioweinbau-Kongresses zur Sprache kommen.

Es sind Fragen von hoher Dringlichkeit, und wir Weinbauern sind in höchstem Maße dankbar dafür, dass sie an diesem Kongress angegangen werden, besteht doch die Hoffnung, dass der internationale Erfahrungs- und Wissensaustausch rascher fruchtbare Lösungsansätze hervorbringen wird.
In diesem Sinne möchte ich im Namen der Schweizer Biowinzer und auch unserer Kollegen im nahen Ausland, wo die Probleme ähnlich liegen, den Dank aussprechen für die große Arbeit, die in Vorbereitung und Durchführung dieses Kongresses sowie für die Redaktion dieses Tagungsbandes geleistet wurde.

Malans, August 2000

Louis Liesch
Präsident BIOVIN SUISSE

Preface

Preparations are in full swing for the 6th Congress on Organic Viticulture. Delegates put the finishing touches to posters and rehearse their talks for national and thematic presentations, while the organizers' phone lines threaten to overheat. Meanwhile out in the vineyard, the vine-grower has quite different problems to contend with:

Will he have more success at keeping grape downy mildew in check this year than in 1999, or will he have to apply copper to within a gram of the permitted level?
Yet again, the situation is critical. Can the business withstand a second poor harvest?
When will the researchers come up with a really effective organic spray?

The wines on the supermarket shelves bear the seal of the BIO SUISSE Bud, but they are foreign imports. They are cheaper by one third than the Swiss growers own products. Aditionally, abroad more copper may have been applied in the production. Hardly a level playing field.

These and other contentious issues (such the failure to legislate in favour of new fungus-resistant varieties within the EU) are raised in papers at this 6th International Congress on Organic Viticulture.

The issues demand urgent attention and we vine-growers are exceedingly grateful that this conference is addressing them, because it keeps up our hopes that the international exchange of experience and expertise will speed up progress towards productive solutions.

With this in mind, on behalf of the Swiss organic vine-growers as well as our colleagues in neighbouring countries who face similar problems, I would like to express our thanks for the tremendous effort that has gone into preparing and organizing this Congress and compiling this conference publication.

Malans, Switzerland, August 2000

Louis Liesch
President of BIOVIN SUISSE

Preface of the Editors

The 6th International Congress on Organic Viticulture, held in Basel, Switzerland from the 25th to 26th of August 2000 in conjunction with the 13th International IFOAM Scientific Conference, is organised by the Swiss Forschungsinstitut für biologischen Landbau (FiBL), together with Schweizerischer Bioweinbauverein Biovin Suisse, Ecovin and Stiftung Ökologie & Landbau (SÖL).

It is sponsored by Delinat AG, SÖL, Peter Riegel Weinimport GmbH and Weinhandlung am Küferweg.

The Congress has as its theme “Organic Viticulture - Quality, the key factor to success” and the importance of variety choice, soil management, plant protection and biodiversity for organic wine quality are to be discussed at this congress. An overview of organic viticulture world-wide will also be given.

The sessions were prepared by their chairpersons who also helped to compile these proceedings. The chairpersons are Pierre Basler, Norbert Drescher, Uwe Hofmann, Paulin Koepfer, Randolph Kauer, Lucius Tamm and Helga Willer.

The 6th International Organic Viticulture Congress in Basel is in the tradition of the organic viticulture congresses, the first of which was held in 1985 in Geisenheim (D), organised by the German organic wine growers’ association Ecovin. At this congress, the German standards for the production of organic grapes, grape juice, wine and champagne were launched. The 4th congress in Würzburg 1994 dealt with marketing, market development and the labelling of organic wine. The fifth congress, held in Bad Dürkheim 1995, was the first one to be organised by all German organic producer organisations and by Stiftung Ökologie & Landbau, and it was also the first international organic viticulture congress. It dealt with questions of soil management and wine quality as well as farm management aspects. The proceedings of the 3rd, 4th and 5th conference were published by Stiftung Ökologie & Landbau (see list in the appendix).

We would like to thank the chairpersons for their efforts and all those who contributed to this conference with a paper or a poster. Thanks are also due to the sponsors, without whose support it would not have been possible to carry out this congress.

Frick and Bad Dürkheim, August 2000 *Urs Meier, Helga Willer*

Session 01

Marketing Opportunities and Consumer Expectations

Chair: Randolf Kauer and Paulin Köpfer

Biowein: Chancen der Vermarktung

Thomas Vaterlaus

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Durch die extreme Differenzierung im Angebot sind im Weinmarkt zunehmend verschiedene, teilweise völlig gegensätzliche Trends auszumachen. Während sich der Weinanbau und der Weinkonsum in den letzten 20 Jahren generell negativ entwickelt haben, sind in einzelnen Segmenten (hochpreissige Spitzenweine, Neue Welt-Weine) spektakuläre Zuwachsraten zu verzeichnen. Zu den Siegern gehört – aus dieser vereinfachenden, weil generellen Perspektive – auch der Biowein, der zu Beginn der 80er Jahre noch – von wenigen Ausnahmen abgesehen – gar nicht existent war. Diese erfreuliche Tatsache kann aber nicht darüber hinwegtäuschen, dass es heute den Bio-Protagonisten immer noch nicht gelingt, das unbestritten beträchtliche Marktpotential des Bioweins wirklich auszuschöpfen. Hierfür gibt es verschiedene Gründe:

1. Die verschiedenen Bio-Label verwirren den Konsumenten. Wie soll der Konsument bei Angeboten ohne große Beratung (Großverteiler, Direkt-Mailings) wissen, für was ein Label XY überhaupt steht. Selbst Fachleute sind oft überfordert, wenn sie beispielsweise den exakten Unterschied zwischen Demeter oder Ecovin erklären sollen. Der Dschungel an Bio-Labels ist – weil nicht transparent - eine Zumutung für den Konsumenten und zementiert letztlich nur den Exoten-Status dieser Produkte. Kaum ein Markt hat in den letzten Jahren einen derart internationalen Charakter entwickelt, wie der Wein. Deshalb ist hier ein einheitliches Label notwendig.

2. Bio-Weine können sich im normalen Handel gegenüber konventionellen Gewächsen kaum profilieren. Dies gilt sowohl für den Großverteiler als auch für den Fachhändler, wo die Bio-Gewächse meist anonym eingeordnet unter dem betreffenden Anbaugebiet zwischen konventionellen Weinen vor sich hindämmern. Hier könnten Shop-in-the-Shop-Konzepte oder spezielle Verkaufsdisplays helfen. Solange Bioweine jedenfalls nur von spezialisierten Weinhandlungen oder von Bio-Winzern selber adäquat kommuniziert werden, kann das vorhandene Potential nicht ausgeschöpft werden. Es scheint auch nicht ganz klar, ob die gegenwärtigen Vertreter des Bioweins überhaupt wollen, dass ihre Produkte wirklich marktrelevante Umsätze erreichen. Einige scheinen in ihrer Bio-Nische ganz zufrieden zu sein. Allerdings droht dann die Gefahr, dass den Bio-Pionieren (mit ihren Labels) von anderen Anbietern das Diktat aus der Hand genommen wird. Es ist nicht ausgeschlossen, dass Global-Players wie Fetzer oder Mondavi in den nächsten Jahren massiv mit Bio-Weinen auftreten werden.

3. Das größte Problem bei der Vermarktung von Bioweinen sind aber die Produzenten selber, die sich aus völlig unterschiedlichen Beweggründen für den Bioanbau entscheiden. Grundsätzlich aber sind drei verschiedene Gruppen auszumachen.

- ***Bio-Winzerwein***

Der Bio-Selbstkelterer, der sich aus einer ganzheitlichen Lebensphilosophie zu dieser Anbaumethode entschlossen hat, und seinen Wein direkt an die Kunden verkauft. Hier kauft man ein Produkt mit emotionalem Mehrwert, man nimmt über den Wein und den direkten Kontakt mit dem Winzer Anteil an einem Konzept, das über das Produkt hinausgeht. In diesem Umfeld nahm die Bio-Weinbau-Bewegung einst ihren Anfang. Produkte aus diesem Umfeld gelten auch heute noch als besonders glaubwürdig.

- ***Bio-«Marken»-Wein***

Die Produzent agiert marktorientiert, erzeugt von unterschiedlichen «Lagen» oder auch «Marken» beträchtliche Volumen und setzt diese über klassische Verkaufskanäle ab. Die Weine sind preislich im mittleren oder unteren Preissegment positioniert. Der Faktor «Bio» wird in einer verkaufsorientierten Kommunikation (Inserate, POS-Material) stark gewichtet (ohne viele Detailinformationen). Die Erwartung: Wenn der Konsument für Fr./DM 15 die Wahl zwischen einem biologisch angebauten und einem konventionellen Weißwein aus Frankreich hat, wird er sich spontan tendenziell für ersteren entscheiden.

- ***Bio-Spitzenweine ohne Deklaration***

In den letzten Jahren haben immer mehr Spitzenbetriebe (Chapoutier im Rhônetal, Leroy im Burgund, Zind-Humbrecht im Elsass) auf Bio umgestellt, ohne dies groß zu kommunizieren oder auf ihren Labels überhaupt zu vermerken. Dies mit der Begründung, sie (die Winzer) betrieben den Bio-Anbau eben nicht, um sich ideologisch in eine Schublade drängen zu lassen, sondern einfach deshalb, weil ihrer Meinung nach Bio heute die beste (und langfristig die einzige) Methode sei, um Spitzenweine zu erzeugen. Weitere Spitzengüter (darunter auch die Bordeaux Spitzengüter Château Pétrus und Château Ausone) überlegen sich diesen Schritt offenbar ebenfalls. Es ist durchaus möglich, dass sich der Bio-Anbau im qualitativen Spitzensegment mit den Jahren als «undeklarierter» Standard durchsetzt. Wenn «Bio» aber - wenn auch nur in einem kleinen Bereich des Marktes - zum Standard würde, so hätte dies langfristig auch Konsequenzen für die anderen Gruppen von Anbietern.

Bioweine sind komplexe Produkte. Themen wie «interspezifische Sorten», «Problematik von Kupfer und Schwefel» sind schwer zu kommunizieren in einer Zeit, wo die Konsumenten einem Überangebot von Infotainment ausgesetzt sind. Vorfälle in der Schweiz (irreführende Berichte über Pestizid-Rückstände in Bioweinen) haben nachdrücklich gezeigt, dass es praktisch unmöglich ist, das «schwierige Produkt» korrekt und doch verständlich «rüberzubringen». Patentlösungen gibt es nicht. Jeder Wein muss auf die ihm angepasste Weise den Weg zum Konsumenten finden.

Session 02

Organic Viticulture World-Wide

Chair: Helga Willer

Organic Viticulture World-Wide

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The Development of Organic Viticulture

In most wine growing countries organic viticulture is now becoming more and more important. In most non-European countries organic viticulture is still in an initial stage and the number of organic vineyards is still small.

The expansion of organic viticulture is hindered by the fact that in many countries incentives are provided for growers to adopt integrated pest management. Such incentive schemes are generally supported and promoted by the government, the chemical industry and conventional producer associations. As demand for conventional wines is booming, market forces do not provide much incentive for growers to convert to organic production methods. The limited knowledge about organic viticulture also poses a severe restriction of its expansion. Many conventional wine growers only have very little information about organic production techniques. However, there is also growing concern about decreasing soil fertility among some of the large corporate wine growers in Australia who are looking for more "sustainable" means of production.

The organic producer associations in many countries do not have sufficient expertise about organic viticulture yet. Therefore, various specific organisations for commercial organic wine growers were formed recently in countries such as New Zealand (Organic Wine Growers' Association), Australia (Organic Vignerons Association) and South Africa (Cape Organic Growers Association).

Inspection and Certification

In Australia certifications are done by local organisations since it features on the third country list of EU-regulation 2092/91, allowing organic products into the European Union without further certification. On the contrary, in New Zealand inspections are carried out by European organisations on behalf of BioGrow, the New Zealand certifier. In some countries, especially the former Commonwealth countries, the establishment of local certifying organisations is supported by the Soil Association.

Problems, however, emerge in those countries , which hare heavily dependent on export markets and which need EU-certification. In these cases the activities of European inspection bodies can hamper or sometimes even prevent the establishment of local inspection bodies and producer associations.

Plant protection

Most of the organic grape growers are also winemakers and abide to the principle that the wine is made in their own winery. Various organic plant protection techniques are used, primarily to create a healthy environment for the vines and to reduce the cause of fungal infection and minimize disease pressure.
Like in Europe the extent of pest and disease problems in a vineyard depends largely on climatic conditions. In table grapes mainly powdery mildew (*Oidium*) causes problems. Control agents in organic grape production for this organism are sulphur or herb extracts. In warm and humid conditions botrytis (sour rot, bunch rot) can destroy the entire harvest.
The Mediterranean fruit fly can severely damage table grapes. Grapes exported to the United States and to Japan have to be absolutely free of such damage, incl. eggs or larvae. Growers tackle this problem with yellow traps and pyrethrum or chilli-garlic teas. Mealy bugs can also cause problems. The use of neem preparations in combination with pyrethrum has shown good results. Depending on the continent we are talking about, damage can also be caused by wild boars, rabbits, deer, baboons and kangaroos.
On the whole, in non-European countries the development of biological plant protection agents or the use of bacteria or fungi for this purpose is far more advanced than it is here. This is also the case from a legal point of view.
In most cases it is no problem for growers to promote predators through improved biodiversity as a preventative measure against pests. Vineyards are often large and can cover more than fifty hectares, which leaves enough space for hedges or corridors of remnant vegetation. The pesticide drift from neighbouring conventionally managed vineyards is far less of a problem than in Europe.

Varieties

While grape varieties that are resistant against fungal infection are gaining importance in many European countries (Germany, Switzerland, Austria, Eastern Europe) they are not that common yet in other parts of the world , even though trial plots are established in New Zealand. Due to quarantine regulations in these countries it is difficult to introduce new varieties. There is no market for such grape varieties yet, partly because they are unknown. Decisions by organic wine growers outside Europe regarding the choice of variety are often strongly driven by international market demands. Therefore, the main varieties grown today are Cabernet Sauvignon and Chardonnay. In Canada and the northern United States, however, hybrids of old varieties are used. In Australia and in California mainly European varieties are grown. The Italian vinifera varieties are currently becoming increasingly important internationally.
Table grapes are far more difficult to grow organically than grapes for wine making. Therefore, new and more disease resistant varieties are sought after when vineyards are to be planted with table grapes.

Outlook

The outlook for organic wine production on a global level is positive. The market for organic wines is growing and a considerable expansion of organic vineyards and particularly the area under vines in the new world can be observed. However, some challenges for the organic wine growers, mainly related to grape production, still remain to be met. Further problems are posed by the lack of training, advice and research. The number of people with expertise in organic viticulture is still too small to meet the needs of the wine growers. The lack of local certification results in high costs for inspectors from overseas.

Viticulture Addresses outside Europe

California Certified Organic Farmers CCOF, 1115 Mission Street, USA-Santa Cruz, phone +1-408-4232263, fax +1-408-4234528
NASAA, National Association for Sustainable Agriculture Australia, P.O. Box 768, AUS-Stirling-SA 5152 phone +61-8-83708455, Fax +61-8-83708281
Organic Vignerons Association of Australia, PO Box 503, Nuriootpa, SA 5355, Australia, Phone: +61-8-85622122, Fax: +61-8-85623034, Email:boss@dove.net.au
BIO-GRO New Zealand, P.O.Box 9693, Marion Square, Wellington , New Zealand, Phone: +64 4 801 9741, Fax: +64 4 801 9742, www.biogro.co.nz, Email: info@biogro.co.nz

IFOAM

IFOAM represents the world-wide movement of organic agriculture and provide a platform for global exchange and cooperation.
Major aims and activities are:

- To exchange knowledge and expertise among its members and to inform the public about organic agriculture.
- To represent, internationally, the organic movement in parliamentary, administrative and policy making forums (IFOAM has for example consultative status with the UNO and FAO).
- To set and regularly revise the international "IFOAM Basic Standards of Organic Agriculture and Food Processing”
- To make an international guaranty of organic quality a reality. The International Organic Accreditation Services, Inc., (IOAS) runs the IFOAM Accreditation Programme to ensure equivalency of certification programmes world-wide.

IFOAM offers many platforms for information exchange,

- for example at the numerous international, continental and regional IFOAM conferences, or
- through our publications such as the magazine Ecology and Farming and conference proceedings
- Through the directory "Organic Agriculture World-wide", and also
- through its network of international contacts

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Thanks are due to Johannes Biala for supplying information on Australia and for correcting the English.

Organic Viticulture in Europe

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For this paper, which gives an overview of the state of organic viticulture in Europe, several information sources were used: the country reports prepared by experts for the sixth international viticulture congress; the results of the EU-research project *Effects of the CAP reform and further development of organic agriculture*; the proceedings of viticulture congress at the German state research station Weinsberg in 1999.

Statistical overview

So far no official statistical data on the current status of organic viticulture in Europe exist. Even though most countries in the European Union, the EU accession countries and the EFTA countries collate data on their land under organic management, figures on land use patterns are not always available. Table 1 was compiled with the available data material. The table shows that the share of organic vineyards of all vineyards is still small. The percentage of organic vineyards is – with the exception of Greece, Italy, Spain - smaller than the percentage of organic land of all agricultural land in the respective countries. This is particularly striking for Austria and Switzerland where only little more than 1 % of the vineyards are organic whereas the total organic land is around eight per cent of all agricultural land. It is also interesting to look at the shares organic vineyards have within the organically managed land. The Mediterranean countries have, compared the northern wine growing areas, high shares of vineyards. This reflects the general cropping pattern but also the fact that most southern countries are exporters of organic products; the main products being typical Mediterranean products, one of which is wine. From the articles of the authors for these proceedings it may be concluded that organic viticulture is growing in all European countries (table 1).

Historical development and relevant organisations

The first activities in organic viticulture date back to the 1970s and beginning of the 1980s. In Germany in the 1970s, the first pioneers made great efforts to apply the basic principles of organic agriculture to viticulture. In Germany, for example, Stiftung Ökologie & Landbau (Foundation Ecology & Agriculture) organised the first meeting of organic wine producers from Germany, France and Switzerland in 1977. Standards for ecological grape and wine production were issued by regional organic producer groups in the years 1983 to 1985. This was a first step towards facilitating the declaration "from organic production" on the label. In 1985, the *Bundesverband Ökologischer Weinbau* (Federation Organic Viticulture), now *Ecovin*, gathering producers specialising in organic viticulture, was established in order to defend the interests of the organic wine growers. In Switzerland, the *Schweizerische Bioweinbauverein* was founded in 1989. In

Austria, private standards for organic wine production were established in 1990 by the producer association Ernte-Verband; in 1999 *Bio-Veritas*, a marketing association for organic quality wine was founded. Also in other countries specific organisations for organic producers were created – e.g. in France the national Federation for Organic Wine *FNIVB* (1998). In Central and Eastern Europe the beginnings of organic viticulture date back to the beginnings of the 1990s. In Hungary for instance *Altervitis*, the association of the organic wine producers was founded in 1992, today associated to *Biokultúra*. In the Czech Republic at the beginning of the 1990s *Altervin* was founded, uniting the organic wine producers, now merged with the countries biggest producers association *Pro Bio*.

Organic viticulture has clearly trigged many innovations in conventional viticulture. Many techniques which were developed by organic viticulture are applied by conventional wine growers. In Switzerland, where the political environment is particularly favourable towards organic production, the organic wine growers are watched curiously by their conventional counterparts (Tamm, 1999). Well managed farms show that organic viticulture is possible and as well as highly economical. Existing organic wine growers act as local centres of knowledge and generally are open to share their experiences with their colleagues.

Challenges in Production

Cultivation techniques of the organic system include the creation of a stable soil structure, a high root density, a harmonious nutrition of the vine, a mix of green cover crops, and biodiversity measures around the vineyards (hedges etc.). With these measures an optimum balance between pest and predators is enhanced and diseases are reduced. Some major problems have however, remained for the organic wine growers.

In all European countries fungus diseases like powdery and downy mildew (*Uncinula necator* and *Plasmopara viticola*) and gray mould (*Botrytis cinera*) pose particular problems to organic wine growers. Research is urgently needed in order to find efficient copper substitutes. An already existing solution are the fungus resistant grape varieties.

Fungus Resistant Grape Varieties

In most countries the organic wine growers use the same varieties as their conventional counterparts. Most of these varieties are highly susceptible to the fungus diseases mentioned above. According to many experts the only long-term solutions to the fungus problems are interspecific hybrids. In Switzerland, many organic wine growers use them already. The German *Ecovin* recommends the cultivation of these varieties in its standards, and it promotes less rigid laws regulating their cultivation - in Germany most of them may only be planted for experimental purposes. *Ecovin* also presses the state breeding stations to continue intensive work on these varieties. A lot of research into resistant varieties has been done in Central Eastern Europe. In the Czech Republic, almost all organic vineyards are planted with interspecific hybrids. It is expected that the area under organic management will increase substantially once these hybrids are included into the official variety list in 2001, even though, according to the Czech wine law only table wine may be produced from these grapes.

Several wine tastings for instance in Germany, Switzerland and Hungary (blind tastings) with traditional and fungus tolerant varieties have shown that the sensorial quality of the new varieties is as high as that of the traditional varieties and in some cases even higher.

The wine growers often fear that consumer acceptance of these new varieties might be too low, but the results of these tastings demonstrate that this will most likely not be the case.

Market shares / marketing structure

Especially the Southern European countries produce organic wine mainly for export. In France for instance, 70 % of the organic wine is exported. Germany is the biggest market, followed by other Northern / Central European countries (Rousseau 1999). In most countries, wines are processed and marketed by the growers themselves. In Germany, France and Italy, however, some co-operatives who do the processing for their members have converted all or a part of their production. In Italy, a survey was carried out among organic wine growers, and it showed that 20 % of them were associated to a co-operative. (Zanoli & Santi, 1999). Organic wine is successfully promoted by the specialised organic wine growers associations, by the organic producer organisations and by the producers themselves. In many countries, organic wine producers have successfully taken part in "conventional" wine tastings, which has given a boost to the marketing of organic wine. In Italy, an organic wine contest has been established. Other promotional measures include leaflets, attractive internet sites and the presence at major wine fairs.

But why should consumers be interested in organic wine? Most companies – both European and overseas – use 'low in sulphite' as key-word in their promotion strategy. A recent Italian study has shown that, indeed, there is a statistically significant difference in sulphur dioxide contents of both red & white organic wines compared to a sample of comparable conventional wines (Zanoli et al., 1999); at the same time, sensorial analysis performed on a randomised panel of standard consumers (not wine experts) has shown that both red & white organic wines did not outperform the conventional sample (see appendix 1, Zanoli & Naspetti, 1999). In general, market research shows that European consumers prefer fruity and floral odour white wines and fruity odour, brilliant and rich colour red wine. Not surprisingly, recent Nielsen data demonstrate that the top-selling wines in supermarkets by grape variety are Chardonnay and Cabernet Sauvignon!

Another key-word is 'environmental-friendly', but this has probably a higher impact on North European consumers (more motivated by ecological goals) than on Mediterranean (more motivated by health related goals), on-going market research shows.

State Support

In all EU-countries, but also in Switzerland and Liechtenstein as well as in some Central and Eastern European countries, organic viticulture is subsidised under the various agri-environment programmes. In Italy Germany, the state aid programmes under the EU's agri-environment programmes differ substantially between the federal states; the a-mounts paid to the wine growers are between 500 and 750 Euro per hectare and year. These amounts cannot cover the extra costs involved in the organic farming system. Also, the differentiation between the subsidies for integrated and organic farming is far too small, and therefore the incentive for wine growers to convert is not great enough. The implementation of Agenda 2000 in Europe probably will not help in supporting the organic wine sector, due to the fact that money is allocated on a 'fast-spending' rule, and investments in wine-making and vineyards are not short-term in nature. Besides, restrictions in increasing land area devoted to vineyards will penalise those organic wine producers which would like to increase their production due to higher market demand.

Certification and Regulations

As the wine-making process is not defined under EU-regulation 2092/91, the term "organic wine" may not be used on the label. In Germany, it is allowed to state "wine from organic viticulture". In France, Italy and Portugal, however, the label may only say "wine produced with organic grapes". This fact is seen by the Portuguese and the French associations as a major obstacle for future market development. In Switzerland, the majority of organic wine is certified by BioSuisse, the major organic certifier in Switzerland (Bud label) requiring full-conversion. According to the Swiss organic law, partial conversions of organic vineyards are, however, permitted; this means that a wine grower can convert some of his wine production, whereas the rest is managed conventionally.

Main challenges

Looking across the papers presented in these proceedings, several challenges need to be tackled in order to increase the organic vine area and attain growth rates similar to those of organic agriculture in general:
First, there are still no satisfactory solutions to various diseases and pests. Fungus diseases are a pan-European problem, and efficient copper replacements still need to be found. A solution to the fungus problems are the interspecific hybrids, for which further breeding efforts are urgently needed. Also state and EU-regulations hindering wine growers to plant these varieties and market the wine derived from their grapes need urgently to be changed.
Second, organic viticulture is not subsidised adequately in any European country. Organic wine growers need higher subsidies in order to compensate lower yields and the higher labour input. The differentiation between integrated farming should be greater in order to provide sufficient organic conversion incentives .
Third, the labelling of organic wine is still not satisfactory. It should be possible in all European countries to declare on the label that a wine stems from organic viticulture in order to strengthen consumer confidence. Integrated production methods are often referred to as "environmentally friendly" on the label, and partial vineyard conversion, which is allowed in Switzerland, does not help to build consumer confidence either because of the lack of a clear concept, and they should be phased out.
Finally, consumer preference for Chardonnay and Cabernet is a subtle challenge for European organic viticulture: Should organic producers follow the trends, and compete on the global market with 'varietal' ("cepage") based wines, or defend the 'protected origin' ("terroir") and quality of their many local grapes? It is not only a market based choice, of course, and not a matter for organic wine makers only, but this is a major choice in the future years. You can be sure that tastes and fashions will change, as we have seen a global shift in consumers preferences from white to red after some studies reported the possible positive health effects of red wine. Should organic wine producers help in protecting the biodiversity of the grapes, or should they follow the main waves of the market?

References

Altındişli, Ahmet: Organic Viticulture In Turkey. In: Willer, Helga and Urs Meier (Eds.): Proceedings 6th International Congress Organic Viticulture. Bad Dürkheim, 2000

Dessylas, Marios: Organic Viticulture in Greece. In: Willer, Helga and Urs Meier (Eds.): Proceedings 6th International Congress Organic Viticulture. Bad Dürkheim, 2000

Firmino, Ana: Organic Viticulture in Portugal. In: Willer, Helga and Urs Meier (Eds.): Proceedings 6th International Congress Organic Viticulture. Bad Dürkheim, 2000

Haeseli, Andi: Organic Viticulture in Switzerland. In: Willer, Helga and Urs Meier (Eds.): Proceedings 6th International Congress Organic Viticulture. Bad Dürkheim, 2000

Jonis, Monique: Organic Viticultrue in France. In: Willer, Helga and Urs Meier (Eds.): Proceedings 6th International Congress Organic Viticulture. Bad Dürkheim, 2000

Köpfer, Paulin: Organic Viticulture in Germany. In: Willer, Helga and Urs Meier (Eds): Proceedings 6th International Congress Organic Viticulture. Bad Dürkheim, 2000

Niggli, Urs: Organic Farming in Switzerland. In: Steffi Graf / Helga Willer (Eds.): Organic Agriculture in Europe. Results of the Internet Project http://www.organic-europe.net, co-funded by the EU-Commission, General Directorate Agriculture (GD Agri), SÖL-Sonderausgabe 75, Stiftung Ökologie & Landbau (SÖL), Bad Dürkheim, Germany, 2000.

Picazos, Joan and Angeles Parra: Organic Farming in Spain. In: Steffi Graf / Helga Willer (Eds.): Organic Agriculture in Europe. Results of the Internet Project http://www.organic-europe.net, Co-funded by the EU-Commission, General Directorate Agriculture (GD Agri), SÖL-Sonderausgabe 75, Stiftung Ökologie & Landbau (SÖL), Bad Dürkheim, Germany, 2000.

Rousseau, Jacques (1999): Organic wine production in France- a fast increase. Paper held at the "Internationaler Erfahrungsaustausch zum ökologischen Weinbau" at the Staatliche Lehr- und Versuchsanstalt für Wein- und Obstbau Weinsberg, 1999, at http://www.landwirtschaft-mlr.baden-wuerttemberg.de/la/lvwo/kongress/IEFA_Vortraege.htm

Sedlo, Jiri: Organic Viticulture in the Czech Republic. In: Willer, Helga and Urs Meier (Eds): Proceedings 6th International Congress Organic Viticulture. Bad Dürkheim, 2000

Smissen, Nicolette van der: Organic Farming in Greece. In: Steffi Graf / Helga Willer (Eds.): Organic Agriculture in Europe. Results of the Internet Project http://www.organic-europe.net, Co-funded by the EU-Commission, General Directorate Agriculture (GD Agri), SÖL-Sonderausgabe 75, Stiftung Ökologie & Landbau (SÖL), Bad Dürkheim, Germany, 2000.

Tamm, Lucius (1999): Der biologische Rebbau in der Schweiz. Paper held at the "Internationaler Erfahrungsaustausch zum ökologischen Weinbau" at the Staatliche Lehr- und Versuchsanstalt für Wein- und Obstbau Weinsberg, 1999, at http://www.landwirtschaft-mlr.baden-wuerttemberg.de/la/lvwo/kongress/IEFA_Vortraege.htm

Bazzocchi, C., Tellarini, Stefano and Raffaele Zanoli: Organic Viticulture in Italy. In: Willer, Helga and Urs Meier (Eds): Proceedings 6th International Congress Organic Viticulture. Bad Dürkheim, 2000

Zanoli, Raffaele and Paola Santi (1997): "Caratteristiche strutturali della filiera del vino biologico in Italia." Economia Agro-alimentare, II (2).

Zanoli, Raffaele and Simona Naspetti (1999): Il vino bio. Valorizzazione e marketing. AMAB, Senigallia, Italy.

Zanoli, Raffaele, Potentini, Giuseppe and Simona Naspetti (1999): "Un buon bicchiere di vino bio. Il vino biologico marchigiano tra tradizione e mercato", Mediterraneo, 3(11), Winter 1999/2000

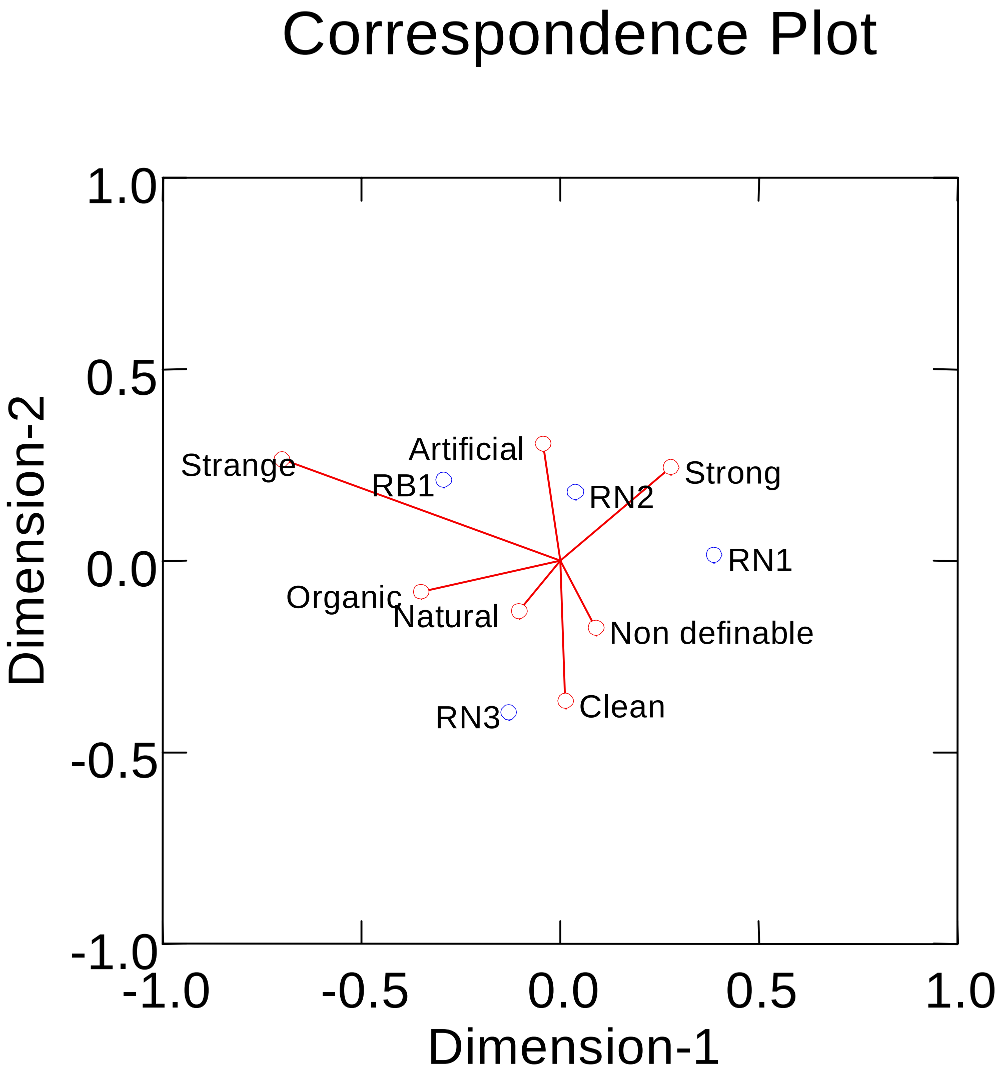
Appendix 1

A Panel of 50 Italian random consumers (45% males, 55% females), with average level of education and age ranging from 15 to 60 years, elicited the relevant possible attributes of an organic wine to be:

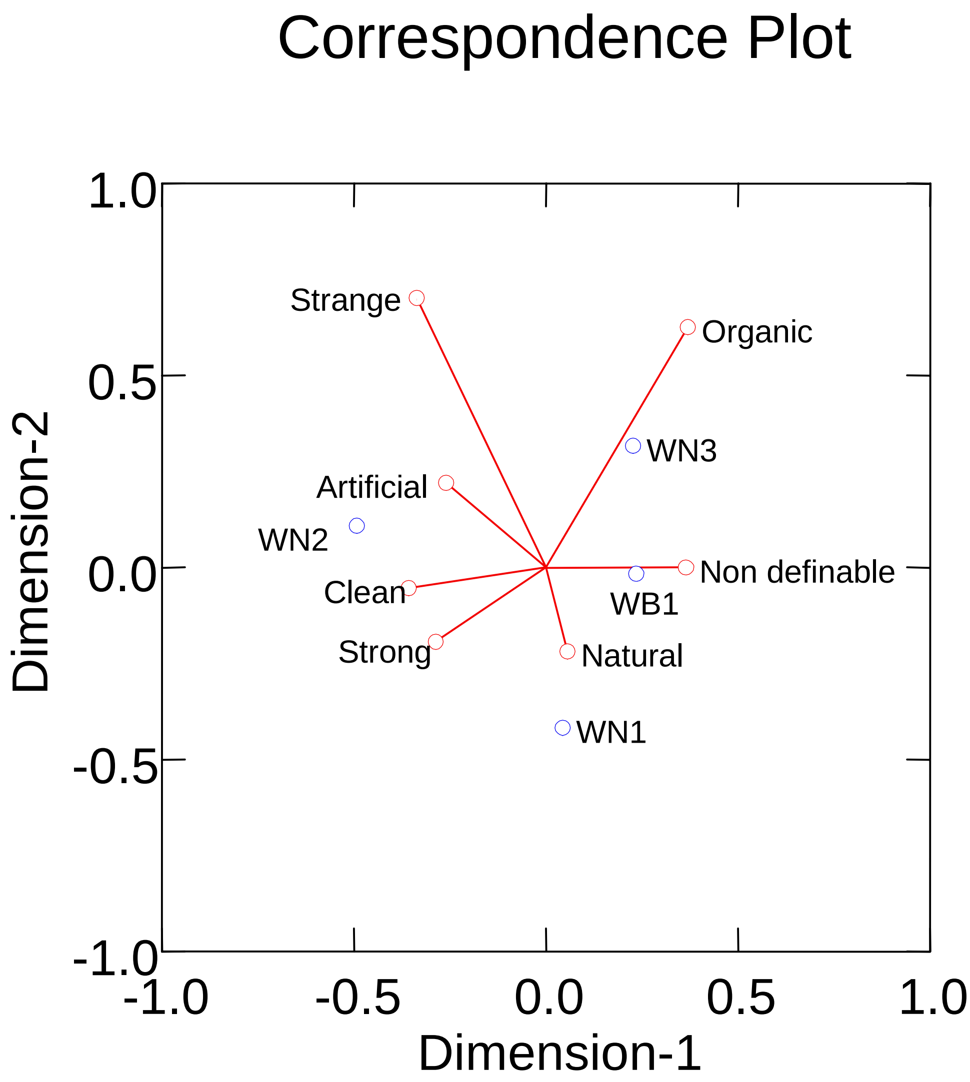
- Organic
- Natural
- Strong
- Clean (colour, odour & taste)
- Strange (colour, odour & taste)
- Artificial (colour, odour & taste)

The most preferred wines were those Natural and Strong, not Artificial. The Organic, Clean and Strange attributes where not considered negative ones, but not so important in choosing a wine.

This information is drawn from Zanoli & Naspetti, 1999.



The organic red wine (Rosso Piceno Superiore) was considered strange and artificial, and definitely different from the non organic reds (all from the same varietal grape and vintage year). The most preferred wines were RN1 and RN3.



The organic white wine (Verdicchio) was considered non definable and somewhat natural. The most prefreed Verdicchio was the non-organic WN1

Table 1: Vineyards under Organic Management in the Countries of Europe (This table is based on the figures provided by the authors of the articles in the conference proceedings).

Country	**Organic vineyards (ha)**	**Conventional Vineyards (ha)**[1]	**Organic vineyards in % of all vineyards**	**Total area under organic management (ha)**[2]	**Organic vineyards in % of organic land**
Austria[3]	564	52,000	1.1	287,900	0.2
Czech Republic[4]	25	13,000	0.2	71,620	0.04
France (1999)[5]	10,213	917,000	1.1	316,000	3
Georgia[6]	Ca. 100	85,000	0.1	-	
Germany (1999)[7]	1,349[8]	105,000	1.3	383,572[9]	0.4
Greece (1998)[10]	1,750	132,000	1.3	15,849	11
Hungary (1998)[11]	350	131,000	0.3	34,500	1.0
Italy (1999)	Ca. 48,000 –54,000[12]	922,000	Ca. 5.2-5.9 %	958,687	Ca. 5 – 5.6 %
Portugal (1999)[13]	888	259,000	0.34	47,974	1.9
Spain (1999)[14]	21,130	1,224,000	1.7	352,164	6.0
Switzerland (1999)[15]	209	14,991	1.4	84,124	0.3
Turkey (1999)	1988,96[16]	567,000	0,4		7.8

[1] Figures for total hectares taken from „Deutsches Weinbau-Jahrbuch 1999“
[2] According to SÖL 2000, for all countries figures end 1999, for Austria, Czech Republic, Greece 1998, see also http://www.soel.de/inhalte/oekolandbau/statistik_europa.html
[3] Schinnerl, 2000
[4] Sedlo, 2000
[5] Observatoire Nationale De L'Agriculture Biologique, in Jonis, 2000
[6] Tourmandize 2000
[7] Köpfer, 2000
[8] Only wine farms which are member of one of the nine German organic producer associations, united in Arbeitsgemeinschaft Ökologischer Landbau (AGÖL; http://www.agoel.de), per 1.1.2000
[9] Only farms which are member of one of the nine German organic producer associations, united in Arbeitsgemeinschaft Ökologischer Landbau (AGÖL; http://www.agoelde)
[10] Dessylas, 2000
[11] Szöke, 2000
[12] Bazzocchi/Tellarini/Zanoli, 2000, Final figures for 2000 were not available at the time of printing of these proceedings. 1998: 19,844 ha, 2,6 % of all Italian vineyards
[13] Firmino, 2000
[14] Ministero de Agricultura 2000, in Picazos / Parra, 2000
[15] Haesli, 2000
[16] Only vineyards for grapes for sultaninas, Altındişli 2000

Organic Viticulture in Austria

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Statistical information

All together there are 50.875 hectares of vineyards in Austria with 35.000 farms. **202** organic wine farms in twelve different regions in the eastern and southern part of Austria cultivate **564,33** ha, which is about 1,1 % of the whole Austrian wine area.

- 46 % are located in Lower Austria
- 34 % in Burgenland
- 19 % in Styria
- 1 % in Vienna

Main grape varieties

There are currently more than 30 grape varieties.
White wines

- 36,7 % Grüner Veltliner
- 9 % Welschriesling
- 7,8 % Müller-Thurgau
- 4,9 % Weißburgunder
- 2,6 % Riesling

Red wines

- 7,9 % Blauer Zweigelt
- 5,4 % Blaufränkisch
- 5,2 % Blauer Portugieser

Historical development – regional distribution of wine farms

Some of the pioneer farms converted their production already in the beginning of the eighties. One of the inspirations was a lecture on the cultivation of green cover crops in vineyards in Burgenland given by Professor Preuschen.

1990 ERNTE standards for Organic Viticulture
1993 According to the Austrian wine law organic wine is allowed to be labelled „organic wine“
1994 Austria joined the EU and the Council Regulation (EEC) 2092/91 on organic production also applies on organic viticulture
1999 Foundation of the marketing organisation for organic quality wines „Weingüter Bio veritas“

Certifying organisations

Most of the farms are associated in ERNTE für das Leben and controlled by Austria Bio Garantie.

Market shares/marketing structure

The marketing is mainly (65-70 %) in direct form which means that the wine is sold at the farm to customers or wholesalers or delivered to re-sellers in different regions. For example in Lower Austria there are 65 „ERNTE Hofläden“. Gastronomic enterprises have less importance (5%). Approximately 10% is sold as „wine-cask“ to „Biocolleagues“, 10% is sold „cask-wine“ to trade enterprises who sell conventional wine and 5% is exported.

The main challenges

1. Raising Quality
   Up to now organic wine had the image to be „sour“. Therefore many seminars concerning the latest techniques of viticulture and education for wine tastings leaded to an increased quality consciousness and to successes at national and international contests for wine awards – country winner, salon winner, winner at wine fairs at Bordeaux, Laibach, Nürnberg, etc.
   Now the main challenge is to inform the consumers of this increased quality and to do positive image work. To enable this the trademark and organisation „Weingüter Bio veritas“ was founded for joint fair activities and common marketing and public relation activities.

2. Research work
   for new resistant grapes and the possibility to reduce the use of copper.

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Organic Viticulture in Croatia

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Keywords: *present status, future prospects, research, standards/regulations*

Introduction

Organic viticulture is still rather undeveloped in Croatia. However, several producers are existing in different parts of the country and some practical research work has been carried out by the Faculty of Agriculture of the Zagreb University.

Materials and methods

The poster briefly describes present status and future prospects of the organic wine production in Croatia providing brief information on existing organic vineyards, grape varieties, scientific research and marketing.

Results and discussion

A first brochure on organic viticulture in Croatian language was published in 1996 but this activity is still not widely accepted by the local farmers and wine producers. In other words, talking about present status of organic viticulture in Croatia one should not mention loudly terms like certified organic hectares and market shares. Two principal obstacles in the past were lack of the appropriate national organic agriculture development strategy/policy and adequate organic standards/regulations, followed by rather poor advisory and training opportunities for producers. Until recently entire Croatian “organic world” was governed solely by a few NGOs and mostly neglected by the Ministry of Agriculture, governmental extension service and scientific institutions. However, Institute of Viticulture of the Faculty of Agriculture in Zagreb had different approach towards organic – it was one of the rare institutions which commenced in late 1990s with scientific and practical work on organic viticulture, resulting in production of its own “eco-wine”.

Conclusions

A national law on organic agriculture and food production should be accepted by the Croatian parliament during year 2000. If that happens, one of the main challenges of organic viticulture development will be permanently removed. Does that mean that the Croatian poster at the 7th congress on organic viticulture will be more optimistic? Come and see for yourself.

Ökologischer Weinbau in der Tschechischen Republik

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An der March, dem Grenzfluss zwischen Tschechien und der Slowakei bzw. der Slowakei und Österreich, wird Weinbau seit mindestens 2.800 Jahren betrieben und man kann sagen, dass davon 2.700 Jahre lang ökologisch gewirtschaftet wurde. Das bedeutet, dass man im Weinbau lediglich während des letzten Jahrhunderts nicht ökologisch gewirtschaftet hat.

Seit 1991 wird in Tschechien wieder ökologischer Weinbau betrieben, jedoch leider nur auf einer sehr eingeschränkten Fläche. Ursprünglich wurde diese Initiative vom Verband ALTERVIN gesetzt, welcher mittlerweile eine Sektion des Verbandes PRO-BIO geworden ist. Die ökologisch bewirtschaftete Fläche betrug im Jahr 1999 25 Hektar (0,2 % der Gesamtrebfläche), wobei diese Weingärten fast ausschließlich mit interspezifischen Sorten bepflanzt sind. In der offiziellen Sortenliste sind jedoch noch keine resistenten Sorten eingetragen, sondern es läuft ein staatliches Programm zur Sortenprüfung, das mittlerweile 4 interspezifische Keltertraubensorten umfasst, welche im Jahr 2001 eingetragen werden können. In der Folge kann ein rascher Zuwachs an ökologisch bewirtschafteter Rebfläche erwartet werden, wenngleich nach dem tschechischen Weingesetz aus interspezifischen Sorten nur Tafelwein erzeugt werden darf. Wir erwarten jedoch, dass nach der VO (EG) 1493/99 ab dem Jahr 2004 in der Europäischen Union auch Qualitätswein aus interspezifischen Sorten zugelassen sein wird.

In Tschechien wird in naher Zukunft eine Sortenumstellung in zwei Richtungen erwartet: Einerseits in Richtung Weinqualität und andererseits in Richtung Ökologie, wobei der Umweltaspekt keineswegs untergeordnet erscheint. In der Geschichte hat es sich immer wieder gezeigt, dass jedes neue Bewirtschaftungssystem eigene Rebsorten benötigt. Dies gilt für den Einzug der Chemie gleichermaßen wie für die Entwicklung der Weinbautechnik sowie der Rebenveredlung und auch für die aktuelle Ökologie-Bewegung im Weinbau.

Die Sortenentwicklung in den letzten 100 Jahre in der Tschechischen Republik ist in der folgenden Abbildung dargestellt. Wie zu erkennen ist, haben die einstmals wichtigsten Rebsorten Blauer Portugieser oder Grüner Sylvaner heute praktisch keine Bedeutung mehr. Im letzten Jahrzehnt haben auch die traditionellen Sorten Grüner Veltliner und Welschriesling an Bedeutung verloren. Andererseits bilden Neuzüchtungen innerhalb der Gattung Vitis vinifera bereits 25 % der Gesamtrebfläche, obwohl diese erst im laufe der letzten 100 Jahre neu angelegt wurden. Auch die Sorte Sankt Laurent, die in Tschechien am weitesten verbreitete Rotweinsorte, existiert wahrscheinlich seit über 200 Jahren und wurde erst vor 100 Jahren eingeführt.

Aus unserer Sicht besteht daher eine große Chance für interspezifische Sorten, insbesondere im Bezug auf den ökologischen Weinbau. Diese Sorten benötigen weniger als

3 chemische Behandlungen pro Jahr, was vor allem im Zusammenhang mit einem künftigen Verbot des Kupfers interessant erscheint. Die heute verfügbaren interspezifischen Sorten können zwar noch nicht als vollkommen resistent gegen alle Krankheiten bezeichnet werden - Probleme bestehen meistens mit Botrytis cinerea, wo kaum erhöhte Widerstandsfähigkeit im Vergleich zu konventionellen Sorten besteht. Jedoch wird dieses Problem durch weitere Kreuzung ohne negative Auswirkungen auf die Weinqualität lösbar sein. Dies scheint auch der bessere Weg zu sein als neue Behandlungsmittel zu entwickeln.

Der Wein aus den ökologischen Betrieben wird derzeit ausschließlich direkt an die Endverbraucher vermarktet. Für die Kontrolle und Zertifizierung existiert in Tschechien eine einzige Organisation für den gesamten ökologischen Landbau: KEZ (Kontrolle der Öko-Landwirtschaft). KEZ ist eine gemeinnützige Organisation, welche unter anderem auch den Öko-Weinbau kontrolliert.

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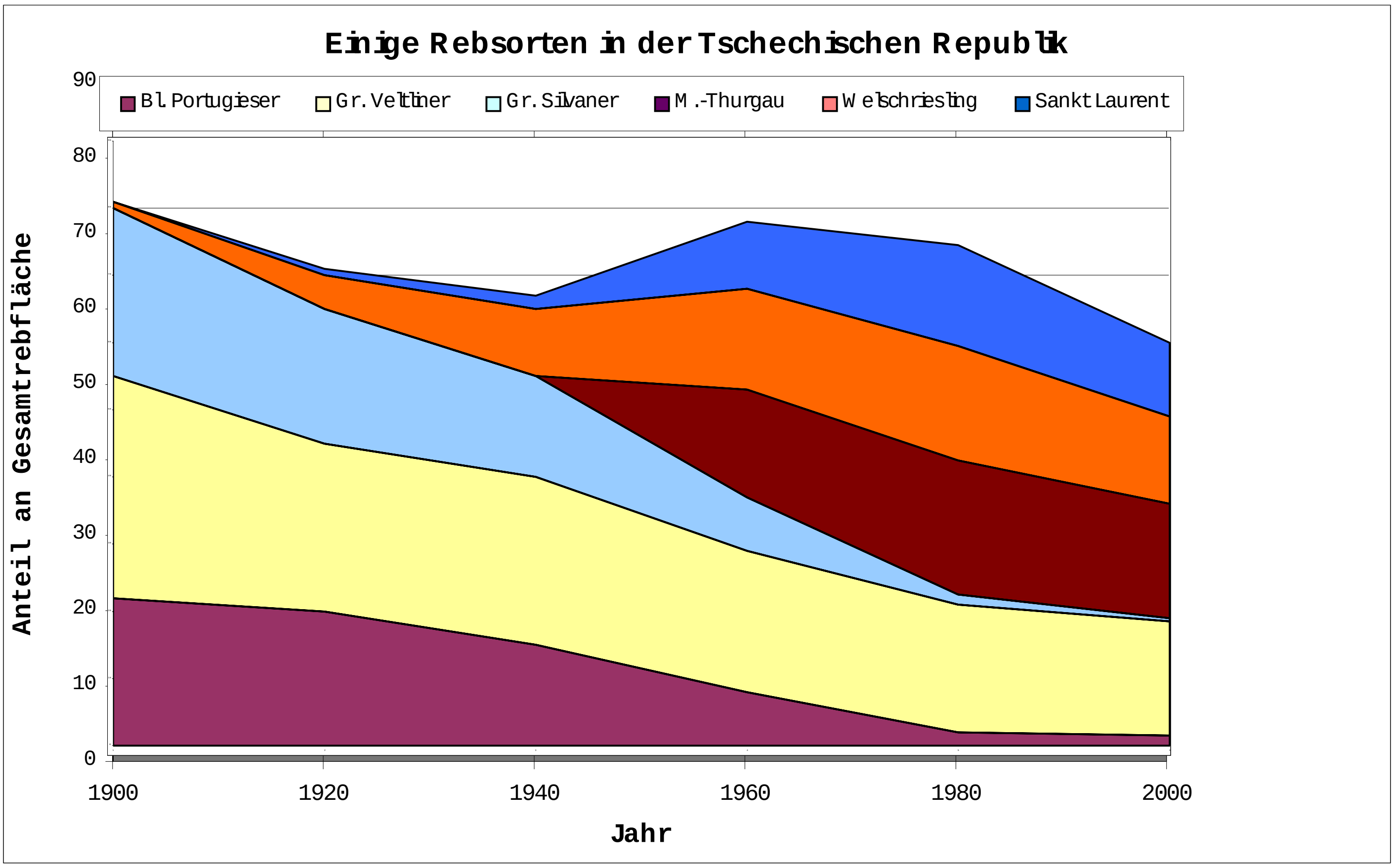

Organic Viticulture in the Czech Republic

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On the March, the border river between the Czech Republic, Slovakia and Austria, viticulture has been practised for at least 2,800 years, and one can say that for 2,700 years wine had been produced organically. This means that only during the last century viticulture was not ecological.

Since 1991 organic viticulture has been practised again in the Czech Republic. The area under organic management is, however, very small. Originally organic viticulture was promoted by the association „Altervin“, which has now become part of the Czech organic producer association „Pro Bio“. In 1999 the organically managed area amounted to 25 hectares; (=0.2 % of all vineyards). The organic vineyards are planted almost exclusively with interspecific hybrids.

The resistant varieties have not yet been included into the official variety list. There is, however, a state programme testing varieties, among them four interspecific hybrids, which will be included into that list by 2001.

As a consequence of this a quick increase in the area under organic management may be expected, even though according to the Czech wine law only table wine may be produced from these grapes. We expect, however, that according to EU regulation 1493/99 from the year 2004 onward it will also be allowed to produce quality wine from interspecific hybrids.

In the Czech Republic we expect a shift of the grape varieties into two directions: The aspects of wine quality and ecology will both gain equally in importance. History has shown that every new production method needs its own grapes. This applies to the introduction to chemical viticulture, to developments in the wine making process and to the present ecology movement.

The development of grape varieties in the Czech Republic is shown in the graph attached. It can be seen that the formerly important varieties „Blauer Portugieser“ and „Grüner Silvaner“ have lost importance totally. In the past years the traditional varieties „Grüner Veltiner“ and „Welschriesling“ have also decreased in importance. On the other hand the new varieties of the genus „vitis vinifera“ account for almost 25 % of the vineyards today, even though they were only established within the past 100 years. Also the variety of „St. Laurent“, the most common red grape variety in the Czech Republic, has existed for more than 200 years, but it was only introduced 100 years ago.

From our perspective the interspecific hybrids have a high potential, especially as regards organic viticulture. These varieties need less than three treatments per year, which is interesting mainly because copper will be forbidden in the future. The varieties which are available today cannot all be called totally resistant against all diseases - there are often problems with „botrytis cinera“, here resistance is hardly higher than in conventional varieties.

It will, however, be possible to solve this problem by further breeding efforts. Wine quality will not be affected.

Organic wine is presently mainly marketed directly to the consumer. For inspection and certification there is only one body, catering for all organic farms: KEZ. KEZ is a non profit organisation which also controls organic viticulture.

Addresses

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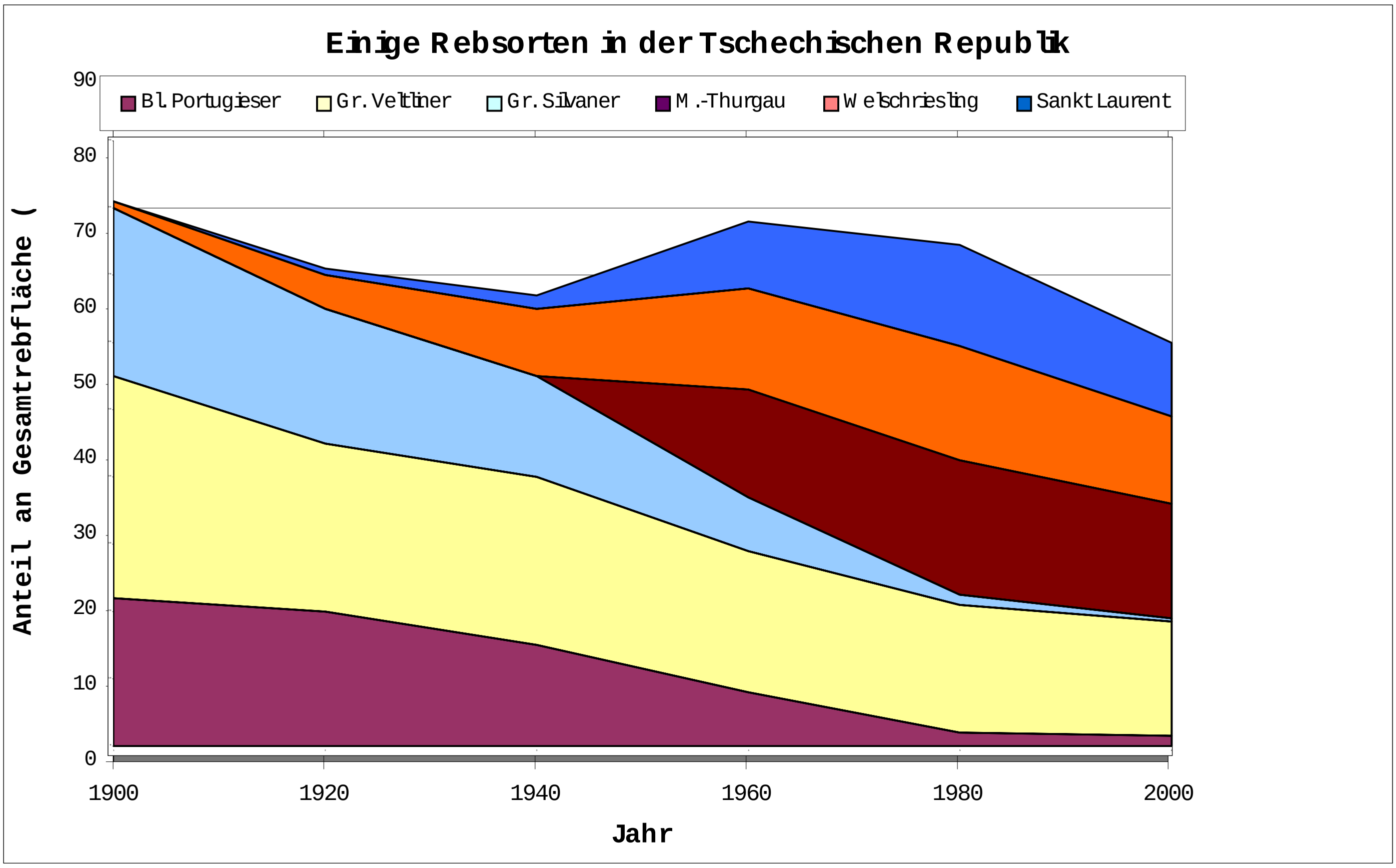
Figure 1: Some grape varieties grown in the Czech Republic

Anteil and der Rebgesamtfläche = Share of the total viticulture area, *Jahr* = Year



Organic Viticulture in France

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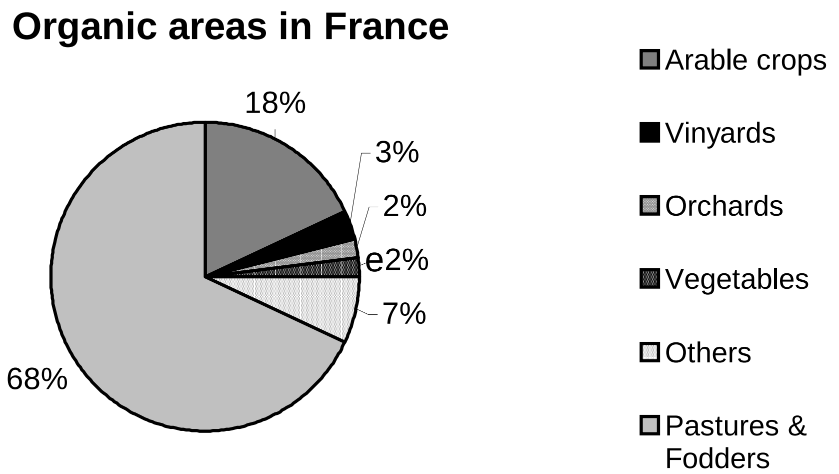
At the end of 1999, **French organic vineyards represented 948 wine farms and 10 213 hectares**, that is to say 3% of total organic and conversion area in France.



Three regions represent more than 70% of total area: Languedoc-Roussillon with 2 759 hectares (+30% in 1999), Provence-Alpes-Côte d'Azur with 2 614 hectares (+51%) and Aquitaine with 1 607 hectares (+2% in 1999).

Table 1. Distribution of organic vineyards

Regions	Number of wine-farm	Vineyard areas (ha)				Farm area average (ha)
		Organic	Conversion	Total	98/99	
Alsace	31	47	220	**267**	+128%	8.6
Aquitaine	149	1 214	394	**1 607**	+2%	10.8
Auvergne	7	9	4	**12**	+5%	2.4
Bourgogne	37	164	134	**298**	+30%	8
Centre	42	233	156	**389**	+21%	9.3
Champagne	13	47	5	**53**	+24%	4
Corse	5	43	64	**107**	+22%	21.4
Franche-Comté	14	21	77	**98**	+230%	7
Languedoc-Roussillon	190	1 547	1 212	**2 759**	+30%	14.5
Midi-Pyrénées	68	82	104	**186**	+90%	2.7
Pays de Loire	52	205	412	**616**	+55%	11.8

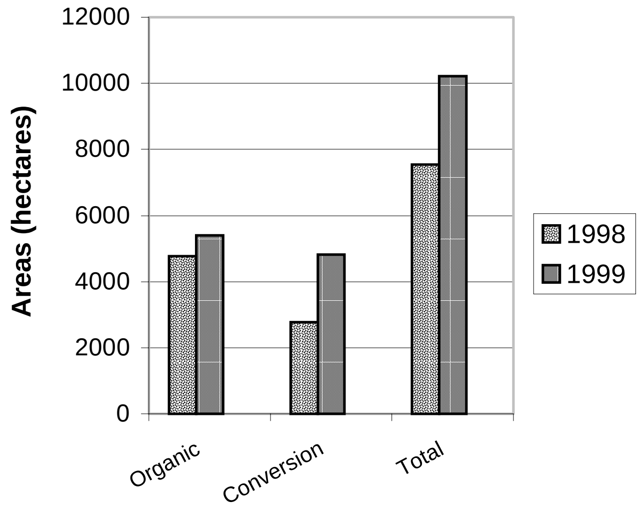
Poitou-Charentes	67	199	350	**549**	+81%	8.2
Provence-Alpes Côte d'Azur	179	1 203	1 411	**2 614**	+51%	14.6
Rhônes-Alpes	88	378	269	**647**	+40%	7.35
France	**948**	**5 395**	**4 817**	**10 213**	**35%**	**10.8**

The total organic vineyards areas increased by 35% in 1999. Conversion areas are the boosters of this growth with +74% in 1999.

From this results a doubling of the organic wine production may be expected for 2002

	1998	1999	98/99
Organic	4 765	5 395	13%
Conversion	2 773	4 818	74%
Total	7 538	10 213	35%

Organic and conversion vineyards areas



Source : Observatoire National de l'Agriculture Biologique –Résultats 1999-

Addresses

- **ITAB** (Institut Technique de l'Agriculture Biologique), Monique Jonis, 149 rue de Bercy, F-75 595 Paris cedex 12, Tél. +33-1-40 04 50 64, Fax : +33-1 40 04 50 66, E-mail : itab@itab.asso.fr
- **FNIVAB** (Fédération Nationale Interprofessionnelle des Vins de l'Agriculture Biologique), Mas de Saporta, F-34 970 Lattes, Tél.: +33-4 67 92 25 02, Fax : +33-4 67 06 55 75
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Organic Viticulture in Italy

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Statistical Data

The fast development of organic agriculture in Italy in recent years makes an up-to-date and reliable evaluation of the organic wine sector difficult. However, on the basis of the data presently available (August 2000) we think we are not too far away from the truth if we say there are 9,000 to 11,0000 organic farms with vineyards, the land area (organic and in conversion) oscillating around 48,000 and 54,000 hectares.
These data show an enormous development considering that in 1993 there were only 857 organic / in conversion farms with vines (2,998 ha) whereas in 1998 there were 5,343 (with 19,844 ha).
In 1998 viticulture took place five in importance in organic land use patterns (after forage/pasture, grains/cereals, fruit/vegetables, and olives): 3,6 % of the land managed by organic farms were vineyards. The most specialised region in terms of importance of viticulture is Abruzzo, which, however, is lagging behind considerably in the development of the organic sector compared to the other regions. The organic vineyards in Sicily, on the other hand, represent 45 % of all organic vineyards in Italy, whereas one other region, Marche, is also highly specialised in organic viticulture. Here exist many processors that are well positioned in the market: Moncaro for its "Verdicchio" (province of Ancona) and Aurora for "Rosso Piceno" (province of Ascoli). In Tuscany the importance of organic viticulture compared to conventional viticulture is not so high, even though it is above the Italian average. This indicates that the natural disposition of the Tuscan hills for viticulture is also reflected in the organic sector, which, however, cannot compete with conventional viticulture. Other regions, where the development of organic agriculture is lagging behind that of Italy in general, are also strongly specialised in organic viticulture like Veneto and Friuli, even if the importance of organic viticulture is not as high as that of conventional viticulture.
Here the farms are small, and the size of their vineyards ranges between 4 and 4,5 hectares. Most of these farms have mixed production (for example orchards and vines; vines and animal husbandry, etc.), and they often do not make the wine themselves but bring the grapes to co-operative wineries.

Development

The main reason for the fast development of organic viticulture is due to the fact, that many Italian regions chose to apply EU regulation 2078/92 which grants subsidies for farms. These subsidies range from 600 to 900 Euro per hectare and year for vineyards managed according to the rules laid down in EU-regulation 2092/91. The organic option was chosen by many wine growers because in many regions they can cope with the diseases relatively easily and because of the low incomes in conventional viticulture at that time (mid 1990s).

Marketing

Unfortunately, the particular economic conditions of organic viticulture and the dynamic development of the wine sector in general, especially that of the red DOC wines, result in the fact that only 25 % of the organic wines are marketed as organic. 55 to 65 % of the wines which are marketed as organic wines are exported.

Certification

The Italian inspection bodies are now waiting for an appendix to the EU regulation 2092/91 regulating vinification according to the organic methods. Even though they have good co-ordination compared to some years ago, they propose different rules in regard to:

- Permitted form of sulphur dioxide (e.g. gaseous sulphur dioxide in liquid solution, sulphite salts, etc.)
- Permitted acids: e.g. citric acid, tartaric acid, ascorbic acid
- Quantities of total sulphur dioxide and of free sulphur dioxide permitted (between 60 and 80 ppm total sulphur dioxide and between 10 and 25 ppm of free sulphur dioxide)

Challenges

Presently the most important challenges in organic viticulture are:

- Lowering of copper levels in the coldest and most humid areas of northern Italy (through in research, but also through active information of farmers and on-farm experiments)
- The dissemination of agricultural practices against erosion in the vineyards of the hilly Mediterranean zones (green manuring in alternating rows with legumes, temporary green cover crops, cover crops in the rows, total green cover cropping of the whole vineyard).
- In regard to processing and marketing, we expect an increase of visibility and credibility of the whole sector, including the production of some “great wines”. Especially organic red wines can compete with conventional wines. They can convince sommeliers and the public not only because of health reasons, but also because of their high quality which reaches generally accepted standards.

Important Addresses

- Fiao Federazione Italiana Agricoltura Organica, Via Orfeo 30, 40124 Bologna, Tel. +39-051-296.01.64, fax +39-51/291.86.89, E-mail: fiao@greenplanet.net
- GRAB – IT c/o Raffaele Zanoli – DIBIAGA – via Brecce Bianche – 60131 Ancona – zanoli@agrecon.unian.it
- IFOAM ITALIA c/o Centro e Divulgazione per l’Agricoltura biologica – loc. Grave 33097 Spilimbergo (Pn)
- Gruppo di Ricerca sul Rame segr. c/o Cristina Micheloni c.micheloni@aiab.it - tel./fax ++39 0432800371

Organic Viticulture in Georgia

Tamaz Tourmanidze

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The Republic of Georgia is situated in the Caucasus, at the Black Sea coast. It is a mountainous country with a vertical distribution of the land. Subtropical climate, fertile soils and old traditions of agriculture promote a high level and diversity of agricultural production – vine, orchards, tea, citrus, wheat, maize and cattle breeding. South Eastern Georgia is one of the origin centres of wheat, vine and some other plants. Georgian vines, fruit and some other crops have a high potential for producing competitive export products.

Now, in the transition period of Georgian economy, agriculture fell into crisis – shortage of machinery, fuel, fertilisers and other necessary materials and tools hinder agricultural development. The population of Georgia has a serious shortage of food.

In this situation the significance of agro-ecological research rose, which can find the shortest and cheapest way and methods for improving agriculture.

Viticulture in Georgia has an ancient history. Diversity of natural resources and numerous original varieties determine a high quality and diversity of vine types. There are more then 400 original grape varieties and a number of dry, half sweet, naturally sweet and sparkling wines, produced from these varieties.

During the last two centuries Georgian vine production was oriented towards the Russian market where demand was enormous. The vineyards were treated intensively with agro-chemicals – fertilisers and pesticides. As a result of the use of these technologies for vine growing, the soil and groundwater under vineyards are compacted and contaminated by nitrates, heavy metals and pesticides (Fig. 1).

There are old traditions of research on vine ecology in Georgia. Investigations are mainly done on soil and climate conditions for vine growing and wine making. In our investigation special attention was paid to the quantitative estimations on climate and soil moisture influence on the bio-physiological processes going on in vine plants as well as on a vineyard (Fig. 2). Also heat and water requirements of the vine and influence of solar radiation, heat balance and precipitation supply on grape yield and wine quality was investigated. Research was also done on irrigation norms, nitrogen requirements and potential bioproductivity of vineyards, according the agro-climatic resources.

The Georgian Agro-ecological Society in co-operation with Biological Farmers Association of the Georgian Greens and some Governmental bodies are trying to develop organic viticulture in Georgia.

The introduction of the organic farming system in Georgia is now in its early stage, and the organic farmers association “Elkana” promotes the establishment of ecological farms, but the creation process of new ecological farms is very slow. The Georgian Agro-ecological Society and the organic farmers association try to organise training, workshops, scientific conferences, etc for young farmers.

The organic agriculture movement in Georgia started in 1991-92. In 1992 the first 0.5 hectare vineyard was planted with resistant varieties (Save Willard hybrids) at the experimental organic farm of the Agro-ecological Research Centre.

In 1994-95 several small organic vine growing farms were established (total area about 100 ha) but they are not yet certified.

The Georgian Agroecological Society (GAS) and the biofarmers Association “Elkana” are trying to convert more and more vineyards into organic. In 1999 GAS organised a new organic wine farm on 13 ha (Vartsikhe). We are working with the Georgian Wine and Spirits Company (GWS). We hope we will have success in converting their vineyards (500 ha) to organic production.

Certain attention is paid to the organisation of the control of vine products. The Georgian Agriecological Research Institute tries to organise a monitoring system on soil and water pollution with pesticides, nitrates and heavy metals, but the scale of these works is not enough because of technical and financial problems (Tab. 1).

The main goal of this program is to carry out a quality control of vine products at the town markets, and products containing toxic agents more than it is allowed, are prohibited for sale.

As a result of the above mentioned, the Georgian Agriecological Research Institute, the biofarmers association “ELKANA” and the Georgian Agriecological Society approved a National Action plan for the development of organic agriculture in Georgia.

Last year we made a general concept and basic standards for organic agriculture. So the action plan is the next step on the way for developing organic agriculture in Georgia.

The plan supports the following organisations and groups: the Georgian Agriecological Society, the Biofarmers association, the Georgian Agriecological Research Institute and the Georgian Academy of Agricultural Sciences, the Ministry of Agriculture and Food Production and the Ministry of Environmental Protection of Georgia.

We discussed this plan with the Georgian Government and international organisations, who are responsible for development of organic agriculture over Central and Eastern Europe (UNDP, IFOAM, AVALON).

The national action plan has the following goals:

- To stimulate co-operation within the agroecological movement in Georgia.
- To expand the network of financial and technical supports of organic agriculture.

- To learn and critically analyse the present situation and to develop an optimal strategy for the development of ecological agriculture from the 2000 year on
- To gain better access to funds of governments and funding organisations.
- Conservation of the environment and biodiversity.
- Food safety.
- Agricultural export.
- Stabilisation of markets.
- Good income for organic farmers.

In order to achieve our goals we need the following instruments:

- Organisation of ecological (organic demonstration) farms in different geographical regions of Georgia for training, research and extension.
- To develop the basic standards and main principles of organic farming and research.
- To develop education and training programs, guidelines, hand-books, booklets and other papers for farmers students and other interested people.
- To develop norms and methods for wine quality control and certification.
- To develop the marketing systems for organic products.

The main weaknesses of agricultural production in Georgia today are as follows:

- The farmers and other village people have no money to manage the land in the next years.
- More then 50% of the agricultural land in Georgia is eroded, compacted and polluted by chemical fertilisers and pesticides.
- Farmers and other village people have not mini tractors and other equipment (tools) for their small vineyards and gardens.
- Shortage of experience and information in the Georgian Language on organic viticulture.
- Weak contacts with other non-governmental and governmental organisations and local municipalities (shortage of fuel and communication).
- Difficulties in financial and technical support from international organisations, Government and individual donors.

GAS and “ELKANA” work in contact with Agriecological Research Institute and other research institutes and universities. So they have the opportunity to develop scientific and education programs of organic farming on a high professional level.

In 1991 GAS founded the first ecological (organic) demonstration farm in Georgia. Today we have 8 years of experience with research and farming for organic viticulture. The point of our activities is to develop a network of organic demonstration-research farms in Georgia. These farms could be used for training as well. The main results of this part of our activity would be: promotion of organic farming ideas, development of research programs, training of the local farmers and others interested.

The next step in our activities is to establish a food safety control and a certification system for vine; to develop education and training programs, preparing handbooks, guidelines, booklets and brochures for students, farmers and interested people.

Addresses

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Table 1. Ecological Monitoring System for Production

	Monitoring Components	Levels of organic matter structure				
		1	2	3	4	5
Biotic System of Vineyards	**Ontogenetic development of vine**	0110	1110	0110	0010	0010
	Vine productivity elements	1110	1110	1110	0110	0010
	Grape quality control	0110	1110	1100	0110	0010
	Soil fertility control	0110	1110	0000	0000	0000
	Vine diseases and pests control	1111	1111	1110	1110	0110
	Weed control	1111	1111	1110	1110	0110
Abitiotic Systrm of Vineyards	Soil, water and grape pollution control by:					
	Pesticides	0110	0110	1010	0010	0010
	Nitrates	0110	0110	0110	0010	0010
	Heavy metals	1110	1010	1010	0010	0010
	Sulphur	1110	1110	1010	0010	0010
	Traces of vines pollution in past times	0110	0110	1010	0010	0010
	Spontaneous damages monitoring:					
	Frost damage	1101	1101	1101	1110	1110
	Hail damage	1101	1101	1101	1110	1110
	Heat damage	1101	1101	1101	1110	1110
	Wind damage	1101	1101	1101	1110	1110
	Drought damage	1101	1101	1101	1110	1110
	Soil Characteristics Control:					
	S.compacting control	0110	0110	0110	0000	0000
	S.erosion control	1100	1100	1100	0000	0000
	S.moisture control	0110	0110	0110	0110	0110
	S.salinity control	0110	0110	0110	0000	0000

Levels of organic matter structure
1. – Agrocenose (vineyard)
2. – Vine plant
3. – Parts of vine plant (leaves, roots ect)
4. – Tissue of vine plant
5. – Cell of vine tissue

Table 2. Ecological damages coming from vine production and the mitigation strategy in Georgian viticulture

Ecological demises	Mitigation strategies
1. CO_2 and other greenhouse gases 1.1. From cars and tractors 1.1.1. Soil tillage 1.1.2. Transporting pesticides and fertilisers 1.1.3. Transporting grapes using material and vines 1.1.4. Cultivated soil on vineyards 1.2. Wine factories 1.2.1. Burning the fuel 1.2.2. Burning SO_2 2. Air, soil and water pollution 2.1. From mineral fertilisers 2.1.1. Evaporating nitrogen from fertilisers stores, during transportation and using 2.1.2. Nitrogen leaching by precipitation and irrigation waters 2.1.3. Soil and water contamination with heavy metals 2.2. From pesticides 2.2.1. Air, soil and water pollution by insecticides and fungicides 2.2.2. Soil and water pollution with herbicides 3. Water pollution by the wine factories with polluted waters	1. CO2 emissions reduction Reducing fuel by cars and tractors by reducing: • soil tillage • transporting products and materials • use of plant fuel (rape seed oil) • control of erosion processes • no burning of the rests of wine production 2. Reducing the use of mineral fertilisers and development of organic fertilisers – manure, composts and other 3. Reducing the use of synthetic pesticides and development of organic methods of pest and disease management 4. Better distribution of vineyards and wine factories, according to the climatic and soil conditions, orography etc. 5. Using resistant varieties for disease control and other natural damages

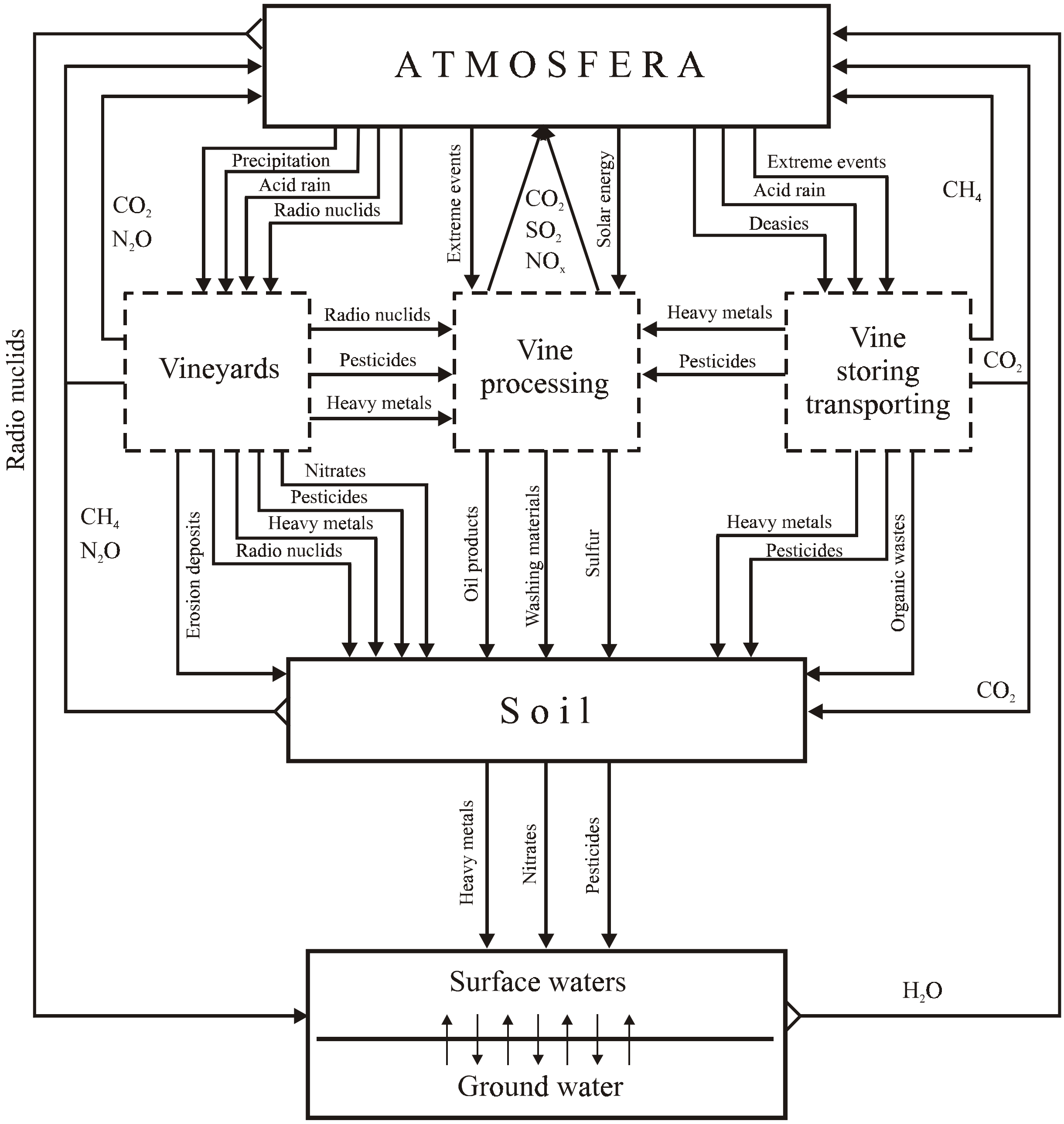

Fig. 1. Enterrelationshep between environment and vineyards

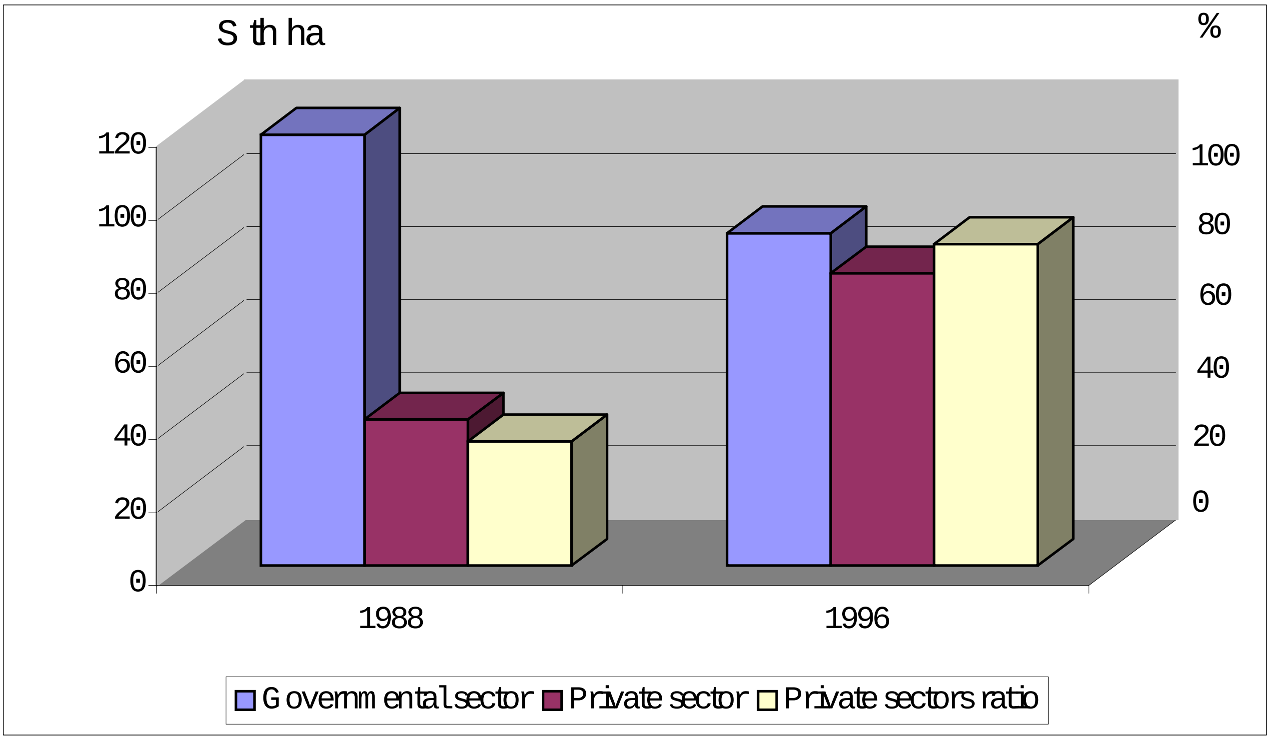

Figure 2. Changes in vineyards structure in Georgia before (1988) and after the land reform (1996).

Ökologischer Weinbau in Deutschland

Paulin Köpfer[1] *und Eva Gehr*[2]

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Rückblick

Erste Pioniere machten in den 70er Jahren große Anstrengungen in der Umsetzung der biologischen Grundregeln aus der Landwirtschaft im Weinbau. Als erster Schritt, die Deklaration zu ermöglichen, haben in den Jahren 1983 - 85 die damals ökologisch arbeitenden WinzerInnen aus allen deutschen Weinbauregionen die ersten Erzeugungsrichtlinien für ökologischen Weinbau erarbeitet. Als berufsständische Organisation und Interessensvertretung formierte sich 1985 der ECOVIN-Bundesverband ökologischer Weinbau, als ein Anbauverband, der sich speziell auf den biologischen Rebbau ausrichtete. Auf Basis der Weinbau-Richtlinien konnte dann die Deklaration auf dem Weinetikett mit einem Warenzeichen der Verbände des ökologischen Landbaues erfolgen, wie z.B. "Bioland", "Naturland" und ab 1990 "ECOVIN", als Warenzeichen des Bundesverbandes ökologischer Weinbau.

Seit 1995 auf Basis der EG-VO 2092/91 ist die explizite Deklaration "aus ökologischem Weinbau" zulässig.

Die Verbände haben sich mit Erfolg für die Beratung der Weinbaubetriebe eingesetzt, sie haben darüber hinaus erreicht, dass sich mittlerweile unzählige Forschungseinrichtungen den unterschiedlichsten Fragen des Öko-Rebbaues widmen.

Der ökologische Weinbau hat in den vergangenen Jahren vor allem auch einen deutlichen Innovationsschub im gesamten Weinbau ausgelöst. Viele der Verfahren, die im ökologischen Weinbau entwickelt wurden, werden mittlerweile auch bei vielen konventionellen Winzern wie selbstverständlich angewendet.

Speziell der ECOVIN-Bundesverband hat sich seit Einführung des Warenzeichens mit großem Erfolg verstärkt der Verbraucherinformation, der Presse- und Öffentlichkeit und anderen Vermarktungsaktivitäten zugewandt, um die Mitgliedsbetriebe in ihrer Vermarktung zu unterstützen.

Ökologischer Weinbau in Deutschland heute

Die von AGÖL-Mitgliedsbetrieben bewirtschafteten Rebflächen belaufen sich heute auf 1349 ha (ca. 1,5% der deutschen Rebfläche), die jährliche Erzeugung macht mit ca. 8 Mio. Liter etwa 1 % der deutschen Weinerzeugung aus. Zwei Drittel der Öko-Winzer in Deutschland sind Mitglied im ECOVIN-Bundesverband (Tabelle 1).

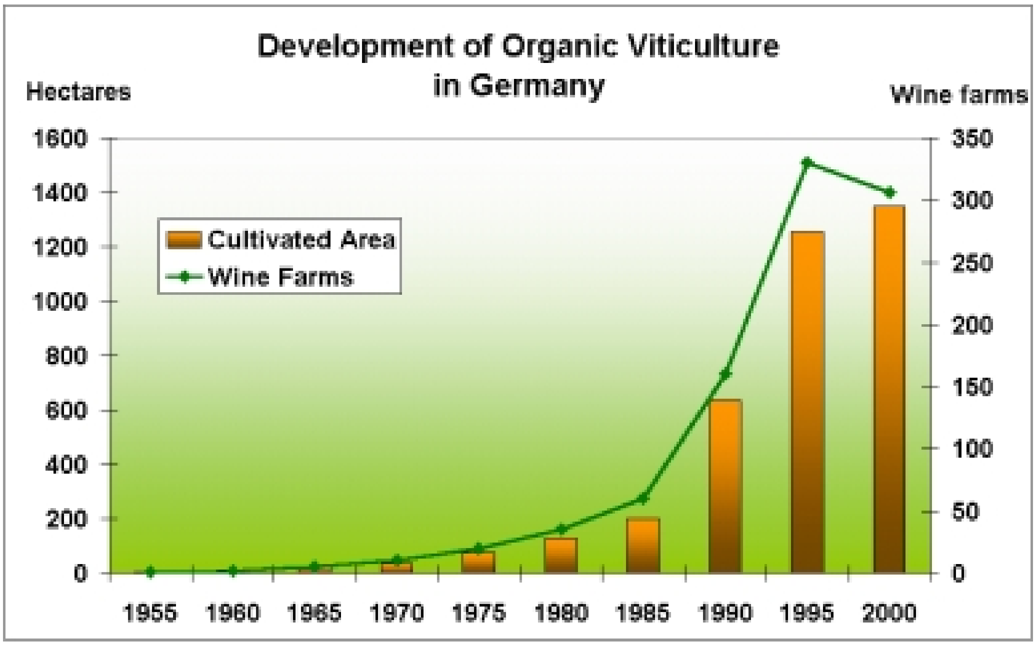
Nach fast exponentiellem Wachstum zu Anfang der 90er Jahre, stagniert derzeit die weitere Ausweitung des ökologischen Weinbaues: leichter Rückgang bei den Betriebszahlen (-4 %), leichter Zuwachs bei den Flächen (+3 %).

Tabelle 1: Ökologischer Weinbau in Deutschland, 31.12.1999

Verband	Betriebe	Fläche (ha)
ECO VIN	195	864
Bioland	67	275
Naturland	19	108
Wein aus demeter Trauben	23	91
Gäa Ökologischer Landbau	2	11
Gesamt	**306**	**1349**

Quelle / Zusammenstellung: Eva Gehr, Stiftung Ökologie & Landbau, August 2000

Grafik 1: Entwicklung des ökologischen Weinbaus in Deutschland
Quelle: Uwe Hofmann und Stiftung Ökologie & Landbau;
Zusammenstellung: Eva Gehr, Stiftung Ökologie & Landbau, August 2000



Anbau

Bodenpflege

Das Kennzeichen des ökologischen Weinbaues in Deutschland ist die durchgehend praktizierte aktive Begrünung der Rebbergsböden mit großen Vorteilen für die gesamte Produktion:

(1) Mit der Neueinsaat wird in der Regel der Boden gelockert, die nachfolgende Begrünung stabilisiert das Bodengefüge. Die Vorteile der Strukturstabilisierung sind weitreichend bis hin zur besseren Wasseraufnahme- und Wasserspeicherfähigkeit.
(2) Die aktive Durchwurzelung der Böden fördert das Bodenleben. Die biologische Aktivität ist wichtige Grundlage für die Nährstoffversorgung der Reben. Die Verwendung von Leguminosen trägt darüber hinaus die Stickstoffversorgung. Die Begrünung als echte Grün-"Düngung".
(3) Nur die Begrünung bringt wirkliche Vielfalt in die Monokultur Weinbau. Die Begrünung im Bestand ist wesentliche Grundlage für das stabile Nützlings-Schädlingsgleichgewicht.

Der ökologische Weinbau hat in der Praxis eindeutig bewiesen, dass ohne chemische Stickstoffdüngung mit unterschiedlichen Kombinationen von organischer Düngung sowie Lockerungs- und Begrünungsmaßnahmen die Reben sehr wohl zu ernähren sind. Es wurden insbesondere was das Begrünungsmanagement betrifft sehr viele verschiedene an die jeweiligen Standorte angepasste Verfahren, häufig Kombination von Einzelmaßnahmen, entwickelt, die mit sehr gutem Erfolg praktiziert werden.
Diese Bodenpflege stellt einen hohen Anspruch an die Mechanisierung. Die alternierende Bewirtschaftung der Rebgassen hat sich dies als sehr großer Vorteil erwiesen, zum einen da sich Maßnahmen (z.B. Mulchen in jeder zweiten Zeile, oder Bodenbearbeitung in jeder zweiten) weniger gravierend auswirken auf das gesamte System, zum anderen durch sehr viele verschieden Kombinationsmöglichkeiten viele Feinabstimmungen möglich sind: z.B. Gassen begrünt, Unterstock offen, usw.

Tierische Schädlinge

Hier kommt die Effizienz der biologisch-ökologischen Gesetzmäßigkeiten voll zum Tragen. Das optimale Nützlings-Schädlingsgleichgewicht kann sich einspielen durch

- die aktiven Begrünungsmaßnahmen im Weinberg mit Förderung vielseitigen und blühenden Pflanzenbeständen (Lebens- Schutz- und Nahrungsräume!)
- Anlage und Pflege von Hecken und Feldgehölzen im Weinbergsumfeld

Der Verzicht auf Insektizide ist so problemlos möglich und kann als einer der größten Erfolge des ökologischen Weinbaus betrachtet werden. Glücklicherweise ist gerade hier der konventionelle Anbau dem positiven Beispiel unmittelbar nachgefolgt!
Regional, teils nur lagenweise, ist sicherlich der Traubenwickler nicht zu unterschätzen. Abgesehen davon, dass durch hohe Biodiversität die Schadschwelle des Heu- und Sauerwurms deutlich gesenkt werden kann, stehen hier auch wirksame biologische bzw. biotechnischen Verfahren zur Verfügung: der Einsatz von Antagonisten (bei uns in Deutschland Bacillus thuringiensis) oder die Anwendung des Konfusionsverfahrens mit Pheromonen. Die Ökowinzer geben dabei dem Einsatz von B.T. eindeutigen Vorrang.

Pflanzenkrankheiten

Vielseitiger Pflanzenunterwuchs, reichhaltige Durchwurzelung und harmonische Ernährung der Reben reduzieren physiologische Krankheitserscheinungen (Chlorose und

Stiellähme), das Auftreten von Viruskrankheiten, sowie auch diversen Pilzkrankheiten, u.a. Botryits.
An die Grenzen stöst der ökologische Weinbau in Deutschland beim Anbau der mehltauanfälligen Vinifera-Rebsorten. Nicht weil das Konzept der biologischen Krankheitsvorbeugung falsch wäre, sondern weil hier massiv gegen die Grundregel der richtigen Sortenwahl verstoßen wird (mehr als 90 % der ökologisch bewirtschafteten Anbauflächen sind mit vinifera-Sorten bepflanzt).
Konsequenz: von Mai bis Mitte August ist der deutsche Ökowinzer in großem Masse mit dem Pflanzenschutz befasst. Möglichkeiten der Prognose mittels Erfassung der Klimadaten ist insbesondere in Bezug auf Peronospora weitgehend Standard. Schwachpunkt ist hierbei nach wie vor den Termin der Primärinfektion eindeutig und reell festzulegen.
Neben dem nach wie vor gegebenen hohen Risiko, stellen die häufigen Applikationen, der damit verbunden Arbeitsaufwand, Maschineneinsatz und der vor allem damit einhergehende Befahrdruck der Rebgassen, den größten Nachteil dar. Hier sind dringend Auswege gesucht. Diese Auswege aus der Pilzfrage erhofft der Winzer natürlich auch von der Forschung:

- wirksamere biologische Bekämpfungsmittel oder
- Mobilisierung der Eigenvitalität der Vinifera-Sorten mittels systemisch induzierter Resistenz durch Naturstoffe
- möglicher Einsatz von Pilz-Antagonisten

Pilzresistente Rebsorten

All dies können jedoch nur kurz- und mittelfristige Lösungen darstellen. Die langfristige Lösung kann nur der Anbau resistenter Sorten bedeuten. ECOVIN empfiehlt den Anbau dieser Sorten in seinen Richtlinien, setzt sich seit Jahren für erleichterte Anbauregelungen ein, und fordert die staatlichen Züchtungseinrichtungen auf, in diesem Gebiet intensiv weiter zu arbeiten.
Die pilztoleranten Sorten wie Regent, Rondo, Johanniter, Bronner, sowie einige weitere, die bisher noch unter ihren Züchtungsnummern laufen, geben viel Hoffnung.

Ökonomie

Das Magische Dreieck Ökologie, Qualität und Ökonomie muss sicherlich ausgeglichen sein. Volkswirtschaftlich ist Ökologischer Weinbau ist in höchstem Masse ökonomisch. Nur wird dies den Ökowinzern nicht leistungsgerecht honoriert.
Betriebswirtschaftlich relevant sind nur zum geringsten Teil Mehrkosten, die auf Mehraufwand in der Produktion zurückgehen. Es sind vielmehr die durchschnittlich 15 - 20 % geringeren Erträgen, die zu einem erheblichen Anstieg der Stückkosten führen. Pro Liter Öko-Wein fallen damit im Vergleich zum konventionellen ca. 30 % höhere Kosten an.

Die Förderprogramme (im wesentlichen aus den flankierenden Maßnahmen der EU-Agrarreform) wie MEKA in Baden-Württemberg, FUL in Rheinland-Pfalz usw. (je nach Bundesland zwischen 1000 - max. 1500.- DM/ha) können diese Mehrkosten nur zu einem sehr geringen Teil decken. Insbesondere ist die für den Vergleich entscheidende Differenz zwischen der Förderung der "guten weinbaulichen Praxis" und dem Fördersatz für ökologischen Anbau viel zu gering.

Gerade auf Grund der aufgezeigten Mehrkosten in der Produktion müssen in der Vermarktung höhere Erlöse erzielt, d.h. höhere Weinpreise realisiert werden.
Wo liegen hier die Vorteile und Chancen der Ökowinzer?

- Geringere Mengeerzeugung ist immer qualitätsfördernd: in den Ökobetrieben ist so der Prädikatsweinanteil höher und damit das Potential für höheren Flaschenpreis gegeben.
- Im Sinne eines "total-quality"-Denkens schafft nicht nur die Qualität im Glase das spezifische Bild beim Kunden. Neben einigen weiteren Aspekten ist eben auch die Qualität der Erzeugung, die Ökologische Qualität ein nicht wegzudenkender Faktor. Das Argument "aus ökologischem Anbau" spielt daher bei Kaufentscheidungen eine nicht unwichtige Rolle.
- Monetär schwerer erfassbar, dennoch nicht unterschätzbar, ist der Imagegewinn der innovativen, ökologisch engagierten Betriebe sowie ein Plus beim Vertrauen zum Wein von Seiten des Weinkonsumenten.
- Deutschland selbst ist einer der besten Märkte für Weine aus ökologischem Anbau. Das ist einerseits eine Chance, andererseits sind gute Märkte immer sehr stark umkämpft.

Adressen

ArbeitsGemeinschaft Ökologischer Landbau (AGÖL), Brandschneise 1, D-64295 Darmstadt, Tel. 0049-6155-2081, Fax 0049-6155-2083, E-Mail: AGOEL@t-online.de Internet: http://www.agoel.de

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Organic Viticulture in Germany

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Retrospect

In the 1970s the first pioneers made great efforts to apply the basic principles of organic agriculture to viticulture. In the years 1983 to 1985 the organic wine growers from all German wine producing regions decided on the first standards for organic viticulture. This was a first step towards facilitating the declaration "organic wine" on the label. In 1985 the Bundesverband ökologischer Weinbau (Federation Organic Viticulture), now Ecovin, gathering producers specialising in organic viticulture, was established in order to defend the interests of the organic wine growers.
The standards for organic viticulture were the basis for the declaration of the ecological production method via the trademark of the producer associations, like "Bioland", "Naturland" and "Ecovin" (the trademark of the Bundesverband ökologischer Weinbau; since 1991).
Since 1995, due to EU-regulation 2092/91, the explicit declaration "from organic viticulture" is permitted on the label.
The organic producer associations have successfully lobbied for an advisory service for the organic wine growers, and they were also successful in initiating many research projects at numerous research stations dealing with urgent questions related to organic viticulture.
Organic viticulture has trigged off many innovations in conventional viticulture. Many techniques which were developed by organic viticulture are today applied by conventional wine growers as if they were the most natural thing in the world.
Especially Ecovin has, since the introduction of its trademark, been carrying out successfully consumer information, PR work and other marketing activities, in order to support the marketing of its members.

Organic Viticulture in Germany today

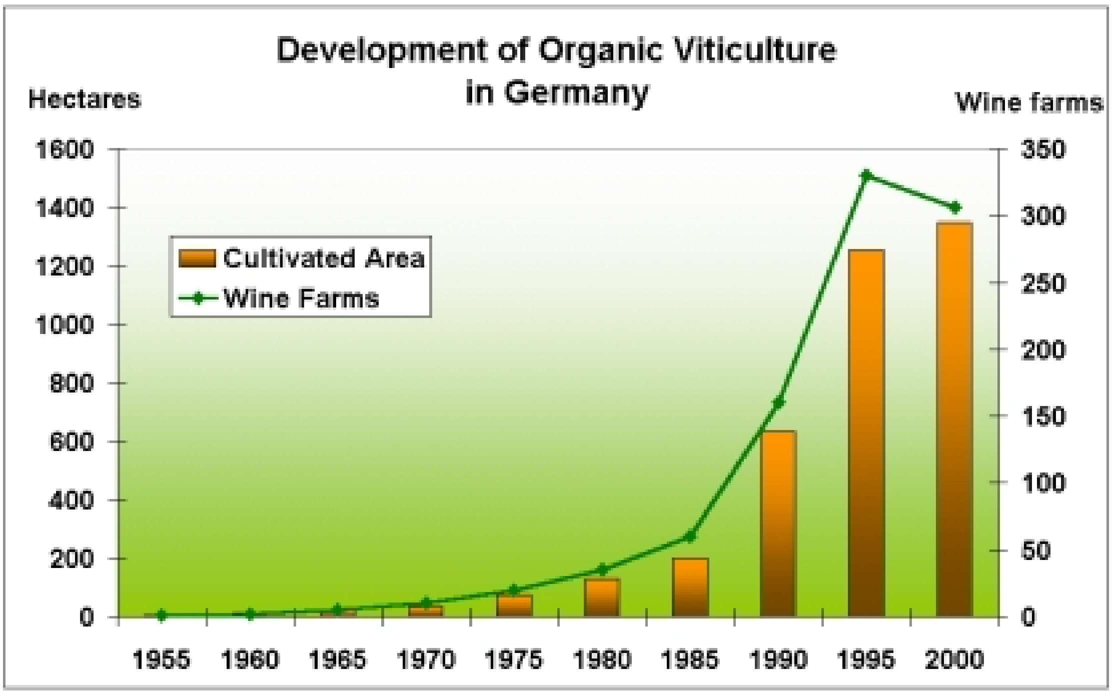
Today 1349 hectares are managed organically by organic wine growers who are associated to one of the nine member associations of AGOEL, the federation of the organic producer associations in Germany.
This constitutes 1.5 % of the total vine area. Annually eight million litres of organic wine are produced; this is about 1 % of Germany's total wine production. Two thirds of the organic wine growers are members of Ecovin (Table 1).

Table 1: Organic Viticulture in Germany, 31.12.1999

Association	Farms	Land area (ha)
ECO VIN	195	864
Bioland	67	275
Naturland	19	108
Wein aus demeter Trauben	23	91
Gäa ÖKOLOGISCHER LANDBAU	2	11
Gesamt	306	1349

Source / compiled by: Eva Gehr, Stiftung Ökologie & Landbau, August 2000

Figure 1: Development of Organic Vitiuculture in Germany
Source: Uwe Hofmann und Stiftung Ökologie & Landbau
Compiled by: Eva Gehr, Stiftung Ökologie & Landbau, August 2000



After an exponential growth at the beginning of the 1990s today there is stagnation: the number of farms went down slightly (-4%), whereas the area slightly increased (+3 %).

Production

Soil Management

The characteristic of organic viticulture in Germany is a mix of permanent green cover crops in the vineyards, which is practised everywhere. Permanent cover crops have major advantages for the whole production system.

1. When the cover crop is sown the soil is generally loosened and the green crops then stabilises the soil structure. The advantages of a stable soil structure are among others an enhanced capability of collecting and storing water.
2. A high root density enhances soil life. Biological activity is an important basis for the nutrient supply of the vines. The use of legumes ensures nitrogen supply.
3. Only a green cover crop can facilitate a real biodiversity in the vineyard. It is an essential basis for a stable balance of predators and pests.

Organic viticulture has clearly proven that the plants can be fed without chemical fertilisers: by using various combinations of organic fertilisers; by loosening the soil; by using a mix of green cover crops. Especially as regards cover crops many different techniques – often combinations of individual techniques, adapted to various locations - are practised successfully.

This type of soil management is very demanding in terms of requirements for machinery. Alternating management of the space between the vine rows has proven to be highly advantageous: on the one hand because certain measures (like mulching or soil management between every second row of vines) have less grave effects on the whole system, and on the other hand because with combination of various measures "fine tuning" is possible (e.g. green cover crops between the vine rows, no cover crops in the rows).

Animal pests

As regards animal pests the efficiency of the application of ecological principles is fully exploited. The optimum balance between pest and predators can be enhanced through:

- Use of a mix of green cover crops in the vineyard with the promotion of a high diversity of flowering plants (as habitats and as feeding bases for predators)
- Instalment and care for hedges and other habitats in the vicinity of the vineyard.

Thus the renunciation of insecticides in organic viticulture is possible. This represents one of the biggest successes of organic viticulture. Luckily, especially in this field conventional farming has followed on.

On a regional level the grape berry moth must not be underestimated, but because of the high biodiversity it has been possible to reduce the threshold of the first and second generation. Also available are effective antagonists (like *bacillus thuringiensis*, BT) and confusion by pheromones. The organic wine growers prefer, however, BT.

Diseases

A mix of green cover crops, a high root density, and the harmonious nutrition of the vines reduce diseases like chlorosis and stem dieback, virus diseases and several fungus diseases like botrytis.

A special challenge to organic viticulture are the vinifera varieties which are highly susceptible to downy and to powdery mildew. This fact does not prove that the concept of

organic viticulture is wrong; it rather shows that the basic rule of the right choice of varieties is being neglected (more than 90 % of the organic vineyards are planted with vinifera varieties). As a result the German organic wine grower is very busy with plant protection measures all summer long. Using climatic data for prognoses has become a standard. A weak point is, however, that the date of the primary infection of downy mildew still cannot be determined for sure.
Apart from the high risks the biggest disadvantages are the high number of applications, the high labour and machinery input and soil compaction between the vine rows. Solutions are urgently needed. Therefor the wine growers are, of course also hoping for research results on the following themes:

- Efficient biological pest control agents
- Mobilisation of the intrinsic vitality of the vinifera varieties via systemically induced resistance through natural agents
- Use of fungal antagonists

Fungus resistant varieties

All of these measures can, however, only be short or medium term solutions. The long-term solution can only be resistant varieties. Ecovin recommends the cultivation of these varieties in its standards, and for years it has promoted less rigid laws regulating the cultivation of these varieties. It also presses the state breeding stations to continue intensive work on these varieties. The fungus resistant varieties like Regent, Rondo, Johanniter, Bronner as well as further varieties which so far are only known by their breeding numbers give rise to much hope.

Economical Aspects

The magic triangle “ecology, quality and economy“ must certainly be balanced. On a macroeconomic level organic viticulture is certainly highly economical. The organic wine growers are, however, not rewarded for their efforts in an adequate way.
On a farm level the higher costs which are due to higher input costs for the cultivation techniques are only to a minor degree economically relevant. Lower yields (15 to 20 % less than in conventional viticulture), however, result in higher costs per unit. Per litre of organic wine the costs are around thirty percent higher than for conventional wine.
The state aid programmes (mainly under the EU’s agri-environment programmes like MEKA in the federal state of Baden-Württemberg and FUL in Rhineland-Palatinate; depending on the federal state between around 500 and 750 Euro per hectare and year) can cover these extra costs only to a small degree. The differentiation between the subsidies for integrated and organic farming is far too small, and the incentive for wine growers to convert is not high enough.
Especially because of the higher costs due to the production system higher prices must be obtained when marketing the products.
What are the chances and advantages for organic wine growers?

- Lower quantities always have a positive effect on quality. In organic viticulture the proportion of high quality wine is higher and therefor also the potential for a higher price per bottle.
- Quality is not restricted to the end product in the wine glass. For many customers – apart from many aspects – the fact that a wine was organically grown plays an important role when buying wine.

- Only hard to grasp in monetary terms but not to be underestimated is the positive image of the innovative, ecologically committed farms as well as a higher trust in their wines by the consumers.
- Germany is one of the biggest and best markets for organic wine. On the one hand this is an opportunity, on the other hand, however, big markets are always very competitive.

Addresses

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Association of most of the German organic wine producers

Organic Viticulture in Greece

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History

The roots of organic agriculture can be traced back to the 1970s: environmental problems such as industrial and urban pollution (smog in Athens) give rise to a growing concern for the quality of living. During the early 1980s this environmental movement tends to focus on specific topics, one of them being organic agriculture and sometimes a "back to the land" wave: motivated growers start applying organic agriculture on a small scale.

On the other hand traditional farmers have been using a cultivation style with low or not at all chemical inputs. In 1981 a project of organic currants started in Aegion – north Peloponnese triggered by foreign (Dutch) counterparts. This project united traditional vine (currant) growers who re-introduced fertilization with animal manure while keeping on their simple treatments with sulphur and –sometimes- copper. This was the first example of successful organic farming on a professional level.

Some years later, organic olive growing which has expanded with quite strong dynamics, as well as the implementation of EC Regulation 2092/91 made o.a. well known to a broader public of farmers, traders etc. This is the time when wine producing farms and estates start converting to organics : in northern Greece (Naoussa- variety Xinomavro), in Peloponnese (Tripoli- variety Moschofilero), in Ionian and Aegean islands etc.

Soon after that, big wine firms (such as Tsantalis, Boutaris, etc) show their interest and start conversion trials in some of their vineyards.
In 1996 in order to meet a growing demand for cooperation and exchange of know-how, a conference of organic viticulture is organized by DIO in Tripolis, with foreign participation.
In the last years organic wine producers have made an outstanding progress in wine making and marketing of their products both in Greece and towards the Mediterranean Europe. Quality of organic wines meets the high standards that have gradually been established in a wider range of wine producers the last ten years.

Organic Viticulture in Greece – the Development

	Year	1981	1991	1994	1995	1996	1997	1998	1999**
Surface/ area	*Currants sultanas*			353	636	924	1.847		
	Fresh grapes			96	230	520	1.423		
	Wine production			318	2.285	4.262	7.947		
	Total	130	300	767	3.151	5.706	17.217	15.660	17.500
In hectares		10,3	30,0	76,0	315,1	570,6	1.721,7	1.566,0	1.750,0
Number of producers		10*	20	50	200	400	750	1.000	1.200

*Estimation done on the assumption that each grower cultivates 1.5 ha on average.
**Estimation, precise data available only from one organization – DIO - giving 1269 ha for 1999.

Grape varieties

Organic wine growers rely mainly on traditional Greek wine varieties such as :

- Aghiorgitiko, Xinomavro etc.(black-red)
- Savatiano, Moschofilero, Asyrtiko, Athiri, Roditis etc (white),

but also strongly outshine the neglected characteristics of those varieties.

The last two decades there has also been an interest in French varieties such as Cabernet-Sauvignon, Merlot, Chardonnay etc, which have been introduced in Greece and are also used in organic growing.

Percentage

Given that the total cultivated area (including fresh and dried grapes) as well as wine varieties is about 130.000 hectares, the organically cultivated section (1.750 hectares) represents 1,3%.

Referring specifically to wine varieties this percentage goes a little bit down to 1,1% (850 out of total 69.500 hectares).

Farm structures

The size of traditional vineyards in Greece is in general quite small: ranging from 0,1 hectare (for home consumption) to 1,0 –2,0 hectares when referring to producers who are cultivating for market purposes.

In the past ten years relatively largest estates of 5-10 hectares have converted to organics. These farms are processing their grapes and usually promote their products in the market in their own.

They also often process the crop of neighboring vineyards.

Small producers usually tend to sell to local private wineries. Sometimes they take advantage of, and work within the framework of a wine cooperative (as in Santorini and Limnos- famous islands of the Aegean).

Marketing

Considering the whole range of vine products, we have:

Currants and raisins are gathered, cleaned, packed and marketed under the schemes of the union of Aeghion cooperatives and Messara (Kriti) Agri-environmental group respectively.
Fresh grapes are sold in organic shops in main cities (Athens, Thessaloniki, etc.). Supermarkets such as the "A-B" chain, have also recently started with an organic sector of fresh fruit and vegetables.
Some products are also sold in the farm while export of fresh produce has not developed yet.
Wine: Bottles of organic wine can be purchased in organic shops, supermarkets, as well as specialized shops for quality wines. A good deal of bottled quality wines is also usually exported mainly to non-Mediterranean European countries. Greek organic wine producers have presented their wines at the BIOFACH exhibition the last years.

Certification

In early years (1981-1992) control was done by foreign inspectors (mainly the Dutch SEC then Skal).
Since 1993 when the official implementation of EC 2092/91 started, control has been undertaken by three Greek organizations, approved for this purpose by the Greek Ministry of Agriculture.
They are :
DIO Inspection and Certification Organization, with a nation wide expansion, controlling about 70% of the bio-growers, the Organization of **SOYE** based in Athens and controlling about 20% and **PHYSIOLOGIKI**, based in Thessaloniki, Northern Greece. They are not organizations dealing especially with the organic wine sector; they deal with all kinds of organic cultivations.

The challenge for the future.

In our opinion the challenge for organic viticulture in Greece is to **grow successfully** without sliding back to a certain **"neo-conventional**" spirit.
What we mean by **growing successfully** is to manage effectively the various -more or less routine -problems of production and marketing.
What we mean by "**neo-conventional**" spirit is a cultivating approach where 2092/91 standards are "just" met but practices and product quality stand somehow apart from original organic spirit and philosophy. This is e.g. illustrated when we consider the wide use of commercially available packed manure or the indiscriminate use of approved plant protection agents.
Now, trying to redefine this "real organic spirit", we could say that concerning the agricultural practices, it would mean:

Soil fertility

To rely as much as possible to

- the recycling of organic matter produced on the vineyard, such as composted cut wood and winery waste or
- locally produced animal manure: a vine grower who is not involved in animal husbandry should look out for cooperation with neighboring sheep and goat shepherds
- suitable green manures: Selected for their adaptation to climate (scarcity of water resources) as well as soil type and cultivation.

Plant protection

Give priority/preference to

- cultural measures such as: proper manual defoliation in order to prevent disease (e.g. mildew) and reduce treatments.
- monitoring tools and techniques such as visual checks, traps and mini meteo stations, so as to properly assess infestation risks by fungi and insects. The goal is to have well timed (that is effective) and less treatments.
- reduction and/or substitution of copper compounds. Fortunately enough wet areas in Greece are limited. Main areas of wine growing such as the Aegean islands and the Peloponnese have not a considerable rainfall in spring and therefore producers practice only a minimum use of copper there. However the problem stands for the more wet areas of northern Greece.

Concerning the "real" organic quality

People have great expectations concerning wine quality. Organic people may have even greater expectations. We shall try to explain that:
Wine has a special characteristic among other foodstuff: It contains alcohol. We know that alcohol is a toxic (dehydrating) substance for human and all living cells. Therefore wine consumption can have negative effects on the organism of the human body (brain, liver etc.) Further it can also affect a human's behavior or in other words destroy the "finer" bodies (vital, ethereal etc.) or even disorientate self consciousness and spiritual balance. This is in brief the reason why wine is often seen with skepticism and it does not raise an enthusiastic support among "esoteric" therefore "health food" and therefore "organic" circles.

On the other hand we are well aware of the fact that a good naturally fermented wine can be a highly valuable concentrate, containing a host of precious molecules and minerals. These have been shown to have a positive effect e.g. in the prevention of cardiovascular disease.

But finally what is the balance between positive and negative effects? Or better how can we improve this balance to produce a really healthy wine? Which factors are crucial and how can they be influenced by proper agricultural practices? And furthermore:
Are these differences limited to a material level (that is to say they can be detected by chemical analysis) or do they extend to a higher energetic level? And in such a case can they be identified or measured?
(The experience of bio-dynamic wine farmers would be valuable in helping to answer these questions).

Addresses

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Ökoweinbau in Ungarn

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Keywords: *Ökoweinbau, Ungarn, Gesetz, Sorten, Möglichkeiten*

Abstract

Wir stellen den ungarischen Weinbau und den Stand des Ökoweinbaus dar sowie die gesetzliche Situation und Veränderungen seit 1995. Außerdem werden die wichtigsten Rebsorten und Weinlagen beschrieben.

Einführung

Beim des 5. Ökoweinbaukongresses in Bad Dürkheim (1995) haben wir Stand und Richtlinien des ungarisches Ökoweinbaus kurz dargestellt. Seither haben wir uns mit Weingesetzen und Verordnungen der Europäischen Union befasst, denn Ungarn ist einer der EU-Beitrittstaaten. Die neuen ungarischen Gesetze richten sich zur Zeit nach den Verordnungen der EU.

Stand des Weinbaus in Ungarn

- Anbaufläche: 131 000 ha
- Zahl der Weinproduzenten: 200 000
- Durchschnittliche Betriebsgröße: 0,655 ha
- Weinbaufläche, die bei der Weinbauverwaltung registriert ist: ca. 70 000 ha. (Dazu gehören Ortschaften mit mehr als 50 ha Weinbaufläche und Flächen ab 500 m^2 Größe).
- Gesamte Produktion: 550 - 650 000 Tonnen Trauben/Jahr und 4,0 - 4,5 Millionen Hektoliter Wein
- Traubenpreise: 25 - 60 Forint/kg bei weißen Sorten; 50 - 150 Forint/kg bei roten Sorten
- Weinpreise: 60 - 150 Forint/Liter bei ab Hof-Verkauf (0,75-Liter-Flasche); im Supermarkt: 250 - 400 Forint; im Weinfachgeschäft: 400 - 1600 Forint; Qualitätswein mit Prädikat: 2000 - 10 000 Forint
- Export (Wein, Weinsaft, Most): 1,0 - 1,2 Millionen Hektoliter/Jahr
- Inlandsverbrauch: 30 - 32 Liter/Kopf und Jahr
- Kosten für die Pflanzung einer Neuanlage: 2,5 - 8,0 Millionen Forint/ha
- Pflanzgutpreise: wurzelechte Rebe: 100 - 130 Forint pro Stück; Pfropfrebe: 200 - 250 Forint pro Stück

Weinbau und Kellerwirtschaft werden durch zwei Gesetze geregelt (ab 1999 drei Gesetze):

1. 1998 wurde ein Weingesetz verabschiedet, das seither noch oftmals modifiziert worden ist.
2. 1994/95 wurde die Weinbauverwaltung nach dem Weinbauverwaltungsgesetz gegründet. Seitdem ist auch dieses Gesetz modifiziert worden.
3. 1999: Gefallssteuer-Gesetz, ab 1. August 2000

Gegenwärtig gibt es vier Weinbauregionen mit den folgenden Weinbaugebieten:

I Tiefebene
Weingebiet Kunság
Weingebiet Csongrád
Weingebiet Hajós - Baja

II.Nord- Transdanubien
Weingebiet Ászár - Neszmély
Weingebiet Badacsony
Weingebiet Balatonfüred - Csopak
Weingebiet Balatonfelvidéki
Weingebiet Etyek - Budai
Weingebiet Móri
Weingebiet Pannonhalma - Sokoróalja
Weingebiet Somló
Weingebiet Soproni

III. Süd- Transdanubien
Weingebiet Süd - Balaton
Weingebiet Mecsekalja
Weingebiet Szekszárd
Weingebiet Villány - Siklós
Weingebiet Tolna
Weingebiet Zala

IV. Nord - Mittelgebirge
Weingebiet Bükkalja
Weingebiet Eger/ Erlau
Weingebiet Mátraalja
Weingebiet Tokaj

Stand des Ökoweinbaus in Ungarn

- Kontrollierte Anbaufläche: 350 ha
- Zahl der Ökobetriebe: 19
- Weinbaugebiete mit Ökoweinbau: 10
- Ökoweinproduktion: 20 - 24 000 Hektoliter / Jahr

Die Richtlinien für den Ökoweinbau wurden durch die Fachabteilung Weinbau und Kellerwirtschaft von "Altervitis" ausgearbeitet. Altervitis ist der Verein der ungarischen ökologischen Winzer, der im Rahmen des Vereins Biokultúra arbeitet.

In Ungarn wurden viele neue resistente Rebsorten gezüchtet, die auch im Ökoweinbau eine wichtige Rolle spielen.

Bianca	488 ha
Kunleány	1017 ha
Lakhegyi mézes	546 ha
Kunbarát	60 ha
Zala gyöngye	2032 ha
Medina	50 ha
Andere resistenten Sorten	50 ha
Gesamt	**4243 ha**

Außerdem findet man noch ungefähr 6000 ha Weinanbaufläche in Hausgärten und Sommerkurorten.
Die größte Fläche mit resistenten Sorten findet man im Weinbaugebiet Kunság. Die ökologischen Verhältnisse der Tiefebene, zu der das Weinbaugebiet Kunság zählt, sind

ungünstig (Sandböden, Frostgefahr). Die resistenten Sorten haben eine sehr gute Anpassungsfähigkeit an diese ungünstigen Verhältnisse.

Von den neugezüchteten Sorten ist insbesondere "Cserszegi fűszeres" sehr beachtenswert. Sie hat eine höhere Widerstandsfähigkeit als andere Sorten. (Cserszegi fűszeres wird auf ungefähr 2400 ha angebaut).

In letzter Zeit hat man sich mit Biowein- und auch Traubensaftbereitung beschäftigt. Eine neue Möglichkeit ist die Pflanzung resistenter Tafeltraubensorten.

Im Oktober 1999 hat die Regierung ein Agrarumwelt-Programm verabschiedet. Ein Ziel dieses Programms ist es, den Ökolandbau zu fördern. Danach soll sich die ökologisch bewirtschaftete Fläche zwischen 2000 und 2006 verzehnfachen – auf 300.000 Hektar. Auch für die Umstellung auf Ökoweinbau wird Unterstützung gewährt (5 bis 50.000 Forint/ha, abhängig von der Kultur).
Die Pläne für die Umsetzung des Programms werden nach Region und Kleinregion differenziert. Die Süd-Tiefebene mit den Regionen Kecskemét und Kiskunfélegyháza zählt zu den hervorragenden Weinbaugebieten. Hier haben Ökolandbau, Ökoweinbau und Kellerwirtschaft Priorität.

Ziel ist es, bis zum Jahr 2006 in der Tiefebene die ökologisch bewirtschaftete Weinbaufläche auf 300 ha, in anderen Weingebieten auf 1500 ha zu steigern. In allen Weinbauregionen soll zukünftig der Ökoweinbau vertreten sein. Um dieses Ziel zu erreichen, organisieren wir verschiedene Ökokurse und Bioweinwettbewerbe. Die Fakultät für Gartenbau der Hochschule Kecskemét bietet gemeinsam mit der Universität für Gartenbau in Budapest eine Fachausbildung für ökologischen Landbau an.

Literatur

1) Szõke L. (1998): Bioszőlőtermesztés Európában. Hazai lehetőségek és feladatok. Biokultúra. IX. évf. 7-8. sz. 6-7 p.
2) Szõke L. (1998): Az öko-biotermesztés szabályozása, hazai feladatok az EU csatlakozás tükrében. MTA SzAB Műszaki Szakbizottságának Élelmiszertudományi Munkabizottsága Tudományos Ülése. Kecskemét 1998. MTA-SzAB XXV. 46-52 p.
3) Szõke L. - Hamzáné Lakó J. (2000): A Kecskemét-Tiszakécskei kistérség szőlőtermesztési-borászati fejlesztési koncepciói a SAPARD program keretében. VII. Nemzetközi Agrárökonómiai Tudományos Napok. Gyöngyös. Vol. 4. 163-168 p.
4) Szõke L. (1998): Az alföldi borvidékek lehetőségei az EU csatlakozás tükrében. VI. Nemzetközi Agrárökonómiai Tudományos Napok Gyöngyös 4.kötet S-Z.184-189. p.
5) Szõke L. (1999): Bács-Kiskun megyei agrátstruktúra és vidékfejlesztési program. Bács-Kiskun Megyei Területfejlesztési Tanács Titkársága Kecskemét, 138 p. + 210 táblázat. A szőlő-, gyümölcstermesztés és borászat fejezeteket írta Szőke L.
6) Szõke L. (1999): Dél-Alföldi Régió agrárstruktúra és vidékfejlesztési program. DARFT. Szeged. 34 p. + 120 táblázat. Kézirat. A szőlő-, gyümölcstermesztés és borászat fejezeteket írta Szőke L.
7) Szõke L. (1999): Kecskemét és térsége agrárstruktúra és vidékfejlesztési program. Kecskemét és Térsége Területfejlesztési Önkormányzati társulás Kmét 102 p. + 46 táblázat. A szőlő-, gyümölcstermesztés és borászat fejezeteket írta Szőke L.

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Plant Protection in Organic Viticulture in New Zealand

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Keywords: *Climatic conditions; Organic Pest & Disease control, Inputs*

Introduction

In 1860 to 1870 first grape vines were planted in different areas of New Zealand. In the 1970s a fast growing wine industry established, and since the 1980's New Zealand has seen the first biodynamic/organic wine growers/winemakers.
Organic viticulture is happening in both the North Island and in the South Island.
There were a total of 363 licensed wine-makers in New Zealand, of whom 203 are in North Island and 160 are in South Island in January 2000 (1). 10 of these licensees are certified organic. That calculates to 2.75% of New Zealand vineyards are certified organic.
The organic vineyards spread from 35 to 45 degrees latitude and climatic-and soil conditions vary widely from hot/humid to cold/dry. These regional conditions require locally adapted systems of organic and bio-dynamic management.

Plant protection is very important for an optimum quality control. Various aspects of a preventative and curative plant protection are being used in New Zealand.

Materials and methods

There are four fully certified Bio-Gro vineyards (2 each in the North and South Island), two are Transitional Bio-Gro (1 North, 1 South Island) and four (1 North 3 South Island) have applied for registration with Bio-Gro.

Most of the organic grape growers are winemakers as well and honor the guideline that wine is made in the vineyard (2). For organic plant protection and pest and disease control, management techniques like shoot thinning, bunch removal, leaf-plucking, hand harvesting, spacing of vines and cordon length (3) are engaged with a sense of regulating the vegetative (leaves) and generative (fruit) growth and to create a healthy environment for the vines to reduce the causes of fungal infection and minimize disease pressure. For example, an open, airy canopy reduces the likelihood of humidity in the bunches and also increases the effectiveness of the sprays which are applied in a preventative or curative way (3).
Two growers run trial plots with varieties GM 312/53+GM 322/58 of Geisenheim (4+5) which are bred for resistancy to fungal disease.
The use of limited amounts of copper, sulphur and lime sulphur is common practice. The growers are aware of the risks involved and some are using sodium silicate to strengthen the berry skin and give the plants natural disease resistance(3+6). Compost

teas and liquid seaweed as foliar sprays together with rock dust, ground seaweed and compost as on the ground applications (3) are used for the same purpose. Some growers (2+4+5) use the made up formulations of plant health enhancing preparations
Myco-Sin for Downy mildew and Oikomb for Powdery mildew, to induce resistance to the plants and to strengthen the berry skin. Others (6+7) use soft soap+bentonite to protect of powdery mildew. They also use the biodynamic preparations to enhance life and the environmental sytems, and to make the vines more responsive to pest and disease infestation. One biodynamic grower (6) applies Talcum powder for Botrytis prevention, another one (7) is using the liquid valerian preparation 507 to give his grapes a better frost resistance.

Insect Regulation

The main insect problems are Spider mite, Leafroller (in the South Island) and Mealy Bug (Pseudococcus longispinus in the North Island).
For Spider mite control dormancy application of vegetable oil or fishoil, and the use and support of the predatory mites Typhlodromus pyri and Phytoseiulus persimilis are used. One grower (6) uses bentonite, yeast and kieselgur which are also used in the winemaking process as a vine paste to protect against spider mite and mealy bug (6). Herbal leys and a mix of flowering plants (umbelliferae, phacelia, chickory, buckwheat, wildflowers) are grown in alternate or every 3-5th row to provide a habitat for the beneficials, and allow the populations of all species to live in harmony(6).
For leafroller regulation the establishment of braconid wasps is encouraged. With heavy infestation rates which are monitored with Pheromone traps, Bacillus thuringiensis or pyrethrum/garlic are applied.
Mealy bug is controlled with pyrethrum/garlic. On trial a mix of Neem formulation, sodium silicate and alcohol is used. A biodynamic grower uses potentised ashes of the Mealy bug.

Results and discussion

Considering the effects of the very different climates of an island nation in the South Pacific, the annual changes of weather patterns and of global warming with an increase in temperature and humidity, it is obvious that the infestation pressure of fungal diseases is growing. Organic and biodynamic growers with experience and a fine tuned management system in place have enough tools to regulate fungal diseases and insect pests, and keep them below a treshold level of economic damage. Vineyards which are just starting with the conversion process are more likely to rely on sulphur and copper as a safeguard, as soon as high infestation pressure of pests and diseases is evident.
The use of sodium silicate, seaweed, herbal teas, soap, bentonite and other natural, biological plant health enhancing and plant protection agents shows good results in the conversion and in the more established organic and biodynamic vineyards. The management of the new approach to plant protection and the use of permitted inputs reflects in growing individualization and fine-tuning of the plant protection systems in the vineyards themselves. They become more resilient and responsive to harmful fungi and insects while the vineyard as a whole develops to a more balanced organism.
The viticulturist is the planner, initiator and executioner of these new management systems. The learning about new skills and techniques, as much as the open exchange and transfer of the information amongst viticulturists and winemakers in New Zealand does

support the future of certified organic viticulture. There is progressive development over time in the North and the South Islands of New Zealand and once the pioneering spirits and capital investments settle down there will be greater movement towards an organic approach in these areas(6).
Demand increases for organic produce overseas and in the New Zealand market. Organic wine is slow to follow suit, although those who are producing high quality wine, organically , are successful because of the overall quality. General retail is slow in picking up although supermarkets are the most active. Health Food shops and their customers are not wanting to spend more than NZ$ 15.00 per bottle with rather bland taste perceptions. This could well improve (6).
To produce the best wine you have to have the best grapes. To really attain the best grapes then they must be grown organically or better still bio-dynamically, and this has to embrace the three-folding order -environmental, financial and social.

Acknowledgements

The author's grateful Thank You goes to the organic and biodynamic wine growers/wine makers of New Zealand who have supported this report with a lot of background data and information so generously and dedicated time and effort to this process.

References

(1) New Zealand Wine Grower magazine
(2) Sirocco Vineyard, Rakaia, Canterbury, Sth Island, Paul&Helena Phillips; www.geocities.com/NapaValley/8992
(3) Kingsley Estate, P.O.Box 1100 Hastings, Gimblett Rd, Hawkes Bay, Nth Island, Kingsley Tobin; www.kingsley.co.nz
(4) Richmond Plains, Mc Shane Rd, R.D., Richmond/Nelson, Sth Island, David Holmes; www.organicwines.co.nz
(5) Sunset Valley Vineyard, Eggers Rd, Upper Moutere/Nelson, Sth Island, Ian Newton;
(6) Millton Vineyard Ltd., P.O.Box 66, Manutuke, Gisborne, Nth Island, James&Annie Millton; E-mail: millton@bpc.co.nz
(7) Covell Estate Wines Ltd., R.D.1, Galatea, Murupara, Nth Island, Bob Covell;

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BIO-GRO: "Bio-Gro" is the official trademark given to produce grown to the strict standards set by the New Zealand Biological Producers Council. These standards are evaluated and audited by IFOAM. Bio-Gro is cleared for EU entry.
Address: BIO-GRO New Zealand, P.O.Box 9693, Marion Square, Wellington , New Zealand, Phone: +64 4 801 9741, Fax: +64 4 801 9742, www.biogro.co.nz, Email: info@bio-gro.co.nz

BIO-DYNAMICS: Bio-Dynamics is based on Rudolf Steiner's spiritual science, which presents a new understanding of agriculture with the capacity to meet the agricultural demands of the present times.The trademark of Bio-Dynamics is Demeter. Bio-Dynamics is not yet cleared for EU entry.Bio-Dynamic growers do export through the Bio-Gro trademark.
Address: Bio Dynamic Association, P.O.Box 39045, Mail Centre, Wellington, E-mail: biodynamics@clear.net.nz

A third certifying organisation called CERTENZ has been recently established by the official Agri Quality administration and tries to enter the organic certification market. Certenz and its organic standards have not yet been approved by a 3rd party in the potential export markets.
Initial stages of COWNZ (Certified Organic Winegrowers of NZ) or is it EWNZ (Ecological Winegrowers of NZ) occured in January 2000, and are still in infancy.

Organic Viticulture in Portugal

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Keywords: *organic viticulture, wine production, rural development*

Abstract

Organic farming has been steadily increasing in Portugal especially in the last six years, due to the Agri-Environmental Measures (EU Reg. 2092/91) and consumption requirements. The awareness towards the problems concerning the environmental protection are little by little also being taken into consideration but the better price and subsidy paid for organic products are no doubt the best incentive to embark in this alternative and sustainable production system.

Based mainly on direct inquiries to the farmers, since literature on the theme is almost inexistent, this study aims at presenting an overview of the development and quality of Portuguese organic viticulture and wine production, and how it can become an important economic resource due to the potentialities shown and large number of producers already registered (21% of the organic farmers have vineyards).

Special attention will be paid to the emerging sector of wine, which is not certified as bio because some unauthorized chemical substances are used, following the traditional techniques recommended for the conventional wines.

Introduction

The lack of information on the Portuguese organic farming explains the necessity of studies that point out the potentialities and constraints of the several sectors, contributing to the divulgation of the quality food already available and identifying at the same time the bottlenecks urging to be solved. This is what this short appraisal intends to achieve for the organic viticulture and wine production in Portugal.

Material and methods

The sole statistical information to be found was supplied by the General Directorate for the Rural Development (DGDR).

In order to get more data 50% of the farmers with vineyards were inquired, covering the whole country. This direct contact with the producers allowed a better understanding of their problems and particularities of each region, namely in terms of sorts used and pest control.

Results and discussion

As shown on Figure 1, the share of the vineyards in the total organic area is particularly important along the northern coastline: Beira Litoral (38ha) and Entre Douro e Minho (14ha) i.e. 34% and 24% of the total organic area respectively. The largest areas of organic vineyards however are located in Trás-os-Montes (432ha) and Beira Interior

(268ha) but they only represent 7.4% and 11.5% of their total organic areas. Together with Alentejo these three Regional Directorates are responsible for almost 83% of the area with organic vineyards in Portugal.
In Alentejo, where crops like olives, cereals or pastureland are dominant, organic vineyards account for only 0.2% of the total area, occupying 48ha, but there are good conditions for its diffusion, since this province produces excellent wines.

In general the evolution between 1994 and 1998 of the areas with organic vineyards has been quite irregular in some Regional Directorates (Fig. 2) but according to the inquiries the tendency is to enlarge the area and increase the production; therefore a sounder importance of this sector, that at the moment ranks as the second most important after olive oil in the transformed organic production, is to be foreseen in the near future.
Since there is no organic wine, due to the fact that sulphur dioxide is used to disinfect the must, the Institute for the Vineyard and Wine (IVV) makes no distinction between conventional wine and wine produced with organic grapes (this is the designation shown on the bottle). Thus it is impossible to have an estimation of how many farmers produce this kind of wine, since some only produce grapes to sell fresh or as raisins (especially in South) or eventually produce wine for their own consumption and to sell in small quantities to restaurants but at the same time they may supply the conventional cellars with organic grapes, which are mixed up with the ordinary grapes in order to produce conventional wine. A few are responsible for their own production that is sold through a regional or national distributor or directly exported abroad.
In terms of grape varieties the farmers try to follow the sorts and percentages recommended by the above mentioned IVV. These change from one winegrowing region to another, since the climatic and soil conditions also differ. So in North, rainy and with less solar radiation per year, the main varieties are: Vinhão, Touriga Nacional (red wine) Diagalves and Esgana Cão (white wine). In South varieties like Moreto and Trincadeira Preta (red wine) Manteúdo, Rabo de Ovelha and Síria (white wine) are often to be found. Diagalves is a mixed variety recommended either to produce wine or eat fresh.

For a complete description of the varieties accepted for each sub-region and respective percentages it is recommended to consult the Yearbook published by IVV (1999).
The production of wine with organic grapes is of course relatively recent. Some farmers are still converting part of their vineyards or planting new areas, reinforcing the varieties for red wine since the market shows more appetency for this one, probably reflecting the conclusions of some studies, according to which red wine can contribute to prevent arteriosclerosis due to its action anti-aggregative of the blood plaquettes (Paccalin, 1993).

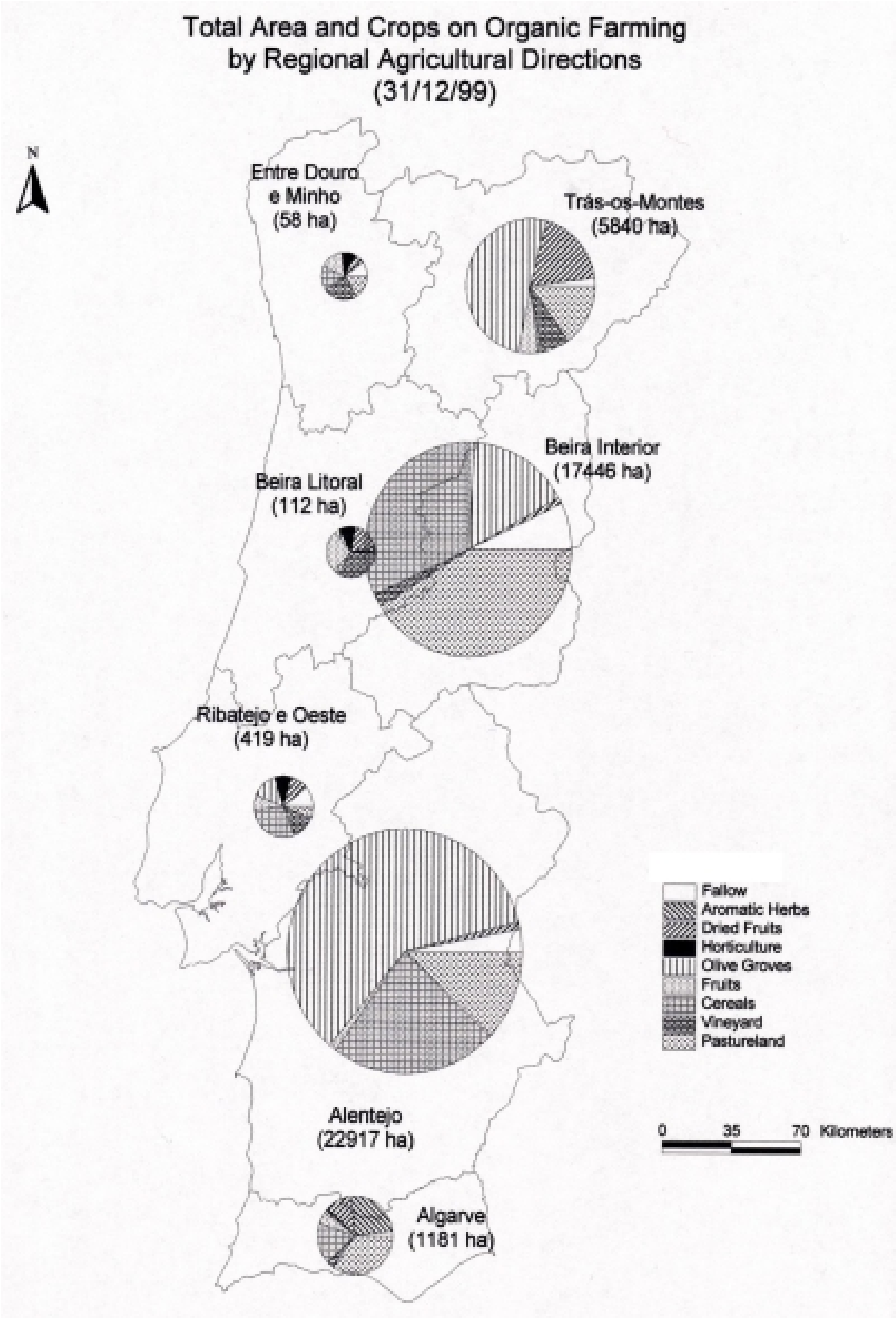

Figure 1. Organic farming in Portugal (1999)
Source: Data supplied by DGDR

In general the area occupied by the vineyard in the farm is small and the production is also low due to the fact that some varieties like Touriga do not produce much quantity and some plants are old. A study developed by Geoideia, based on an inquiry among 90 organic farmers, indicates that 12% of the wine producers have an average production above 20 000 litres (Geoideia, 1998). In our study we found a couple of farmers with productions ranging between 150 000 and 200 000 litres per year. It depends much on the weather conditions!

The fact that research on organic farming is almost inexistent does not help much these farmers. Beyond a handbook on organic farming (Ferreira, 1999) which deals with the organic production in general, we only know a study on *Lobesia botrana* (Frescata et al, 1995). In 1993, after a disastrous year for agriculture, the Magazine "A Joaninha" published by Agrobio (an association of organic farming) presented a plan of treatments and measures for viticulture, which gives information on how to prevent some of the most common problems: mildew (cultural measures like green manure, in order to avoid excess of nitrogen and accelerate the decomposition of the dead leaves; 2% of copper and lime if there were severe attacks) and oidium (2% of sulphur or potassium, the last one being also used against *Phomopsis viticola)*).

Technical support is not easily available since there is not many technicians habilitated in the area of organic farming and no research is undertaken regularly.

In terms of certification, for the grapes only, farmers have now two bodies: SOCERT and SATIVA (addresses at the end).

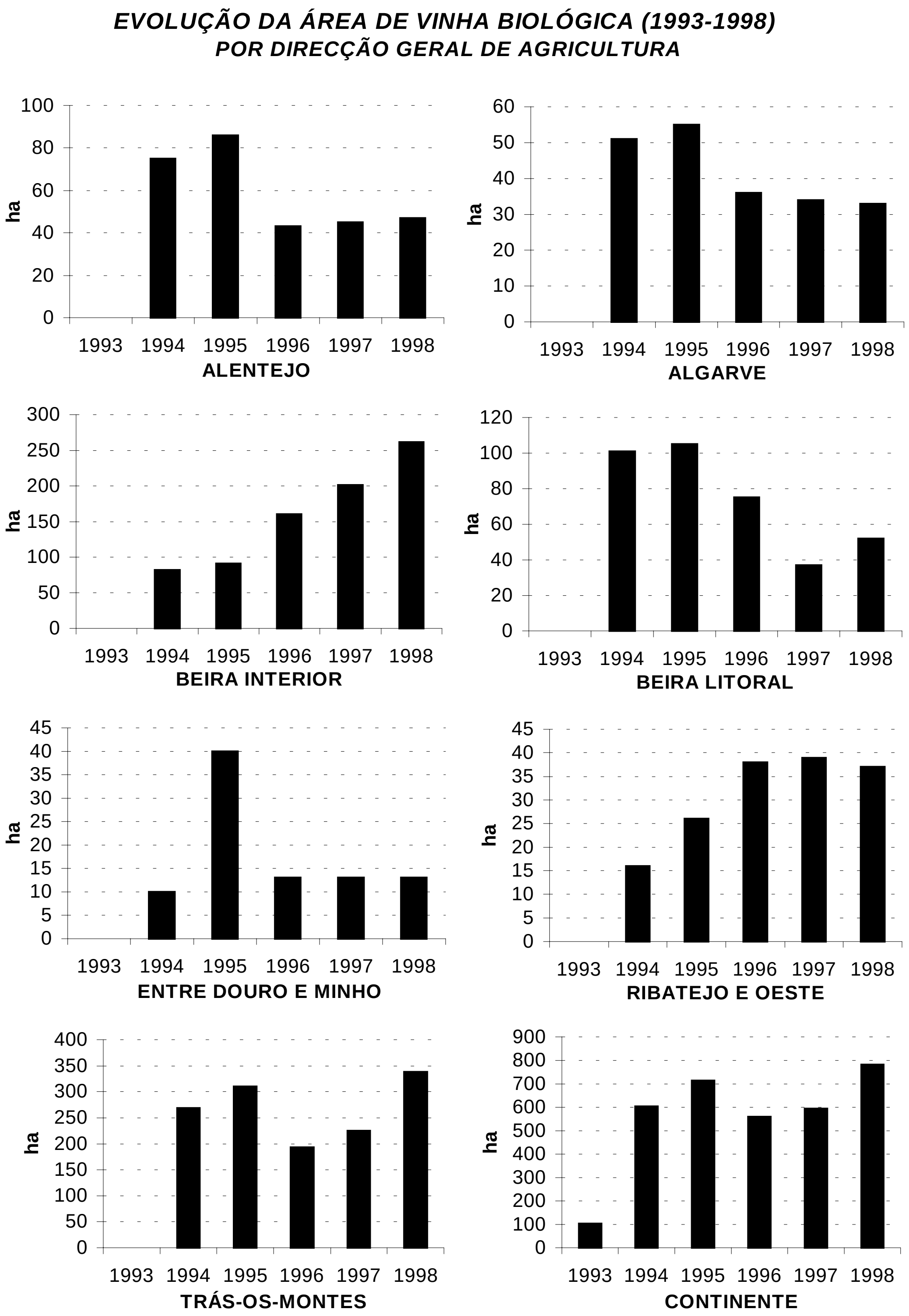

Figure 2. Evolution of organic viticulture in Portugal (1993-1998) by Regional Directorate, (Source: Data supplied by DGDR) (1999), In: Firmino (1999)

Marketing is perhaps one of the most limiting bottlenecks at least for the small farmers, who prefer to work alone and resist to the idea of founding a cooperative. It is also problematic to create a brand, since much effort will be necessary to struggle against bureaucracy. So many still prefer to sell their wines in bulk to the local market, without any identification of the producer. However, occasionally we find farmers who export almost the whole production (USA, Japan, Germany, Denmark, Switzerland) or market it through some of the most important supermarkets (Continente, Pão d'Açucar,etc.) but these are a minority.

During fairs like Terra Sã, which takes place every year, the public also has the opportunity to purchase these wines, which usually are sold out very quickly.

Conclusions

In spite of the hindrances presented above most of the inquired believe that organic viticulture has many potentialities that were not yet exploited. The fact that in normal years the diseases are relatively easy to control, with products that are familiar to the most traditional farmers, makes the conversion into organic farming attractive, since the subsidy is rewarding (483 ECU/Ha/Year) and the better prices offered by the demand are an important added value to a production, that as seen above, cover large areas along the border with Spain, which is considered to be an unfavourable area and has been suffering from depopulation since decades.

The production is still low and the market tends to extend; so the perspectives for the future are good and it is foreseen that it will take time until the offer matches the demand.

Organic farmers are usually younger and with a higher level of education than the conventional ones, but even so it is still difficult for them to work together. Thus cooperatives are a solution that is not well accepted, although these could solve some of the most embarrassing problems such as the transformation of the grapes into wine in good conditions and the marketing of the production. Under these conditions it would also be easier to get permanent technical support, if the cooperative would have a good dimension.

Associated to wine production is often rural tourism. This constitutes a good diversification of revenues and a benefit for the maintenance of the architectural and cultural heritages as well as of the landscape (in North Portugal are still common the vineyards planted on terraces). Some producers included their farms in the Wine Routes and beyond accommodation they also offer visits to the vineyards and cellar tour, as well as tasting and retail wine sales. These initiatives contribute to the settlement of people, who otherwise would not find a job in the area, and create wealth in regions that often have been devoted to abandon for not being rewarding to produce whatsoever.

As we have seen there are good opportunities to the expansion of organic viticulture. However to assure a better acceptance abroad of the Portuguese wines produced with organic grapes, it is essential that efforts may be canalised to overcome some technical problems, as referred for the disinfecting of musts, and this involves investment in research and technical training, otherwise there is no production of organic wine!

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References

Agrobio (1993) A Joaninha, nr.43, July/November 1993, Lisbon, Portugal, 5-7
Ferreira, J. et al (1999) Manual de Agricultura Biológica, DGDR, Lisbon, Portugal
Firmino, A. (1999) Modo de produção biológico: a vinha. In: Actas do VIII Colóquio Ibérico de Geografia, Volume I, DGPR, UNL, Lisbon, Portugal, 113-119
Frescata & Mexia (1995) Trabalho em traça da uva na região de Setúbal, ATEV, Portugal
Geoideia (1998) Potencialidades de criação de emprego no âmbito da agricultura biológica, Geoideia e Espaço e Desenvolvimento, Lisbon, Portugal
IVV (1999) Anuário de Vinhos e Aguardentes de Portugal, IVV, Lisbon, Portugal
Paccalin, J. (1993) Cholestérol:Dr. Jekyll & Mr. Hyde?. In: Science & Vie, Hors de Serie, Paris, France, 48-57

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Developments in Organic Viticulture in South Africa

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Keywords: *organic viticulture, South Africa, development, wine grapes, table grapes*

Abstract

Organic viticulture is still in its early stages in South Africa, but interest is growing rapidly. The main wine grape-growing region of South Africa is the Western Cape. There was 98 203 ha of wine grapes (80.4% white varieties and 19.6% red varieties) and 9 622 ha of table grapes in South Africa in 1997, which represented only 1.4% of the worlds' total grape growing area.

On the 1st March 2000 there was 29.36 ha of certified organic wine grapes and 52.22 ha of in-conversion wine grapes in South Africa. The main certified organic and in-conversion wine grape varieties with their respective surface areas are shown in table 1.

Table 1. Main certified organic and in-conversion wine grape varieties[1)]

Varieties	Char.	S.Bl.	Pino.	Col.	C.S.	Sh.	Cin.	R.C.
Organic(ha)	11.16	9.9	8.3					
In-Conversion(ha)	2.8	2.2	1.4	23.64	11.88	7.3	1.8	1.2

[1)] Char.= Chardonnay; S.Bl.=Sauvignon Blanc; Pino.= Pinotage; Col.= Colombard; C.S.= Cabernet Sauvignon; Sh.= Shiraz; Cin.= Cinsaut; R.C.= Ruby Cabernet

The first wine farm in South Africa to receive certified organic status was Sonop which is owned by the company SAVISA (Pty) Ltd. Sonop is situated in the Paarl wine-growing region of the Western Cape. SAVISA (Pty) Ltd processes their organic wine grapes at their own wine cellar in Stellenbosch. The farm is currently certified by SKAL.

There are 2 in-conversion wine farms situated in the Porterville region (1) and Bonnievale region (1) of the Western Cape. They supply their grapes to co-operative wine cellars in their respective regions. The Soil Association certifies these 2 farms.

The main marketing challenge for organic wine farmers without their own wine cellar is the ability of the co-operatives to handle organic and conventional grapes separately.

There are also 156.4 ha of in-conversion table grapes. The main certified organic table grape varieties with their respective surface areas are shown in table 2.

Table 2. Main certified organic and in-conversion table grape varieties[1)]

Varieties	Rg	Wc	R	Cs	Ps	Ts	Dbh	A	Sr	B
In-Conversion(ha)	22.7	19.7	18.8	17	16	15.1	14.7	8.6	7.4	5.9
Varieties	Bd	P	M	Ba	Lr	S	D	Mj	Ss	
In-Conversion(ha)	5	4	3	3	2.7	2.7	2	1	1	

[1)] Rg = Red Globe; Wc = Waltham Cross; R = Regal; Cs = Crimson Seedless; Ps = Prime Seedless; Ts = Thompson Seedless; Dbh = Dan-ben-Hannah; A= Alphonse Lavellee; Sr = Sunred Seedless; B = Bonheur; Bd = Bien Donne; P = Peridot; M = Muscat Supreme; Ba = Barlinka; Lr = La Rochelle; S = Sonita; D = Dauphine; Mj = Majestic; Ss = Superior Seedless

There are 5 in-conversion table grape farms situated in the Paarl (2), Halfmanshof (2) and Ashton (1) regions of the Western Cape. The Soil Association certifies them all.

The marketing of organic table grapes is still developing as there are some obstacles due to the long distance to the market and the risks involved in not using sulphur dioxide impregnated sheets, which are not allowed by the Soil Association, for post harvest disease prevention.

The two main challenges facing the organic viticulture industry in South Africa are:
1. Research/training and advice and
2. Certification

There are not enough people with knowledge and/or experience about organic viticulture available to assist South African farmers and the universities and agricultural colleges are slow to meet this need. The lack of local certification results in inefficient regulations of standards and also the high costs involved in using overseas certification.

The other issue, which could make large-scale conversion to organic viticulture in South Africa very difficult, is finding acceptable sources of non-organic manure for compost production. The main obstacles are BST use in dairies, genetically engineered feeds, routine anti-biotic use and animal welfare issues.

The outlook for organic viticulture in South Africa is very positive. There is plenty of interest from farmers and the number of organic wine and table grape farms is expected to grow rapidly over the next 5 years. We still need more support from universities, colleges and the government, and increased public awareness in South Africa on the benefits of organic farming in general. In order for organic viticulture to develop in South Africa all other sectors of the farming industry in South Africa must also develop towards organic farming thus confirming the nature of organic farming to stimulate holistic and integrated development on a regional basis.

Bioweinbau in der Schweiz

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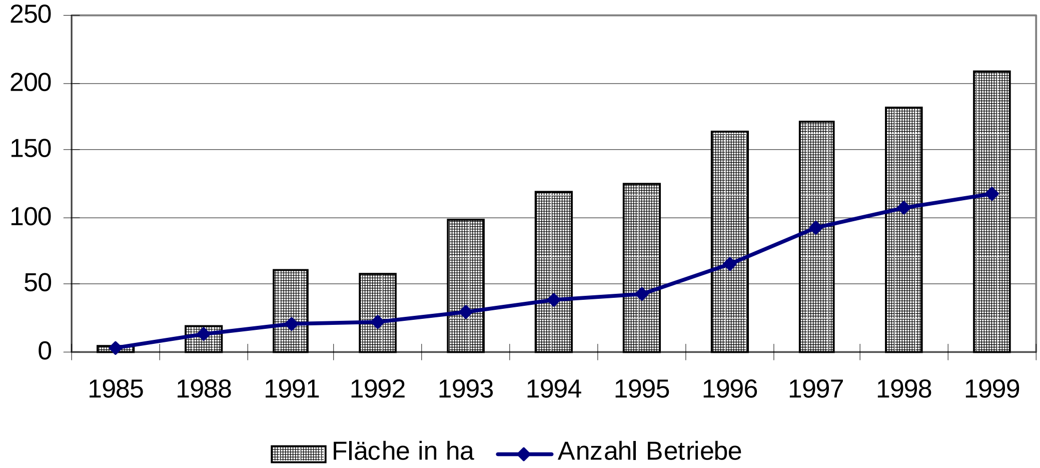
Keywords: *Biorebbauentwicklung, Schweiz, Richtlinien, Produktionsunterstützung*

Dank der Nachfrageentwicklung, verbesserten Produktionsmitteln und gestärkten Strukturen durch Forschung, Beratung und Verbände hat sich der biologische (ökologische) Rebbau in der Schweiz in den letzten 15 Jahren stark ausgedehnt.

Entwicklung des Biorebbaus und heutige Struktur

Der biologische Rebbau hat in der Schweiz eine lange Tradition. Schon vor über 40 Jahren bemühten sich ein paar wenige Winzer ihre Rebberge ohne Einsatz von Herbiziden, synthetischen Insektiziden und mineralischen Düngern möglichst naturnah zu pflegen. Die zu geringe Ertragssicherheit, vor allem aufgrund unzureichenden Möglichkeiten bei der Regulierung des Falschen Rebenmehltaus *(Plasmopora viticola)* liess die Zahl Biowinzer lange Zeit stagnieren. Die Pioniere des biologischen Rebbaus, erhielten erst seit den frühen 80er Jahren Unterstützung aus der Forschung. Die intensive Versuchstätigkeit des Forschungsinstitutes für biologischen Landbau (FiBL) ab 1985 in Zusammenarbeit mit den Biowinzer und der Forschungsanstalt in Wädenswil trugen schon bald erste Früchte. Durch die praxisreife Entwicklung von neuen Pflanzenschutzmitteln wie Tonerdemehlen, Sojalecthin und Fenchelöl wurde die Basis für eine rasante Ausdehnung des Biorebbaus gelegt. Liessen sich 1985 erst 3 Winzer auf die Einhaltung der strengen Biorichtlinien der nationalen Biolabelorganisation BIO SUISSE kontrollieren, steigerte sich deren Anzahl bis 1989 auf 13. Diese legten zusammen mit dem FiBL 1989 mit der Gründung des Schweizerischen Bioweinbauvereins BIOVIN einen wichtigen Meilenstein für die weitere Entwicklung des Biorebbaus. Mit einer Organisationsstruktur im Rücken, präzisierten Richtlinien und Reglemente zum Bioweinbau, verbesserten Produktionsmitteln sowie mit zunehmender Nachfrage nach Biowein steigerte sich die Zahl der Bioproduzenten kontinuierlich (Abb. 1). Der Einstieg von Grossverteilern in den Bioweinhandel ab 1994 erleichterte auch grossflächigen Rebbetrieben die Umstellung auf Biobewirtschaftung.

Abb. 1: Entwicklung des Biorebbaus in der Schweiz

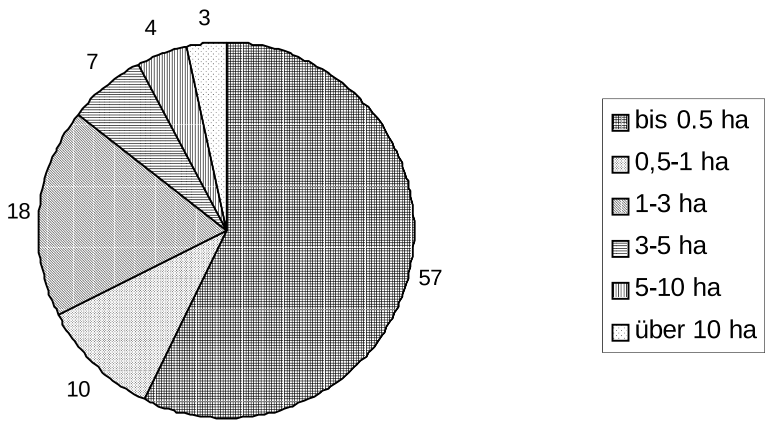


Biorebfläche

1999 bewirtschafteten in der Schweiz 117 Betriebe insgesamt 209 ha Rebfläche nach den Richtlinien der BIO SUISSE. Neben 20 reinen Weinbaubetrieben gibt es Gemischtbetriebe, Nebenerwerbsbetriebe und auch reine Hobbybetriebe.

Die Biorebfläche entspricht 1,4% der totalen Rebfläche in der Schweiz. Biorebbaubetriebe finden sich in allen wichtigen Rebbaugebieten der Schweiz. Mit 67 ha, verteilt auf 3 Betriebe, weist der Kanton Genf die grösste Biorebbaufläche auf. Im Gegensatz dazu ist der Biorebbau des Kanton Tessins mit 16 ha, verteilt auf 19 Betriebe, eher klein strukturiert. Zwei Drittel der Betriebe weisen eine Rebbaufläche bis eine Hektare auf. Der restliche Drittel bewirtschaftet Flächen von 1 ha bis über 20 ha. (Abb. 2). Die Flächenstruktur im Biorebbau entspricht etwa derjenigen des konventionellen Anbaus.

Abb. 2: Betriebsgrössenstruktur der Schweizer Biorebbaubetriebe 1999 in %



Sorten

Bei den Sorten dominieren in der Deutschschweiz Blauburgunder und Riesling x Sylvaner, in der Westschweiz und Wallis der Chasselas, Blauburgunder und Gamay und im Tessin der Merlot. In den letzten Jahren haben die interspezifischen Sorten, vor allem in Gebieten mit einem hohen Krankheitsdruck, eine zunehmende Bedeutung erlangt. Sorten wie Regent, Maréchal Foch, Seyval blanc und weitere belegen bereits ca. 5% der Bioanbaufläche.

Bioweinkonsum

Die Bioweinproduktion im Inland mit durchschnittlich 1,3 Millionen Flaschen vermag zur Zeit etwa 30% des Bedarfs zu decken und liegt damit noch unter dem Inlandanteil bei den konsumierten konventionellen Weinen (40%). Jährlich werden ca. 3 Millionen Flaschen Bioweine vor allem aus Frankreich und Italien sowie aus Spanien importiert. Dabei dominieren rote Weine mit gut 80%.
Die Qualität der Schweizer Bioweine hat in den letzten Jahren einen hohen Stand erreicht, wie verschiedene Auszeichnungen bei Weindegustationen zeigen. Das Preisniveau liegt im Durchschnitt ca. 10% über demjenigen von konventionellen Weinen.

Regelungen im biologischen Rebbau

Richtlinien

Schon 1989 begann der Schweizer Bioweinbauverein BIOVIN als Mitglied der privaten Labelorganisation BIO SUISSE Feld- und Kellerrichtlinien für den Bioweinbau auszuarbeiten. Heute sind die gesetzlichen Mindest-Anforderungen für den Biolandbau in der 1997 von der Eidgenossenschaft neu geschaffenen schweizerischen Bioverordnung (Bundes-Bio) auch staatlich verankert. Diese regeln die Erzeugung, Verarbeitung und die Kennzeichnung der Bioprodukte. Sie sind aus handelsrechtlichen Gründen EU-kompatibel ausgerichtet.

Zur Zeit sind praktisch alle Biorebbaubetriebe der Schweiz Mitglied der BIO SUISSE. Dieser Bioproduzenten-Vereinigung gehören heute rund 5300 Betriebe mit 8% der landwirtschaftlichen Fläche der Schweiz an. Ihr Label ist die Knospe. Im Unterschied zu den BIO SUISSE-Richtlinien, die zwingend eine gesamtbetriebliche Biobewirtschaftung vorschreiben, lässt die Bioverordnung des Bundes für den Weinbau bis Ende 2006 befristet eine sektorielle Biobewirtschaftung zu; das heisst, die Biobewirtschaftung kann unabhängig vom Rest des Betriebes auf einzelne Parzellen beschränkt bleiben. 1999 konnte der erste Wein aus einer solchen sektoriellen Biobewirtschaftung mit dem BIO-VINATURA-Label ausgezeichnet werden.

Kontrollwesen

Die Feldkontrolle im Sommer und die Kellerkontrolle im Winter sowie die Zertifizierung der Betriebe erfolgt mindestens 1 x jährlich durch eine unabhängige, durch das Eidgenössische Amt für Messwesen akkreditierte Inspektionsfirma (z.B. bio.inspecta)

Unterstützung der Produktion durch Forschung, Beratung und Verbände

Forschung

Die grösste Herausforderung für die Biowinzer stellt die Regulierung des Falschen und Echten Rebenmehltau (*Plasmopara viticola* resp. *Uncinula necator*) dar.

Durch die intensive Forschungstätigkeit in den letzten Jahren konnten die Möglichkeiten im direkten Pflanzenschutz verbessert werden. Die Handhabung der Bekämpfungsmethoden bleibt jedoch wesentlich anspruchsvoller als im integrierten Anbau. Besonders für Anbauregionen mit einem hohen Krankheitsdruck ist die Suche nach robusten Sorten mit einer gleichzeitig hohen Weinqualität vordringlichstes Ziel. Die Forschungsanstalten Wädenswil und Changins sowie das FiBL arbeiten durch Prüfung und Züchtung resistenter Rebsorten intensiv an dieser Zielsetzung. Sie werden dabei durch die internationale Arbeitsgemeinschaft für pilzwiderstandsfähige Sorten und den BIOVIN-Verein stark unterstützt.

Beratung

Zur Verbreitung von Beratungsinhalten und neuen Erkenntnissen aus der Forschung führt das FiBL zusammen mit BIOVIN jährlich eine Fach- und Weiterbildungstagung durch, organisiert regionale Biorebbauringveranstaltungen auf Praxisbetrieben sowie Biorebbaukurse und orientiert über Merkblätter sowie während der Saison mit wöchentlichen Mitteilungen.

Verbände

Der Schweizerische Bio Weinbauverein BIOVIN, bei dem die überwiegende Zahl der Biowinzer organisiert ist, fördert zusammen mit dem FiBL die Weiterentwicklung des Bioweinbaus durch Erfahrungsaustausch und Weiterbildungsveranstaltungen. Als Fachkommission der BIO SUISSE arbeitet der Verein Richtlinien und Reglemente zum biologischen Reb- und Weinbau aus. An einer alljährlich stattfindenden Pressekonferenz präsentiert BIOVIN der Öffentlichkeit die Bioweine und stellt in einem Weinkaufsführer die Mitglieder mit ihren Produkten und einer Beschreibung ihrer Betriebe vor.

Entwicklungstendenzen

Zur Zeit zeichnet sich ab, dass die Nachfrage nach biologisch produzierten Weinen in der Schweiz auch weiterhin zunehmen wird. Vor allem der Grosshandel ist an einer Erweiterung des Biosortimentes interessiert. Das bietet besonders auch für grössere Betriebe, die in der Lage sind, ein grosses Weinvolumen zu liefern, eine gute Chance für die Umstellung auf Bioanbau. Die zunehmende Bedeutung des Biorebbaus schafft ein günstiges Umfeld, dass Forschung, Beratung, Firmen, Züchtungsinstitutionen und andere weiterhin intensiv an der Steigerung der Ertragssicherheit im Biorebbau arbeiten.

Wichtige Adressen in der Schweiz

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Organic Viticulture in Switzerland

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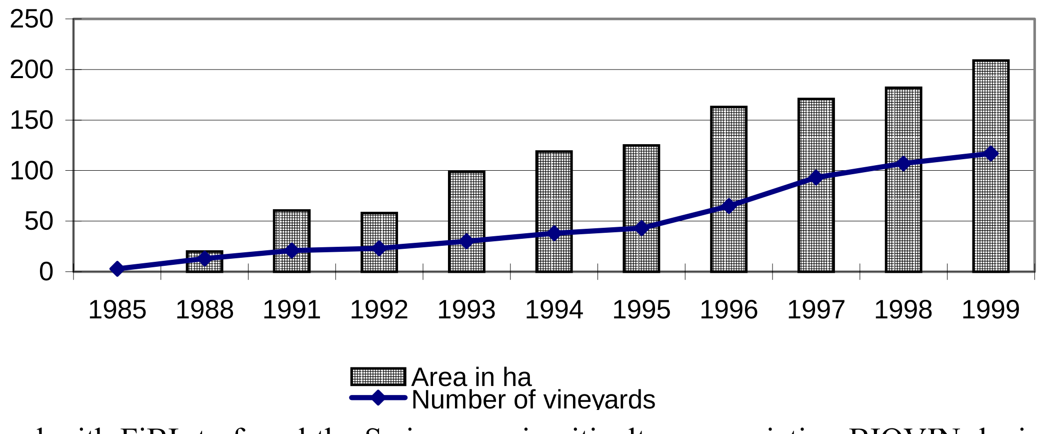
Keywords: *organic viticulture development, Switzerland, standards, support for producers*

Thanks to growth in demand, better means of production and structures reinforced by research, consultancy and associations, organic viticulture in Switzerland has seen a great expansion in the last 15 years.

The Growth and Present Day Structure of Organic Viticulture

There is a longstanding tradition of organic viticulture in Switzerland. More than 40 years ago, a few individual vine-growers began to practise natural management of their vineyards, without resorting to herbicides, synthetic insecticides and mineral fertilizers. The unsatisfactory yield reliability, primarily due to the lack of effective controls for downy mildew of grape *(Plasmopora viticola),* caused the numbers of organic vine growers to stagnate. It was only in the early 1980s that the pioneers of organic viticulture began to receive support from the research establishment. The intensive experimental work of the Research Institute of Organic Agriculture (FiBL) from 1985, in co-operation with organic vine-growers and the Federal Research Station in Wädenswil, soon proved to be fruitful. In thoroughly piloting the use of new plant protection agents such as bentonite, soya bean lecithin and fennel oil, they established the basis for a rapid expansion of organic viticulture. Whereas in 1985 only 3 vine-growers applied for inspection under the strict organic standards of the Swiss national organic labelling organization, BIO SUISSE, by 1989 their number had risen to 13. In 1989 these growers

Fig. 1: Development of Organic Viticulture in Switzerland

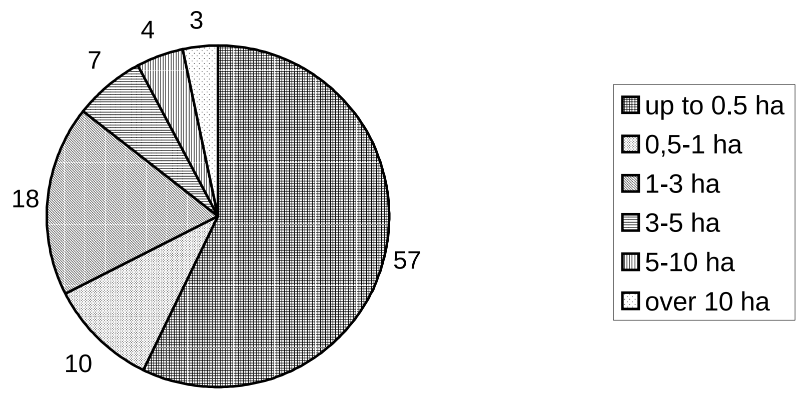


joined with FiBL to found the Swiss organic viticulture association BIOVIN, laying an important milestone for the further development of organic viticulture. Backed by an organizational structure, clearly articulated standards and regulations on organic viticulture, better methods of production and increasing demand for organic wine, the number of organic producers rose continually (Fig. 1). The entry of wholesale distributors to the organic wine market in 1994 paved the way even for large-scale vineyards to convert to organic methods of management.

Area of Vineyards Managed Organically

In 1999, there were 117 vineyards covering 209 ha managed in accordance with the BIO SUISSE standards. Alongside 20 specialist vineyards, there are some mixed farms, some growers cultivating vines for a second income and some hobby vine-growers.
The area under organic management comprises 1.4% of all vineyards in Switzerland. Organic vineyards can now be found in all the principal wine growing regions of Switzerland. With 67 ha, distributed over 3 vineyards, the canton of Geneva boasts the largest area of organic vine cultivation. In contrast, organically managed viticulture in the canton of Ticino accounts for only 16 ha, and its distribution over 19 vineyards indicates a small-scale structure. Two thirds of vineyards are up to one hectare in vine-growing area. The other third have areas under cultivation from 1 ha to over 20 ha (Fig. 2). The structure of small-scale and large-scale production is essentially similar to that in conventional viticulture.

Fig. 2: Structure of Holding Size in Swiss Organic Vineyards 1999 in %



Varieties

The dominant varieties in German-speaking Switzerland are Blauburgunder and Riesling x Sylvaner. In Western Switzerland and in Valais the honours go to Chasselas, Blauburgunder and Gamay, while Merlot takes pride of place in Tessin. In recent years hybrid grape varieties have assumed greater significance, particularly in regions more subject to disease. Varieties such as Regent, Maréchal Foch, Seyval Blanc, and others, already account for some 5% of the total area under organic management.

Organic Wine Consumption

The 1.3 million bottles of organic wine produced in Switzerland currently satisfy 30% of demand, a lower proportion than is met by the volume of domestically produced conventional wines (40%). Annually some 3 million bottles of organic wine are imported,

particularly from France and Italy, as well as from Spain. Imports are dominated by red wines, which make up at least 80%.
Swiss organic wines have attained high quality standards in recent years, as various wine-tasting awards demonstrate. The price level is on average some 10% above that of conventional wines.

Regulation of Organic Viticulture

Standards

As early as 1989, the Swiss organic wine association BIOVIN, in its capacity as a member of the private labelling organization BIO SUISSE, began to develop field and cellar standards for organic viticulture. Today the legal minimum requirements for organic agriculture are also enshrined in law by the new Swiss Organic Farming Regulation (*Bioverordnung*) adopted by the Swiss Confederation in 1997. The requirements cover the production, processing and labelling of organic products. For reasons of commercial law they are devised with EU compatibility in mind.
Today practically every organic vineyard in Switzerland is a member of BIO SUISSE. Around 5300 holdings covering 8% of agricultural land in Switzerland belong to this organic producers' union. Their seal is the 'Bud'. In contrast to the BIO SUISSE standards, which insist on organic management of the entire farm, the Swiss Organic Farming Regulation allows a sectoral approach to organic management of viticulture, time-limited up to the end of 2006: this means that organic management can be practised on parcels of land regardless of the remainder of the farm. In 1999 the first wine produced under sectoral organic management was awarded the BIO-VINATURA label.

Inspection and Certification

A summer field inspection and a winter cellar inspection, together with certification of the vineyard, is carried out at least once per year by an independent inspection firm (e.g. bio.inspecta) accredited by the Swiss Federal Office of Metrology.

Support for Producers: Research, Consultancy and Associations

Research

The greatest challenge for organic vine growers is the control of downy mildew and powdery mildew of grape (*Plasmopara viticola* and *Uncinula necator*).

Intensive research work in recent years has improved the range of options for direct plant protection. The application of control methods continues to pose more of a challenge than in integrated agriculture, however. Particularly in areas subject to disease the search for robust varieties that maintain wine quality is the most urgent goal. The research institutions in Wädenswil and Changins, as well as FiBL, work towards this goal by intensively testing and breeding resistant vine cultivars. They are strongly supported in this by “Internationale Arbeitsgemeinschaft für pilzwiderstandsfähige Sorten”, an international working group on fungus resistant varieties, and the BIOVIN association.

Extension

To disseminate information and new research insights, FiBL works with BIOVIN to hold an annual specialist information and training conference. FiBL organizes regional 'Organic Viticulture Circle' events at field testing stations, holds organic viticulture courses, and provides guidance in the form of information leaflets and weekly bulletins throughout the season.

Associations

The Swiss organic viticulture association BIOVIN is the umbrella organization for the vast majority of Swiss organic vine-growers, and together with FiBL, it supports the further development of organic viticulture with events to update training and promote the exchange of experience. As a specialist commission of BIO SUISSE, the association devises the standards and regulations for organic viticulture and wine production. At an annual press conference, BIOVIN presents organic wines to the public and, in the form of a wine-buying guide, introduces its members together with their products and a description of their vineyards.

Outlook

Current indications are that demand for organically produced wine will continue to grow in Switzerland. Above all it is wholesalers who are keen to expand the organic range. This provides an excellent opportunity for conversion to organic management, particularly for larger vineyards that are in a position to deliver greater volumes of wine. The increasing significance of organic viticulture is creating a beneficial climate in which researchers, consultants, firms, breeding establishments and others can work intensively on improving the reliability of yields in organic viticulture.

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Organic Viticulture in Turkey

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The total acreage of vineyards is 560 000 hectares in Turkey. The Aegean Region which lies in the western part of Turkey, is the most important region in terms of production and acreage. It occupies 150 000 hectares of vineyards and provides 44% of the total production. The major variety is Seedless Sultana (=Sultanina) with a percentage of 80%. Almost all of the production is dried.

Organic viticulture started in Turkey in the late 1980s. The grape is one of the most important organically grown crops. All the organic vineyards are located around the provinces of Izmir and Manisa.

Up to 1990s, no statistical data was collected for organic production. From 1990 to 1998, in 8 years the number of grape growers increased from 170 to 1089 resulting in an increase rate of 540.6%, whereas the acreage of vineyards increased from 278.2 ha to 1988.96 ha resulting in an increase rate of 614.94%. The total production increased by 418.34% from 1472.5 to 7632.51 tons.

Organically-grown grapes are entirely dried. Almost all of the production is exported to European countries. At present, 65 different crops are grown and certified as organic in Turkey. Among these crops, organic raisin have a great importance. Organic raisins supply 8.36% of total organic production, whereas organic grape growers make up 13.11% of the total number of organic farms and organic vineyards cover 7.8% of total organic acreage.
Turkey is the second biggest raisin producing country, following U.S.A. On the other hand, it is the biggest raisin exporter world-wide. The total amount of organic raisin is 3.6% of total raisin production in Turkey.

Powdery mildew (*Uncinula necator*) is the major disease and the European grapevine moth (*Lobesia botrana*) is the key pest which occurs in the vineyards of the Aegean Region. Cultural precautions such as green pruning have been given priority in the control of the disease. Sulfur is the unique permitted product against the diseases in organic viticulture. Forecasting system have been utilized for the timing of the applications against *L. botrana*. *Bacillus thuringiensis* is being used in the sprays.

Nevertheless, organic table grape and wine production newly started in Turkey due to the limited local consumption. More efforts should be accomplished in terms of educating consumers to increase local organic consumption.

Traditional Viticulture in Southern East Anatolia: A case study for Siirt, Turkey

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Keywords: *organic viticulture, pest management, labour requirement, gross margin*

Abstract

Viticulture is one of the main agricultural activities in the studied area. The type of viticulture is essentially organic. In this study, the town of *Aydınlar* in the province of Siiert has been selected as the case because of its organic characteristics of viticulture. The data used were collected from 62 farmers selected by strafed random sampling. The data belong to 1998 and 1999 production periods. In the studied farms, no inputs such as fertilisers and pesticides were used. Labour covered all variable costs. Although gross margin was positive in all farm groups, it fluctuated substantially between years because of the yield and price variations.

Introduction

The major aim of this study was to determine organic viticulture applications in some parts of Southern East Anatolia .The determination of input levels used and gross margin was another important aim of the study. The town of *Aydınlar* in Siirt was selected as the case. Since there exists no such research in the area, the importance of this study is obvious.

Material and methods

There exist a total of 315 viticulturists in *Aydınlar*, Siirt, Turkey where nearly each family is involved in viticulture. The data used in this study were collected from 62 viticulturists, using strafed random sampling method (*Erkuş*, 1977; *Güneş*, 1988). The data belong to 1998 and 1999 production periods. Farms were classified into three groups according to their sizes (Vineyard areas): The first group farms (less than 5 decare (da)), the second group (between 5 and 10 da) and the third group (equal or more than 10 da). 27 farms from the first group, 25 farms from the second group and 10 farms from the third group were taken as the sample size. Tabular statistical methods were used in evaluating the data.

Results and discussion

Main insect pests occuring in the studied vineyards are *Anaphothrips vitis* Pries (Thysanoptera: Thripidae), *Klapperichicen viridissima* (Valker) (Homoptera: Cicadidae), *Lobesia botrana* (Den-Schiff.) (Lepidoptera: Tortricidae) and *Arctia villica* (Lepidoptera: Arctiidae). Powdery mildew caused by *Uncinula necator* (Schw.) Burr is the only devastating disease in the area. Viticulturists do not spray chemicals to control insect pests. They use cultural practices or mechanical control techniques to reduce pest populations. Weeds in 20 cm diameter of trunks are removed by hand in March. This process is also believed to reduce some pest populations overwintering in soil around trunks. Leaf eating lepidopteran pests are controlled mainly either by shaking branches and dropping larvae to the ground and squashing them or using trap leaves laid on ground that attract the pests and keep them away from plants. The main weed control occurs in spring through spading which is a standard procedure in viticulture in the area. The timing of the spading is very critical in controlling powdery mildew. Vineyards are spaded after mid of May to avoid the powdery mildew incidences. Earlier spadings are believed to increase the incidences of the disease.

In the examined farms, the average viticulture area was 5,77 da. The average raisin yield was 220 kg/da in 1998 and 104 kg/da in 1999. All farm practices were realised by manpower. Manpower requirement for overall farms was 43.13 h./da in 1998 and 38.32 h./da in 1999. Lower manpower requirement in 1999 was mainly due to lower raisin yield.(Table 1). Manpower requirement per da decreased in parallel to farm size. This figure was the highest in the first group farms with 45,08 h. while it was the lowest in the third group with 39,49 h. in 1998. The same figure was 41.50 h. and 35.54 h. for the first and third group in 1999, respectively. At a study conducted in Erzincan, Turkey manpower requirement per da was found as 75.09 h. (Ören, 1995).

Table 1. Hourly manpower requirement per da for examined farms.

	Pruning	Trunk spad-ing up	Shoot remov-ing	Spadi ng	Taking the gems	Har-vesting	Col-lecting	Sorting	Trans-porting	Total
1998	2.75	4.75	2.36	20.79	3.74	4.99	2.32	0.65	0.78	43.13
1999	2.63	4.82	2.79	19.57	3.56	2.70	1.33	0.50	0.42	38.32

Labour expenditures covered all variable costs. The reason for this was that no inputs of chemicals such as fertilisers or pesticides were used. Labour costs per da were $ 47 in 1998 and $ 42 in 1999. Approximately, half of the total variable costs per da accounts for spading. This figure was 48,16 % in 1998 and 53,79 % in 1999 (Table 2). At a study conducted in Aegean region the proportion of labour in the total vineyard costs was found as 33,50 % (Artukoğlu, 1986).

Table 2. Percentage distribution of variable costs per decare for examined farms.

	Variable Costs ($)	Pruning	Trunk spad-ing up	Shoot removing	Spad-ing	Taking the gems	Har-vest-ing	Col-lect-ing	Sorting	Trans-port-ing
1998	47	6.43	11.12	5.52	48.16	8.34	11.68	5.42	1.51	1.82
1999	42	7.19	11.42	6.17	53.79	9.31	6.25	3.47	1.31	1.09

Gross margin per da was positive in all farm groups and calculated as $195 for overall farms in 1998. The same figure was extremely low in 1999 ($33 for average farms) because of lower raisin yield and price. Gross margin per da increased in proportion to farm size .This figure was the lowest in the first group ($188.) and the highest in the third group farms ($ 217) in 1998. Gross margin per farm was $ 1150 in 1998 and increased relative to farm size. The same figure remained at $ 193 in 1999.

Conclusions

In conclusion, viticulture in the area is essentially organic. All variable costs stem from labour. Gross margin fluctuates substantially due to yield and price variations between years.
It is worth studying how the situation would change if fertilisers and pesticides were used.

References

Erkuş, A., (1977). Tarım Ekonomisinin Bazı Teorik Esasları ve Bunların Tarım İşletmelerine Uygulanması, Publication of Türkiye Ziraî Donatım Kurumu, Ankara, pp.52

Güneş, T, and Arıkan, R. (1988). Tarım Ekonomisi İstatistiği, Faculty of Agriculture, University of Ankara, Publication No.1049, Ankara, pp.293.

Eren, E., (1995). Erzincan Yöresinde Elma ve Üzümün Üretim Maliyetleri, Başbakanlık Köy Hizmetleri Genel Müdürlüğü, Erzurum Araştımma Enstitüsü Publication No. 45, Erzurum, pp.75.

Artukoğlu, M., (1986). Kemalpaşa İlçesi Yukarı Kızılca Köyünde Şeçilmiş Bir Grup Bağcılık İşletmesinin Ekonomik Analizi, Msc., University of Ege, Faculty of Agriculture, Department of Agricultural Economics, İzmir, pp.54

Session 03

Soil Management – Care and Quality

Chair: Uwe Hofman

Comparisons of Chemical Analysis and Biological Activity of Soils Cultivated by Organic and Biodynamic Methods

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Keywords: *Soil biological activity, organic viticulture, biodynamic viticulture.*

Introduction

To understand the influence of biodynamic method on wine yard soils, we have made chemical and biological measures on two types of soils: one of "Côte de Beaune" and "Côte de Nuit".
The first results reveal that biodynamic method has a strong influence on deep soil, which is the most important part of the soil for the typicity of the wines.

Materials and method

Two "clos" of Burgundy wine yard were divided in two parts one cultivated with organic method and the other with biodynamic method.
The experiment shows the results after two years of cultivation.
The chemical analysis of macro (basic) and -trace nutrients was made with classical method: Phosphorus: Olsen; Sulfates: Mono calcique phosphorus extraction;
K_2O and MgO: Ammonium acetate extraction; Zn, Cu, Fe and Mn: DTPA method; Boron: Boiled water method.
Biological analysis was:

- Alcaline phosphatase method (Tabatabai 1982).
- Plate counting for micro-organisms number.

The difference between organic and biodynamic method was caused by the use of biodynamic preparations applied on the soil, on the leaves of the vines and on the compost used for fertilization.
The same quantity of 5 tonnes / ha of compost was used on the two plots.

Results

On the top soil of Clavoillon (Côte de Beaune) there is no difference in chemical and biological analysis of the two methods (Cf: Table n° 1, 2, figure n° 1).
The unique significant result is the increase of aerobic microbes on biodynamic soil (Cf: Table n°3).
On the other hand the results on the deep soil show strong differences between organic and biodynamic method.
We observe more biological activity and higher macro and trace elements content in soil cultivated with biodynamic method on "Côte de Beaune" (Cf.: Table 1 et 2) soil and on "Côte de Nuit" soil (Table 4 and 5).

Discussion

If these results can be confirmed on other soils of wine yard it could be possible to conclude that biodynamic method has a strong influence on the bioavalability of soil elements.
The hypothesis which can be developed on the action of biodynamic method is the rhizospheric effect.
The wine send in its roots sugar and proteins through the sap.
These roots excretions are able to induce rhizospheric micro-organisms activity.
These microbes are responsible of the oxidation and chelation of soil nutrients which become water soluble and them assimilable by plant roots.
More experiments are necessaries to confirm or firm this hypothesis.

Conclusion

If these types of results are confirmed by further analysis, biodynamic method could be an useful method to increase the role of the soil in wine typicality.

Function of the Soil in the Expression of the "Terroir"

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Introduction

If the agronomists have managed to prove the role played by the climate conditions and topography in the expression of the "Terroir", they have brought only superficial scientific explanations on the part taken by the soil. This is due to the fact that they had only a physical-chemical approach of the soil, and through this they have ignored its biological aspect.

The soil fauna is responsible for the soil porosity and therefore of the circulation of oxygen and water in the soil depths.

The microflora is responsible for the formation of negative elements assimilable for the plants, like the nitrates: NO_3^-, the phosphates: PO_4^{2-}, the sulphates: SO_4^{2-}.

Those elements, which are oxides, can be formed only if the soil is well aerated, by the actions of the fauna, which will be found only if the plant roots are present (i.e.: same depth).

So if we destroy the soil fauna with pesticides, by compacting the soil with ever more heavy machinery, it is easy to understand that we are stopping the soil aeration along with the microbial activity.

Wine roots creep up to the surface in order to breathe and we are substituting the work of the microbes with the same fertilisers.

So we tend to get an uniformisation of wines and slowly we are switching from a wine of "Terroir" to a wine of "cepage" (vine variety). By disregarding the soil's biology, the winemaking profession has standardised its wine. It is now easy to reproduce those wines, this is making them vulnerable to foreign competitors.

For 4 years, our Laboratory has been working to define the physical, chemical and biological characteristics of the vineyard soils especially the one of Burgundy. If we can define the part played by the soil in the wine typicality, we would not be limited to the climate, the topography, the "cepage" and the wine fermentation.

Those 4 criteria are relatively easy to copy by other countries. On the other hand the soil diversity along with fundamental relations that unify soil, microbes and plants reach such a high complexity that its is impossible to copy it. These assure the wine makers that their wines are unique and original.

- To define the physical, chemical and biological criteria in the definition of "Terroir".
- To develop new cultivation techniques, that respect those characteristics. In order to illustrate our idea we have chosen the Burgundy region, because of its "monocepage" and its constant geology (Jurassic calcareous).

In this area, the difference in taste observed between two wines of the same appellation can be due only by the soil, especially if those two wines are produced by the same wine maker.

Physical characteristics of the soil of a "Terroir"

Texture

Classical granulometric approaches have never showed correlation with the "Terroir".
In Burgundy, for example, two "clos" can have the same granulometry and give two very different wines: ie "Latriciere" and "Chapelle Chambertin".
On the other hand, soils have an unusual characteristic, the specific surface of clays. This is the total surface area of the clay layers in 1 gram of soil.
The studies we carried out on the "Côtes de Nuits" and 'Côtes de Beaune" seem to indicate 3 things:

- The soil of each vintage is characterised by a unique specific clay surface.
- Soils with a high clay surface are good for red wines while the ones with a lower specific clay surface are suited for white wines.
- The smaller the specific clay surfaces, the better and finer the white wines will be.

On the hill of Puligny-Montrachet we observed for example:

- AOC Village: "Les Houlières": 375 m^2 / g
- First vintage: "Clavaillon: 233 m^2 / g
- Vintage: "Le Montrachet": 176 m^2 / g.

Those results can be checked out in other French regions.

The smallest specific clay surface that we have ever encountered was 57 m^2 /g in the "Coulée de Serrant". The highest 550 m^2 / g was found in the plot of "Richebourg".

Since we have a linear relation between the specific clay surface and its C.E.C we can bring forward the hypothesis that each type of clay will nourish its wine in a specific way. This is the first level of typicality due to the soil, the one of the specific clay surface and their C.E.C.

Structure

The great "Terroirs" are characterised by a strong porosity in the surface and in depth. Those porosities can be from physical origins like the one of surface in gravel soils or alluvial pebble soils. (I.e.: Bordelais, Côtes du Rhônes or Val de Loire) or the one of depth for the cracked calcareous soils of Burgundy and Alsace.

Those porosities are also from biological origins (galleries, faeces of the soil fauna). This is the case for porosity of deep clays in "Bordelais" and "Val de Loire" and the porosity of surface in the calcareous soils of Burgundy and the chalk of "Champagne".
Those strong porosities of surface and at depth allow a quick drainage of soils after the rain, and a quick warm-up of the soil surface, which is necessary for the good ripening of the grape, and a good oxygenation of the deep roots.

The water flow at depth enables the wine to have a constant availability of water during the summer. By stopping the work of the soil and by killing the soil fauna through excess of pesticides, the wine makers have stopped the water flow through the soil and instead promoted the flow of water horizontally increasing the erosion. Then the oxygen cannot flow down in the soil and the roots become shallow.

The chemical characteristics of the "Terroirs"

No content of key assimilable elements could be correlated with the typicality of terroir. On the other hand, high contents of some assimilable oligo-elements seem to characterise some "Terroirs". "Coulée de Serrant", "Le Morgon" and "Montrachet" are all high in magnesium.

The wine can assimilate those oligo elements of the "Terroir" only if the soil microflora is active. The activity of the microflora can be stopped by massive input of pesticides.

Another interesting characteristic is the type of calcareous soils. Our observations under microscopes show that depending of the water circulation, there are two types of calcareous soil:

- Originated from the rocks.
- Originated from the recarbonation by microbes.

It is on the first type that the red wine are found and the white on the second type.
Curiously soils with a rich content of microbial calcareous are poor in freely available Fe^{++} which is necessary for the synthesis of the "anthocyanes".

The biologic characteristic of "Terroirs"

The biologic characteristic of "Terroirs" is found at three different levels: roots, soil fauna, and microbes.

I. Characteristics of root's depth.
   All the vintages we worked for had wines deeply rooted. When the root's depth is important the taste of "Terroir" is stronger.
   After the war, productive stocks were commonly used, they were exploiting the input of fertiliser very efficiently and promoted shallow roots. SO_4 is an example of those stocks.
   We have the same type of problems with the deep soils present in "Herault", "Aude", "Côte d'Or" (below the national road) because they are too rich in nutrients, and badly aerated at depth, and those factors give a taste of "Cepage".
   The deeper the roots, the better they are at extracting the elements of the "Terroir" and they give a protection to the wine against drought.
II. Characteristic of the soil fauna.
   In the vintage we have always observed, in the clays at depth or on the parent material rock, a concentration of dead roots. This mass is the primary source of food for a fauna called "endogenous Fauna" (acarids, earth worms etc.). The multiplication of this fauna along with its activity increases the porosity at depth (galleries) and increases the biological activity, against the rock. This activity allows the formation of assimilable elements distinctive of the "Terroir".
III. Microbiological characteristics.
   Our microscopic observations show that the dominant micro flora changes depending the soils. Some are dominated by fungi other by bacteria. Some bacterial groups can be very abundant like the sidero bacteria in the soils of "Bordeaux", or calcareous bacteria in "Champagne", "Chablis". Our measures of microbial activity shows that the activity is link to the specific internal surface of clays, the type and content in carbonates of calcium, the quantity and quality of the soil humus.
   On a general basis, modern practices in viticulture have' lead to a dramatic decrease

of microbial activity, in the soils of "Terroir". In some soils, we have observed activities lower than in Sahara soils. At the opposite, vineyards that switched to organic techniques, we have noticed an increase in those activities, along with a better depth of roots. It is in the "Terroirs" practising “biodynamic agriculture”, where we have observed elements of the deep soil.

Conclusion

This quick presentation the role-played by the soil in the characteristics of "Terroir" is a proof that the soil is not a myth but real and important.
The role of the soil in the typicality is found on the physical of level: types of clays, their C.E.C. which will have different effect on providing the wine with nutrients.
The superficial and deep structure of the soil is important in the terms of porosity to allow a good circulation of O_2 and the good flow of water towards the roots.
This action of the soil is showed by the soil biology because it is the microbes of the "Terroir" that produce the assimilable oxides. The porosity is made by the action of the fauna.

It is by integrating and by applying those new know ledges of soil biology, that we can improve our understanding of "Terroirs" and develop new viticulture practices able to respect it.

Wine fermentation is not the limiting factor anymore, to improve the quality of the wine, but the soil is.
We have to respect it, to improve the "Terroirs".
"Less chemicals and more life in our wine soils" must be leitmotif of the future wine makers.

Cover Cropping in California Vineyards: Part of a Biologically Integrated Farming System

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Abstract

The expansion of winegrape vineyard acreage through much of California dictates strict attention to existing and potential adverse environmental impacts. Practical examples of bio-responsible commercial vineyards exist: Organic and reduced-risk practices are viable options. Cover cropping, in many variations, is a cornerstone for most organic and biologically integrated farming systems. Options for sustainably managing vineyards are well established in the winegrape industry, but by no means universally understood or practised. The ongoing development of a "bio-responsible" vineyard on the University of California Davis campus will provide a high-profile model.

Introduction

Cover crops are plants grown not for harvest but to vegetate ground that would otherwise be bare or weed ridden. Cover crops are important tools for ecological vineyard management (Bugg and Van Horn, 1998), and are used to promote soil life, prevent soil erosion, add N, improve soil structure, manage soil moisture, enhance trafficability during wet weather, improve footing for vineyard workers, suppress resident vegetation, and to enhance beneficial arthropods. Improperly selected or managed cover crops may reduce vine growth and yields, or grape quality, and increase frost problems. There is a rich array of cover-cropping options. In vineyards, a wide range of species may be used (Bugg et al., 1996; Ingels et al., 1998), including several annual and perennial plants that can be managed to self-regenerate.

Materials and Methods

Many vineyardists in North Coast counties manage winter-annual resident vegetation as a cover crop intended to protect the vineyard soil from erosion during the most intense winter rains. Tillage by mid-March and thereafter at intervals is intended to provide vegetation-free middles until herb seeds germinate with fall rains. With such a schedule, only early-maturing, low-growing, low-biomass herbaceous plants can complete their life cycles.

Seeded winter-annual cover crops include large-seeded mixes with vetches, field pea, bell bean and oat. These are often tilled under at peak bloom. Small-seeded mixes managed without tillage often include ‘Blando’ brome (soft chess) and several legumes: burr medic and various clovers: crimson, Persian, rose, and subterranean. These are typically managed by mowing rather than tillage.

California native perennial grasses used in vineyards include several bunchgrasses and a few sod-forming species. These present both challenges and opportunities to winegrape vineyardists. In general, these grasses are suitable in vineyards that are dry-farmed or irrigated by sprinkler or drip systems, and may be used with some difficulty in those that are irrigated by flood or furrow. Difficulties that may arise in using perennial grasses include:

(1) The relatively high price of seed relative to most other cover crops;
(2) Poor seedling vigor makes establishment difficult where high seed densities of vigorous winter-annual species occur;
(3) Possible increases in pocket gopher (*Thomomys bottae*), necessitating special vigilance and an intense trapping program;
(4) Possible excessive devigoration of vines through competition for soil moisture or nitrogen, necessitating careful matching of soil type, rootstock vigor, native perennial grass phenology, seeding pattern, and irrigation system.

Some advantages include the following:

(1) One-time establishment cost for native perennial grasses may be amortized over a ten-year period;
(2) Some native perennial grasses are summer dormant, drought tolerant, and have low stature;
(3) Fibrous roots of perennial grasses absorb nitrate, bind soil, add soil organic matter (humus);
(4) Native perennial grasses may reduce weeds;
(5) Pollen of grasses is food for some lacewings and predatory mites;
(6) Some native perennial grasses work well with winter-annual legumes;
(7) Perennial grasses provide excellent trafficable surfaces that allows vehicles entry for fungicide applications during wet springs.

Results

The Lodi-Woodbridge Winegrape Commission has for several years taken a Biologically Integrated Farming Systems (BIFS) approach (Ohmart, 1998). This typically comprises:

(1) Weekly monitoring of in-season pest densities in conjunction with action thresholds;
(2) Emphasis on cultural and biological control of pests with pesticides the tools of last resort;
(3) Cover cropping to reduce soil erosion and enable easy vehicular access;
(4) Conservation and restoration of native plants and animals in riparian and other adjoining wildlands.

Application of BIFS technology by Lodi-Woodbridge Winegrape Commission (LWWC) has led to documented reduction of sprays against leafhoppers, reduced use of pre-emergence herbicides, increased use of cover crops, and provision of habitat for owls and other desirable wildlife (Broome et al. 1999). Specific accomplishments include:

(1) One hundred percent (100%) of the enrolled grower demonstration acreage was monitored weekly for pests.
(2) Seventy-two percent (72%) of the Winegrape BIFS vineyards were planted to cover crops in 1998.
(3) In 1996, 51.3% of BIFS vineyards were sprayed with imidachoprid (Provado®) to control leafhoppers. In 1997, only 27.8% were sprayed despite similar pest populations, and in 1998 only 18.3% received a treatment.
(4) Intensive monitoring of predacious mite populations enabled growers to forgo pesticide applications against mites.
(5) The percent of BIFS vineyard acreage receiving the pre-emergence herbicide simazine for under-vine weed management decreased from a pre-project high of 45% in 1994 to a low of 15.6% in 1998.
(6) The percent of the BIFS vineyard area treated with the reduced-risk contact herbicide glyphosate increased from a pre-project low of 14.8% in 1994 to 31.3% in 1998, the final year of the BIFS program. Data for non-BIFS growers fluctuated between 20 and 25% of the grape area in San Joaquin County.

Discussion

We view cover cropping as the leading edge of vegetational diversification in and around California vineyards. Some Californian vineyardists are exploring the integration of other crops into the vineyard environment. These crops may include olives, cut or dried flowers, and culinary and medicinal herbs. Such an approach may be used to limit the movement of insect vectors of plant pathogens and to diversify the economic base, enabling year-round employment of more workers. Some vineyardists believe that seasonal and year-to-year stability of the vineyard work force can improve worker morale and commitment and thereby enhance overall environmental stewardship of a farming operation.

Results such as those for Lodi-Woodbridge Winegrape Commission have inspired the conversion of the vineyard managed by the University of California Department of Viticulture and Enology. The Department currently maintains 50 acres of wine-production blocks; additional acreage will be developed from 2000-2004. These blocks are routinely used for faculty and graduate student research, undergraduate education, and extension. If managed bio-responsibly, these blocks have immense potential value as a demonstration tool.

For many years, the U.C. Davis Department of Viticulture and Enology was committed to “old school” management of vineyards. The old school dictated heavy use of tillage and pre-emergence herbicides to provide an image of “clean farming.” There was a policy of not tolerating or encouraging native or even selected non-native vegetation on vineyard edges. Such an approach runs the environmental risks of contaminating ground and surface waters with pesticides, of contributing to increased sediment loads in nearby Putah Creek, and of failing to harbor desirable wildlife species, such as various raptors.

In 1998, the Department began a graded conversion of the vineyard from “old school” to bio-responsible management. Initial emphasis has been on establishing cover crops on most of the area. Farmscaping the area was initiated in spring 2000 with the installation of culinary and medicinal herbs and low-maintenance ornamental plants at vine row ends and gated entrances (Bugg et al., 1998). Formal technical presentations on the new, ecologically based management began in 2000.

Developing the UC Davis Bio-Responsible Vineyard will require the following tactics:
(1) Evaluation and annual scoring of vineyard by Central Coast Positive Point System (Anonymous, 1998);
(2) State-of-the-art soil remediation and conservation through use of composts, organic mulches, and a range of cover-cropping techniques, e.g. perennial grasses, annual grasses, and annual legumes;
(3) Preservation and restoration of native plants on roadsides, field edges, and the interfaces with the Putah Creek riparian corridor;
(4) Provision of nesting, perching, and roosting habitat for raptors, e.g. barn owl and Swainson's hawk;
(5) Insectary plantings and habitat for predatory mites;
(6) Integration of low-maintenance landscape plants, including cut flowers and culinary and medicinal herbs, near gates and along fence rows;
(7) Use of irrigation backflush water in drainage areas for creation of mini-wetlands, includinguse of local native plants;
(8) Production of $100m^2$ per year of compost using manures from the facilities of the Department of Animal Science;
(9) Educating visitors from the winegrape industry, students, and international groups by means of ongoing vineyard projects.

References

Anonymous. 1998. Central Coast Vineyard Team Positive Points System. Practical Winery And Vineyard 19(1): 12, 14-24.

Broome J.C., R.L.Bugg, D. Denton, D. Zeleke, A. King, M. Stevenson & C.P. Ohmart. 1999. Promoting environmental health through Biologically Integrated Farming Systems. Poster Presentation at the International Congress on Ecosystem Health, Sacramento, CA. August 15-20, 1999.

Bugg, R.L., J.H. Anderson, C.D. Thomsen, and J. Chandler. 1998. Farmscaping: restoring native biodiversity to agricultural settings. Pp. 339-374 in: Pickett, C.H. and R.L. Bugg [Eds.], Enhancing biological control: habitat management to promote natural enemies of agricultural pests. University of California Press, Berkeley, CA.

Bugg, R.L., and M. Van Horn. 1998. Ecological soil management and soil fauna: best practices in California vineyards. Pp. 23-34 in: R. Hamilton, L. Tassie, and P. Hayes (eds). Proceedings of the Viticulture Seminar: Viticultural Best Practice, Mildura Arts Centre, 1 August, 1997, Mildura, Victoria, Australia. Australian Society For Viticulture And Oenology, Inc., Adelaide, South Australia, Australia.

Bugg, R.L., G. McGourty, M. Sarrantonio, W.T. Lanini, and R. Bartolucci. 1996. Comparison of 32 cover crops in an organic vineyard on the north coast of California. Biological Agriculture and Horticulture 13:65-83.

Ingels, C.A., R.L. Bugg, G.T. McGourty, and L.P. Christensen, eds. 1998. Cover Cropping in Vineyards: A Grower's Handbook. University of California, Division of Agriculture and Natural Resources. Publication 3338.

Ohmart C.P. 1998. Lodi-Woodbridge Winegrape Commission's Biologically Integrated Farming System for Winegrapes. Final Report to the University of California Sustainable Agriculture Research and Education Program, 9/1/95 11/30/98. Lodi-Woodbridge Winegrape Commission, Lodi, California.

Plant Biodiversity and Biological Control of Insect Pests in a Northern California Organic Vineyard

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Introduction

One the major effects of the simplification of agricultural landscapes through monocultures in California, is a decrease in the abundance and activity of the natural enemies of agricultural pests, due to the disappearance of habitats providing them with critical food resources and overwintering sites (Corbett & Rosenheim, 1996). Many scientists are concerned that, with accelerating rates of habitat removal, the contribution to pest suppression by biocontrol agents using these habitats will decline further (Fry, 1995; Sotherton, 1984), thus increasing insecticide use with consequent negative effects on the sustainability of agroecosystems.

To halt or reverse this decline in natural controls, many researchers have proposed ways of increasing the vegetational diversity of agricultural landscapes as it is known that biological pest suppresion is more effective in diverse cropping systems than in monocultures (Andow 1991, Altieri 1994). One such biodiversification method, employed in vineyards and orchards, is to plant cover crops, a tactic designed to maintain habitats for natural enemies and thus enhance their populations. Reductions in mite (Flaherty, 1969) and grape leafhopper populations (Daane et al., 1998) have been observed with winter cover crop plantings, but such biological suppression has not been sufficient from an economic point of view (Daane & Costello, 1998).

A main constraint is that winter cover crops are mowed or plowed under at the beginning of the growing season, leaving the systems as virtual monocultures by early summer. Natural enemies need a green cover for habitat and alternative food during the entire growing season. One way to achieve this condition is to sow summer cover crops that bloom early and throughout the season, thus providing a highly consistent, abundant and well-dispersed alternative food source, as well as microhabitats, for a diverse community of natural enemies. Our main goal was to test whether the presence of neutral insects and pollen and nectar in summer cover crops provides a constant and abundant supply of food sources for natural enemies, thus decoupling predators and parasitoids from a strict dependence on grape herbivores, and allowing natural enemies to build up in the system and keep pest populations at acceptable levels.

Another biodiversification option is the maintenance or planting of vegetation adjacent to crop fields (Thomas et al., 1991; Nentwing et al., 1998). Ideally, such areas provide alternative food and refuge for predators and parasitoids, thereby increasing natural enemy abundance and colonization of neighboring crops (Altieri, 1994; Corbett & Plant 1993; Coombes & Sotherton, 1984, Fry, 1995; Wratten, 1988). Several studies indicate that the abundance and diversity of entomophagous insects within a field is dependent on the plant species composition of the surrounding vegetation, and also on its spatial extent and arrangement, which affects the distance to which natural enemies disperse into the crop (Lewis 1965; Pollard, 1968).

The classic study by Doutt and Nakata (1973) in California was pioneering in determining the role of riparian habitats, and especially of wild blackberry patches, near vineyards in enhancing the effectiveness of the wasp *Anagrus epos* in parasitizing the grape leafhopper (*Erythroneura elegantula*). Later, research by Kido et al. (1984) established that French prunes adjacent to vineyards could also serve as overwintering sites for *A. epos*, and Murphy et al. (1996) detected higher leafhopper parasitism in grape vineyards with adjacent prune tree refuges than in vineyards lacking refuges. Corbett and Rosenheim (1996), however, determined that the effect of prune refuges was limited to a few vine rows downwind and *A. epos* exhibited a gradual decline in vineyards with increasing distance from the refuge. This finding indicates an important limitation in the use of prune trees for biological control protection in vineyards.

In order to ovrcome this limitation we borrowed from concepts of landscape ecology and tested the effects of an established vegetational corridor to enhance movement of beneficials beyond the “normal area of influence” of adjacent habitats or refuges. Corridors have long been used by conservation biologists for protecting biological diversity, as they provide multiple avenues for circulation and dispersal of biodiversity through the environment (Rosenberg et al., 1997). Such study is relevant in northern California’s Mendocino County, where most vineyards are interwoven in a matrix of riparian forests, thus providing ample opportunities for the study of arthropod colonization and inter-habitat exchange of arthropods, especially those restricted to the interstices between agricultural and uncultivated land.

The corridor, which was connected to a riparian forest cutting across a monoculture vineyard, allowed for testing whether such a strip of vegetation could enhance the biological control of insect pests in a vineyard. We were interested in evaluating if the corridor acted as a consistent, abundant, and well-dispersed source of alternative food and habitat for a diverse community of generalist predators and parasitoids, allowing predator and parasitoid populations to develop in the area of influence of the corridor well in advance of vineyard pest populations. We also thought that the corridor would serve as a biological highway for the dispersion of predators and parasitoids within the vineyard, thus providing protection against insect pests within some area of influence.

As the vineyard was also diversified with cover crops, we could test another hypothesis: that the presence of neutral insects and pollen and nectar in summer cover crops provides a constant and abundant supply of food sources for natural enemies, thus decoupling predators and parasitoids from a strict dependence on grape herbivores, and allowing natural enemies to build up in the system and keep pest populations at acceptable levels. We tested this hypothesis and examined the ecological mechanisms associated with insect pest reduction when summer cover crops were planted early in the season between alternate vine rows.

Materials and methods

This study was conducted in two adjacent organic Chardonnay vineyard blocks (blocks A and B, 2.5 ha each) from April to September, in 1996 and 1997. Both vineyards blocks were surrounded on the north side by riparian forest vegetation, but block A was penetrated and dissected by a five meter wide and 300 meter-long vegetational corridor composed of 65 different species of flowering plants. The vineyard was located in Hopland, 200 km north of San Francisco, California, in a typical wine-growing region . Before and during the study, both blocks were under organic management, yearly planted to winter cover crops every other row, receiving an average of 2 tons of compost per hectare and preventive applications of sulfur against *Botrytis* spp. and *Oidium* spp.

Corridor

To determine if the corridor influenced the species diversity and abundance of entomophagous insects in the adjacent vineyard we placed ten yellow and ten blue sticky traps were placed at different points within the vineyard at increasing distances from the corridor or the bare edge (rows 1, 5, 15, 25, 45) in blocks A and B respectively) to monitor diversity and abundance of the entomofauna. Yellow sticky traps were used to monitor leafhoppers, the egg parasitoid *Anagrus epos*, and various predator species. Blue sticky traps were mainly used to assess thrips and *Orius* populations. Traps were oriented perpendicular to the predominant wind direction and positioned above the vine canopy. Traps were deployed beginning in April and replaced weekly throughout the 1996 and 1997 growing seasons. All traps were returned to the laboratory and examined with a dissection microscope to count the number of phytophagous insects and associated natural enemies on the traps.

In the same rows where sticky traps were placed, grape leaves were visually examined in the field and the number of *E. elegantula* nymphs recorded. Populations of leafhopper nymphs were weekly estimated on 10 randomly selected leaves in each row.

Cover crop blocks

Half of each block was kept free of ground vegetation by one spring and one late summer disking (the monoculture vineyard). In April, the other two halves of both blocks (the cover-cropped vineyard) were undersown every alternate row with a 30/70 mixture of sunflower and buckwheat. Buckwheat flowered from late May to July and sunflower bloomed from July to the end of the season.

From April to September of 1996 and 1997, relative seasonal abundance and diversity of phytophagous insects and associated natural enemies were monitored on the vines in both treatment plots. Ten yellow and ten blue sticky traps (10 by 17 cm [Seabright Laboratories, Emeryville, CA] coated with tanglefoot) were placed in each of 10 rows selected at random in each block to estimate densities of adult leafhopper, thrips, *Anagrus* wasps, *Orius* sp. and other predators.

In the same rows where sticky traps were placed, grape leaves were visually examined in the field and the number of *E. elegantula* nymphs recorded. Populations of leafhopper nymphs were estimated on 10 randomly selected leaves in each row. This sampling method was carried out in sections with and without cover crops, allowing one to de-

termine quickly and reliably the proportion of infested leaves, densities of nymphs, and rates of leafhopper egg parasitization by the *Anagrus* wasp (Flaherty et al., 1992, Murphy et al., 1996).
In order to determine whether cover crop mowing forced movement of natural enemies from cover crops to vines, three different selected cover crop rows in block B were subjected to mowing three times each year. Both years, 5 yellow and 5 blue sticky traps were placed in the three random rows with cover crops every time they were mowed, and in three random rows that were not mowed.

Results and discussion

Influence of the corridor on leafhoppers and thrips

In both years in block A, adult leafhoppers exhibited a clear density gradient, reaching lowest numbers in vine rows near the corridor and forest and increasing in numbers towards the center of the field, away from the adjacent vegetation. The highest concentration of leafhoppers occurred after the first 20–25 rows (30-40 meters) downwind from the corridor. Such gradient was not apparent in block B, where the lack of the corridor resulted in a uniform dispersal pattern of leafhoppers (Fig. 1, similar trends were observed in 1997). Nymphal populations behaved similarly, reaching highest numbers in the center rows of block A in both years. Apparently, the area of influence of the corridor extended 15–20 rows (25-30 meters), whereas the area of influence of the forest on nymphs reached 10–15 rows (20-25meters)as evident from 1997 catches. Nymphs were similarly distributed over the whole block-B field.

A similar population and distribution gradient was apparent for thrips in both years. In both years catches in block A were substantially higher in the central rows than in rows adjacent to the forest; catches were particularly low in rows near the corridor. In block B there were no differences in catches between the central and bare edge rows, although catches near the forest were lowest, especially during 1997.

Response of natural enemies

Generalist predators in the families Coccinellidae, Chrysopidae, Nabidae, and Syrphidae exhibited a density gradient in block A, clearly indicating that the abundance and spatial distribution of these insects was influenced by the presence of the forest and the corridor, which channeled dispersal of the insects into adjacent vines (Fig. 2, similar trends were observed in 1996). Predators were more homogeneously distributed in block B, as no differences in spatial pattern in predator catches was observed between bare edge and central rows, although their abundance tended to be higher in rows close to the forest (10-15meters).
Leaf examination revealed high levels of parasitism across leafhopper generations for both 1996 and 1997 in both blocks . Eggs in center rows had slightly higher mean parasitization rates than eggs located in rows near the forest or corridor. The proportion of eggs parasitized tended to be uniformly distributed across all rows in both blocks. It is assumed that the presence of the forest and corridor was associated with the colonization of *A. epos* but this did not result in a net season-long prevalence in *E. elegantula* egg parasitism rates in rows adjacent to such habitats.

Density responses of the grape leafhopper to summer cover crops

In both years, densities of adult leafhoppers were significantly lower throughout the season (except on 6/27 and 7/18 in 1996 and early in the summer in 1997) on vines with summer cover crops than on monoculture vines (Fig. 3, $t=2.612$, $df=10$, $p<0.05$).

Comparing the cover-cropped vineyard with the monoculture shows that increasing plant diversity also results in a decrease in the number of leafhopper nymphs. During 1996, nymphal densities were generally lower on vines in cover-cropped sections. Differences were not statistically significant, however, from August 15 until the end of the season ($t=2.31$, $df=13$, $p<0.05$). In 1997 significantly lower abundance levels of nymphs on cover-cropped vines were evident from July 9 onward ($t=2.50$, $df=6$, $p<0.05$).

Effects of cover crops on Anagrus populations and parasitization rates

During 1996 the mean densities of *Anagrus* present on yellow sticky traps placed on cover-cropped and monoculture vineyard sections were similar, although towards the end of the season *Anagrus* attained significantly greater numbers in the monoculture. Similarly during 1997, a year in which elevated capture rates were evident, sampling revealed significantly higher numbers of *Anagrus* in the monoculture starting in late July (Fig. 7, $t=2.41$, $df=9$, $p<0.05$). Clearly, *A. epos* was more abundant in the vineyard monocultures associated with higher host densities. There was no consistent relationship between leafhopper abundance and the measures of parasitism done in this study. No statistical differences in parasitization rates were detected between treatments in both years.

Effects of cover crops on thrips and general predators

Densities of thrips, as revealed by blue sticky trap captures in 1996, were significantly lower ($t=2.37$, $df=9$, $p<0.05$) in cover-cropped vineyards than in monocultures, and remained lower throughout the growing season . Such differences were also apparent in 1997, a year of extreme thrips pressure.

Table 1 gives the numbers of predators from cover-cropped and monoculture systems. The predators include spiders, *Nabis* sp., *Orius* sp., *Geocoris* sp., Coccinellidae, and *Chrysoperla* sp. Generally, the populations were low early in the season and increased as prey became more numerous during the season. The table shows that, during 1996, general predator populations on the vines tended to be higher in the cover-cropped sections than in the monocultures.

Table 1. Monthly mean densities* (± SE) of various arthropod predator species on vines with and without summer cover crops (Hopland, California. 1996)

		Orius	Spiders	Coccinelli-dae	*Geocoris* sp.	*Nabis* sp.	*Chrysoperla* sp.
w/ cover crop	June	3 ± 0.7	3 ± 1.3	0	0	1 ± 0.3	3 ± 2.2
	July	5 ± 1.9	9 ± 3.4	4 ± 1.9	2 ± 1.7	1 ± 0.6	5 ± 3.1
	Aug	4 ± 2.0	12 ± 3.7	1 ± 0.8	4 ± 2.3	2 ± 1.1	2 ± 1.0
w/o cover crop	June	2 ±1.3	2 ± 1.1	2 ± 0.7	0	0	2 ± 0.7
	July	3 ± 0.9	8 ± 2.6	2 ± 0.4	1 ± 0.5	0	4 ± 1.5
	Aug	2 ± 0.8	9 ± 3.4	1 ± 0.3	2 ± 0.9	1 ± 0.7	2 ± 0.8

*Number of individuals per 25-m D-Vac transect

D-Vac sampling of cover crops in both blocks revealed that in 1996 the most abundant predator present on the flowers of buckwheat and sunflowers was *Orius*, followed by several species of Coccinellidae. Among the spiders, members of the family Thomisidae were the most common.

Effects of cover crop mowing on leafhoppers and A. epos

To determine if mowing influenced leafhopper abundance in 1997, leafhopper densities were assessed on vines selected before and after mowing compared to numbers on vines where cover crops were not mowed. Before mowing, leafhopper nymphal densities on vines were similar in the selected cover-cropped rows. One week after mowing, numbers of nymphs declined on vines where the cover crop was mowed, coinciding with an increase in *Anagrus* densities in mowed cover crop rows. During the second week, this decline was even more pronounced ($t=2.93$, $df=4$, $p<0.05$), although by then differences in *Anagrus* numbers between mowed and not mowed rows were not significant (Fig. 4).

Conclusions

Our studies showed that cover crops harbored a large number of *Orius*, coccinellids, thomisid spiders and a few other predator species, which tended to be more abundant in the cover cropped vineyard blocks compared to the clean cultivated systems. Our analysis does reveal that greater densities of predators was correlated with lower leafhopper numbers and this relationship is most clear-cut in the case of the *Orius*–thrips interaction.

The mowing experiment suggests a direct ecological linkage, as the cutting of the cover-crop vegetation forced the movement of the *Anagrus* and predators harbored by the flowers, resulting in a decline of leafhopper numbers on the vines adjacent to the mowed cover crops in both years. We suggest the need for more research in order to better determine the timing of mowing in relation to the biology of the leafhopper and the phenology of the vine and cover crops.

This research also indicates that dispersal and subsequent within-vineyard densities of herbivores and associated natural enemies is influenced by the forest edge and the corridor. The presence of riparian habitats enhances predator colonization of and abundance in adjacent vineyards, although this influence is limited by the distance to which natural enemies can disperse into the vineyard (Corbett & Plant, 1993). The corridor, however, amplifies this influence by allowing enhanced and timely circulation and dispersal movement of predators into the center of the field. The great availability of pollen and nectar displayed by the various flowers of the corridor, as well as the diversity and prevalence of neutral insects, attracted high numbers of generalist predators. In turn, this increased the impact of predators, especially in vine rows close to the corridor.

The data obtained in this study point to two main conclusions:

- Habitat diversification using summer cover crops supports season-long high populations of predators, thereby favoring enhanced biological control of leafhoppers and thrips in vineyards.
- The creation of corridors across vineyards can serve as a key strategy for allowing natural enemies emerging from riparian forests to disperse over large areas of otherwise monoculture systems. Such corridors should be composed of locally adapted plant species exhibiting sequential flowering periods, which attract and harbor an abundant diversity of predators and parasitoids. These corridors or strips, which may link various crop fields and riparian forest remnants, can create a network of habitat allowing many species of beneficial insects to disperse throughout whole agricultural regions, transcending farm boundaries (Baudry, 1984).

Our study suggests that it is possible to restore natural controls in agroecosystems through vegetation diversification, thus providing a robust ecological foundation for the design of pest-stable and sustainable vineyards in northern California and elsewhere in the mediterranean world.

References

Altieri, M.A. 1994. Biodiversity and Pest Management in Agroecosystems. Haworth Press, New York.

Andow, D. A. 1991. Vegetational diversity and arthropod population response. Annual Review of Entomology 36: 561-586.

Baudry, J. (1984). Effects of landscape structure on biological communities: the cases of hedgerows network landscapes. In: J. Brandt & P. Agger (eds). Methodology in Landscape Ecological Research and Planning. Roskilde University Center. Denmark, Vol. 1., pp. 55-65.

Boller, E.F. 1990. The ecosystem approach to plan and implement integrated plant protection in viticulture of eastern Switzerland. In: R. Cavalloro (Ed.). Plan-Protection problems and prospects of integrated control in viticulture, Proc. Int. CEC-IOBC Symposium, Lisboa, Portugal. Report EVR 11548. Pp. 607-617.

Bugg, R.L and C. Waddington, 1994. Using cover crops to manage arthropod pests of orchards: a review. Agricul. Ecosystems and Environ. 50: 11-28.

Corbett, A.& J.A. Rosenheim.1996. Impact of natural enemy overwintering refuge and its interaction with the surrounding landscape. Ecological Entomology 21: 155-164.

Corbett, A. & R.E. Plant. 1993. Role of movement in the response of natural enemies to agroecosystem diversification: a theoretical evaluation. Environmental Entomology 22: 519-531.

Coombes, D. S. & N.W. Sotherton. 1986. The dispersal and distribution of polyphagous predatory Coleoptera in cereals. Annals of Applied Biology. 108: 461-474.

Daane, K.M.; M.J. Costello; G.Y. Yokota & W.J. Bentley. 1998. Can we manipulate leafhopper densities with management practices? Grape Grower 30 (4): 18-36.

Daane, K.M. and M. J. Costello. 1998. Can Cover crops reduce leafhopper abundance in vineyards? California Agriculture 52(5): 27-32.

Doutt, R.l & J. Nakata. 1973. The *Rubus* leafhopper and its egg parasitoid: an endemic biotic system useful in grape-pest management. Environmental Entomology 2: 381-386.

Duelli, P; M. Studer; I. Marchand & S. Jakob. 1990. Population movements of arthropods between natural and cultivated areas. Biol. Conserv. 54: 193-207.

Flaherty, D.L. 1969. Ecosystem trophic complexity and the Willamette mite, *Eotetranychus willamettei* (Acarine: Tetranychidae) densities. Ecology 50: 911-916.

Flaherty, D.L.; P.T. Christensen; T. Lanini; J. Marois & L.T. Wilson. 1992. Grape Pest Management. University of California Division of Agriculture and Natural Resources.

Fry, G. 1995. Landscape ecology of insect movement in arable ecosystems. In: Glen D.M, Greaves, M.P. & Anderson H.M. (Eds). Ecology and Integrated Farming Systems. John Wiley and Sons, Bristol, UK. pp. 177-202.

Hanna R., F.G. Zalom & C. L. Elmore. 1996. Integrating Cover Crops into Vineyards. Grape Grower, February. pp. 26-43.

Kido, H., D.L. Flaherty; D.F. Bosch & K.A. Vaero. 1984. French prune trees as overwintering sites for the grape leafhopper egg parasite. Am. J. Enol. Vitic. 35: 156-160.

Lewis, T. 1965. The effects of shelter on the distribution of insect pests. Scientific Horticulture 17: 74-84.

Lys, J.A., M. Zimmermann & W. Nentwing. 1994. Increase in activity density and species number of carabid beetles in cereals as a result of strip-management. Entomol. Exp. Appl. 73: 1-9.

Murphy, B.C., J.A. Rosenheim & J. Granett. 1996. Habitat diversification for improving biological control: Abundance of *Anagrus epos* (Hymenoptera: Mymaridae) in grape vineyards. Environ. Entomol. 25 (2): 495-504.

Pollard, E. 1968. Hedges IV. A comparison between the carabidae of a hedge and field site and those of a woodland glade. Journal of Applied Ecology 5: 649-657.

Rosenberg, D.K., B.R. Noon & E.C. Meslow. 1997. Biological corridors: form, function and efficacy. BioScience 47 (10): 677-687.

Settle, W.H. & T. Wilson. 1990. Invasion by the variegated leafhopper and biotic interactions: parasitism, competition, and apparent competition. Ecology 71: 1461-1470.

Settle, W.H., L.T. Wilson; D.L. Flaherty & M. English-Loeb. 1986. The variegated leafhopper, as increasing pest of grapes. California Agriculture 40: 30-32.

Sluss, R.R. 1967. Population dynamics of the walnut aphid Chromaphis juglandicola (Kalt) in northern California. Ecology 48: 41-58.

Sotherton, N.W. 1984. The distribution and abundance of predatory arthropods overwintering on farmland. Annual of Applied Biology 105: 423-429.

Thomas, M.B., S.D. Wratten & N.W. Sotherton. 1991. Creation of “islands” habitats in farmland to manipulate populations of biological arthropods: predator densities and emigration. J. Appl. Ecol. 28: 906-917.

Wratten, S. D. 1988. The role of field margins as reservoirs of natural enemies. In: A.J. Burn (Ed.). Environmental Management in Agriculture. Belhaven Press, London.

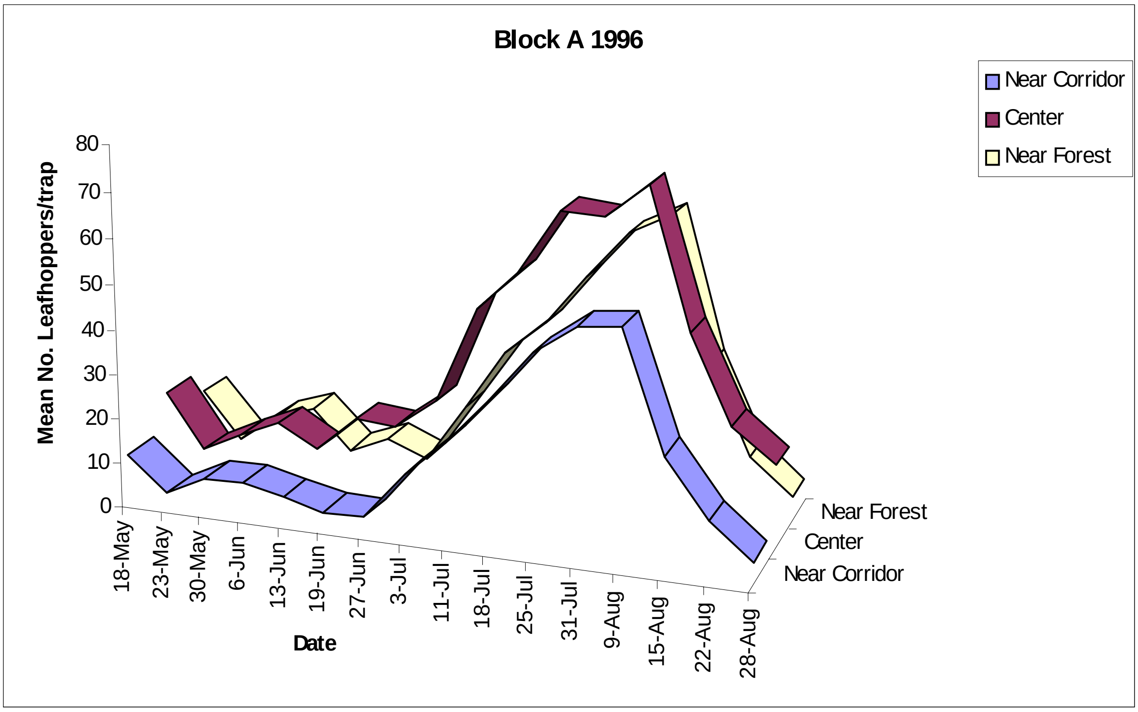
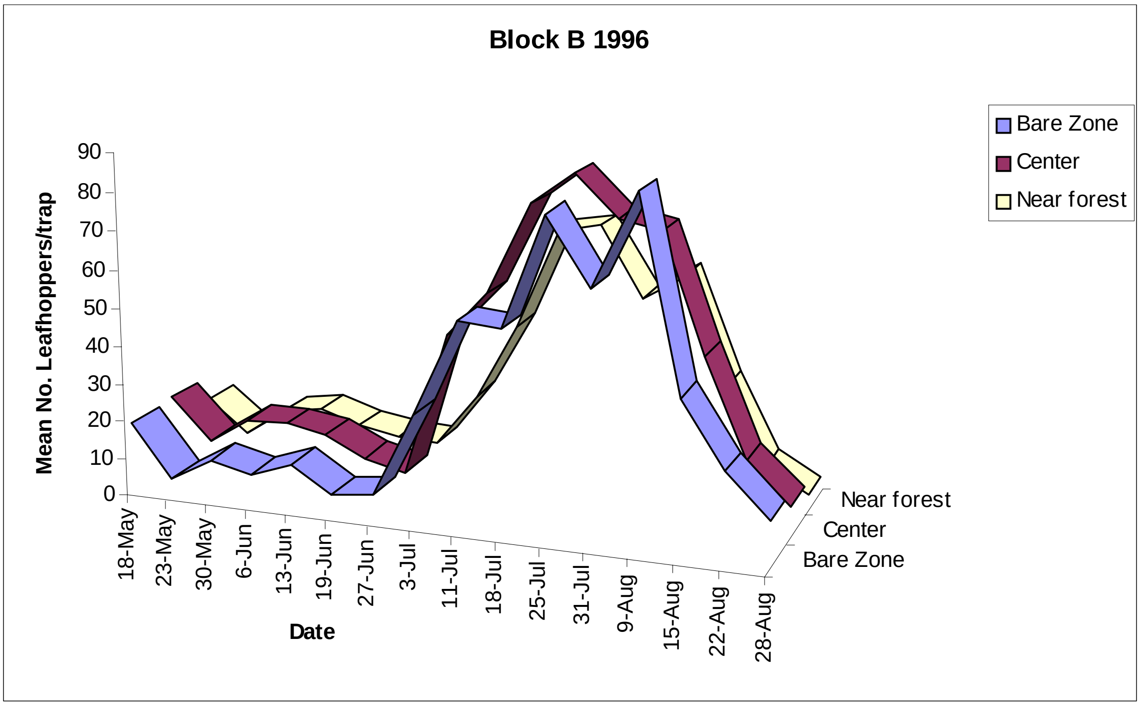


Figure 1. Seasonal patterns (numbers per yellow sticky trap) of adult leafhopper *E. elegantula* in both vineyard blocks, as influenced by proximity to forest or the corridor



(Hopland, California, 1996).

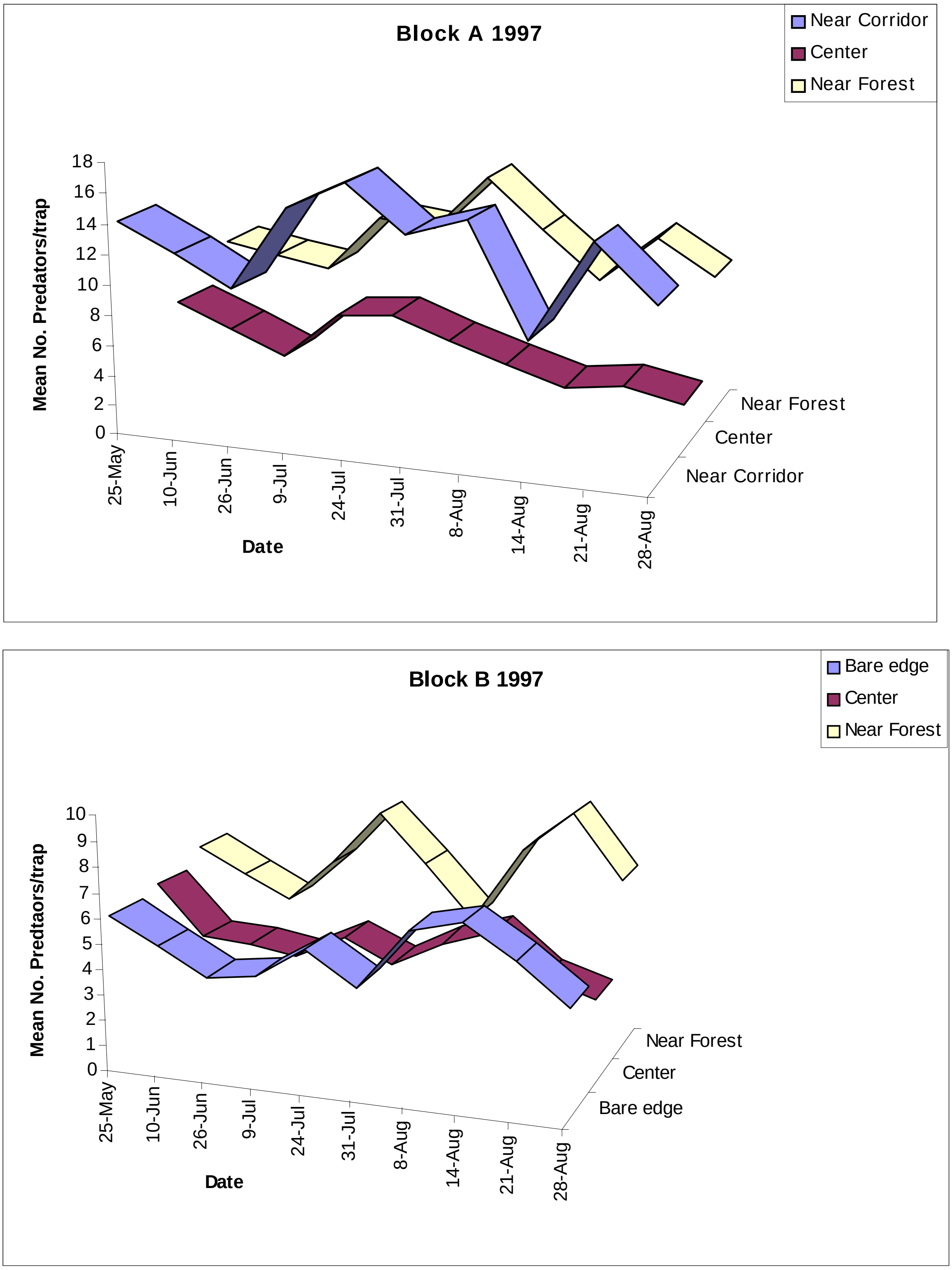


Figure 2. Seasonal patterns of predator catches (numbers per yellow sticky trap) in both vineyard blocks, as influenced by the proximity to forest or the corridor (Hopland, California, 1997).

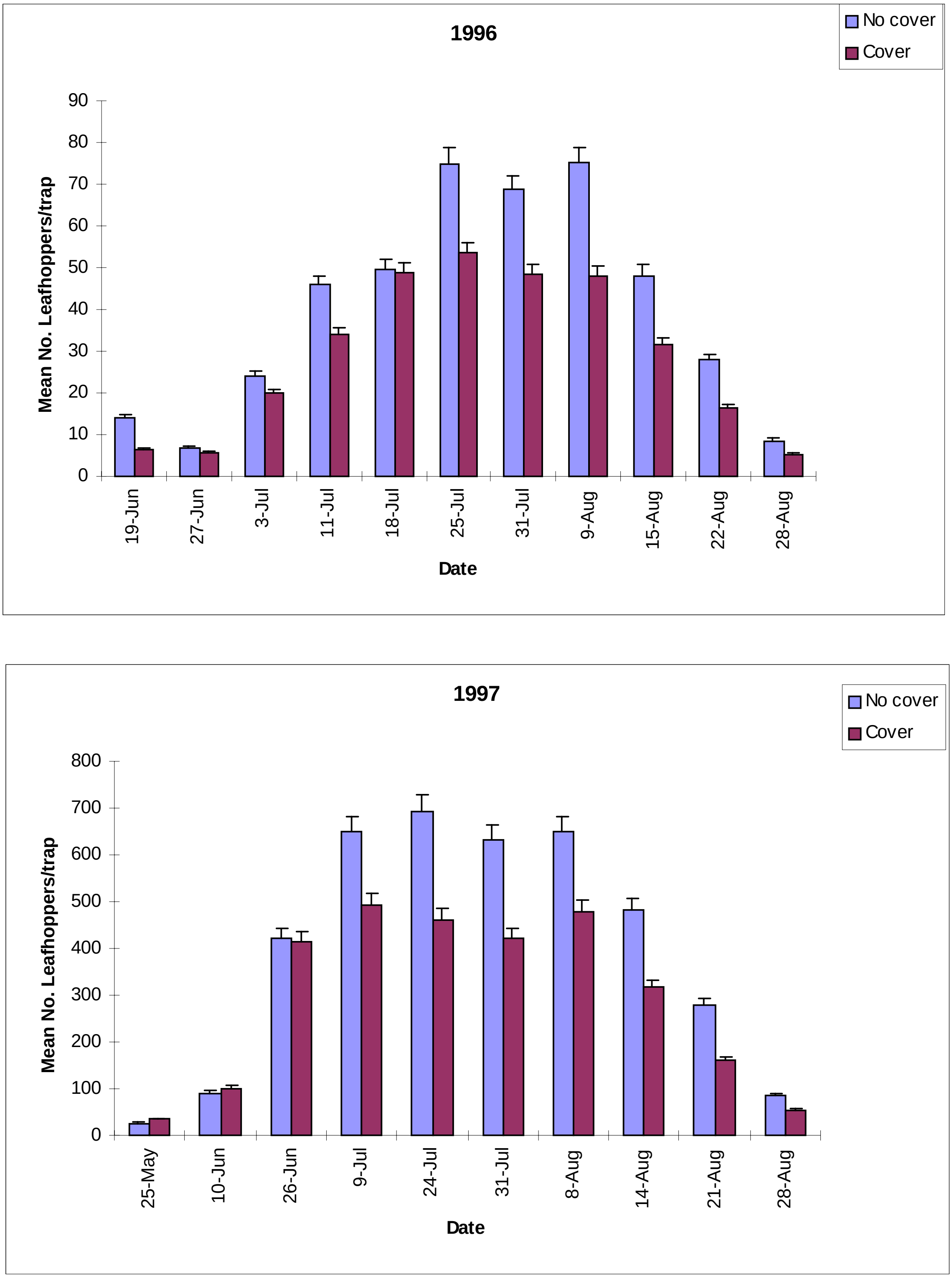


Figure 3. Densities of adult leafhoppers *E. elegantula* in cover-cropped and monoculture vineyards in Hopland, California, during two growing seasons. Mean densities (number of adults per yellow sticky trap) and standard errors of two replicate means are indicated. In some cases error bars were too small to appear in the figure.

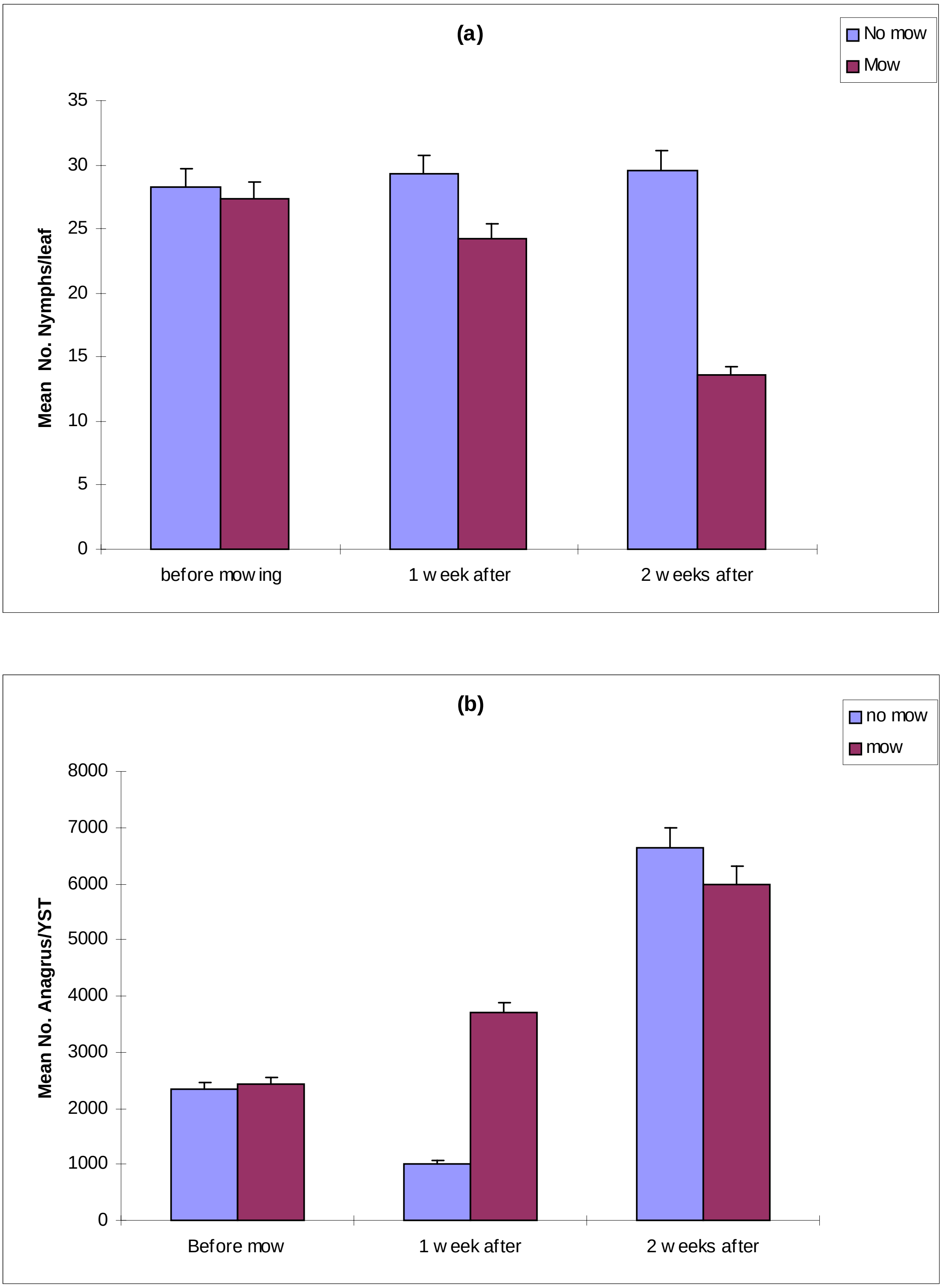


Figure 4. Effects of cover crop mowing in vineyards on densities of (a) leafhopper nymphs and (b) *Anagrus epos* during the 1997 growing season in Hopland, California.

Standortgerechte Bodenpflege und die Vitalität und Bonität im Wein- und Obstbau

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Schlagworte: *Düngung, Bodenpflege, Sanierung, Optimierung*

Zusammenfassung

Die Bioproduktion ist nicht allein der Markttrend, sie kann auch zum Ursprung gesünderer, produktiverer Standorte und vitalerer, bonitätsreicherer Kulturen werden. Eine derartige Bioproduktion bedarf eines einfacheren oder umfangreicheren Pflegerepertoires, das je nach Bedarf zu einem einfachen oder mehrgliedrigen Maßnahmenpaket abzustimmen ist. Den Bedarf legen der Boden- und Standortszustand einerseits, sowie der Zustand, die Vitalität und Bonität der Kulturen andererseits fest.
Eine standortspezifische Methode der genannten Art ist zu Zwecken der Erhaltung, Sanierung und Optimierung seit 17 Jahren im Wein- und Obstbau der verschiedensten Standorte Europas, Nordafrikas und des Nahen Ostens in Verwendung. Das Kernstück des variierenden Maßnahmenkataloges ist ein organischer Dünger aus Pilzmasse. Dieser Dünger (Biosol) dient als Nährstoffträger und als Bioaktivator für Boden und Pflanze; eine Nebenwirkung ist seine phytosanitäre Schutzwirkung.
Die Ergebnisse sind in jeder Hinsicht zufriedenstellend. Vergleichsversuche haben nicht allein die Überlegenheit gegenüber konventionellen Methoden, sondern auch gegenüber anderen Biotechniken unter Beweis gestellt.

Einführung

Das vorgestellte Konzept ist alles was standorts- und bedarfsgerecht und gestattet eine qualitäts- und gesundheitsgerechte, umweltschonende Produktion gestattet. Das erfordert den Einsatz zweckentsprechender Mittel und Methoden. Zweckentsprechend sind nur solche Dünger, die die Nährstoffe bedarfssynchron und bedarfsgerecht freisetzen und die darüber hinaus schadstofffrei und frei von Unkrautsamen sind. Solche Dünger sind gleichzeitig zur Aktivierung des Bodenlebens und der Pflanzenvitalität befähigt. Bei punktuell starkem Mangel resp. im Falle der Sanierung einseitiger Bodenfehler (z.B. pH) müssen auch schadstofffreie Sanierungsdünger eingesetzt werden (z.B. Kalk, Spurenelemente). Darüber hinaus sind auch alle Maßnahmen biologisch, die auf mechanischem, resp. mechanisch-biologischem Wege das Gefüge und die gefügebedingten Bodeneigenschaften (Luft, Wasser) optimieren.
Das Um und Auf des Biolandbaues ist demnach eine ganzheitliche Vorgangsweise. Das erfordert ein hohes Maß an Diagnostik und eine zielgerichtete Therapeutik.

Material und Methoden

Die hier beschriebene Methode der Bioproduktion war in den Jahren 1983-1987 auf extremen Weinbau-Standorten Österreichs (Fehldüngung und geologische Exhalationen auf Schotterböden, extremes Mulchen und Mulch-Rigolen auf Lößböden, inaktive und

wasserstauende Böden auf Grundgestein) erarbeitet und geprüft worden. Seither ist diese Methode in Wein- und Obstbaugebieten Europas, Nordafrikas und Vorderasiens eingeführt.
Der Maßnahmenkatalog umfasst je nach Bedarf einfache Erhaltungsmaßnahmen, oder Erhaltung- und Optimierungsmaßnahmen. Der einfachste Fall ist die Erhaltungsdüngung mit Biosol, einem harmonisch komponierten organischen Dünger aus Pilzmasse; dieser Dünger erfüllt alle an organische Dünger gestellten Forderungen (s.o.). Biosol wird zwecks Bodenaktivierung auch im Sanierungsfall eingesetzt, wenn eine starke initiale Aktivierung des Bodens angestrebt wird. Der Sanierungsfall ist umfangreicher; dabei müssen neben dem organischen Dünger auch größere Mengen an mineralischen Düngern zugeführt werden. Diese mineralischen Sanierungsdünger dienen sowohl der Behebung eines punktuell starken Nährstoffmangels (am häufigsten Ca, Mg) als auch der Behebung anderweitiger Bodenfehlerhaftigkeit (z.B. Gefüge, pH). Der einfache Optimierungsfall beschränkt sich i.a. auf Blattdüngung mit Spurenelementen additiv zur Biosol-Erhaltungsdüngung. Alle über Boden verabreichten Dünger werden in der stehenden Kultur oberflächlich-breitflächig appliziert. Bei Neuanlagen können und werden die mineralischen Dünger auch über die Hauptdurchwurzelungstiefe (ca. 40/50cm) platziert. Den Umfang der Maßnahmen legen der feldmäßige und laboranalytische Zustandsbefund der Kulturen und Böden fest, Beurteilt werden die oberirdischen Pflanzenorgane mit Frucht, die Wurzeln, der Bodenaufbau und die phasenanalytisch differenzierten Bodenkomponenten.

Ergebnisse und Diskussion

Die Ergebnisse der beschriebenen Biolandbaumethodik sind in Versuch und Praxis außerordentlich zufriedenstellend. Diese Methodik erweist sich nach Maßgabe aller Beurteilungskriterien allen Kontrollvarianten überlegen. Die Methodik und ihre Teilglieder erfüllen die oben zitierten Bedingungen des Biolandbaues in allen Punkten. Hervorzuheben ist der Zusatzbonus in Form der positiven phytosanitären Zusatzeffekte.
Die Methodik ist in Konzeption und Wirkung polyfunkionell. Die Phänomene der Ernährungs- und Stoffwechselstörungen treten erst gar nicht in Erscheinung oder werden saniert. Das gilt im oberirdischen Bereich in besonderer Weise für Chlorosen, Stiellähme und Kümmerwuchs. Diese Wirkung ist das Resultat des ausgewogenen Nährstoffangebotes und der Harmonisierung des gesamten Bodenzustandes. Daraus resultiert auch die beschleunigte Einreifung von Holz und Frucht.
Die Optimierung des Fruchtzustandes äußert sich zunächst an der gleichmäßigen Ausbildung, Einfärbung und Einreifung der Frucht. Dieses Gleichmaß wird bei Wein und Holunder von Beere zu Beere einer Traube bzw. Dolde und ebenso von Traube zu Traube bzw. Dolde besonders deutlich. Die Zuckereinlagerung in die Früchte, besonders in Trauben, ist ausgeprägt (vgl. a. BVA Klosterneuburg 1998). Die generell verstärkte Produktivität der organischen Fruchtmasse und die Konzentrationsabnahmen mineralischer Komponenten in Frucht und Saft belegen die höhere Produktivität der eingesetzten Mittel. Bei Trauben äußert sich dieses Phänomen in der Endphase der Einreifung besonders deutlich an starker Zuckereinlagerung, konstantem Gesamtsäuregehalt unter gleichbleibender Dissoziation und gleichzeitig sinkender Stickstoff-Konzentration. Die gesetzten Maßnahmen führen demnach noch in der Endphase der Reifung zu wesentlichen Stoffumsetzungen, -Auslagerungen und –Einlagerungen. Neben dem Stickstoff sind daran auch die beiden Erdalkalien Calcium und Magnesium beteiligt. In dieser Phase spielt die Einlagerung von Molybdän und die Reduktion des

Nitratanteiles in den Holunderbeeren eine artspezifisch hervorstechende Rolle. Ein für die gesunde Ernährung wichtiges Phänomen ist die Entwicklung eines hochreduzierten Status der Frucht und wurde beim Apfel nachgewiesen (s. H. Keppel 1998).
Die gesamte Optimierung und Vitalisierung setzt an der Wurzel an. Das Wurzelwachstum und die Wurzelvitalität werden stark angeregt, das Wurzelsystem entwickelt sich mehr und mehr zum Wurzelnetztypus mit allseitiger Durchdringung der Bodenmasse und das Redoxpotential der Wurzel wird gegenüber dem Boden deutlich negativiert. Diese Negativierung der Wurzel geht parallel mit der Negativierung der Frucht und ist ein Maß der Vitalität und des biogerechten Zustandes (s.a. H. Keppel et al 1997. F. Solar et al 1999). Ein signifikantes Merkmal der Wurzelvitalität resp. der Wurzelgesundung sind das Fehlen resp. Verschwinden von Wurzelfäule und Wurzelverkohlung.

Schlussfolgerungen

Die beschriebene ganzheitlich-standortbezogene Bioproduktion hat sich auf den verschiedensten Standorten und bei allen danach behandelten Kulturen bewährt. Der Bioanspruch besteht im Hinblick auf die Vitalisierung von Boden und Pflanze und im Hinblick auf die erzielbare Qualität der Produkte zu Recht. Die Qualität lässt sich an Hand herkömmlicher Parameter und an Hand moderner, biomedizinischer Gesundheit-Förderungsindikatoren belegen. Damit und im Hinblick auf die umweltschonende Anwendung liegt diese Art der Bioproduktion voll im Markttrend.

Literatur

BVA Klosterneuburg (1998): Ergebnisse von Untersuchungen über die mittelfristige Wirkung zweier Humusdünger auf Boden und Rebe. Versuchbericht 1995-1998, 39 S)

Keppel H. (1998): Messbarkeit der biologischen Qualität von Äpfeln mittels P-Wertes in Abhängigkeit verschiedener Düngemittel. Obstbau, Weinbau (Südtirol) 7/8, 259-261

Keppel H., Pieber K und Solar F. (1997): Das Redoxpotential am Standort und die Potentialdifferenz Boden/Pflanze als allgemeines Vitalitätsmaß. Mitteilungen Klosterneuburg 47/6, 205-210

Solar F., Keppel H., Pieber H., v.Bormann M. (1999): Das Redoxpotential von Bäumen als Bonitätsmaß der Düngung. Mitteilungen Klosterneuburg 49/5, 205-210

Role of Nature in Soil Management and Quality

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Abstract

The aim of soil management is optimum utilisation of biomass and its timely biodegradation to maintain a continuos formation of high quality humus in live soil in heap formation to realise a proper balance of the elements which are the basis of all matter. High quality grapes are cultivated without chemicals for winemaking and table use.

Introduction

The enriched soil is placed in heap formation and the grape plants are grown on the heaps which are well balanced having all the right nutrients as the five basic elements (Akash, Air, Fire, Water, Earth) are present in the right proportion. This is managed by a method that has been developed for creation of appropriate soil from locally available topsoil and biomass stacked in heaps by imitating Nature's process for generating humus – enriched soil. Thus grapes can be cultivated in any area where the temperatures suit the grape plantation though the soil may not suit as now the grape plants are supplied the balanced soil in heaps above the ground level.

Material and methods

The foundation of soil management is a continuous creation of nursery soil. An ideal composition of nursery soil has a structure that gives it form, texture, porosity, fertility, air, and water holding capacity at optimum levels. The health and growth of the plants will depend on the availability of good quality of nursery soil having equal parts of mineral rock particles and well-composted fibers of plant material, which has lignin and cellulose. The soil has different types of microflora that feed on the lignin to create lignoproteins and the dead bodies of the microflora form the humus. The various lignin decomposing at various times provide the stability to the soil and contain the nutrients that are absorbed by the root hairs of the plant by the process of ion exchange in the presence of film of moisture held by decaying organic matter and humus.

We imitate Mother Nature while preparing the nursery soil by placing fine layers of moistened biomass alternatively with layers of mineral soil to make heaps. A variety of biomass such as weeds and grasses, small twigs and fine branches, new tender growth of bushes and trees, tender, young, mature, old, or dry leaves from any green vegetation are spread in layers alternatively with fine layers of mineral soil up to a height of 30 to 45 cm. The last layer is of nursery soil and seeds of cereals, legumes, vegetables, spices, and condiments, oilseeds, and bigger trees, are planted on the heap. The vegetation including weeds cover the heaps on germination. In three to four weeks about 1/3 rd of the plants are pulled out to thin the vegetation. This vegetation is turned back in the soil for decomposition. Another 1/3rd mature plants are removed after six to seven weeks, when they flower to be mixed with the soil. The last 1/3rd of the plants is removed at the end of ten weeks. This soil is ready in about twelve weeks and can be used for a long time. Thus optimum soil with good fertility and productivity can be created with the help of microbes which work on the moistened soil and biomass. In tropical climates it takes about 90 days to create this quality of nursery soil and it is a continuous process of creating the soil and supplying to the plants as their canopy expands and their requirement for soil and nutrients increases. This soil has to be given in their root zone area of the plants at least two months before it is required for their growing needs. The wood and dry leaf ash contains known and many unknown nutrients; a pinch of ash given to the plants regularly boosts the plants by improving health and vitality. The pH level can be adjusted by adding humus and lignoproteins to alkaline soil to make it neutral or acidic. Ash added to acidic soil makes it neutral or alkaline.

All the grape plants are planted on the heaps and these heaps help the grape plants to extract the right nutrients at various stages in their life cycles. Later all the prunings of the plants are carefully recycled by the soil microflora and reused by the plants growing there so that the soil is enriched while being utilised for growing the food. Farmers have harvested up to 50 tons of grapes per hectare through this method.

The live soil has microscopic flora and fauna: vegetative microbes such as bacteria, fungi, virus, algae, and moss inhabit the soil. It is estimated that these microbes weigh about 25 kilo per 100-sq. meter in the heaps of 30 – 45 cm. The right environment produces new humus weighing 25 kilo by the continuous cycle of life and death every month making a total of 300 kilo per annum. The animal microbes such as protozoa and nematodes also inhabit the soil heaps weighing up to 10 kilo in 100 sq. meter and every month produce their own weight of humus in the similar life cycle so in one year they prepare 120 kilo manure by decomposition. Every year about 420 kilo per 100 sq. meter of good manure of lignoproteins and humus is made in presence of biomass and moisture, by the microbes so no other external input is required. The microbes feed on 2 to 3 times their own weight of fibrous material and biomass hence constant mulching of about 100 cm is essential for continuous process of decomposition. The weeds and grasses that grow on the farm and pruned parts of the grape plants are a ready source of the biomass. Weeds or rather the herbs are also beneficial as they have medicinal value and they have deep burrowing taproots to help the water percolation. One or two wild herb growing per m2 is highly beneficial for cultivated crops. The soil contains most of the nutrients needed by the plants and if there is a deficiency then Nature usually corrects herself by growing accumulator plants such as thistle and mushrooms which are rich in nutrients and grow in soils that are deficient in those nutrients.

An organic farmer is totally involved in his work and he consciously involves his mind and his senses to be aware of his plants. The realm of the mind begins where the matter world ends, mind is the form of energy. Organic farming is efficient when done more with the mind than with the matter. He needs faith, devotion and commitment. The faith is a belief in certain principles of Nature, and with devotion he has to continuously follow the same path, with no diversions or doubts and with a commitment that he will reach his goal. All these three interplay together to help him reach his goals faster.

When he is on the right path, right people, right literature and opportunities appear at the right time to help him on the way. The organic farming is for holistic development of Man and Nature.

Hindu philosophy propounds that all matter is from the basic five elements the Akash, Air, Fire, Water and Earth. In the beginning there was an un-manifested state of Consciousness, then subtle vibrations of the cosmic soundless sound AUM manifested. From the vibrations the Akash appeared, when Akash began to move the movement created Air, which was Akash in action. The movement of Akash produced friction and so heat was generated, these particles of heat energy combined to form intense light and from this light the Fire element manifested. The heat dissolved and liquefied some of the Akash particles manifesting the Water element, and then some particles solidified to form Earth element. Hence Akash manifested into the four elements Air, Fire, Water and Earth. The sixth element, the intense longing of the universal mind accelerates the process of conversion from one element to another and the life process does this itself.

The Fire, Earth, Water, and Air vibrate with different speeds having different directions and velocity. The area used by these vibrations is called Akash. The shape and location occupied by the matter is recognised because of the Akash. When matter has to be changed then one has to go beyond the Akash of the matter to bring about the change by changing the proportion of Earth, Water, and Air. In nature the matter changes form by changing from one element to another by the life forms with the heat of the Fire element. The matter is created out of Earth and Water, and also Akash and Air. The various proportions of these elements give rise to various forms of matter that is basically element Earth. The Akash creates a composition process with a frame of thought because of the desire to grow. The movement of the Air starts from the plant towards the shape, which may not exist there but there is a concept, and the Air starts to fill that space. The Water pushes the cells to fill the shape made by the Air. The colour is then supplied to the cells by the Fire element. The Water carries the various components with it and deposits them in the cells in form of sugars, lignin, and other tissues; these are the Earth element predominately. The growing plant changes the angle of the leaf stock and the stem and a concept of the bud appears. The bud carries the Akash (blue print) of the whole branch having a fixed number of leaves, the flowers, and fruits at that point. At any time only one element is playing a prominent part and if the right element is supplied to the plant before it is required then the plant grows not only unhindered but also at an accelerated rate.

Soil management is maintaining the balance by supplying the five elements having six tastes such as sweetness, sourness, bitterness, salinity and astringency. Honey providing sweet taste is added to the soil when Earth and Water elements have to be added. Sour buttermilk providing sourness is added when Fire and Earth element have to be added. Neem leaves or oil cakes are added providing bitter taste so supplying Akash and Air. Black pepper provides pungent taste so supplying Fire and Air. Rock salt provides salinity and is added to supply Water and Fire. Alum provides astringent taste and increases Earth and Air. The life forms know how to bring this change by the use of Fire element to alter relative velocity of the matter.

Akash is the subtle element and is the energy within things. Through the Akash the energy within us we can communicate with the energy within the plants. When we consume plant or animal matter we also imbibe the subtle life force of energy that can affect our mind and body and at the same time we upgrade the Conscious level of the food to the human level. When we offer the same food to the Gods and then we imbibe the blessed food we raise our own Consciousness to a higher level and so evolve in spirituality. The fruits have to be fresh, wholesome, attractive, welcoming, having a distinct colour, firm texture, good form, and special taste that makes them irresistible. The healthy plants will produce such nutritive food by growing in the soil that has all the elements and compounds necessary for the optimum growth. The balanced soil has all the known and unknown elements that the plants will extract from the soil in ionic form at the right time in the presence of the moisture film. As long as the food is right for human consumption no other creature will attack it, later microflora and insects attack the food and feed on it, leaving various colored spots, a mushy texture and a putrefying smell on the food, indicating that the food is not fit for man. The plants invite the pests when the fruits are not fit for human consumption and have degraded up to a level where only insects and other forms of life can feed on them. The biological controls such as the predator – pest ratio also help in preserving the food for humans. There are large orange ants, which move like an organised army to attack any insect that alights on the fruit, but do not themselves feed on the fruit, as they are carnivorous. Various groups of plants are grown as inter-crops which protect the main crops and become hosts for the pests or distract the pests by sending confusing smells, colour and other signals to the insects that feed on them. There are some companion plants which grow well with grapes such as asparagus, basil, blackberries, elm, mulberries grown in the vicinity help the grape plants to grow better and act as deterrents for pests. Cabbage radish and sage are known to stunt the growth and fruiting of the grapes and lower the vitality of the grape plant. No external inputs for pest management are required as the loss of yield is less than 10% which is acceptable as all the other creatures also must thrive in the web of life.
The plants are healthy when all the elements are in balance and then the pest- predator ratio is also maintained. Various lady- birds, spiders, lizards, snakes and other numberless creatures as well as birds dot the horizon and keep the humming and singing levels to enhance the farms.

Results and discussion

In India this used to be the basis for farming for countless generations and hundreds of innovative farmers have joined hands under the banner of organisations such as Prakruti, Prayog Parivar, Lok Jagruti and share their experiences regularly for the last fifteen years. High yields of grapes are obtained even in areas having scanty rainfall and high temperatures because the soil technology uses heap methodology to control the factors of fertility, moisture content and porosity of the soil. Plants develop profuse root hairs and their capacity to take the right nutrients at the right time increases leading to better yields year after year as fertility levels of soil rise continuously in Eco friendly manner.

Prayog Parivar was established in 1980. The first members were active experimental grape growers in Maharashtra. It is based on the principle of involvement, interaction innovation, and integration going international and spreading information. Prakruti (Sanskrit word for Nature) is a public charity and registered society of members who agitate for development of an environmentally viable society based on natural living and sustainable agriculture. Natural living means a living within the finite natural resources of the region, country and the Earth. Sustainable agriculture covers diverse farming practices where use of synthetic fertilizers and pesticides, hybrid seed and heavy agriculture equipment is withdrawn. The members of Prakruti follow these practices. Prakruti runs campaigns to help the farmers to pursue Eco friendly practices, encourages massive afforestion projects which are productive for the tribal in the forests, reviving and spreading knowledge of ancient farming practices as well as conserving the genetic seed bank are some of the activities.

The Use of Recycled Organics Compost in Viticulture
- A review of the international literature and experience -

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Introduction

Currently the Australian Department for the Environment is funding nation-wide compost application trials covering all major grape-growing regions in Australia. These trials are not primarily targeted at promoting organic viticulture but rather to support the development of markets for recycled organics. Nevertheless, the use of compost as a management tool with a wide range of beneficial effects is very relevant for the organic grape growing industry.

As part of this project a literature review was compiled which presents an international overview of the current level of knowledge and the state of play of compost use in viticulture. The amount of information directly related to the use of recycled organics compost (source separated organic garden and kitchen waste) in viticulture was limited and even more so with respect to organic grape growing. However, it appeared that the organic vine growing industry had a leading role in developing and researching the use of compost in viticulture.

The use of compost in viticulture can, as in other agricultural/horticultural applications result in a wide range of positive effects. However, there is also scope for potentially detrimental effects.

Positive effects of compost use

Supply of humus
The use of compost replenishes soil humus, which is reduced particularly in cultivated soils; in Germany for example at a rate of approximately 4 t/ha per year. Long-term compost use has been shown to increase organic matter levels and it is assumed that compost dressings of 8 – 10 t dry matter (dm) are sufficient to maintain or increase soil organic matter levels.

Supply of plant nutrients
Compost contains all macro- and micronutrients essential for plant growth. However, not all nutrients are readily available in mineral forms for plant uptake. Considerable amounts of nitrogen and phosphorus are organically bound in the compost and are released only once the organic matter is mineralised through microbial activity. The level of readily available mineral nitrogen contained in compost and the degree of nitrogen release due to the mineralisation process following compost application are of particular interest.
The nutrient budget in Table 1 shows that a compost application of approximately 10 t dm/ha (20 m^3/ha) should be sufficient to meet the demand of grapevines, except for

nitrogen. However, the apparent lack of nitrogen in the budget is alleviated through air-borne nitrogen deposits (30 – 50 kg/ha per year in Germany), through mineralisation of soil humus reserves or through leguminous cover crops.

Most, or a high proportion of phosphorus, potassium, magnesium and calcium found in recycled organics compost is available to plants immediately or becomes plant-available over time. Approximately 20 % of phosphorus in compost react like P in mineral fertilisers and are immediately available for plant uptake while the remainder is more strongly bound and will become available later. Virtually all potassium supplied with compost can be used immediately by plants.

Table 1. Availability and supply of nutrients contained in 10 t dm/ha (20 m^3/ha) of an average bio-waste compost in comparison to the nutrient demand of grape vines

Nutrient	**Nutrient level (% dm)**	**Nutrients available to plants in kg/ha and as percentage of total (in brackets)**		**Nutrient demand of vines** [1)] **(kg/ha per year)**
		In first year	**Within four years**	
N	1.2	10 –20 (10 – 15 %)	approx. 50 (approx. 40 %)	45 – 80
P_2O_5	0.7	20 – 30 (30 – 40 %)	70 (100 %)	16 –23
K_2O	1.2	70 – 100 (65 - 85 %)	120 (100 %)	83 –100
MgO	1.8	10 – 30 (5 - 15 %)	?	10 – 151
CaO	6.0	sufficient	sufficient	15 - 40

1) Average yield: 10 t/ha grapes, 2.7 t/ha (dm) shoots and cuttings

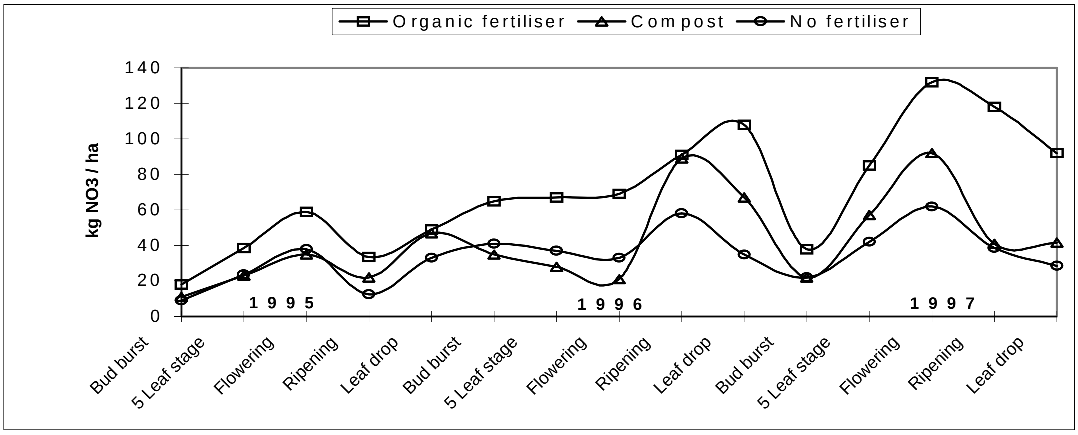
The situation is more complex with nitrogen of which only a small proportion is directly available to plants initially and the remainder being mineralised and released only over time (3 – 4 years). As a rule of thumb it is generally assumed that approximately 5 % of the total amount of nitrogen found in recycled organics compost is present in a mineral form and hence directly plant available and that annually approximately 10 % of the total nitrogen is mineralised over the next few years. It is estimated that in total approximately 40 % of all nitrogen contained in compost at the time of application will become available to plants.

Several research projects focused on this aspect but found inconsistent results. Horticultural trials established that the use of immature compost provided relatively little additional nitrogen, also during the second year after application while the use of mature compost delivered a flush of soil nitrate, which decreased over time. This effect of using mature compost was confirmed by one experiment in vineyards while two others showed that even the use of mature compost provided little additional nitrogen for plant uptake (Figure 1).

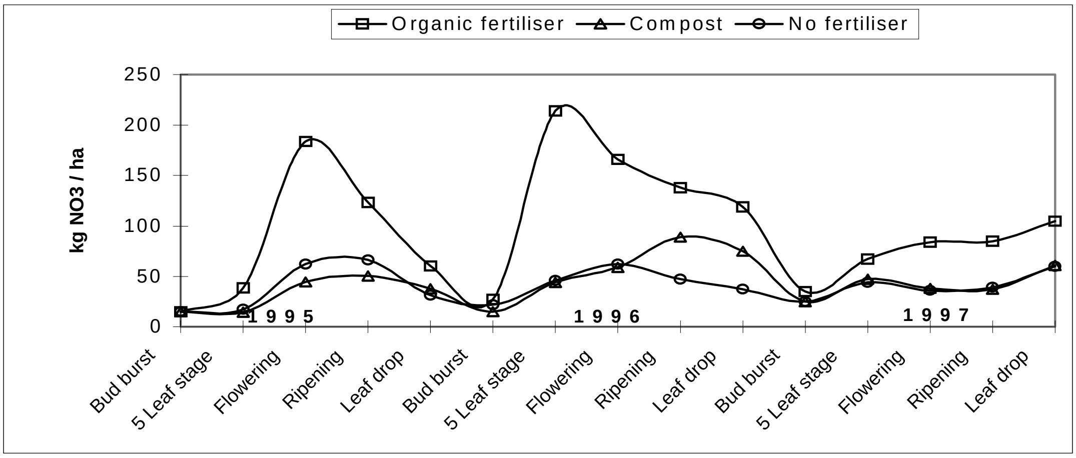
In order to reconcile conflicting research results and to solve many open questions related to nitrogen availability and the mineralisation of organic matter, which is important both from a plant nutritional and environmental point of view, a 10 year long-term, co-operative research project was established in Germany. It aims to provide a better understanding of the long-term dynamics of mineralisation and nitrogen supply potential of compost.

However, most available data relate to temperate climatic conditions in Europe and it has to be expected that nitrogen dynamics associated with compost use are quite different in climatically different wine growing regions. An assessment of nitrogen availability from composted chicken manure and slaughterhouse waste in tropical conditions showed that compost is not necessarily a slow release fertiliser. Surprisingly, according to plant growth results, composted chicken manure provided more nitrogen than urea during the first seven weeks of the trial and generated a flush of growth which peaked after nine weeks simultaneously with that of urea fertilised plants and at almost the same level (Figure 2). Considerably more research is warranted to examine the effects of using compost in various climatic conditions.

Nierstein

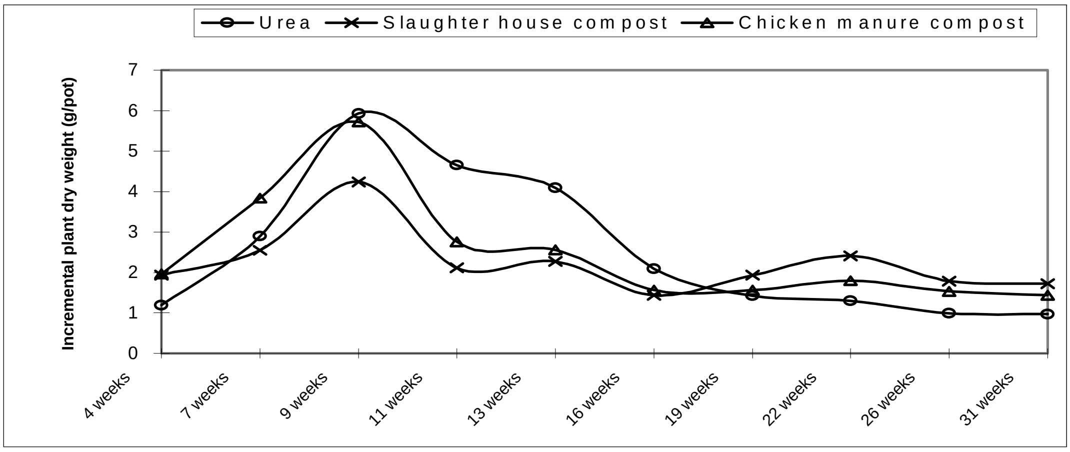


Biebelsheim



Note: Organic fertiliser applied annually to provide 50 kg N/ha
Compost applied at 40 t/ha (fm) at beginning of trial, assumed annual N availability = 50 kg/ha

Figure 1. Effect of recycled organics compost and organic fertiliser on soil nitrate levels (0 – 60 cm) in two vineyard soils over a three year period



Figrue 2. Effect of inorganic and organic nutrient sources (2 g N/12 lt. pot from each source) on plant growth (grass) in tropical conditions

Improvement of soil physical, chemical and biological properties

In many experiments it was shown that compost use could substantially improve soil physical, chemical and biological properties, which are often important factors in determining its fertility status. The improvement of these soil properties results often in indirect benefits such as reduced erosion, ease of cultivation or a reduced disease incidence.

Crop yield and quality effects

Compost use showed inconsistent effects on grape yields, depending on the type of compost used, the vineyard soil and the control it was compared against. A 3-year trial in an organic production system started to show beneficial long-term effects of compost use in the last year of the experiment.

The use of compost as mulch resulted in substantial yield increases in some Australian trials. An observed three-fold yield increase was primarily due to increased survival of bunch numbers in very dry growing conditions (Figure 3). Additional nutrient supply through the use of mulch was not looked at.

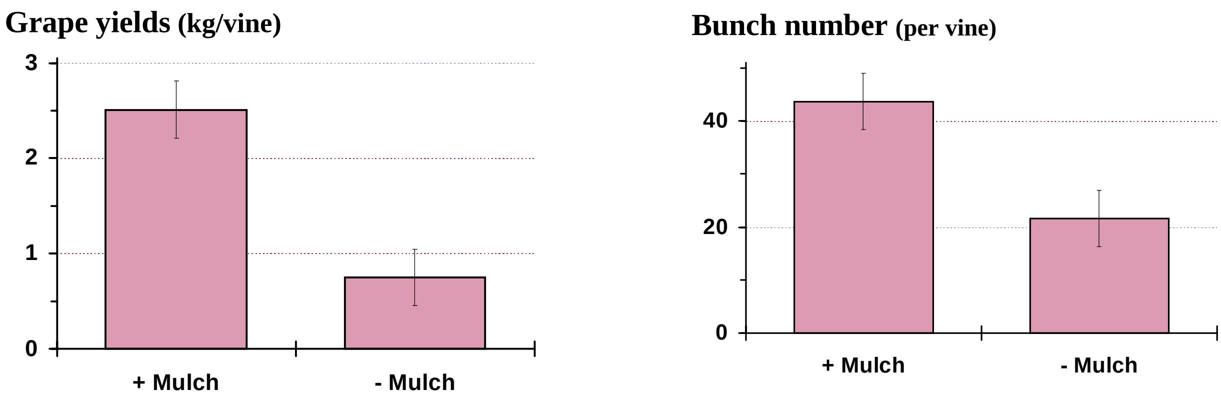


Figure 3. Effect of 7.5 cm mulch layer (50 cm wide) on grape yield and bunch survival in 18 month-old vines (conventional production)

According to the available literature, compost use on grapevine makes relatively little difference to the quality of the must or wine generated from these grapes.

Potential negative effects

Oversupply of nutrients

Particularly nitrogen and phosphorus have the potential of causing detrimental environmental effects if compost is used inappropriately. Generally compost does not have high nutrient densities and only a limited amount of the total nutrients contained in compost is immediately available. However, if large quantities of compost are used (mulching) or if compost is applied to soils with high organic matter levels, nitrate leaching can occur. This is a potential problem particularly in viticulture since grapes have relatively little nutrient requirements and, as a survey in Germany has shown, many vineyard soils are already very well supplied with phosphorus. In Germany the agricultural/horticultural use of compost is limited to a maximum of 10 t dm/ha per year (30 t dm/ha every three years) by way of federal legislation.

Heavy metals

Depending on the quality of processed input material, compost may contain considerable heavy metal contents. Growers need to check for compliance with their certifying bodies. It was shown however, that sources other than compost can also contribute significantly to the heavy metal load received by a vineyard. Grapevines take up very little heavy metals and very little is deposited in the grapes. Any potential residues are filtered out in wine production, which is why heavy metals do not pose a problem for wine drinkers. However, high levels of heavy metals can have detrimental effects on plant growth and microbial activity. Heavy metals are, therefore, in a vineyard situation more of concern with regard to the long-term protection and stewardship of the soil.

Conclusion

Most of the obtained research data and information on the use of compost in viticulture originates from Europe, specifically Germany. A wide range of positive effects can be attributed to the use of compost, some of which were also shown in vineyard trials. Compost provides essential plant nutrients but their release over time seems unpredictable. This is why research efforts in Europe now focus on this aspect which is important both from a plant nutritional as well as environmental point of view. Research in other regions has focused on the use of compost to redress the most pressing local problems, for example water shortage. However, future research into the use of compost should also investigate aspects such as nitrogen mineralisation from compost in warmer climatic conditions and the release of nitrogen and phosphorus from compost to assess its nutritional value over time and its potential detrimental effects if used inappropriately.

It has to be realised that both the soil and the compost represent biological systems whose interaction depends on a range of factors, many of which are not as well understood as previously thought. Compost use tends to show its full potential only after prolonged use. Therefore it is encouraging to see that several new research projects, which assess the effects of compost use in viticulture, are long-term, running for 5 – 10 years. The only drawback is that we have to wait a long time to implement the results.

References

Due to limited space references are not included but can be obtained from the author either separately or as part of the full report.

Biological Activity of Upper Vaucluse Soils

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Keywords: *soil activity, micro-organisms, soil interpretation, biomass*

Abstract

In perennial crops, soils are the base of many agronomic factors, and condition the specificity of the vine. However, modern wine techniques may lead to soil impoverishment and fertility losses.

Pedological studies contribute to the understanding of soil complexity.
This study focused on variations in four upper Vaucluse vineyards, emphasising elemental microbial analyses, with fumigation and extraction methods.

Four different sites were considered to be integrated based on the following criteria:
- *soil management* (herbicide, grass covering, tillage)
- *soil covering* (old vineyard, young vineyard, uncultivated ground)
- *soil management* (Medicago, grass, tillage) *in a sloping parcel* (upper part more fertile, lower part)
- comparison of *different plots takings* of the parcel

Results show that microbial organic carbon levels may be used to assess biomass levels, and the renewing index provided a good assessment of organic matter turn-over.

Data demonstrate that organic matter levels differ significantly according to depth, soil characteristics, and management.
Values of microbial carbon are globally low, and renewing organic matter indexes are highly variable.

These first preliminary results indicate that we have to improve our understanding of biomass analyses, which do not sufficiently characterise the parcel's health.

However, biomass analyses may be used as an addition to different types of data, with references needed for each climate, soil and crop.

Dry Stone Walls in Switzerland

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Keywords: *Landscape structures, Biotopes, Dry Stone Walls*

Abstract

The Foundation for Environmental Activities has successfully reintroduced knowledge of building dry stone walls in Switzerland. Since the beginning of its commitment six years ago, we built about 7000 m^2 with different groups (school-children, handicapped persons, adults, drug addicted persons, apprentices, conscientious objectors doing community services, etc.) all over Switzerland.

Introduction

The Foundation for Environmental Activities has been planning, leading and financing nature work-camps since 1976. About 3500 persons per year volunteer for week-long conservation work in rural Switzerland. Since 1994 this work includes dry stone walling.

Development in Switzerland

The knowledge of building dry stone walls in Switzerland got lost more and more in the last 50 years. Reasons are migration from rural to urban areas, cheap building materials (e.g. concrete) and the industrialisation of agriculture. The Foundation for Environmental Activities is involved in dry stone walls for the following reasons: Dry stone walls are biotopes for rare animals and plants, they are a cultural heritage both as structures in the landscape and as examples of our ancestors‘ crafts. Building dry stone walls is a low-tech technique and ecologically well adapted, especially when material from nearby surroundings is used.

When the Foundation began the work, it had to look for instructors. It found them in the Dry Stone Walling Association of Great Britain. Slowly interest in this type of work increased in Switzerland and in other parts of Europe. Since the beginning we exchanged information in order to learn from each other.

What types of dry stone walls exist?

In Switzerland we find two types of walls: Retaining walls and free standing walls. The retaining walls shape the terrain in order to facilitate farming and to stop soil erosion. We find them mostly in steep valleys in the Alps (Ticino, Valais, Graubünden and so on). Free standing walls are rock fences to keep cattle in places or form property boundaries between plots (Jurassic and alpine pastures).

Building dry stone walls

Dry stone walling is as much an art as a science. However, if certain rules and techniques are not observed, the walls will not look good and will soon fall apart. Well built walls have level stone courses and constant angles depending on the type of material used. They will last many decades or even centuries with occasional minor repairs.

Future prospects

The Foundation for Environmental Activities is interested in sharing its experience with workers in other countries all over the world. There should be a scientific evaluation of the technical and economical aspects of dry stone walling in order to define its place within the building industry.

References

Books:
Stiftung Umwelt-Einsatz Schweiz (1997). Trockenmauern. Anleitung für den Bau und die Reparatur. 82 pp.

Soil Microbial Biomass and Soil Quality in Vineyards

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Keywords: *soil quality, microbial biomass, vineyards*

Abstract

The soil is an important factor supporting the growth of vines. Soil physical and chemical but also soil biological properties have an influence on a lot of soil functions like structure, water infiltration, nutrient supply and cycling, determining the vigour of plants and the oenological potential of grapes. Soil management and weed control are manmade factors interfering with theses functions.

Soil management systems had often been regarded only in point of view of their efficacy for weed control, the security of vintage being the key factor. With the discussion about sustainable agriculture, also in viticulture effects of cultivation on soil ecological parameters were placed into the foreground.

The aim of this work is to investigate the use of biological parameters for quality assessment of vineyard soils. For this, soil samples were taken from vineyards with different soil management systems: cultivation, green cover, mulching (straw, rind), and post-emergence herbicide application with glyphosate. The samples were analyzed for soil microbial biomass and soil microbiological activity.

The results showed distinct differences of the soil microbial biomass in relation to different soil management with highest microbial biomass in non-cultivated soils like mulching and green cover. Only the comparison of mechanical versus post-emergence weed control with glyphosate revealed no clear differences on soil microbiological parameters. Furthermore, the effects of different soil management systems were masked partly by site specific soil characteristics. The variations of soil biological properties between different sites were in some cases higher than those between different soil management.

In the investigated vineyards, the permanent single-crop cultivation and rigid trellis systems produced a high spatial heterogeneity of soil parameters within short distance. Further, especially in the northern wine-growing regions vineyards have particular site requirements and local conditions. These facts require additional observations, since results are only in part comparable with results from other agricultural soils. Our intention is to further investigate quality of vineyard soils with particular reference to soil biological parameters. Vineyards cultivated according to ecological viticulture (for example *ECOVIN*) are the focal point, since adequate soil management has priority to support soil health. To better adapt soil management to soil ecological conditions, observations are conducted at different sites in a local region to get data sets for geostatistical evaluation.

Session 04

Plant Protection and Quality - New Findings and Future Hazards

Chair: Lucius Tamm

Principles for Managing the Foliage Diseases of Grapevine with low Input of Pesticides

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Keywords: *powdery mildew, downy mildew, inoculum depletion, disease predictors, soft fungicides*.

Abstract

Advances in knowledge of epidemiology have paved the way for improved disease control. Low fungicide input strategies have been developed for powdery mildew (*Uncinula necator*), downy mildew (*Plasmopara viticola*) and anthracnose (*Sphaceloma ampelinum).* The foundation of these strategies is to apply fungicides when disease levels are low and stop the epidemics before they gain momentum. This relies upon a 'clean vineyard' approach where disease carryover is minimised each season. In so doing, there is a strong reliance upon monitoring of the vineyard and the weather to predict/determine the occurrence of primary infection events. Advances in monitoring make this possible even for the average grape grower. In addition, there are also a number of environmentally friendly (or 'soft') fungicides that are effective in some situations. In the future, we believe precise monitoring procedures will allow for some diseases to be controlled by removing overwintering inoculum *ie.* some of the foliage diseases may be controlled without input of fungicide. A management strategy based on well-timed hand-removal of inoculum may prove useful. European viticulture with small plots and intensive labour practices represents one of the most likely proving grounds of such a strategy.

Introduction

Many times in history, diseases and pests have compromised the economic practice of grapegrowers. Notable examples have been downy and powdery mildew and phylloxera. Even today, despite a large body of disease information and an arsenal of effective fungicides, crop losses continue. The challenge for effective management is even greater in organic viticulture, where many effective chemical treatments can not used. In the past, disease controls have often been applied with little understanding of the biology of the pathogens. In the last 15 years, there has been a rapid increase in understanding the epidemiology of important grape diseases. In this paper, we explain how this understanding has lead to minimal intervention strategies for disease control. This means managing diseases with low chemical inputs. Our results have shown that fewer fungicides are needed when intervention takes place early in the progress of the epidemic. That progress can be easily halted if treatments are made to remove sources of overwintering inoculum or when the population of disease (inoculum) is small. Finally, we show that the outcome can be a management strategy based on inoculum removal by hand when this is timed and executed with extreme precision. European viticulture with small plots and intensive labour practices represents one of the most likely proving grounds of such a strategy.

To illustrate this approach we will demonstrate how an improved understanding of epidemiology has led to improved and finally minimal intervention management for three diseases in Australia: powdery mildew, downy mildew and anthracnose. After introducing strategies for each disease we discuss the monitoring techniques that make this possible.

Powdery mildew

Powdery mildew is a good example of how our understanding of epidemiology has improved. The pathogen *Uncinula necator* causes a widespread, persistent disease of grapevines in world vineyards. It often causes major crop loss and decreases wine quality. In 1996, it was estimated that powdery mildew caused $17m in lost production in Australian viticulture (approximately 2% of estimated crop value) and a further $10m were spent on control measures. Premium wine grape varieties such as Chardonnay are highly susceptible. Entire crops of susceptible varieties are lost when control measures are inadequate. Shipments of grapes with as little as 3-5% bunch disease have been rejected by wineries. Each season, 4-8 pre-infection (protectant) fungicide sprays are applied for disease control, an inefficient and costly approach that is not always successful because of poor spray timing and application.

The main reason for this inefficiency was that fungicide applications were taking place too late in the season. Control of disease is most easily achieved prior to flowering (figure 1). Powdery mildew schedules were often recommended to begin at the 40 cm shoots stage (Coombe's modified Eichorn-Loren (EL) stage 15) (Coombe 1995) but in many cases sprays were not applied until after bunch closure when the disease became obvious in the vineyard. By this time the epidemic was so well advanced that control even with three applications of systemic fungicides, was impossible (figure 1) (Emmett *et al.* 1984). Although disease is not obvious until bunch closure, it has actually begun to spread in vineyards as soon as two weeks after bud burst. Primary infection begins from spores (conidia) from flag shoots (diseased shoots from infected buds) or from spores (ascospores) released from cleistothecia (fruiting bodies of the fungus). Where vineyards with poor disease control are in close proximity (<40m), conidia from adjacent vineyards will be another important source of primary infection (Gadoury *et al.* 1997a).

Once primary infection has occurred, the powdery mildew spreads rapidly under most weather conditions (Gadoury *et al.* 1997b). In five to seven weeks from budburst, the disease spreads from foci of initial infection to produce isolated colonies on leaves and bunches throughout unsprayed vineyards. After this, disease severity also increases rapidly (figure 1). Leaves, shoots and berry stems remain susceptible while green. However, berries are susceptible only until 4-6 weeks after flowering, *ie.* until pea size and bunch closure (figure 1) (Gadoury *et al.* 1998). Consequently, early season control of disease is critical. An early and high level of primary infection will lead to a severe epidemic and crop loss. Conversely, when primary infection does not begin until after flowering, berry damage and substantial crop loss is unlikely.

A second important principle is the concept of 'clean' and 'dirty' vineyards. Vineyards with severe disease will have high levels of flagshoots (shoots that arise from diseased buds) and cleistothecia ready to initiate disease next season. Studies in both Germany and Australia have shown that by controlling the disease before flowering, particularly before EL 15, can over several seasons, eliminate flagshoots (Bleyer *et al.* 1998, Hill pers. com.,) and even possibly eradicate the disease from some localities or regions (Magarey 1998). Cleistothecia are hard to control once formed but a good control program can be greatly reduce the numbers produced.

As a result of the above developments, we developed and tested two strategies for control of powdery mildew (Emmett *et al.* 1997a,b). In the so-called '*2-4-6 strategy',* fungicide sprays are applied at two week intervals three times before flowering. In warmer districts, sprays should be applied 2, 4 and 6 weeks after budburst. The timing of individual sprays may need to be adjusted for vine growth in other districts. Vineyards should be monitored soon after flowering (usually nine weeks after budburst) and sprayed at 10 and 12 weeks after bud burst or later in the season but <u>only</u> if monitoring indicates the disease is spreading in the vineyard, *eg.* disease is present on more than one vine in ten. To avoid crop loss, sprays are only effective until bunch closure. The 2-4-6 strategy slowed early season spread and delayed the onset of epidemics. With good spray coverage over several seasons, it also reduced bud-infection and hence, flag shoot inoculum in vineyards.

The so-called '*Look-first strategy*' is for clean vineyards and involves monitoring for disease and spraying fortnightly only after powdery mildew is found. To be successful, mildew must be detected before it appears on 10% of vines. The look-first strategy reduced spraying but risked crop loss when monitoring failed to find very low levels of disease especially in dense canopies. An extension of this strategy is to remove disease by hand instead of using a fungicide program. A third strategy, is the so-called '*Inoculum removal strategy'*. Although our testing of this is incomplete, it may offer benefit to some growers. This strategy is only possible where labour is plentiful or blocks are small and it requires the cooperation of neighbouring growers to ensure that disease does not spread from adjoining blocks. It would also only be possible in a 'clean' vineyard. In this strategy, e inoculum removal strategy the vineyard must be monitored for powdery mildew every week beginning two weeks after bud-burst and continuing until flowering. The timing of the monitoring periods could be adjusted to accommodate detection of ascosporic infection after favourable weather events. Once detected, flagshoots and mildewed leaves are removed and adjacent shoots are tagged. In subsequent inspections, greater searching time is spent searching for disease near these tags. If disease has spread to > 10% of vines prior to bunch closure then a fungicide spray is required.

Downy mildew

In Australia, the conditions required for primary infection of downy mildew (*Plasmopara viticola*) are summed by the rule of thumb, 10:10:24, *ie.* the temperature must be at least 10^{o}C, while at least 10 mm of rain falls in a 24 hour period. The soil must remain wet for at least 16 hours for oospores to germinate. Then subsequent rain slash is needed to disperse spores from the ground to the undersides of leaves which must remain wet for at least 2 hours. If 10:10:24 conditions and primary infection do not occur, downy mildew infection does not occur.

Levels of disease that result from primary infection are usually very low but rapid and destructive (secondary) spread of disease can occur during a warm (>12°C) humid night. High relative humidity (>97% RH) is needed at night to promote the production of spores on the underside of oilspots. These spores give the undersides of oilspots a white down-like appearance. Once the spores are produced they are dispersed to adjacent foliage and if the leaves remain wet for (a minimum) of 2 hours, secondary infection may occur. New generation oilspots appear 5-20 days after infection depending upon the prevailing temperature.

In recent years, a simulator of downy mildew (DMODEL) has been built to predict infection events under Australian conditions (Magarey *et al.* 1991). The simulator has been incorporated in a decision aid device known as AusVit™ (Magarey *et al* 1997). This computer-based software enables processing of weather data which, when combined with vineyard monitoring data, enables growers to determine the risk of disease at any point in the season. Consequently, it is possible to spray for downy mildew only when the risk of disease is high and to confidently withhold sprays when the risk is low. In inland regions, several sprays per year may be saved. In wet years, the timing of sprays can be improved to optimise control. A version of DMODEL has been incorporated into an automatic weather station (AWS) to function as a disease predictor. Called the *Model T MetStation*™ this low-cost device enables growers to improve their management of downy mildew through precision timing of controls (Magarey and Western 1998). It is possible therefore to consistently control disease efficiently and thus to deplete reservoirs of primary inoculum.

Downy mildew overwinters as oospores in decomposed leaf litter in the soil, where it may survive for many years. However, an inoculum removal strategy can be enhanced by knowledge of when infection events occur and when oilspots appear. Perhaps in some situations, physical removal of the oilspots can be undertaken to prevent additions to overwintering reservoirs. In vineyards where disease has been well managed, oilspots from primary infection are likely to be present on at most one vine in every 20. The vineyard could be monitored and oilspots removed once a downy mildew simulator had indicated that the oilspots had appeared on the leaf. It would be essential to remove inoculum before a subsequent secondary infection period. There is possibility in this to use soft fungicides such as phosphorous acid which has proven highly effective in post-infection management programs (Magarey *et al*. 1991).

Anthracnose

Anthracnose (black spot) is a persistent disease of grapevines caused by *Sphaceloma ampelinum* de Bary. Moisture is required for infection and spread. Infection requires at least 7 hours of leaf wetness at 12°C (Brook 1973), whilst rainfall is important in the dispersal of conidia. *S. ampelinum* infects only young expanding grape tissue (Brook 1973) and thus epidemics only eventuate if wet weather and sufficient infection periods occur early season. Only a minority of cultivars are susceptible to anthracnose, mainly Sultana and table-grape cultivars, while most wine cultivars are relatively resistant (Hart *et al.* 1993). In Australia, the combination of unfavourable climate, cultivar susceptibility and routine use of effective fungicides has lead to a low or nil incidence of anthracnose in most commercial vineyards. Despite this low risk, anthracnose sprays are still routinely applied.

A suitable question is would it be possible to also control anthracnose by inoculum removal? The answer is a tentative 'Yes' but there is little room for error since anthracnose can cause severe crop loss very early in the growing season. The strategy relies upon determining that inoculum is absent or at low level in the vineyard. Studies of spread of black spot showed that economic crop loss from anthracnose prior to flowering is localised and restricted to vines with overwintering inoculum and adjacent vines (RD Magarey, unpublished). Vines with the disease in the previous season had a disease severity on bunches of 30% at berry softening. However, severity was less than 5% on vines more than 4m from vines diseased in the previous season. Inoculum of *S. ampelinum* is almost impossible to detect during the dormant season, since symptoms of the disease are be almost invisible on dormant canes. However, during the growing season the disease is obvious. Once a vineyard is determined to be free of anthracnose, an inoculum removal program could proceed in subsequent seasons.

Alternatives to conventional fungicides

The search for alternatives to present fungicides continues especially the development of environmentally friendly (soft) fungicides. A range of fungicides of varying efficacy have been tested for powdery mildew control including sodium bicarbonate (baking sodium), mineral oils, potassium phosphates and wetters. These chemicals are not as effective as conventional fungicides especially when coverage is poor. For downy mildew control a simple molecule, potassium phosphonate has proven effective (Magarey *et al*. 1991).

Biological control for grape diseases has received considerable attention. Hyperparasites have been tested for powdery and downy mildew control and may have some merit. A tydeid mite has provided some control of powdery mildew, but is killed by some fungicide sprays and does not survive well on *Vitis vinifera*. Other research has shown the potential of a novel method of disease control. Colleagues in New York developed an ultra-violet (UV) 'sprayer' that was effective in controlling powdery mildew. However, concerns about the effect of UV radiation on plant toxins makes this approach publicly unpopular (Gadoury - pers. com.). Likewise, the same researchers experimented with steam cleaning as a method of sanitation but abandoned this approach because of the cumbersome nature of the equipment.

Another important influence on disease levels is canopy management. Some canopy management systems promote foliage arrays with increased airflow and reduced disease pressure. Leaf removal has been found effective in reducing the severity of both powdery mildew and *Botrytis* (Chellemi and Marois 1992). In our studies, we found that minimal pruning systems produce a canopy with shorter shoots but smaller and more open bunches and thus berries that are more exposed to airflow and drying. This proves advantageous against diseases like downy mildew and Botrytis.

Monitoring

Strategies that rely on low chemical inputs or inoculum removal are critically dependent upon accurate vineyard monitoring techniques. This monitoring includes the collection of vineyard weather data and observations of disease in the canopy.

Monitoring the canopy micro-climate

Weather monitoring is critical for the prediction of many diseases and pests. A major limitation for growers with small vineyards has been the capital cost of many AWS often US$2,000 or more. Two recent developments may assist grape growers in monitoring weather conditions in their vineyard. The first is what we have termed the *Model T* weather station concept (mentioned above). Before 1920, the motor car was an expensive product that could only be afforded by the very rich. In USA, a young engineer named Henry Ford took the innovative step of mass producing a low-cost, 'no frills', easy to use automobile called the *Model T Ford*. In doing so he put his motor vehicle within reach of the average American and the subsequent development of the modern transport system we use today. The same concept appears to be ready with weather station technology. In Australia, Western Electronic Design has produced a low-cost, easy to use weather station. That AWS, which incorporates a predictor of downy mildew, retails for about US$600. Other manufacturers including METOS from Austria have also produced a powerful, low-cost weather station/disease predictor with their µMetos™. Such equipment if appropriately calibrated for each region in which they are used, will facilitate greater precision in managing the weather-driven, foliage diseases of grapes.

Another useful development is the emerging site-specific weather forecast systems. These systems can estimate vineyard weather conditions either in historical or forecast mode (Russo 2000). They are based either on the spatial interpolations of weather station networks or on output from high-resolution numerical atmospheric models. The great advantage of this technology is that it does not require any on-site equipment. Consequently there is no capital cost for growers to use these services, but instead costs take the form of a regular subscription. Growers can access these weather data either by fax, e-mail or the web. In many instances the data can automatically be fed into a decision-aid devices.

Monitoring the canopy for diseases

This is probably the most important facet of any low-chemical input strategy. The monitoring procedure we use involves scanning as many leaves as possible during a slow walk past the vines. Occasionally turn or part the foliage to reveal the undersides of leaves or to inspect bunches (Seem *et al.* 1985). This procedure has been shown to detect downy mildew and powdery mildew at incidence as low as 0.5% of vines provided that 200-300 vines are searched (Seem *et al.* 1985, Emmett *et al.* 1998). In test of this procedure in commercial vineyards, the monitoring program successfully detected powdery mildew at incidences below 10%, on 37 out of 41 occasions and below 3%, on 28 occasions (Emmett unpublished). However, on two occasions disease was not found until 11 weeks after bud burst when it had spread throughout the vineyard. Although this was an undesirable outcome it was still possible to apply effective controls and to avoid crop loss in these vineyards.

Late detection of powdery mildew occasionally occurred because: (1) vine foliage was above 2.0 m height and could not be thoroughly inspected early in the season; (2) there was a rapid increase in disease as a result of windblown spores dispersed from an adjacent diseased vineyard; and/or (3) intervals between site inspections exceeded two weeks. A major requirement of effective monitoring procedures is correct identification of symptoms in the vineyard. A pocket-sized field guide to good diagnosis includes standard monitoring protocol and is now available for Australian grapegrowers to maximise efficiency and effectiveness of monitoring for diseases (Magarey *et al* 1999).

Concluding remarks

In this paper, we have outlined strategies for reducing (and possibly eliminating) the need for fungicides in commercial Australian viticulture. Each strategy relies upon a thorough understanding of pathogen biology and adopting the concept of a 'clean' vineyard. We are hopeful that the principle of inoculum removal may find use for some specialised applications in the future. We also make a final speculation on climate change. Although this question should not be trivialised, it is important to point out that variation between seasons often exceeds that anticipated in many climate change scenarios. Consequently, we encourage grape growers to be vigilant in managing disease and in vineyard monitoring programs regardless of the ultimate impact of climate change. The correct use of present knowledge of the foliage diseases of grapes and of procedures and equipment to monitor their development in the vineyard will, we hope, allow growers to reduce the use of chemical controls. Careful and astute use of inoculum removal and/or depletion strategies has potential for success in the organic viticulture industry of Europe.

References

Bleyer, G., Huber, B., Kassemeyer H.H. (1998). Investigations on relationships of treatments before flowering against *Uncinula necator*, appearance of flag shoots and epidemics on leaves and grapes in 1993-1997. Third International Workshop on Grapevine Downy and Powdery Mildew - Book of Abstracts, 21-28 March, 1998. SARDI Research Report Series No. 22. p. 54.

Brook, P.J. (1973) - Epidemiology of grapevine anthracnose caused by *Elsinoe ampelina*, New Zealand Journal of Agricultural Research 11, 333-42.

Chellemi, D.O., and Marois, J.J. (1992). Influence of leaf removal, fungicide applications, and fruit maturity on incidence and severity of grape powdery mildew. American Journal of Enology and Viticulture 43, 53-57.

Coombe, B.G. (1995). Growth stages of grapevine. Australian Journal of Grape and Wine Research 1, 100-110.

Emmett, R. W., Clarke, K. and Wilkins, B. J. (1998). Evaluation of a procedure for monitoring powdery mildew in vineyards. Third International Workshop on Grapevine Downy and Powdery Mildew - Book of Abstracts, 21-28 March, 1998. SARDI Research Report Series No. 22. p. 20.

Emmett, R.W., Magarey, R.D., Magarey, P.A., Biggins, L.T. and Clarke, K. (1997a). Strategic management of grapevine powdery mildew (*Uncinula necator*) in south eastern Australia. Journal of Viticulture and Enological Sciences 52, 203-205.

Emmett, R.W., Magarey, R.D., Magarey, P.A., Biggins, L.T. and Clarke, K. (1997b). The spread of grapevine powdery mildew (*Uncinula necator*) in south eastern Australia Journal of Viticulture and Enological Sciences 52, 206 - 208.

Emmett, R.W., Wicks, T., and McQuinn, D. (1984). Control of powdery mildew in Southern Australia. II Evaluation of fungicides applied after infection. Agricultural Record 16, 16-18.

Gadoury, D.M., Pearson, R.C Seem, R.C., and Park, E.W. (1997a). Integrating control programs for fungal diseases of grapevine in New York state. Viticulture and Enological Sciences 52, 140-147.

Gadoury, D.M., Seem, R.C., Magarey, P.A., D.M., Emmett, R.W. and Magarey, R.D. (1997b). Effects of environment and fungicides on epidemics of grape powdery mildew: considerations for practical model development and disease management. (En, de, fr) Journal Viticulture Enological Sciences 52, 225-229.

Gadoury, D.M., Seem, R.C., and Wilcox, W.F. (1998). The early development of ontogenetic resistance in fruit of *Vitis labrucana* and *Vitis vinifera* grapevines. Third International Workshop on Grapevine Downy and Powdery Mildew - Book of Abstracts, 21-28 March,. SARDI Research Report Series No. 22 p 36.

Hart, K.M., Magarey, R.D., Emmett, R.W. and Magarey, P.A. (1993). Susceptibility of grapevine selections to black spot (anthracnose*), Elsinoe ampelina*. Australian Grape-grower and Winemaker 30(352), 85-87.

Magarey, P.A. (1998). Inoculum zero: The case for eradicating powdery mildew from Australian viticulture. Third International Workshop on Grapevine Downy and Powdery Mildew - Book of Abstracts, 21-28 March, 1998. Loxton, South Australia. SARDI Research Report Series No 22. P 59.

Magarey, P.A., Wachtel, M.F. and Newton, M.R. (1991). Evaluation of phosphonate, fosetyl-Al and several phenylamide fungicides for post-infection control of grapevine downy mildew caused by *Plasmopara viticola*. Australasian Plant Pathology 20(2), 34-40.

Magarey, P.A., Emmett, R.W., Herrmann, N.I., Wachtel, M.F. and Travis, J.W. (1997). Development of AusVit™, a computerised decision support system for integrated management of diseases, pests and other production factors in Australian viticulture. Journal Viticulture Enology Sciences 52, 175-179.

Magarey, P.A., MacGregor, A.M., Wachtel, M.F. and Kelly, M.C. (1999). *The Australian and New Zealand Field Guide to Diseases, Pests and Disorders of Grapes.* A companion to 'Diseases and Pests', Grape Production Series No.1. Winetitles, Adelaide, S Australia. 108pp. ISBN 1 875130 33 0.

Magarey, P.A., Wachtel, M.F., Weir, PC. and Seem, R.C. (1991). A computer-based simulator for rational management of grapevine downy mildew (*Plasmopara viticola*). Plant Protection Quarterly 6(1), 29-33.

Magarey, P.A. and Western, M.D. (1998). Evaluation of the *Model T MetStation*™: A low cost weather station/disease predictor for grapegrowers. p. 10 Third International Workshop on Grapevine Downy and Powdery Mildew – Book of Abstracts, 21-28 March, 1998. SARDI Research Report Series No. 22. 62 pp.

Russo, J.M. (2000). Weather forecasting for IPM. pp. 453-473. In: Kennedy, GG, and Sutton, B. Eds. Emerging Technologies for Integrated Pest Management: Concepts, Research, and Implementation. APS Press, St. Paul 526 pp.

Seem, R. C., Magarey, P. A., McCloud, P. I. and Wachtel, M. F. (1985). A sampling procedure to detect grapevine downy mildew. Phytopathology 75, 1252-1257.

Table 1. The influence of the number of vines monitored on the time and level of first detection of grapevine powdery mildew on unsprayed *cv.* Sultana at Irymple, Victoria, Australia. 1991-1996 (Emmett *et al.* 1998).

	Time when disease was first detected: # weeks after bud-burst (level of initial infection as % vines)			
# Vines Monitored	50	100	200	300
Year				
1991-92	5 (4)	3 (2)	3 (2)	3 (2)
1992-93	2 (4)	2 (3)	*	*
1993-94	6 (8)	3 (1)	3 (0.5)	3 (0.3)
1994-95	11 (18)	11 (12)	8 (1)	5 (0.3)
1995-96	3 (30)	3 (20)	*	*

* Sampling was not necessary due to high disease incidence

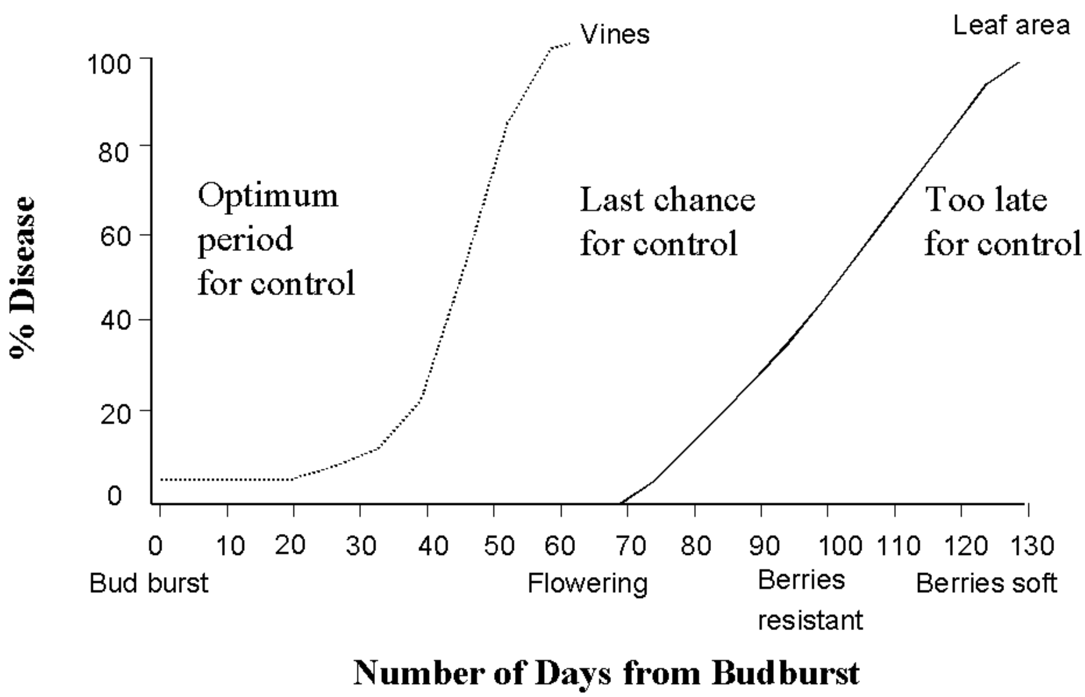

Figure 1. The influence of progress in the disease epidemic upon ease and effectiveness of controlling grapevine powdery mildew in Australia.

Management of Major Arthropod Pests in Organic Viticulture

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Abstract

Three groups of major arthropod pests are important for vineyards of western Europe: grape berry moths, still the first key pests, leaf- and plant-hoppers and spider mites. Drosophilid flies are becoming a problem in some regions. These pest are quickly presented here. Some new tools available for a better grape protection, compatible with organic farming, are also presented: models allowing to precise spraying dates, action or decision tools based on sampling and biological methods based on natural enemies action. The control of those pests is not a problem, except since recently for the leafhopper vector of the "Flavescence dorée" disease. It constitutes the biggest problem in South of France, especially for organic growers.

Introduction

Nowadays, over 100 arthropods, mainly polyphagous, have been identified as pests of grapes in Europe. Among this long list, only few are really key pests that need to be controlled.

Two leaf-rollers or grape berry moths, *Eupoecilia ambiguella* Hübner and *Lobesia botrana* Denis and Schiffermüller (Lepidoptera: Cochylidae and Tortricidae), have gained key pest status of grapevines since the Roman times.

Among Homoptera associated with grapevines, the Cicadellidae Typhlocybinae are probably the most commonly found. Many species are recognised of being vectors of viruses, phytoplasmas and bacteria (Vidano, 1965). Two important species are occurring in Europe. *Empoasca vitis* Goethe is a cosmopolitan polyphagous species recorded on grape since a long time. *Scaphoideus titanus* Ball, of North American origin, is monophagous to *Vitis* sp. and was first identified in Europe in 1958 (Bonfils and Schvester, 1960). It has spread to all regions where *Vitis vinifera* L. is grown. The flatid *Metcalfa pruinosa* (Say) was more recently introduced in Italy and France.

Tetranychid and eriophyid mites constitute secondary pests but still present, sometimes in great densities. In conventional agriculture, pesticides sprayings are required. Five species of Tetranychidae and two species of Eriophyidae occur. *Panonychus ulmi* (Koch) is common on the Northern Europe while *Eotetranychus carpini* (Oudemans) is more common in the South. Three polyphagous species also occur on grapevine. *Tetranychus urticae* Koch and *T. turkestani* Ugarov and Nikolski are present on grapevines and wild weeds. *T. mcdanieli* McGregor was found only in Champagne by Rambier (1982) where it is still limited. The two eriophyid mites are *Calepitrimerus vitis* (Nalepa), which can be injurious for the grapevines depending on local conditions, and

Colomerus vitis (Pagenstecher), which rarely reach economically injurious level. These mites are not causing problems in organic viticulture but some environment management can provide a better phytophagous mites control.

The last but increasing problem concern Drosophila sp. which became a pest in many regions of France. The densities are often correlated with the grape sour-rot disease (Baum, 1987).

Many other pest may occur on vines but they are of less economic importance and they are not presented here.

There is no specific data of the impact of the global change on vine pests. However, studies done on other phytophagous insects show a negative effect on the larval cycle of increase in the level of CO_2 seems to be the rule (Boutaleb Joutei, 1999).

Grape berry moths

Grape berry moths *E. ambiguella* and *L. botrana* are the most important pests in European viticulture (Roerich and Boller, 1991). Their original host plant are respectively *Cornus mas* L. and *Euonymus vulgaris* Miller for the first one and *Daphne gnidium* L. for the second. It is often said that *E. ambiguella* is present in the north of Europe whereas *L. botrana* is found in the south. *L. botrana* has actually a more restricted geographic distribution than *E. ambiguella* and is found mainly in the south. *E. ambiguella* likes cooler regions or fresh local conditions. So it is possible to find this moth in the south in the fresh valleys or in altitude.

E. ambiguella and *L. botrana* are polyphagous insects and they were present in Europe before the growing of grapes. They adopted the vine when grape became a great monoculture.

E. ambiguella and L. botrana overwinter in the pupal stage in a silk cocoon under the bark of vines. In areas where both species coexist, flight period and their duration are about the same. The beginning of the first moth flight can be registered by pheromone traps at the end of April to the beginning of May in northern regions. In Southern Europe, moths appear 15 days earlier. Eggs are laid on buds and bracts or other parts of young shoots. Depending on the temperature, E. ambiguella eggs hatch 7 to 10 days after they have been laid whereas L. botrana eggs require 10 to 15 days. The first generation larvae of both species feeds on the flowers, penetrate the buds, produce webbing and cause yield losses. Pupation takes place in the webbing 20 to 28 days later (end of May, beginning of June in southern regions and a month later in northern regions).

A second moth flight begins in June-July in southern regions and in July-August in northern regions. Eggs are laid on berries and the young larvae penetrate the berries. After "véraison", eggs are laid on ripening grapes and the young larvae grazes on the epidermis of these ripe berries, causing the oozing of juices that allow contamination with fungi or bacteria.

L. botrana completes three and E. ambiguella two generations a year. The last stage larvae migrate to the trunk or stakes and overwinter as pupae.

The activity of both species is temperature dependant. However *E. ambiguella* larvae are more mobile than *L. botrana* larvae and they will quickly take refuge in the middle of the trunk when temperature increase. Their co-existence is closely balanced by the humidity during egg laying. *E. ambiguella* tolerates dry conditions better than *L. botrana*. Today growers know that low lying humid areas in vineyards are attacked by *E. ambiguella*.

The 2^{nd} and 3^{rd} generation damage the green and ripening berries, predisposing the fruit to invasion by *Botrytis cinerea* Persoon. The potential role of the larvae of *L. botrana* as a dispersal agent for *B. cinirea* has been studied by Fermaud and Le Menn (1989). Numerous conidia are trapped, mainly in the ornamentation of the cuticle. Dispersal of the pathogen via the larval feces was also demonstrated. Many conidiophores and conidia are observed in the digestive tract and their germination ability was not modified, *B. cinirea* remaining viable inside feces (Fermaud and Le Menn, 1989). Thirty-five to 95 % of individuals of the second generation can hire *B. cinirea* (Fermaud and Giboulot, 1992). So damages caused by the last two generations of *L. botrana* larvae predisposes grape clusters to invasion by *B. cinerea* and is associated with increased grey mould severity.

Today control depends on a risk estimation based on the control of the adult flights. Sex (Arn *et al.*, 1979,a,b) and food attractants along with visual inspections, permit populations development to be tracked and localised in space and time (Cravedi and Mazzoni, 1989).

Visual techniques is based on the examination of 100 clusters. For the first generation, it is necessary to examine damage on flowers associated with webbing which constitute nests of larvae. Thresholds are : 30 clusters with nests on 100 examined for the northern part and 100 to 200 nests in 100 clusters examined for the south. It is not useful to spray on this generation except on table grapes or if those thresholds are exceeded.

For the second and third generations, one week after the beginning of the flight observed with sex attractants, it is possible to examine clusters looking for eggs. If low captures in the sex traps and no eggs are laid, no treatment is needed. If many adults are trapped, eggs examination allow to spray at the beginning of egg laying or at the beginning of hatching.

Models based on degree-days provide additional information and help forecast outbreaks (Touzeau, 1979 and 1981; Baümgartner and Baronio, 1989). These models have been developed as soft-wares that anybody can buy. One is developed by Association de Coordination Technique Agricole and Institut Technique de la Vigne et du Vin (Blanc, personal communication) and is based on the model of Baümgartner and Baronio (1989). The other one is developed by the Service de la Protection des Végétaux and is called E.V.A. (for "Eudémis", "vigne" and "avertissements") (Speich and Jacquin, 1996). E.V.A. is a simulation model and optimises the date of spraying for *L. botrana* considering the mode of action of the insecticide used and the climatic conditions of the year. The other model is more powerful as it gives the better moment for spraying the first generation in order to quasi-eradicate populations and avoid the development of the two and third generations. This moment is generally the stage 17 or H but may vary depending of climatic factors and densities of moths.

Mating disruption techniques are registered and available against the three generations of the two moths (Schruft, 1986; Stockel, 1994). Vineyard atmosphere is saturated by synthetic sex pheromones similar to those emitted by females. Males are attracted by cannot find the real females inside the crop. The cost is still rather high, the crop must exceed 10 ha and if the density of grape berry moths is high, a treatment is needed against the first generation. So some constraints using this technique still exist. However, mating disruption was used in 10,000 ha in France in 1999 (4,000 in Champagne, 2,000 in Alsace, 1,500 both in Bordelais and Bourgogne, 800 in Val de Loire and 200 elsewhere).

Bacillus thurengiensis Berliner which was first used in European vineyard in 1976 may also be efficient if it is applied before the insect begins to lay eggs (Coscollá *et al.*, 1990).
Releases of *Trichogramma cacoecia* and *T. daumalae* has been realised in Alsace vineyards against *L. botrana*. Results were better with the first species but problems with using these parasitic wasps still exist. Some new development in biological control may occur in the future with a technique of using trichogrammatid wasps coming from Bulgaria (Ferran, personal communication). *Dibrachys affinis* Masi may complete activity of trichogrammatid species (Babi *et al.*, 1992). Combining *B. thurengiensis* and trichogrammatid wasps may produce a great decline in density of the second generation.

Leaf- and plant-hoppers

Empoasca vitis Goethe is damaging only under low humidity and high temperature conditions. The adult and nymphal stages feed on the phloem with injury mimicking nutritional deficiencies, virus diseases (vine leaf-roll), and mite injury. Injury is dependant on the cultivar, pruning systems, and plant vigour. Adults overwinter on various host plants (coniferous, *Rubus* sp., *Lonicera* sp., etc.) and move to the grapevines in spring where 3 to 4 generations may occur. Reddening or yellowing of leaf edges can be observed depending on cultivar. Discoloration progresses from the leaf edges toward the petiole between leaf veins. Downward rolling, thickening, complete reddening or yellowing, and sometimes marginal drying and burning characterise finally the injured leaves. The presence of different stages and exuvia on the underside of leaves is required to clearly identify *E. vitis*. The economic losses correspond to a decrease in sugar content of berries following a decrease in foliar surface and so in the photosynthesis (Rousseau, 1994).
Three to four nymphs per leaf in spring cause persistent foliar symptoms. Injury is directly proportional to the number of leaf-hoppers (Moutous and Fos, 1973). If eight or more leaves are infected on a single shoot, the shoots will become stunted and will grow irregularly (Vidano *et al.*, 1987b). In southern France and Italy, the threshold was about 100 nymphs per 100 leaves (Moutous, 1979; Vidano *et al.* 1987b) but Swiss colleagues has proposed an action threshold of 1-3 individuals per leaf for all generation and of 3-5 per leaf only for some regions (Baillod *et al.*, 1993; Rousseau, 1994). In Switzerland and Germany, *E. vitis* adults move to the vines in spring and develop two to three generations a year. In southern France, northern Italy and northern and central Spain, four to five generations are reported. The first generations rarely requires treatment but control measures greatly reduce the severity of *E. vitis* injury in France and Italy. If the attack of the second generations is severe, sprayings are recommended. The best time to treat is from latter part of June to the beginning of August. The protection of natural enemies of this pests is highly desirable (Vidano and Arzone, 1983; Cerutti *et al.*, 1990). *Chrysopa carnea* Stephens appears to be the most effective agents in Bordelais vineyards where mating disruption technique is used for 7 years (Delbac *et al.*, 1996) but experiments has shown poor results in Aude (Rousseau, 1994). Some other general feeders preyed upon *E. vitis*. They are constituted of several family of spiders, mites and flies.
Some parasitic waps of eggs of *E. vitis* belonging to the family Mymaridae are more specific. Two species, *Anagrus atomus* Haliday and *Stethynium triclavatum* Enock occured in italian and swiss vineyards (Baillod, 1992; Marco, 1992; Duverney *et al.*, 1992). The rate of parasitism can reach 90 % (Cerutti *et al.*, 1989) and the parasitic

wasp occur in 70 % of the crops investigated. These two parasitic wasps hibernate in common surrounding plants of vineyards : *Rosa canina*, *Rubus fruticosus*, *Prunus spinosa* and *Corylus avellana* (Remund and Boller, 1996). Sutre and Fos (1997) has shown that releases of *A. atomus* resulted in a decrease of population of *E. vitis*. The rate of parasitism was 46 % showing an interest of biological control by augmentative release (Sutre and Fos, 1997). The other species, *S. triclavatum* is only responsible of a low rate of parasitism and present in 8 % of vineyards.

Scaphoideus titanus Ball females produce and insert about 20 eggs in August or September in the bark of old wood or in the buds in first year wood. Eggs, laid in groups or singly, hatch the following year at the beginning of May. There is 5 instars. The adults appear at the end of June in Corsica, the beginning of July in the Southwest of France, and still later in Switzerland. Adults disperse at the end of September (Schvester *et al.*, 1962). Feeding injury, caused by larvae and adults on the ventral surface of leaves, is not serious. Nevertheless, its ability to transmit "Flavescence dorée " disease causes serious damages. In regions where the disease is present, control measures should be exercised before the leaf-hoppers acquire the disease from diseased plants. The disease can be transmit to safe plants after 40 days.

The main symptoms are reddening of leaves in July with red cultivars, a rubber-like structure of shoots that hang down and flowers falling down on the soil.

In the Southeast of France, three treatments are obligatory since the law of 1987 (Rouzet *et al.*, 1987). The first one must be applied three weeks to one month after the first hatching when larvae become infectious. The 2nd one must be applied when the 5 stages of larvae and adults are present at the beginning of July. A third treatment must be applied to prevent colonisation from adjacent untreated vineyards at the beginning of August.

The "Flavescence dorée" disease is very dangerous and organic growers have less insecticide weapons for the control of this leaf-hopper. The only mean for preventing the increase of the disease is to detect ill vine stocks and to destroy them very quickly. The use of efficient wide-spectrum chemical insecticides is forbidden and growers loose the organic growing certificate if they use these products. In 1994, the "Flavescence dorée" disease was responsible of 30 % of the losses of organic growing certificates in France (Rousseau, 2000).

There is presently no biological methods available. A survey of Languedoc-Roussilon vineyards has shown that a lot of potential beneficials occurred in vineyards (Rousseau and Martinez, 1997; Cocquempot, 1998). However, it is not possible to find proved efficient biological control agents. The rate of parasitism by Mymaridae was inferior to 1 % and concerned only late instars after the third one, so after potential infection by the two first instars (Rousseau and Martinez, 1997; Cocquempot, 1998).

A survey in the Great Lake region, from where this leaf-hopper originated, is planed by the INRA (Malausa and Millot, 2000) for looking for a possible specific parasitic wasp. No concrete results have already been obtained but Dryinid wasps seem exist in this region.

Metcalfa pruinosa (Say) is a nearctic polyphagous flatid plant-hopper introduced in Italy in Venetia in 1980 (Duso 1984). It was soon after reported in the Northeast Italy and in Southeast France (Della Giustina and Navarro, 1993). They have spread from this region in the north in the Rhone Valley and in the west, in Languedoc-Roussillon. Summer outbreaks are spectacular and damage can be important. *M. pruinosa* infested many kind of trees and bushes (plane tree, horse chestnut, maple, linden, laurel, birch) and cultivated plants (vines mainly but also fig, lemon, apple, pear, plum and peach).

M. pruinosa has only one generation per year. Eggs laid under the bark overwinter and the first newly hatched are found in the vegetation in May. Adults first appear in July and can be observed as late as October. A large production of honeydew and consequently of mould follow the dense populations of larvae and adults. Adults have a great longevity and mobility.

Consequences of this life history traits is that sprayings are inefficient.

The parasitoid *Neodryinus typhlocybae* (Ashmead) (Hymenoptera: Dryinidae) has been introduced in Italy from 1987 to 1992 and in 1996 in the Southeast of France. The survey made in 1998 in this last area have showed the establishment of the parasitic wasp in the release site, where the rate of larval parasitism exceeded 30 %. The spread of this beneficial agent has remained very low with only 100 m maximum dispersal around the release point after the two first years (Malausa, 1999; Malausa *et al.*, 2000).

Phytophagous mites

Unlike the eriophyid mites on grapes, which are obligate parasites of grapes, tetranychid mites are polyphagous and many feed on a number of host species. In the past, they were secondary pests of grapes. Following certain cultural practices and the application of wide-spectrum insecticides, they became key pests. Actually, several factors favour its resurgence among which the decrease in predators and mainly in phytoseiid mites.

The economic importance of the different species is not the same across the grape vineyards of western Europe. *P. ulmi* is found everywhere in France, Italy, Switzerland whereas *E. carpini* is more prevalent in the Southern France, in Switzerland (Tessin) and in Italy. *T. urticae* is important in Northeast of France, in Switzerland (Valais) and in Spain.

P. ulmi overwinters as eggs in diapause at the base of buds, on twigs, and on old wood. All other phytophagous mite hibernates as females. Four to six generations can develop a year.

Management begins with the evaluation of the mite populations. This may be the overwintering populations or that found during the growing season.

Action threshold depend when the control measures will be exercised and the presence of predators such as *Typhlodromus pyri* Scheuten, *Amblyseius andersoni* Chant, *Kampimodromus aberrans* (Oudemans). In the absence of predators, the action thresholds are7 to 20 eggs per bud in winter or 70 % of the buds should have at least one egg. Seventy percent of the leaves should be infested in spring and 30 % in summer (=0.5 mite/leaf). If *T. pyri* is present, it will suppress the phytophagous mites provided that the insecticides used to control pests, and fungicides are non toxic to the predator (Kreiter *et al.*, 1998).

E. carpini is found in northern France on the horn-beam, *Carpinus betulus* L. but never on grapevines. In the South, it is just the opposite. Four to six generations may develop. This species is preyed upon by phytoseiid mites, mainly *K. aberrans* in France and North Italy. Action thresholds in spring and summer are the same as *P. ulmi*.

T. urticae, T. turkestani* and *T. mcdanieli overwinter on the trunks of grapevines. They can seriously injure the vines in the summer when populations have greatly multiplied in spring on vineyard weed species except from *T. mcdanieli* which moves directly on the vines in spring. *T. urticae* and *T. turkestani* migrate on the grapevines following cutting of grass or using some repulsive herbicides (Kreiter *et al.*, 1991). This species

are particularly damaging in summer when it is dry. *T. turkestani* is identical to *T. urticae* morphologically and biologically but it is more subtropical and Mediterranean. So it is mainly present in the South and *T. urticae* everywhere but mainly in northern parts.
T. urticae can develop 10-15 generations a year and the other *Tetranychus* 7 to10.
These species are preyed upon by several species of phytoseiid mites, mainly *T. pyri* in the northern parts. But webbing is not suitable for a lot of predatory mites except *Neoseiulus californicus* (McGregor). Action thresholds in spring and summer are the same as *P. ulmi*.
The leaf rust mite Calepitrimerus vitis is responsible of a severe and conspicuous damage in early spring after bud break which results in the heavily infested vines developing a bushy appearance. Often a second outbreak occurs in August causing the bronzing and browning of leaves. The injuries may be confused with that caused by the thrips *Drepanothrips reuteri* Uzel (Strapazzon *et al.*, 1986). In winter, females can be detected by examining pruned canes.
All European cultivars of grapes are attacked by the gall or erineum mite *Colomerus vitis*.
In vineyards with sufficient numbers of predators, mainly *T. pyri* and the specific cecidomyid fly *Arthroconodax vitis* Rübsaamen, the eriophyid mites rarely reach injurious level.
It was demonstrated recently (Tixier *et al.*, 1998 and 2000) that some of the most important species of phytoseiid mites for management of phytophagous mite populations are found in largest quantities in the natural vegetation, in traps and in the crops. Predatory mites dispersal occurred essentially by aerial dispersal and was dependant on the wind intensity and direction. The more suitable host plants (deep, dense and tall vegetation area) are present, the best the colonisation is. Natural colonisation of vineyards provides considerable phytoseiid mites potential that could be managed in an agricultural landscape (Tixier *et al.*, 1998 and 2000).

Vinegar Flies

Several species of Drosophilidae (*Drosophila melanogaster* Meigen, *D. simulans* Sturtevant, *D. subobscura* Collin, *D. busckii* Cocquillet, and *D. repleta* Wollanston) (Diptera) are often noted at harvest (Capy *et al.*, 1987; Köning, 1988) but since recently a little bit earlier. The flies are attracted by volatiles released by maturing berries but more often by berries injured by birds or wasps. A single female may laid several hundred eggs.
An effective method at one time was copper application used against mildew. This treatment reduced the concentration of acetic acid in the must by 50 % when compared with berries that were only treated with insecticide. Application of copper fungicides were more effective in reducing fly populations by reducing the food supply than were insecticides. These drosophilids are responsible of the development of grapevine acetic- or sour-rot (Baum, 1987) which seems to become an increasing problem in several regions of France.

Conclusions

Except from *S. titanus*, no problem exists with the control of pests in Organic Viticulture. However, this leaf-hopper constitutes a problem and needs more specific control. An efficient registered insecticide would be useful at short time level. Beneficials might be hopefully found in USA in the future and one may hope the success of released of natural enemies for increasing the management of this pest.

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References

Arn, H., Rausher, S. and Schmid, A. (1979a). Sex attractant formulations and traps for the grape moth *Eupoecilia ambiguella*. Mitteil. Schw. Entomol. Gesellschaft 52, 49-55.

Arn, H., Roehrich, R., Descoins, C. and Rausher S. (1979b). Performance of five sex attractant formulations for grape moth *Eupoecilia ambiguella* in European vineyards. Mitteil. Schw. Entomol. Gesellschaft 52, 45-48.

Babi, A., Marro, J.-P. and Schubert, G. (1992). Premières expérimentations de lâchers inondatifs de Dibrachys affinis *Masi contre l'Eudémis de la vigne* Lobesia botrana*. Bull. Soc. Entomol. Mulhouse, 29-32.*

Baillod, M. (1992). Piégeage des parasitoïdes de la cicadelle verte dans quelques vignes du canton du Valais (Suisse). Bull. OILB/SROP, groupe de travail "Lutte intégrée en viticulture", 42.

Baillod, M., Charmillot, P.-J., Jermini, M., Meylan, A. Valloton, R., Antonin, P., Hächler, M., Linder C. and Perrier J.-J. (1993). Protection intégrée et stratégies de lutte contre les ravageurs de la vigne. Revue suisse Vitic. Arboric. Hortic. 25, 23-29.

Baum, D. (1987). Importance of vinegar fly *Drosophila melanogaster* in the spread of grape sour rot. Alon Hanotea 41 : 1071-1075.

Baumgartner, J., and Baronio, P. (1989). Phenological model of the flight of *Lobesia botrana* in relation to the environmental conditions of Emilia-Romagna. Boll. Ist. Entomol. "Guido Grandi" 43, 157-170.

Bonfils, J., and Schvetser, D. (1960). Les cicadelles dans leurs rapports avec la vigne dans le sud-ouest de la France. Ann. Epiphyties 11, 325-336.

Boutaleb Joutei, A. (1999). Etude de l'effet de l'augmentation du CO^2 atmosphérique sur l'interaction plante-phytophage. PhD thesis, University of Louvain-la-Neuve, 193 pp.

Capy, P., David, J.-R., Carton, Y., Pla, E. and Stockel, J. (1987). Grape breeding *Drosophila* communities in southern France: short range variation in ecological and genetical structure of natural populations. Acta oecologica-Oecologia generalis 8, 435-440.

Cerutti, F., Delucchi, V., Baumgärtner, J. and Rubli, D. (1989). Ricerche sull'ecosistema "vigneto" nel Tecino. II: La colonizzazione dei vigneti da parte della cicalina Empoasca vitis e del suo parassitoide Anagrus atomus, importanza della flora circonstanta. Mitteil. Schweizer. Entomol. Gesellschaft 62, 253-267.

Cerutti, F., Baumgärtner, J. and Delucchi, V. (1990). Ricerche sull'ecosistema "vigneto" nel Tecino. III: Biologia e fattori di mortalita diEmpoasca vitis. Mitteil. Schweizer. Entomol. Gesellschaft 63, 43-54.

Cocquempot, C. (1998). Recensement de la faune auxiliaire dans 5 parcelles du vignoble languedocien. Rapport de la Commission Viticole ITAB, Beaune, 25 Nov., 12 pp.

Coscolla, R., Beltran, V., Fabra, M., Ribesi, A. and Laborda, R. (1990). Utilisation du fénoxycarbe et de *Bacillus thurengiensis* dansla lutte contre *Lobesia botrana*. Bull. OILB/SROP, 13, 68-71.

Cravedi, P. and Mazzoni, E. (1989). Relazioni fra la somma delle temperature giornaliere e la catture con trappole e feromoni degli adulti di *Eupoecilia ambiguella*. Boll. Zool. agra. Bachic. 22, 121-138.

Delbac, L., Fos, A., Lecharpentier, P.and Stockel, J. (1996). Confusion sexuelle contre l'Eudémis: impact sur la cicadelle verte dans le vignoble bordelais. Phytoma 488, 36-39.

Della Giustina, W. and Navarro, E. (1993). *Metcalfa pruinosa*, un nouvel envahisseur ? Phytoma 451, 30-32.

Duso, C. (1984). Infestazioni di Metcalfa pruinosa nel Veneto. Inform. Fitopatol. 5, 11-14.

Duverney, C., Junod, E., Cretier, P., Rigazio, L. and Dozio, S. (1992). La cicadelle de la vigne *Empoasca vitis* en vallée d'Aoste: biologie, parasitoïdes, essais de lutte, effets secondaires. Bull. OILB/SROP, groupe de travail "Lutte intégrée en viticulture", 38.

Fermaud, M. and Giboulot, A. (1992). Influence of *Lobesia botrana* larvae on field severity of Botrytis rot of grape berries. Plant Disease 76, 404-409.

Fermaud, M., Le Menn R. (1989). Transmission of *Botrytis cinerea* to grapes by grape berry moth larvae. Phytopathology 82, 1393-1398.

Köning, J. (1988).Uber das Auftreten von exponentiellen Wachtums und Verzögerungsphasen beim Vorkommen von Drosophila subobscura in Kaiserstuhl und Breigau. Z. angew. Entomol. 75, 183-194.

Kreiter, S., Brian, F., Magnien, C., Sentenac, G. and Valentin, G. (1991). Spider mites and chemical control of weeds: interactions. In: F. Dusbabek, and V. Bukva (Editors). Modern Acarology, Academia Prague and SPB Academic Pub., The Hague, 2, 725-736.

Kreiter, S., Sentenac, G., Weber M., Rinville, C., and Auger, P. (1998). Effets non intentionnels de quelques produits phytopharmaceutiques sur *Typhlodromus pyri*, *Kampimodromus aberrans* et *Phytoseius plumifer*. Phytoma 505, encart, 6 pp.

Malausa, J.-C. (1999). Un espoir face aux pullulations de *Metcalfa pruinosa*. Introduction en France de *Neodryinus typhlocibae*. Phytoma 512, 37-40.

Malausa, J.-C, Giuge, L., Brun, P., Chabrière C., Faivre d'Arcier F., Jeay M., Richy D., Trespaille-Barrau J.-M., Vidal C. (2000). Lutte biologique contre *Metcalfa pruinosa*. Bilan des lâchers de l'auxiliaire *Neodryinus typhlocibae* en 1999. Phytoma 527, 39-41.

Malausa, J.-C. and Millot, P. (2000). Perspectives de lutte biologique contre la cicadelle Scaphoideus titanus. Proceed. Jaunisses de la vigne: bilan et perspectives de la recherche agronomique, ENSA.M/INRA/ITAB (Editors), Janv. 2000, 52-54.

Marco, D. (1992). Dynamique de population et évaluation desdégats provoqués par *Empoasca vitis*. Bull. OILB/SROP, groupe de travail "Lutte intégrée en viticulture", 40.

Moutous, G. (1979). Les cicadelles de la vigne: méthodes de lutte. Le Progrès agricole et viticole 96, 232-235.

Moutous, G. and Fos, A. (1973). Influence des niveaux de populations de cicadelles de la vigne *Empoasca flavescens* Fabricius sur le symptôme de la grillure des feuilles. Ann. Zool. Ecol. Anim. 5, 173-185.

Rambier, A. (1982). Un acarien, sur vigne en Champagne, nouveau en France: *Tetranychus mcdanieli* McGregor,du groupe pacificus. Le Progrès agricole et viticole 99, 261-266.

Remund, U. and Boller, E., (1996). Bedeutung von Heckenpflanzen fur die Eiparasitoide der Grunen Rebzikade in der Ostschweiz. Obst- und Weinbau 132, 238-241.

Roehrich, R. and Boller, E. (1991). Tortricids in Vineyards. In: L. van der Geest and H.H. Evenhuis. Tortricid pests. Their biology, natural enemies and control. Elsevier, Amsterdam. World Crop Pests, 5, 507-514.

Rousseau, J. (1994). La cicadelle verte: unéquilibre à protéger. Alter Agri 11, 27-29.

Rousseau, J. (2000). Caractéristiques et contraintes du mode de production biologique en viticulture. Revue Française d'œnologie 180, 14-18.

Rousseau, J. and Martinez, M. (1997). Etude faunistique des auxiliaires de la cicadelle Scaphoideus titanus *dans levignoble languedocien. 11[e] plan Etat-Région, Filière viti-vinicole, rapport recherche-expérimentation, 5 pp.*

Rouzet, J., Bernard, P., Fretay du, G. and Tissot, M. (1987). Flavescence dorée, une maladie sous surveillance. Phytoma 412, 18-24.

Schruft, G. (1986). Die Konfusionmethode oder Verwirrungstechnik – ein neues Verfahren der Biotechnik zur Traubenwickler-Bekämpfung. Deutshes Weinbau-Jahrbuch 38, 231-241.

Schvester, D., Moutous, G., Bonfils, J. and Carle, P. (1962). Etude biologique des cicadelles de la vigne dans le sud-ouest de la France. Ann. Epiphyties 13, 205-237.

Speich, P. and Jacquin, D. (1996). Intégration du modèle E.V.A. pour optimiser les périodes de lutte contre Eudémis. Phytoma 488, 33-35

Stockel, J. (1994). Pour lutter contre l'Eudémis: la confusion sexuelle. Plaquette INRA-BASF, 8pp.

Strapazzon, A, Girolami, V. and Guarnieri, C. (1986). Infestazione fogliare di filossera *Viteus vitifoliae* su *Vitis vinifera* innestat danni. Atti Giornate Fitopatologische 1, 225-229.

Sutre, B. and Fos, A. (1997). Anagrus atomus*, parasitoide naturel des cicadelles. Essai préliminaire de son efficacité en viticulture. Phytom 495, 40-44.*

Tixier, M.-S., Kreiter, S., Auger, P., and Weber M. (1998). Colonisation of Languedoc vineyards by phytoseiid mites: influence of wind and crop environment. Exp. Appl. Acarol. 22: 523--542.

Tixier, M.-S., Kreiter, S., and Auger P. (2000). Colonization of vineyards by phytoseiid mites: their dispersal patterns in the plot and their fate. Exp. Appl. Acarol. 24 (3): 191-211.

Touzeau, J. (1979). Développements récents dans l'établissement des systèmes de prévision et d'avertissements. Biostatistique et modélisation. In: K. Russ and H. Berger. Proceed. Intern. Symp. IOBC WPRS on Integrated Control in Agriculture Forestry, Vienna. 8-12 Oct., 43-55.

Touzeau, J. (1981). Etude des principaux paramètres biotiques et abiotiques nécessaires à l'établissement d'un modèle d'évolution de l'Eudémis pour la région Midi-Pyrénées. Avertissements et lutte intégrée, 8, 1-23.

Vidano, C. (1965). Responses of *Vitis* to insect vector feeding. Proceed. Intern. Conf. on virus and vector on perennial hosts, with special reference to Vitis, Davis CA, 6-10 Sept., 73-80.

Vidano, C., and Arzone, A. (1983). Biotaxonomy and epidemiology of Typhlocybinae on vine. In: W.J. Knight, N.C. Pant, T.S Robertson. and M.R. Wilson. Proceed. 1st Intern. Workshop Biotaxonomy, Classification and Biology of Leaf- and Planthoppers of Economic Importance. Commonwealth Institute of Entomology, 75-85.

Vidano, C., Arzone, A. and Alma, A. (1987). Investigations on Auchenorrhyncha accused or suspected to be noxious to vine in Italy. In: R. Cavalloro (Editor), Integrated Pest Control in Viticulture, A.A. Balkema, Rotterdam, Brookfield, 87-95.

Table 2. Downy mildew assessment at harvest: 1998 and 1999

		1998		Bunches		Leaves		1999		Bunches		Leaves	
Treatment	**Product Rate** (kg/ha)	**N°. App.**	**Cu^{++} Rate** (kg/ha)	**I (%)**	**Eff. (%)**	**I (%)**	**Eff. (%)**	**N°. App.**	**Cu^{++} Rate** (kg/ha)	**I (%)**	**Eff. (%)**	**I (%)**	**Eff. (%)**
Untreated	-	-		56.31a*	-	95.85a	-	-	-	3.80a	-	79.49a	-
Cu-oxychloride	5.0	10	20.0	2.93cd	95	11.18d	88	11	22.0	1.78ab	53	6.77c	91
Cu-oxychloride	2.5	10	10.0	6.72cd	88	15.29cd	84	11	11.0	2.84ab	25	8.04c	90
Cu-oxychloride + Cu-tallate	2.5 +1.0	10	10.5	6.42cd	89	10.01d	90	-	-	-	-	-	-
Cu-tallate	5.0	10	2.5	9.56cd	83	32.16b	66	-	-	-	-	-	-
Cu-oxychloride + Bentotamnio	2.5 + 5.0	10	10.0	7.69cd	86	25.85bc	73	-	-	-	-	-	-
Ramendo	2.5	10	0.8	38.26b	32	88.52a	8	-	-	-	-	-	-
Colloidox	2.5	10	6.8	12.15c	78	17.92cd	81	-	-	-	-	-	-
Ulmasud	1.5	10	0.0	8.76cd	84	30.97b	68	11	0.0	1.65ab	57	37.21b	53
K-phosphite	4.0	10	0.0	0.91d	98	12.49d	87	11	0.0	2.33ab	39	36.25b	54
K-phosphite /Bordeaux mix	4.0 /10.0	-		-	-	-	-	11	16.0	1.00ab	74	6.29c	92
Cu-oxychloride /Bordeaux mix	5.0 /10.0	-		-	-	-	-	11	22.0	1.95ab	49	5.57c	93
Cu-sulphate	4.0	-		-	-	-	-	11	6.6	0.94b	75	10.08c	87
Cu-hydroxide	1.5	-		-	-	-	-	11	6.6	3.37ab	11	12.79c	84
Kendal	4.0	-		-	-	-	-	11	0.0	1.67ab	56	37.40b	53

(*) Numbers followed by the same letter do not differ statistically according Duncan's test (p=0.05)

Biodiversity of Phytoseiid Mites and Outbreaks of Tetranychid Mites in Vineyards with Different Protection Management

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Keywords: *phytoseiid mites, tetranychid mites, vineyard, biodiversity, biological control*

Abstract

A survey of the mite fauna associated with the grapevine was carried out in vineyards of the Friuli-Venezia Giulia region (north-eastern Italy) to assess the influence of protection management on:

1) the biodiversity and abundance of phytoseiid mites;
2) the population densities of tetranychid mites in relation to the economic damage threshold.

The survey was carried out in 65 vineyards with different grape varieties and protection management. Twenty vineyards were conventional, thirty-one organic (according to the EEC Reg. 2092/91) and fourteen consisted of old 'hybrid' cultivars (mostly cv. Isabella and cv. Baco noir) resistant to grape downy mildew and so were unsprayed. Twenty leaves per vineyard were sampled in the summer and observed in the laboratory under a dissecting microscope; the mites found were counted and all the phytoseiid specimens mounted on slides for identification.

On the whole 2447 specimens belonging to ten phytoseiid species were observed and identified. Among tetranychid mites only the European red mite Panonychus ulmi (Koch) was detected.

In the conventional vineyards only the phytoseiid mites *Amblyseius andersoni* (Chant) and *Typhlodromus pyri Scheut*. were found; no phytoseiid mites were observed in the samples from twelve vineyards. High densities of tetranychid mites (> 6 mites per leaf) were observed in seven vineyards (35% of all).

Eight species of phytoseiid mites were found in the organic vineyards. T. pyri was dominant; *A. anders*oni and *Kampimodromus aberrans (Oud.)* were also abundant. High densities of tetranychid mites (> 6 mites per leaf) were observed in five vineyards (16% of all); two of them were in conversion from conventional to organic farming.

In the unsprayed vineyards nine species of phytoseiid mites were observed. *K. aberrans* was dominant; other abundant species were *Euseius finlandicus (Oud.), A. andersoni, T. pyri* and *Phytoseius finitimus Rib. (sensu Denmark)*. Rare tetranychid mites (< 2 mites per leaf) were found in four vineyards.

Different densities of phytoseiid mites were found in the vineyards of the three groups. In the conventional vineyards an average of 0.25 mites per leaf was recorded; in the organic and unsprayed vineyards the population densities of the phytoseiid mites reached, on average, 2 and 4 mites per leaf respectively.

The low densities or absence of tetranychid mites in organic and unsprayed vineyards were associated with higher biodiversity and density of phytoseiid mites, suggesting that these agroecosystems are ecologically more stable.

In contrast, the simplified mite fauna and scarce number of phytoseiid mites in conventional vineyards were frequently related to outbreaks of tetranychid mites, indicating a break in the biological equilibrium between predaceous and phytophagous mites.

Efficacy Evaluation of Different Low-rate Copper Formulations and Acupric Compounds Against Grapevine Downy Mildew (*Plasmopara viticola*) in Piedmont (North-western Italy) During the Period 1994-1999

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Keywords: *Grapevine, Plasmopara viticola, downy mildew control, low copper rate*

Abstract

In regions of Northern-Italy, due to weather conditions, several fungicide applications against grapevine downy mildew (*Plasmopara viticola*) are required in order to obtain satisfactory disease control. Cupric fungicides are the only products efficacious and available in organic viticulture. Due to the use of cupric fungicides, the amount of copper distributed annually can be higher than 10 Kg/Ha. In order to reduce the annual metallic contribution, the fungicide efficacy of some copper formulations at different rates and also alternative products to copper were tested. Field trials were carried out in Piedmont during 1994, 1997, 1998 and 1999.

Results from the four years of trials confirmed good efficacy of copper oxychloride at both higher and lower rates. Copper tallate and acid clay showed insufficient downy mildew control. K-phosphite showed very good disease control until fruit setting, but after this growth stage its effectiveness subsequently decreased. Lower copper hydroxide and copper sulphate applications gave interesting results, but further trials are required to confirm their activity.

Introduction

Grapevine downy mildew caused by *Plasmopara viticola* (Berk. & Curt.) Berl. & de Toni is the most important grapevine disease in Northern Italy. Due to the meteorological conditions in this region the pathogen shows a high level of attack with the strongest infections during the spring. It is not easy to control this disease especially in organic viticulture where few products with the desired efficacy are available. The most used product is copper, with the majority of available formulations showing a high rate of active ingredient. The copper ion is not very mobile in soil therefore application of these formulations produce an accumulation of the element in soil. Laboratory analysis show that in some cases the vineyard soils have a very high copper content.

Since European Community Directive 2092/91 does not allow the use of other fungicides that show similar effectiveness on grapevine downy mildew, field experiments were carried out from, 1994 to 1999 to test different products with low copper contents and acupric fungicides.

Material and methods

Field trials were conducted from 1994 in several areas of Piedmont according to European Plant Protection Organisation (EPPO) methods. Complete randomized block designs with 4 replicates were used. Plot sizes varied from 80-170 m². Spray volumes ranged from 1100-600 litres/ha. Applications of treatments were made using a small plot precision knapsack sprayer. Disease evaluation consisted of visual assessments of percentage area infected on both leaves and bunches, using the sample size recommended by EPPO PP 1/31.

Results and discussion

The results showed that products like copper tallate and Ulmasud (used in other Countries for grapevine downy mildew control) in Northern-Italy did not give good results when strong infections occured. Tallate, still did not show a synergic effect with copper oxychloride at a low rate.

Table 1. Downy mildew assessment at harvest:1994 and 1997

		1994		**Bunches**		**Leaves**		**1997**		**Leaves**	
Treatment	Product Rate (kg/ha)	N°. App.	Cu^{++} Rate (kg/ha)	I (%)	Eff. (%)	I (%)	Eff. (%)	N°. App.	Cu^{++} Rate (kg/ha)	I (%)	Eff. (%)
Untreated	-	-	-	34.80a*	-	11.50a	-	-	-	78.83a	-
Cu-oxychloride	5.0	9	18.0	0.67c	98	0.24c	98	12	24	10.87c	86
Cu-oxychloride	2.5	9	9.0	1.50bc	96	1.46c	87	12	12	15.34c	81
Cu-oxychloride + Cu-tallate	2.5 +1.0	9	9.5	1.86bc	95	0.44c	96	12	12.6	13.85c	82
Cu-tallate	5.0	9	2.3	7.28b	79	1.90b	83	12	3.0	27.07b	66

(*) Numbers followed by the same letter do not differ statistically according Duncan's test (p=0.05)

Very good disease control was observed using Cu-oxychloride at half label rate (1.0 kg/ha Cu^{++}). The results did not show a significant difference (p=0.05) (Duncan's test) to the treatment at full rate. K-phosphite showed very good control of *Plasmopara viticola* until fruit setting, but after this growth stage its effectiveness subsequently decreased. Better results were obtained when K-phosphite was used until fruit setting followed by copper formulations (table 2).

Lower copper hydroxide and liquid copper sulphate applications even with a copper rate per hectare per application lower than 1 Kg gave interesting results.

Conclusion

According to the experimentation carried out in these years the main conclusion is that in Northern Italy conditions where copper formulations are used, it is not practical to reduce the copper rate per hectare per application to under 1 Kg/ha and still maintain good control of the disease. An interesting strategy could be to use an application of K-phosphite until fruit-setting and then a low rate copper formulation.

Table 2. Downy mildew assessment at harvest: 1998 and 1999

Treatment	Product Rate (kg/ha)	1998 N°. App.	Cu^{++} Rate (kg/ha)	Bunches I (%)	Bunches Eff. (%)	Leaves I (%)	Leaves Eff. (%)	1999 N°. App.	Cu^{++} Rate (kg/ha)	Bunches I (%)	Bunches Eff. (%)	Leaves I (%)	Leaves Eff. (%)
Untreated	-	-		56.31a*	-	95.85a	-	-	-	3.80a	-	79.49a	-
Cu-oxychloride	5.0	10	20.0	2.93cd	95	11.18d	88	11	22.0	1.78ab	53	6.77c	91
Cu-oxychloride	2.5	10	10.0	6.72cd	88	15.29cd	84	11	11.0	2.84ab	25	8.04c	90
Cu-oxychloride + Cu-tallate	2.5 +1.0	10	10.5	6.42cd	89	10.01d	90	-	-	-	-	-	-
Cu-tallate	5.0	10	2.5	9.56cd	83	32.16b	66	-	-	-	-	-	-
Cu-oxychloride + Bentotamnio	2.5 + 5.0	10	10.0	7.69cd	86	25.85bc	73	-	-	-	-	-	-
Ramendo	2.5	10	0.8	38.26b	32	88.52a	8	-	-	-	-	-	-
Colloidox	2.5	10	6.8	12.15c	78	17.92cd	81	-	-	-	-	-	-
Ulmasud	1.5	10	0.0	8.76cd	84	30.97b	68	11	0.0	1.65ab	57	37.21b	53
K-phosphite	4.0	10	0.0	0.91d	98	12.49d	87	11	0.0	2.33ab	39	36.25b	54
K-phosphite /Bordeaux mix	4.0 /10.0	-		-	-	-	-	11	16.0	1.00ab	74	6.29c	92
Cu-oxychloride /Bordeaux mix	5.0 /10.0	-		-	-	-	-	11	22.0	1.95ab	49	5.57c	93
Cu-sulphate	4.0	-		-	-	-	-	11	6.6	0.94b	75	10.08c	87
Cu-hydroxide	1.5	-		-	-	-	-	11	6.6	3.37ab	11	12.79c	84
Kendal	4.0	-		-	-	-	-	11	0.0	1.67ab	56	37.40b	53

(*) Numbers followed by the same letter do not differ statistically according Duncan's test (p=0.05)

Contributions to Environmentally Safe Plant Protection Systems in Grapevine Cultivation.

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Keywords: *alternative production strategies, watery compost extracts, rapeseed oil, reduced copper concentration*

Experiments were conducted under laboratory, greenhouse and field conditions to study the effects of watery compost extracts on the control of major fungal diseases of grapevine, such as *Plasmopara viticola*, *Uncinula necator* and *Botrytis cinerea*. Field experiments from 1992 to 1994 under practical production conditions in the vinegrowing region of Baden should allow a definitive judgement of effects and potential of compost extracts in disease management. The application of reduced copper concentrations against *Plasmopara viticola* was also tested. Rapeseed oil was used to study its effects in environmentally safe plant protection systems. Possible side effects on predatory mites were observed. Grape and vine moths (*Lobesia botrana* and *Eupoecilia ambiguella*) were controlled by *Bacillus thuringiensis*. Test plots sprayed with water or unsprayed were maintained in conventional and organically-managed vineyards. Wines were produced from selected plots and tested analytically and by winetasters.

Uncinula necator was well controlled by compost extracts if the infection rate was not extreme, reducing the disease severity by 96 to 98% on ripening berries (veraison; Eichhorn-Lorenz Stage 35). At high rates of infection, compost extracts were not able to provide a sufficient level of protection against *Uncinula necator*. Compost extracts cannot be considered an alternative to copper sprays in practical scale vineyards. The population of predatory mites (*Typhlodromus pyri*) was hardly influenced by compost extracts whereas the population of eriophyid mites (*Calepitrimerus vitis* and *Eriophyes vitis*) increased. Other substances used as sprays by organic growers, such as sodium silicate, Ulmasud® and Mycosin® (two clay mineral preparations) suppressed predatory mites. Rapeseed oil effectively reduced the incidence of *Uncinula necator* by 66 to 99% and the severity of disease by 96 to 99,9% on ripening berries. Against *Plasmopara viticola* however, rapeseed oil was only marginally effective. Use of sprays with a reduced copper concentration and a precise termination of the treatment reduced the required amount of copper required. The limits of this treatment regimen were demonstrated under the high rate of infection by Plasmopara viticola in 1994, when control was not reliable. Compost extracts and rapeseed oil did not have any negative effects on wine quality.

These experiments demonstrate that even under difficult conditions, practical alternative production strategies are available both for conventional and organic grapevine growers.

Kupferminimierung und Einsatz von Tonerden zur Peronosporabekämpfung im ökologischen Weinbau

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Kupfer ist ein anorganischer Wirkstoff, der gegen den aus Nordamerika eingeschleppten Erreger der Rebenperonospora (*Plasmopara viticola*), gegen *Peronospora humuli* im Hopfenanbau sowie weitere Falsche Mehltaupilze im ökologischen Obst-, Gemüse- und Kartoffelanbau im Einsatz ist. Im Weinbau wird seit über 100 Jahren mit Kupfer in den verschiedensten Formulierungen gegen die Peronospora vorgegangen (Claus, 1979). Kupfer wirkt als Kontaktfungizid direkt auf die Sporenkeimung und die Zoosporen des Erregers und muss deshalb präventiv eingesetzt werden. Die Wirkung des Kupfers besteht daneben auch in der Förderung des Eiweißaufbaus und damit der Wiederherstellung der pflanzeneigenen Abwehrkraft (Chaboussou, 1987). Kupferionen werden vom Blatt aufgenommen, dringen tief in das Gewebe ein und bilden einen Schutz auf der Blattunterseite. Kupfer steuert im pflanzlichen Gewebe verschiedene enzymatische Vorgänge insbesondere die Oxydasen, welche wiederum den N-Stoffwechsel mitbestimmen. Mit Kupfer behandelte Blätter enthalten weniger löslichen Stickstoff. Es erfolgt eine wesentlich bessere Verwertung der Kohlehydrate und eine Steigerung der Produktion an Proteinen. Kupferpräparate haben günstige Nebenwirkungen auf weitere Schadpilze wie z.B. den Fäulniserreger *Botrytis cinerea* oder den Roten und Schwarzen Brenner. Die meisten der im ökologischen Anbau eingesetzten Kupferverbindungen schonen die Nützlinge wie z.B. die Raubmilbe Typhlodromus pyri im Weinbau (Schruft, 1990).

Das Schwermetall Kupfer reichert sich jedoch in den Böden an, da der pflanzliche Entzug im Verhältnis zum Kupfereintrag durch Pflanzenschutzmittel keine nennenswerte Rolle spielt und Kupfer bis zur Mitte diesen Jahrhunderts in nicht unerheblichem Maße von 20 – 30 kg / ha und Jahr als Kupfersulfat ausgebracht wurde. Aus den Untersuchungen von Gärtel (1985) zeigt sich, dass Böden aus alten, vor 1920 angelegten Weinbergen durch die 65jährige ununterbrochene Kupferanwendung stark mit Kupfer angereichert sind. In der Schicht zwischen 0 bis 20 cm findet man die höchsten Cu-Gehalte. Böden aus steilen, steinigen Weinbergen an der Mosel und Saar enthielten bis zu 2880 mg/kg Cu in der Feinerde. Schäden an Ertragsreben sowie an Gründüngungspflanzen wurden bisher nicht beobachtet. In Rebschulen und Junganlagen können durch erhöhte Kupfergehalte in humusarmen, sandigen Böden erhebliche Entwicklungsstörungen an den Jungpflanzen auftreten.

Kupfer kann toxisch auf Algen, Fische und Wasserflöhe wirken, wenn es als freies Ion in die Gewässer kommt. Im Boden können höhere Kupferkonzentrationen bei niedrigem Boden-pH-Wert ($pH < 4,5$) und geringen Humusgehalt toxisch auf Bakterien, Algen, Rhizobien, Regenwürmer und Pflanzenwurzeln sein. Verantwortlich für die Kupfertoxizität ist das bioverfügbare Cu^{++} - Ion. Aus den dargestellten Problemen der Kupferanwendung wurde im ökologischen Weinbau in Deutschland, Österreich und der Schweiz die Aufwandmenge von Kupfer pro ha und Jahr auf 2 – 4 kg/ha und Jahr beschränkt. In der EU–Verordnung 2092/91 zum ökologischen Landbau ist bisher keine Begrenzung der Kupferaufwandmenge festgeschrieben. Allerdings ist festzuhalten, dass in der Revisionsverordnung 1488/97 zur EU-Bioverordnung nur noch eine zeitlich begrenzte Zulassung von Kupferpräparaten bis zum Jahr 2002 vorgesehen ist.

In der Abbildung 1 wird eine Übersicht über die im ökologischen Weinbau in Deutschland in den Jahren 1996 bis 1998 eingesetzten Kupfermengen pro ha gegeben. Es zeigt sich, dass je nach Infektionsbedingungen, Jahr und Gebiet die Aufwandmengen stark schwanken und dass mehr als 85% der ökologisch arbeitenden Winzer mit der Begrenzung von 3 kg Kupfer pro ha und Jahr erfolgreich wirtschaften können. Die Tabelle 1 gibt parallel dazu die Situation in Frankreich wieder (Rousseau, 1995). Unter den dortigen klimatischen und spezifischen Infektionsbedingungen kann nur mit größeren Kupfermengen von bis zu 15 kg Cu/ha und Jahr erfolgreich gearbeitet werden.

Seit 1988 wird vom Bundesverband Ökologischer Weinbau zusammen mit Weinbaubetrieben, staatlichen Lehr- und Versuchsanstalten und den Herstellern von Pflanzenstärkungsmitteln Versuche zur Wirkungsprüfung und Eignung dieser Mittel im ökologischen Weinbau durchgeführt.

Im Zeitraum 1990 bis 1997 wurden gegen Peronospora im Rahmen des BÖW-Ringversuches neben Kupfer in sehr geringer Aufwandmenge (50 – 100 g im Vorblütebereich, 250 – 500 g im Nachblütebereich) die beiden Tonerdepräparate Ulmasud und Myco-Sin sowie jeweils verbesserte Versuchspräparate und Kombinationen mit zweimaliger Kupferanwendung im Vergleich zu unbehandelt in insgesamt 236 Versuchen auf 14 Standorten untersucht. Die Tabelle 2 zeigt, dass im Mittel der Versuchsergebnisse mit Myco-Sin und Ulmasud bzw. der Kombination aus Ulmasud mit zweimaliger Kupferanwendung (vor – und nach der Blüte) vergleichbare Ergebnisse wie mit den geringen Kupferaufwandmengen bei fünf bis zehnmaliger Anwendung zu erzielen sind. Bei starken Infektionen, wie sie 1987, 1995 und 1997 in verschiedenen Anbaugebieten auftraten, reichen diese Mittel allerdings nicht aus. Dann wird es mit der Kupferbegrenzung auf 3 kg/ha und Jahr schon eng, was sich in den 18% Kupferüberschreitungen in 1997 (Abb. 1) ausdrückt.

In 1998 und 1999 wurden erstmals die unterschiedlichen Kupferpräparate (Kupferoxychlorid, Kupferkalk, Kupferhydroxid und an Fettsäuren organisch gebundenes Kupfer-Kupferoctanoat) bei sehr geringer Aufwandmenge pro Applikation miteinander verglichen. Die Aussagekraft der durchgeführten Versuche in Bad Kreuznach, Trier und Korb ist durch das geringe Auftreten der Peronospora in den letzten beiden Jahren noch sehr gering. Es zeigt sich aber schon, dass mit den neueren Kupferpräparaten (Kupferhydroxid, Kupferoctanoat) mit noch geringeren Aufwandmengen pro Applikation ein ausreichender biologischer Erfolg zu erzielen ist. Weitere Versuche werden in diesem Jahr durchgeführt.

Zusammenfassend kann nach dem heutigen Kenntnisstand folgende Empfehlung (Tab. 3) für eine erfolgreiche Peronosporabekämpfung bei gleichzeitig minimiertem Einsatz von Kupfer im ökologischen Weinbau gegeben werden.

Ausblick

Die Kupferpräparate stellen zur Zeit die einzig wirksamen Mittel gegen einen starken Befallsdruck von Peronospora dar.
Mit einer Kontrolle der Witterungs- und Infektionsbedingungen für Peronospora mittels eines Thermohygrographen und Blattbenetzungsschreiber kann der Gesamtkupferanteil durch gezielte Applikation gesenkt werden.
Die vorhandenen Prognosemodelle sind auf den Einsatz von geringen Kupfermengen sowie Tonerdepräparate oder biologische Präparate abzustimmen.
Durch eine zeitlich versetzte Kombination der Applikation von Kupfer und den Tonerdepräparaten Ulmasud oder Myco-Sin ist eine Reduzierung des Kupferaufwandes möglich. Allerdings besteht die Gefahr von phytoxischen Schäden.
Eine Anwendungsoptimierung (Applikationstechnik, Zeitpunkt und Formulierungshilfsmittel) für die Tonerdepräparate muss erforscht werden.
Bei einer weiteren Beschränkung der Kupferanwendung sowohl in der Menge wie auch in der Mittelwahl ist nach dem heutigen Stand der Wissenschaft und Praxis kein wirtschaftlich erfolgreicher ökologischer Weinbau möglich.
Bevor über ein Verbot von Kupfer nachgedacht werden kann, sind umfangreiche Forschungsaktivitäten zur Entwicklung praxisreifer alternativer Verfahren auf der Basis der Tonerdepräparate sowie von Kräuter- oder Kompostextrakten oder mikrobieller Antagonisten notwendig. Ebenso muss verstärkt in der Anbautechnik (Sortenzulassung und Eignung, Erziehungsarten und Kulturmaßnahmen) im Hinblick auf eine ökologische Gesunderhaltung der Pflanzen geforscht werden.

Literatur

Claus, D., (1979): 90 Jahre Kupferanwendung im Weinbau und immer noch Erkenntnislücken. Weinberg und Keller 26, 142-172

Chaboussou, F., (1987): Pflanzengesundheit und ihre Beeinträchtigung. Die Schädigung durch synthetische Dünge- und Pflanzenbehandlungsmittel. Alternative Konzepte 60, Verlag C. F. Müller, Karlsruhe

Gärtel, W., (1985): Belastung von Weinbergsböden durch Kupfer. Berichte über Landwirtschaft 198, 123 133

Häseli, A., (1995): Versuche zur Krankheitsbekämpfung im biologischen Rebbau der Schweiz. In : Hampl, Hofmann et al. (Hrsg.) Öko-Weinbau, Boden- und Pflanzenpflege, Weinqualität und Betriebswirtschaft, SÖL-Sonderausgabe 64, 57-64

Hofmann, U.: (1996): Peronosporabekämpfung im ökologischen Weinbau. Obstbau - Weinbau, Bozen 4/96, 105-107

Rousseau, J. (1995): Fight against downey mildew (Plasmopara viticola) in organic viticulture and reduction of copper use. In : Hampl, Hofmann et al (Hrsg) Öko-Weinbau, Boden- und Pflanzenpflege, Weinqualität und Betriebswirtschaft, SÖL-Sonderausgabe 64, 75-82

Schruft, G. et al., (1990): Die Wirkung von Kupfer und Schwefel auf Raubmilben. Rebe & Wein 43, 142-143

Tabelle 1. Kupfereinsatz zur Peronosporabekämpfung im ökologischen Weinbau in Frankreich (Umfrage 1994)

REGION	Befallsdruck	Kupfer / Spritzung	Kupfer / ha / Jahr	Behandlungen
SÜDEN	Schwach bis mittel	1,5	8,2	6
SÜD - WEST	Stark	1,3	14	11
NORD - OST	Mittel bis schwach	1,3	7,3	6

Quelle J. ROUSSEAU, ITAB - CIVAM BIO, 1995

Tabelle 2. Befall in % der Trauben durch Peronospora BÖW - Ringversuch 1990 – 1997

Varianten	Anzahl Versuche	Mittelwert Befall %	Maximum	Minimum
Kupfer 5 - 10 Behandlungen Ø < 3 kg / ha	131	39,3	90,5	0
Myco-Sin	24	37,3	89	0
Myco-Sin – VP	13	36,5	89	0
Ulmasud	8	37,1	87	0
Ulmasud 2xKupfer (1,5–2 kg/ha)	21	26,8	51	0
Ulmasud VP 2xKupfer (1,5–2 kg/ha)	5	34	80	4
Unbehandelt	33	77,2	100	10

Tabelle 3. Bekämpfungsmaßnahmen gegen Peronospora im ökologischen Weinbau

- Möglichen Anbau pilztoleranter, interspezifischer Rebsorten prüfen

- Kulturmaßnahmen

Beim Rebschnitt auf gute Durchlüftung der Anlage achten, kein Übereinandergerten der Fruchtruten, entfernen von Wasserschossen, Ausbrechen von Doppel- und Kümmertrieben, termingerechte Laubarbeit und entfernen von auf den Boden hängenden Trieben, Förderung einer raschen Abtrocknung des Laubes und guter Durchlüftung der Laubwand. - Weitraumanlagen begünstigen eine rasche Abtrocknung.

Eine Bodenabdeckung sowie eine hochwachsende Begrünung, sie vermindert die Spritzintensität der Regentropfen und somit die Befallshöhe der Infektionen vom Boden.

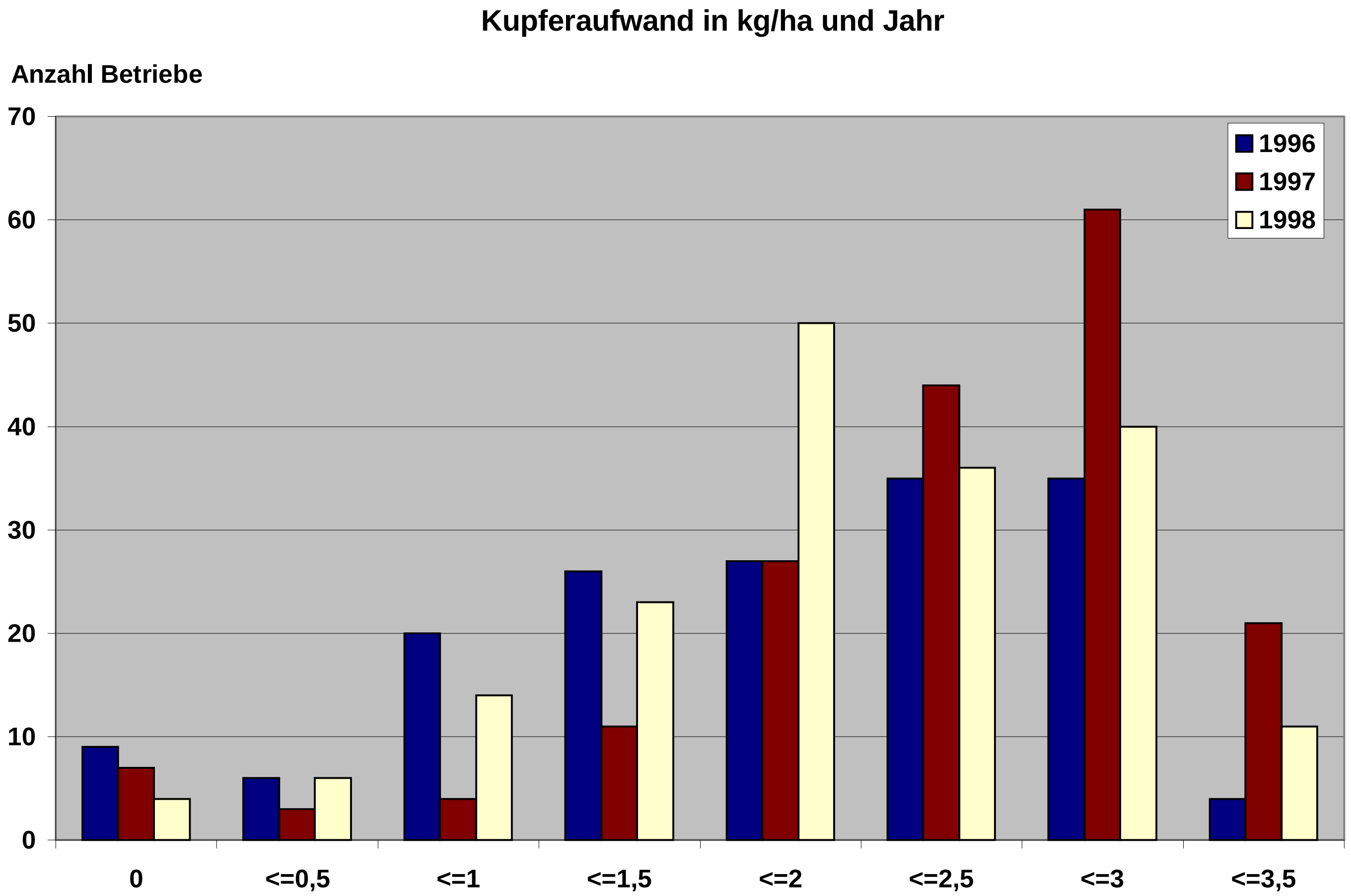
Ebenso wird bei einer Stammhöhe von mindestens 70 cm das Befallspotential reduziert.

Vorbeugend können Kompostgaben und Schachtelhalmspritzungen auf den Boden die Antagonistentätigkeit erhöhen und dadurch ausgekeimte Sporen abtöten

1. Sobald die Keimungsbedingungen der Wintersporen am Boden erreicht sind (Bodenfeuchte, Boden- und Lufttemperatur) und die Gefahr einer Primärinfektion gegeben ist, erfolgt der Einsatz von Ulmasud oder Myco-Sin (Tonerdepräparate).
   Ca. zwei bis drei Vorblütebehandlungen mit Ulmasud oder Myco-Sin in einer Aufwandmenge von 5 – 8 kg oder 80 – 100 g Kupfer im Abstand von 10 – 12 Tage.

2. Bei stärkeren Infektionsbedingungen: Starkregen, länger anhaltenden Niederschlägen mit höheren Temperaturen sollte auf 100 - 300 g Kupfer/ha zurückgegriffen werden.
3. Abgehende Blüte und 1. Nachblütebehandlung mit 200 - 400 g Kupfer/ha.

- Weitere Behandlungen bis Traubenschluss je nach Infektionsbedingungen mit Ulmasud oder Myco-Sin 8 - 15 kg bzw. 200 - 400 g Kupfer / ha.
- Abschlussspritzung mit 500 g Kupfer/ha.


Kupferaufwand in kg/ha und Jahr
Anzahl Betriebe
70
60
50
40
30
20
10
0
1996
1997
1998
0
<=0,5
<=1
<=1,5
<=2
<=2,5
<=3
<=3,5

Plant Protection Strategies Against Downy Mildew in Organic Viticulture
Copper Reduction and Copper Replacement - Results and Experiences of 10 Years on Farm Research

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An ecological, organic vineyard is a complex living system where the grower actively tries to encourage the self regulation of the ecosystem and the health of this organism.
One of the primary interests in organic viticulture is to grow healthy and disease resistant plants. With the help of plant health enhancing products which are accepted by organic standards, and with the correct soil-and plant management the regulation of fungal diseases through the induction and enhancement of the plant's own defence mechanisms, can be approached.
This does not involve the application of synthetic and toxic compounds to plants.
Only as a last resort, biological fungicides (copper, sulfur, limesulfur) are to be used to manage fungal problems.
Copper is a very common pesticide in organic viticulture, used against different diseases. But it is long term toxic for soils. That is why organic winegrowers try to reduce its use. Since 1988 ECO-Consult and the Organic Winegrowers Association of Germany (BÖW) has coordinated a on farm research program concerning copper reduction in organic vine protection.
For most organic winegrowers in cold climate regions downy mildew is the main problem. Organic Winegrowers pay more attention to this disease: they follow official advice and protection methods, make their own observations and are keen on prophylactic methods.
In Germany, Switzerland and Austria the input of Metallic Copper in organic production is limited, not more than 3 - 4 kg / ha and year are allowed.
Experimentations showed that copper preparations like Copper hydroxide, Copper Oxychloride or Copper Oxalate used in a low dose of 80 - 150g/ha copper before flowering, 200 - 400 g/ha after flowering and alternative products like - Ulmasud, Myco-Sin (algamatholithe -natural Bentonit with high aluminium content) has an efficiency against mildew under normal infection pressure (Tab. 1).

Under humid conditions, early and strong primary infection and high infection pressure (3 of 10 years) the plant protection agents were not so efficient in prevention the spread of downy mildew.
In the future new plant protection strategies (Tab. 2) like the combination of 2 or 3 copper treatments and Ulmasud or Myco-Sin also new copper preparations and microbiological antagonists or Plant extracts to increase a natural defense mechanism (SAR) can help to reduce the copper input in organic viticulture.

Table 1: Frequency of Plasmopara viticola infection on clusters in the years 1990 – 1997

Variants 5 - 10 Treatments	Number of trials	Mean of infection	Maxi-mum	Minimum
Copper Ø < 3 kg / ha	131	39,3	90,5	0
Myco-Sin	24	37,3	89	0
Myco-Sin – VP	13	36,5	89	0
Ulmasud	8	37,1	87	0
Ulmasud 2xCopper (1,5–2 kg/ha)	21	26,8	51	0
Ulmasud VP 2xCopper (1,5–2 kg/ha)	5	34	80	4
untreated	33	77,2	100	10

Table 2: Plant Protection Strategy against Plasmopara Viticola - Downy Mildew

- Planting of interspecific, resistant grape varieties

- Preventive Measures:
  Training system, winter and summer pruning
  foliage treatment, leaf removal, side and short shoots removal, thinning and pinching out - work in time to reduce the condition for the diseases.

- Plant Treatments:
  Spraying of compost- equisetum extract, lactic-bacterial extract, on the soil to increase a higher biological activity and a higher population of antagonists.
  If there are optimal conditions for the primary infection (infection from the soil) 2 or 3 pre-blossoming treatments with Ulmasud or Myco-Sin (6 - 8 kg/ ha).
  In case of rainstorm, high humidity using of Copper in a low concentration of 0,1 - 0,2 kg Cu / ha.
  Last pre-blossom spray and first post blossom spray using of Copper 0,3 - 0,5 Cu/ha.

  In dependency of the infection and climatic condition using of Ulmasud, Myco-Sin or Copper.

Figure: Use of Copper per kg/ha and year see preceding paper

Investigations on the Effect of Extremely Low Copper Doses and Different Copper Formulations

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Keywords: *downy mildew, copper, low doses, Plasmopara viticola, formulation*

Abstract

Different copper formulations were tested against downy mildew of vine using extremely low copper doses. The same amount of copper was applied in each variant. The treatment with traditional formulations ($CuSO_4$) had the same, sometimes a better effect on downy mildew disease than modern formulations.

Introduction

The use of copper as a fungicide in organic viticulture against downy mildew (*Plasmopara viticola*) causes serious environmental problems (Gärtel, 1985). Even today copper sprays are vitally necessary to control downy mildew disease. Up to now for a lot of winegrowers it is impossible to grow grapes without copper sprays.

The use of extremely low copper doses is very successful against downy mildew of vine (Kast, 1996). This report deals with the effect of different copper formulations against downy mildew, in order to minimise the amount of copper used.

Material and Methods:

Two field experiments were carried out in 1998 and 1999 at the Burg Wildeck research station (Southern Germany). 10 sprays were applied using the same copper doses at each treatment. The dose was adjusted to the phenological stage (50 – 400 g/ha^{-1}) and 2 kg/ha^{-1} pure Cu in total.

Table 1. Copper fungicides tested

No.	Fungicide *	active component	concentration
01	untreated	-	-
02	test component	novel copper formulation	1.0 %
03	Kupfer fl. 450 FW	copper-oxi-chloride	0.038 %
04	Kupferkalk (Spieß)	copper-oxi-chloride	0.11 %
05	Funguran	copper-oxi-chloride	0.038 %
06	Cuproxat	copper-sulfate	0.1 %

* additional we table sulfur 0.4 – 0.2

Results and discussion:

In 1998 high damage was caused by a severe infection at the end of a longer rainy period on June 28th. The effect of all sprays was very low (table 1). In 1998 fungicide Kupfer fl. 450 FW had no effect on downy mildew infections. Best results were obtained for Funguran and Cuproxat. In 1999 downy mildew also caused severe damage. The use of Funguran and Cuproxat produced the best results in 1999, too (table 2). The highest attack was found in the plots that had been treated with the modern fungicides Kupfer fl. 450 FW and Kupferkalk (Spieß). Thus, the use of novel formulations seems to be no appropriate means to reduce the dose of copper per ha.

Table 2. Downy mildew attack in 1998

No.	Fungicide	evaluation date 21st of July		23rd of September	
		incidence on leaves	severity on grapes	incidence on leaves	severity on grapes
01	untreated	52.7	24.1	92.2	46.2
02	test component	44.6	19.8	52.4	24.8
03	Kupfer fl. 450 FW	49.2	24.8	64.3	41.9
04	Kupferkalk (Spieß)	47.7	14.2	55.3	31.3
05	Funguran	38.7	12.2	53.4	21.4
06	Cuproxat	39.7	10.2	57.6	23.0
LSD 5 %	(Turkey Test)	26.7	14.1	4.6	18.3

Table 3. Downy mildew attack in 1999

No.	Fungicide	evaluation date 21st of July		13th of September	
		incidence on leaves	severity on grapes	incidence on leaves	severity on grapes
01	untreated	37.0	16.5	99.0	27.4
02	test component	17.7	7.3	38.3	4.8
03	Kupfer fl. 450 FW	20.3	3.6	38.3	7.0
04	Kupferkalk (Spieß)	11.8	4.8	41.2	7.6
05	Funguran	8.8	2.2	32.8	3.3
06	Cuproxat	10.5	2.3	27.8	2.4
LSD 5 %	(Turkey Test)	19.2	10.7	19.1	11.5

Literature

Kast, W. K. (1996): Untersuchungen zur Wirksamkeit sehr geringer Kupfermengen gegen Plasmopara viticola im Weinbau. Nachrichtenblatt Deutscher Pflanzenschutzdienst 48 (3), 63 – 65.

Gärtel, W. (1985): Belastung von Weinbergsböden durch Kupfer. Berichte über Landwirtschaft (198. Sonderheft), 123 – 133.

Salicylic and Phosphorous Acid – Possible Alternative of Copper?

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Keywords: *salicylic acid, phosphorous acid, copper, downy mildew, vine, vitis vinifera*

Abstract

Salicylic acid (S) and phosphorous acid (P) were tested in field experiments in order to minimize the use of copper in organic viticulture. Both substances reduced infestation with downy mildew mainly in the prebloom and bloom period. S (applied 0,2 %) had a small effect (maximum 50 % disease reduction). However, P (applied 0,1 %) showed a very good protective effect and could even be used for curative treatments. The amount of S-residues found on grapes and in wine was comparable to that found on other fruits with a naturally high content (< 1 mg/kg). Residues of P were found to be higher (≈ 30 mg/kg).

Introduction

The use of copper as a fungicide in organic viticulture against downy mildew (*Plasmopara viticola*) causes serious environmental problems. Salicylic acid is a natural substance which is part of the defence mechanism of plants. Phosphorous acid is an anorganic substance, that occurs naturally in plants, however in an extremely low dose. Both substances are not listed in the annex II of the EEC-regulation 2092/91 but would fit the principles of the regulation. The objective of our investigations was to proof, whether these substances could help to replace or reduce the use of copper.

Material and Methods

In 1998 the effect of salicylic acid (0,2 %) and phosphorous acid (different concentrations 0,025 – 0,2 %) and combinations with copper and Mykosin was tested in a field trial (location Burg Wildeck – organic research station) using 10 applications. In addition, the effect of salicylic acid (0,2 %, 10 applications) was compared with a conventional fungicide (Aktuan, 0,125 %, 6 applications). In this experiment severe artificial primary infections caused an extreme spread of downy mildew. In 1999 different combinations of phosphorous acid and salicylic acid with copper and Mykosin were tested, also at Burg Wildeck research station. In one plot phosphorous acid 0,1 % was applied as a curative fungicide (4 applications) using a disease predictor (Adcon-Advantage-PeroDiag). Grapes, must and wine were analysed for residues by RCC Ltd. Thingen/Switzerland and Rückstandsanalytik Bremen GmbH/Germany.

Results and discussion

In all experiments disease pressure was high. 10 applications of salicylic acid significantly reduced the disease incidence in all experiments but the effect was small (0 – 60 % reduction). Phosphorous acid reduced disease incidence best in July (> 90 %). But afterwards disease rapidly attacked the leaves. The use of curative sprays with afterwards disease rapidly attacked the leaves. The use of curative sprays with phosphorous acid was very successful in June and July. A synergistic effect was found for the combination of low doses of phosphorous acid (0,05 %) and salicylic acid but was not well tolerated by the grapes at higher temperatures. Residues of salicylic acid in wine were increased, however at a level comparable to different other fruits (table 3). Residues of phosphorous acid were found up to a level of 60 mg/kg^{-1} (table 4).

Table 1. Results of field experiments using Salicylic acid

treatment	**frequency on leaves %**		**incidence on grapes**	
	July	*September*	*July*	*September*
untreated (1998 a)	58.6	93.5	39.3	27.9
Salicylic acid 0,2 % (10 x)	27.1	62.6	14.9	16.4
Aktuan SC 0,125 % (6 x)	4.1	7.1	0.4	0.6
LSD 5 % (Tukey-Test)	4.8	6.2	6.0	4.4
untreated (1998 b)	63.7	42.3	94.4	52.5
(1) Salicylic acid 0,2 % (10 x)	61.4	25.3	85.8	54.0
(2) Kupfer fl. 450 FW 0,04 % (10 x)	59.3	27.0	70.4	45.8
(1) 0,1 % + (2) 0,04 % (10 x)	55.4	23.2	68.6	41.4
(1) 0,2 % + (2) 0,04 % (10 x)	52.2	16.2	68.8	37.4
(1) 0,2 % + Mykosin 0,8 % (10 x)	51.2	23.4	69.0	33.3
LSD 5 % (Tukey Test)	7.9	8.0	6.7	8.4
untreated 1999	32.8	99.2	2.7	15.3
(1) Salicylic acid 0,2 %	23.3	99.2	1.1	8.3
(2) Kupfer fl. 0,04 % (10 x)	6.2	23.2	0.9	3.1
(3) Mykosin 0,8 % (10 x)	10.7	36.7	0.3	2.1
(1) 0,2 % + (3) 0,8 % (10 x)	4.8	36.3	0.1	2.5
(1) 0,2 % + (2) 0,02 % (10 x)	10.3	61.2	0.3	4.7
LSD 5 % Tukey Test	7.7	11.3	1.1	5.7

Table 2. Results of field experiments using phosphorous acid

treatment	frequency on leaves %		incidence on grapes	
	July	*September*	*July*	*September*
untreated (1998)	63.7	94.4	42.3	52.5
(1) Phosphorous acid 0,025 % (10 x)	56.2	87.4	33.2	53.2
(1) 0,05 % (10 x)	47.3	79.6	28.0	42.9
(1) 0,1 % (10 x)	26.1	62.8	4.7	14.4
(1) 0,2 % (10 x)	4.6	39.2	1.1	2.1
(1) 0,05 % + Salicylic acid 0,2 % (10 x)	21.7	77.0	5.6	21.6
Kupfer 450 FW 0,04 % (10 x)	59.3	70.4	27.0	45.8
LSD 5 % (Tukey Test)	7.9	6.7	7.9	8.4
Untreated (1999)	32.8	99.2	2.7	15.3
(1)Phosphorous acid 0,1 % (10 x)	2.3	93.8	0.2	1.5
(2) Kupfer fl. 450 FW 0,04 % (10 x)	6.2	23.2	0.9	3.1
(1) 0,1 % + (2) 0,04 % (10 x)	2.0	39.8	0.4	2.3
(1) 0,1 % (4 x curative treatments)	1.0	96.5	0.2	6.1
LSD 5 % (Tukey Test)	7.7	11.3	1.1	5.7

Table 3. Residues of Salicylic and phosphorous acid (mg^{-kg})

	Salicylic acid		Phosphorous acid				
sample	**untreated**	**0,2 %**	**untreated**	**0,025 %**	**0,05 %**	**0,1 %**	**0,2 %**
grapes 1 daa *	0.1	3.0	0.2	1.5	1.3	3.9	6.3
grapes 14 daa	0	0.8	0.4	1.4	18.5	39.2	89.7
grapes 28 daa	0	0.5	0.3	6.9	14.1	26.6	63.9
grapes 42 daa	0	0.5	0.4	6.8	13.6	26.6	60.2
grapes at harvest	0	0.3	0.5	7.1	12.7	14.1	30.7
must	1.2	1.2	1.2	4.7	10.0	27.1	46.3
wine	0	0.9	1.2	13.9	14.0	31.1	57.9

- daa = day after last application

Organic Viticulture Without Sulfur?
3 Years of Experience With Sodium- and Potassiumbicarbonate

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Keywords: *organic viticulture, oidium tuckeri, sulfur, sodium- and potassiumbicarbonate*

Abstract

Sodium- and Potassiumbicarbonate were highly effective against powdery mildew and can be used in organic viticulture to minimise sulfur or completely substitute the use of sulfur. The agents are harmless on predatory mites and seem to increase winequality.

Introduction

Organic Viticulture within the scope of regulation EC-VO 2092/91 depends on the use of sulfur against powdery mildew (Uncinula necator / Oidium tuckeri) to ensure a sufficient success with respect to health and quality aspects of grapes. From this the following problems arise:

*	Humantoxicology	user protection
*	Ecotoxicology	soil, air, water, flora, fauna
*	Oenology	residues, sensory inpact

From 1997 –1999 sodium- and potassiumbicarbonate were tested as possible substitutes for sulfur in several field trials.

Materials and methods

Growthconditions:

Experiments were conducted with Riesling at the State Research Institute at Geisenheim, Germany (50° North, 8° East). The experimental vineyard had been converted to an organic viticulture system in 1996.

Treatments:

Plant protection started on the 15th of May and was repeated in 10 day intervals.
Several production systems were compared:

I: Organic Viticulture

Mycosin 0,6-0,8 %	(4,8 kg/ha)	2x (until flowering)
Kupferkalk	(500-900 g Cu/ha)	6x (after flowering)
Wettable sulfur 0,2-0,5 %	(3,0-3,2 kg/ha)	9x

II: Organic Viticulture without sulfur:

Sodiumbicarbonate (1997/98)	0,5 % until flowering;	1,0 % after flowering 8x
Potassiumbicarbonate (1999)	0,5 % until flowering;	1,0 % after flowering 8x
Kupferkalk		(200-230 g Cu/ha) 8x

III: Integrated system (IPM):

Wettable sulfur	0,2-0,6 %	
Organic fungicides	Metiram, Cymoxanil, Dithianon, Penconazol, Triadimenol, Dimethomorph, Fenarimol)	6-8x

IV: Control: no treatments against powdery mildew

Evaluationmethods:

At BBCH 81, 4 100 cluster replicates per treatment were visually evaluated for the frequency and intensity of infection by Oidium tuckeri according to the standard of the Biologische Bundesanstalt, Braunschweig.

The frequency of infection was calculated in % = $\frac{\text{Number of infected clusters}}{\text{Number of evaluated clusters}} \times 100$

The intensity of infection of the clusters was ranked in 4 levels:

1:	no infection	2:	up to 25%
3:	25-50%	4:	50-100%

Results

***Table 1**: Intensity and frequency (in parenthesis) of infections by Oidium tuckeri on clusters in 1997, 1998, 1999.*

	1997	1998	1999
Control	*3,03 a[1] (98,0 %)*	*3,95 a (100,0 %)*	*3,14 a (93,0 %)*
Integrated	*1,08 b (7,8 %)*	*1,60 c (57,5 %)*	*1,05 c (4,0 %)*
Organic	*1,22 b (26,3 %)*	*1,61 c (57,0 %)*	*1,37 b (24,0 %)*
Organic without sulfur	*1,20 b (16,8 %)*	*1,37 c (33,0 %)*	*1,10 c (8,3 %)*

[1)] Numbers with different letters are significantly different; * $P<0.05$

Conclusions

Sodium- and Potassiumbicarbonate were highly effective against powdery mildew and can be used in organic viticulture to minimise sulfur or completely substitute the use of sulfur. The agents are harmless on predatory mites and seem to increase wine quality. Further investigations are necessary to evaluate:

- Combination effects with other agents and ways to enhance efficiency
- Treatment intervals and minimisation strategies
- Responses of different grape varieties
- Reactions of other beneficial arthropods in the canopy

- Residues in must and wine; sensory development of wines
- Costs of treatment

Acknowledgements

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References

A list of references can be requested from the author.

Reduced Root Damage in Organically Managed Phylloxera-Infested Vineyards in California

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Grape phylloxera, *Daktulosphaira vitifoliae* (Fitch) (Homoptera: Phylloxeridae), is one of the most important pests of grape because it kills vines, and once in a susceptible vineyard cannot be controlled. Use of resistant rootstocks with parentage of North American *Vitis* prevents vineyard losses caused by phylloxera. Phylloxera remains a viticultural problem because the rootstock technology is not used universally, and because some of the more virulent phylloxera strains are selecting for certain rootstocks, especially those with partial *V. vinifera* parentage (Granett et al. 1996, Kocsis et al. 1999, Walker et al. 1998). Where phylloxera damage occurs, vine losses are high. No other generally applicable control tactics are consistently effective (e.g., Weber et al. 1996).
Alternative management tactics for grape phylloxera and phylloxera-related damage would be useful for preventing or slowing losses and for delaying the need to replace declining vineyards with vines grafted to resistant rootstocks. Cultural methods for controlling phylloxera damage would be less subject to natural selection for biotypes and would spread replanting costs over time. They could further provide a model for controlling other vine root pests and diseases.
Soil-borne pathogens enter root wounds caused by phylloxera feeding and cause a substantial portion of the damage associated with phylloxera activity (Granett et al. 1998, Omer et al. 1995). A number of plant pathogens have been implicated in the damage, including *Fusarium* and *Pythium* species. Soils suppressive to these or other plant pathogens have been described for other plants and the suppression may be related to soil organic matter dynamics (Drinkwater et al. 1995, Hu et al. 1997a, Schneider and Huber 1982, van Bruggen 1995, Voland and Epstein 1994). Non-quantitative reports from researchers in eastern Europe have described the recovery of phylloxera-infested vineyards with use of cover crops and compost amendments (Riabchun 1971).
In California, vineyards may be certified as "organic" by following strict management rules, which include use of cover crops and organic matter amendments and not using certain types of chemicals. Such methods may bear a resemblance to reported characteristics attributed to pathogen-suppressive soils. We therefore hypothesize that organically managing vineyards may result in reduced phylloxera numbers and phylloxera-related damage.
The purpose of this work was to determine whether differences in phylloxera populations or phylloxera-related damage could be attributed to organic or conventional management regimes.

Materials and Methods

Two types of long-term vineyard management regimes were compared, organic and conventional. Organically managed vineyards chosen for study were certified by the

California Certified Organic Farmers program (Santa Cruz, Calif.) and were characterized by the use of cover crops and composts and no synthetic fertilizers or pesticides. Vineyards that had been organically certified for at least 5 years and were infested with phylloxera were selected for this study. The time threshold of 5 years of organic management was chosen based on experiences of organic farmers, consultants, and researchers indicating that the full effects of management by organic methods takes 3-5 years to develop.

In spring of 1997 a total of four OMVs that fit these criteria were found in three California wine growing counties: Napa, Sonoma, and Mendocino. No vineyards could be found in the northern San Joaquin Valley that fulfilled the criteria for OMV. Conventionally managed vineyards (CMV) infested with phylloxera were selected in the above three counties plus San Joaquin County to best replicate the soil and climatic conditions of the chosen OMVs. All of the CMVs were managed with use of synthetic fertilizers, chemical pest and weed control, and with the exception of one vineyard in 1998 (CV), no cover crops. CMVs were rejected from the study if insecticides were used to control phylloxera directly.

All vines were on AXR#1 rootstock except for the San Joaquin County vineyards, which were own-rooted (Table 2.1). Vineyards on sandy soils were rejected because phylloxera tend not to colonize effectively or to cause vine damage in these soils (Nougaret and Lapham 1921).

Two sampling cycles, early summer (15 June - 15 July) and early fall (1 September - 1 October), were carried out in each of 2 years, 1997 and 1998. In 1997 one OMV, sampled in summer (VE) was lost to the study because it was replanted with resistant rootstock; we chose another vineyard (KW) to replace it. The CMV roster was reduced from eight to five vineyards in the fall 1997 sampling for feasibility reasons. In 1998 two CMVs (EL and SF) from the 1997 sampling roster were rejected because of insecticide treatments for phylloxera begun in spring 1998. A third CMV (CH) was lost because of vineyard replanting. These three were replaced in the 1998 sampling roster by CV, GC, and PO vineyards (Table 2.1). In the 1998 summer sampling one new (i.e., not sampled in 1997) OMV (ZD) was substituted for the FE in order to add to the total number of OMVs sampled in the 2-year period. However, despite accounts that ZD had been infested with phylloxera in 1994, it was found to have neither phylloxera nor signs of phylloxera in 1998 and was replaced by FE again in the fall sampling. Data for 1998 for two additional vineyards (KW and PO) had to be rejected after sampling had terminated, because flooding in the winter and spring of 1998 had apparently killed all phylloxera. No phylloxera were found in these vineyards during either of the 1998 samplings.

Cover crops most often used in OMVs were winter barley (*Hordeum vulgare* L.), rye (*Secale cereale* L.), oats (*Avena sativa* L.), lana vetch (*Vicia villosa* Roth), common vetch (*Vicia sativa* L.), and purple vetch (*Vicia benghalensis* L.), burr, sub- and berseem clovers (*Trifolium* sp.), bell bean (*Vicia fava* L.), and mustards (*Brassica* sp.). The most common resident weed species, found in both OMVs and CMVs, were winter annual weedy grasses such as wild oat (*Avena fatua* L.), ripgut brome (*Bromus rigidus* Roth), and wild barley (*Hordeum leporinum* Link), plus other non-grass species such as cheeseweed (*Malva parviflora* L.), various mustards (*Brassica* sp.) and common fiddleneck (*Amsinckia intermedia* Fischer & Meyer). Winter covers and weeds were disked under in spring in all vineyards with the exception of one OMV in 1998 (FE), which was converted to permanent cover, eliminating spring disking.

In 1998 only, resident vegetation and cover crop above-ground biomass samples were taken in March, before disking or mowing, by harvesting three samples of 1 m^2 area adjacent to where roots were sampled in each vineyard. Samples were dried at 60° C for 24 h, weighed, and used to calculate spring biomass inputs per hectare.

Three soil samples were collected from 0-0.2 m depth root at collection sites, combined, dried at 60° C for 24 h, and analyzed by the University of California Division of Agricultural and Natural Resources laboratory. Percentage organic matter (OM%), total Kjeldal nitrogen (TKN), ammonium nitrogen (NH_4N), nitrate nitrogen (NO_3N), and percentage sand, silt, and clay were determined for each sample.

Individual grapevine root samples, averaging 30 g dry weight, were taken by digging a hole approximately 0.6 m long by 0.3 m wide by 0.2 m deep within 0.5 m of the base of each of 10 vines in each vineyard and collecting exposed roots. Individual vines were sampled only once. In 1998 control samples were collected from vines not infested with phylloxera for comparison of percentage necrosis of infested vs. uninfested roots. In the case of CMVs, a non-infested part of one vineyard was used for control samples. None of the OMVs had phylloxera-free vines, therefore a non-infested vineyard from outside the sampling roster was used for OMV control samples. Root samples were cooled to < 10° C upon excision and counts of phylloxera made within 24 h.

All samples showed signs of phylloxera infestation, either as phylloxera colonies, or as tuberosities (galls induced by phylloxera feeding on mature roots) or as nodosities (galls induced by phylloxera feeding on immature feeder roots). Phylloxera populations were counted and classed as eggs, 1st, 2nd, 3rd, 4th instars, or adults (Omer et al. 1997). Phylloxera populations on each root sample were recorded as numbers of total phylloxera of all stages per 100 g of root dry weight. After phylloxera counts were made, roots were washed of adhering soil and cross-sectioned at 4 cm intervals, and percentage of the circumference showing necrosis of the phloem and phloem parenchyma tissues was recorded for each cross-section (Granett et al. 1998).

Root samples were assayed for presence of fungal species as described in Omer et al. (1995). Tissue sections (2 x 2 mm) from necrotic feeding sites of grape phylloxera were surface-sterilized in 70% ethanol for 30 sec, and 0.5% sodium hypochlorite for 3 min, then rinsed twice in sterile distilled water and blotted dry with sterilized absorbent paper. Sections of necrotic root tissues were placed onto acidified potato dextrose agar (APDA) (Tsao 1970), five necrotic sections per Petri dish, and incubated at 24° C for 6 d. Ten Petri dishes were used per root sample for each sampled site. Fungi isolated from these samples were identified based on colony and spore characteristics (Omer et al. 1995).

Data from phylloxera counts and root necrosis surveys were analyzed using analysis of variance (ANOVA) (PROC GLM, SAS Institute 1989). Management and season were considered fixed effects; site nested within management was considered random effect. For testing significance, we used the "H" option to specify the appropriate error term. Type III sums of squares were used. Soil analysis data were analyzed with *t*-tests at $P \leq 0.05$. Root necrosis percentage data were transformed to arcsine square roots before the ANOVA. A regression analysis was used to test the relationship between phylloxera populations (independent variable) and root necrosis (dependent variable).

Table 2.1. Phylloxera populations and root necrosis in organic vs. conventinal northern California vineyards. All vineyards were on AXR#1 rootstock otherweise noted

Season	***Vineyard***	***County***	***Comment***	**Necrosis (%)**		**Phylloxera**[z]	
			Organic				
Summer 1997	FL	Napa		9,2		78	
	FE	Mendocino		10,5		163	
	JR	Sonoma		11,8		442	
	VE	Napa		10,1		6008	
		Mean		**10,4**		**1673**	
Fall 1997	FL	Napa		9,0		456	
	FE	Mendocino		9,7		5	
	JR	Sonoma		19,1		637	
	KW	Sonoma		13,7		85	
		Mean		**12,9**		**296**	
Summer 1998	FL	Napa		4,6		143	
	JR	Sonoma		5,3		89	
	KW	Sonoma	Flooded winter/spring 1998[y]	-		-	
		Mean		**5,0**		**116**	
Fall 1998	FL	Napa		6,8		6561	
	JR	Sonoma		8,4		329	
	KW	Sonoma	Flooded winter/spring 1998[y]	-		-	
	ZD	Napa	Control (uninfested)[y]	[2.5]		[0]	
	FE	Mendocino		7,5		444	
		Mean		**7,6**		**2445**	
Mean (n = 134)				**9,0**	**a**	**1132**	**a**
S.E.				2,2		631	
			Conventional				
Summer 1997	VP	San Joaquin	Own rooted - Chenin blanc	22,0		115	
	SF	Sonoma		14,9		550	
	HH	Napa		20,5		105	
	CH	Sonoma		56,3		1620	
	EL	Napa		7,1		182	
	WW	San Joaquin	Own rooted - Zinfandel	21,9		99	
	HW	Sonoma		19,5		294	
	VA	San Joaquin	Own rooted - Zinfandel	28,5		62	
		Mean		**23,9**		**378**	
Fall 1997	VP	San Joaquin		29,8		266	
	SF	Sonoma		40,3		401	
	HH	Napa		36,3		687	
	CH	Sonoma		24,7		78	
	EL	Napa		23,7		460	
		Mean		**31,0**		**379**	
Summer 1998	VP	San Joaquin		56,1		370	
	HH	Napa		31,9		434	
	GC	Napa		6,0		173	
	CV	Napa	Control (uninfested)[y]	[1.4]		[0]	
	PO	Napa	Flooded winter/spring 1998[y]	-		-	
		Mean		**31,3**		**326**	
Fall 1998	VP	San Joaquin		44,0		30	
	HH	Napa		38,2		357	
	GC	Napa		12,5		179	
	CV	Napa		40,9		691	
		Mean		**33,9**		**314**	
Mean (n = 170)				**30,1**	**b**	**305**	**a**
S.E.				4,6		167	

[y] Control (uninfested) samples not included in averages, [z] No./100g root d.w.

Table 2.2. Analysis of variance for phylloxera populations and root necrosis in organically (OMV) vs. conventionally (CMV) managed vineyards, 1997 and 1998.

Year		Phylloxera			Necrosis	
	Source of variation	**df**	**F**	**p**	**F**	**p**
1997	Management[z]	1	2.1	0.17	19.5	>0.01
	Season[y]	1	2.7	0.10	3.8	0.05
	Site (management)[x]	11	5.6	0.01	2.4	>0.01
	Management*Season	1	0.1	0.77	0.8	0.36
1998	Management	1	>0.1	0.87	6.9	0.03
	Season	1	1.8	0.18	1.5	0.22
	Site (management)	7	1.9	0.07	12.7	>0.01
	Management*Season	1	5.1	0.03	0.1	0.36

[z] Organic (OMV) vs. conventional (CMV)
[y] Summer and fall
[x] Sites nested within management

Table 2.3. Soil analysis of organically (OMV) and conventionally (CMV) managed vineyards in 1997 and 1998.

Year	**Variable**	**OMV**		**CMV**		**p**
1997	% OM	2.52[z]	a	2.06	a	0.06
	% Total N	0.15	a	0.12	a	0.08
	NO3-N (ppm)	12.4	a	14.9	a	0.94
	% Sand	36	a	41.5	a	0.19
	% Silt	47	a	41	a	0.30
	% Clay	14.5	a	17.5	a	0.94
1998	% OM	2.72	a	2.20	a	0.17
	% Total N	0.14	a	0.12	a	0.11
	NO3-N (ppm)	15.0	a	15.1	a	0.97
	Biomass[y] (Mkg/ha^{-1})	4.2	a	1.9	b	0.01

[y] Spring 1998 biomass inputs from cover crops in OMVs and resident weeds in CMVs.
[z] Mean separation within columns and years by t-test at $p \leq 0.05$.

Results

In both 1997 and 1998 percentage root necrosis was significantly lower in OMVs, averaging 9% in OMVs and 30% in CMVs over the 2 years (Table 2.1). Percentage root necrosis in both OMVs and CMVs was significantly higher in infested roots than in their respective non-infested controls. There was no significant difference in percentage necrosis between OMV and CMV non-infested controls, which averaged 2.5% ± 1.3 and 1.4% ± 0.59 (mean ± SE) necrosis, respectively. Root necrosis was not significantly affected by season (Table 2.2).

Phylloxera populations were not affected by management type or season. Root necrosis was not related to phylloxera populations in OMVs; however, in CMVs root necrosis tended to increase as a function of phylloxera populations; this trend was significant in 1997 ($r^2 = 0.58$, $P = 0.0016$) but not in 1998.

Soil analyses indicated no significant difference between OMVs and CMVs in percentage total OM or nitrogen (%N-total), or concentration of nitrate nitrogen (NO_3-N), and percentage sand, silt and clay did not differ significantly in either 1997 or 1998 (Table 2.3). When the 2 years of percentage OM data were pooled, the difference between OMVs and CMVs was significant at $P = 0.015$ (OM% = 2.67 ± 0.16 S.E. for OMVs, 2.18 ± 0.11 for CMVs). Over all vineyards and both years there was a weak ($r^2 = 0.069$) but significant ($P < 0.001$) inverse correlation between root necrosis and soil OM% . Spring 1998 biomass inputs from cover crops in OMVs were significantly higher (4.3 ± 0.5 Mkg ha^{-1}) than those from resident weeds in CMVs (1.9 ± 0.4 Mkg ha^{-1}).

The incidence of beneficial fungus of the genus *Trichoderma* was significantly higher in OMVs in 1997 ($X^2 = 5.32$, df = 1, $P < 0.05$), but not in 1998. *Fusarium oxysporum* and *Pythium ultimum* were the most common secondary pathogens in both vineyard types. In 1998 *Fusarium* and *Cylindrocarpon* pathogens were significantly higher in CMV soils (Table 2.4).

Discussion

Prior to this research we hypothesized that organic management of vineyards would reduce both phylloxera populations on grapevine roots and phylloxera-related grapevine damage. Our data refute the hypothesis relative to phylloxera populations. Populations in the OMVs and CMVs sampled in this study were statistically indistinguishable when both years' data are considered.

The portion of the hypothesis relative to vine damage was evaluated as percentage of the sampled root circumferences showing necrosis. Granett et al. (1998) and Omer et al. (1999) have suggested that this is a reasonable measurement of phylloxera-related damage in vineyards. Our results showed that by this measure vine damage was lower in the OMVs than in the CMVs. Therefore, the portion of the hypothesis relative to vine damage is supported.

Our data do not explain the mechanisms by which OMVs resist vine damage. The 0.5% difference in OM% between OMVs and CMVs may be significant, considering that the range of OM% in soils is rarely outside 0.5% - 5% (Cox and Atkins 1979). One possibility is that the higher organic matter supports higher microbial activity, which reduces infections by root pathogens (Hu et al. 1997a). The beneficial fungi *Trichoderma* sp. were not consistently more abundant in the OMVs, nor was the prevalence of particular pathogen infections substantially and consistently different between the two management regimes. Microbial differences between the two situations may be found in the future. The microbial community in the soil is complex and may intercept plant pathogens before they cause infection. Looking in feeding wounds, as we did, may be the least likely place to find beneficial microbes. A better understanding of soil community and community dynamics is needed.

Simple measurement of percentage organic matter in the soil does not adequately reflect differences in microbial dynamics between OMVs and CMVs. Soil OM% subsumes three major pools of organic matter: "upstream" fresh plant material, "midstream" microbial biomass and "downstream" tightly sequestered and highly stable humic substances (Paul 1984). To understand microbial dynamics, we must be able to measure an upstream microbial energy pool such as coarse organic debris (COD) (Hu et al. 1997b), and a correlate of microbial biomass such as potentially mineralizable nitrogen (Drinkwater et al. 1996). COD and microbial biomass have been related to suppression of soil pathogens (Boehm et al. 1997, Hu et al. 1997b). Use of these and other measures in models of organic matter dynamics such as that of Verberne et al. (1990) may be useful for evaluating how farm management options will influence soil microbial dynamics, including pathogenesis.

A possible alternative cause of the suppression of plant pathogens in the OMVs might be soil conditions that induce plant resistance to pathogens, or "systemic acquired resistance" (SAR) (Sticher et al. 1997). Compost, which is commonly applied to OMVs, elicits SAR in another system (Zhang et al. 1998). Conversely, glyphosate (Roundup™; N-phosphonomethylglycine) a commonly used herbicide in CMVs (all CMVs in this study used glyphosate) inhibits the SAR response (Liu et al. 1997) and increases root pathogenesis (Descalzo et al. 1998) in other systems.

Although phylloxera are easily controlled by using strongly resistant rootstocks, phylloxera problems are prevalent world-wide. The reason for the continued problems with phylloxera is that there are negative incentives for using strongly resistant rootstocks in many situations, even though the risk of devastation by phylloxera is high. Current recommendations to farmers who have phylloxera problems are to remove the vineyards when they are no longer productive and replant with strongly resistant rootstocks. Supplementary control tactics for phylloxera are needed, especially control tactics that could be used to ameliorate damage in order to delay replanting of vineyards under attack. An understanding of the mechanisms by which damage in OMVs is reduced could provide the basis for formulating such control tactics.

Literature Cited

Boehm, M. J., T. Wu, A. G. Stone, B. Kraakman, D. A. Iannotti, G.E. Wilson, L. V. Madden and H. A. J. Hoitink. 1997. Cross-polarized magic-angle spinning 13C nuclear magnetic resonance spectroscopic characterization of soil OM relative to culturable bacterial species composition and sustained biological control of Pythium root rot. *Appl. Environ. Microbiol*. 63:162-168.

Cox, G. W. and M. D. Atkins. *Agricultural ecology*. San Francisco: W. H. Freeman. 1979.

Descalzo, R. C., Z. K. Punja, C. A. Levesque and J. E. Rahe. 1998. Glyphosate treatment of bean seedlings causes short-term increases in Pythium populations and damping off potential in soils. *Appl. Soil Ecol*. 8:25-33.

Drinkwater, L. E., D. K. Letourneau, F. Workneh, A. H. C. van Bruggen and C. Shennan. 1995. Fundamental differences between conventional and organic tomato agroecosystems in California. *Ecol. Applications* 5:1098-1112.

Drinkwater, L. E., C. A. Cambardella, J. D. Reeder and C. W. Rice. 1996. Potentially mineralizable nitrogen as an indicator of biologically active soil nitrogen. In: *Methods for assessing soil quality*. Eds. J. W. Doran and A. J. Jones. Soil Sci. Soc. of Amer. Spec. Publ. 49. Madison, WI: Soil Sci. Soc. of Amer.

Granett, J., M. A. Walker and E. Weber. 1996. California grape phylloxera are more variable than expected. Will this variability affect replacement rootstocks? *Cal. Agr*. 50:9-13.

Granett, J., A. D. Omer, P. Pessereau and M. A. Walker. 1998. Fungal infections of grapevine roots in phylloxera-infested vineyards. *Vitis* 37:39-42.

Hu, S., A. H. C. van Bruggen, R. J. Wakeman and N. J. Grunwald. 1997a. Microbial suppression of in vitro growth of *Pythium ultimum* and disease incidence in relation to soil C and N availability. *Plant and Soil* 195:43-52.

Hu, S., N. J. Grunwald, A. H. C. van Bruggen, G. R. Gamble, L. E. Drinkwater, C. Shennan and M. W. Demment. 1997b. Short-term effects of cover crop incorporation on soil carbon pools and nitrogen availability. *Soil Sci. Soc. Amer. J.* 61:901-911.

Kocsis, L., J. Granett, M. A. Walker, H. Lin and A. D. Omer. 1999. Grape phylloxera populations adapted to *Vitis berlandieri* x *V. riparia* rootstocks. *Amer. J. Enol.Viticult*. 50:101-106

Liu, L., A. K. Punja and J. E. Rahe. 1997. Altered root exudation and suppression of induced lignification as mechanisms of predisposition by glyphosate of bean roots (*Phaseolus vulgaris* L.) to colonization by *Pythium* spp. *Physiol. Mol. Plant Pathol*. 51:111-127.

Nougaret, R. L. and M. H. Lapham. 1928. *A study of phylloxera infestations in California as related to types of soils*. U.S. Dept. of Agriculture Technical Bulletin 20. Washington, D.C.: USDA

Omer, A. D., J. Granett, J. A. De Benedictis and M. A. Walker. 1995. Effects of fungal root infections on the vigor of grapevines infested by root-feeding grape phylloxera. *Vitis* 34:165-170.

Omer, A. D., J. Granett, D. A. Downie and M. A. Walker. 1997. Population dynamics of grape phylloxera in California vineyards. *Vitis* 36:199-205.

Omer, A. D., J. Granett and R. J. Wakeman. 1999. Pathogenicity of *Fusarium oxysporum* on different *Vitis* rootstocks. *J. Phytopath. Zeit.* 147:433-436.

Paul, E. A. 1984. Dynamics of organic matter in soils. *Plant and Soil* 76:275-285.

Riabchun, O. P. 1971. On biological control of phylloxera (In Russian). *Vinodelie Vinogradarstvo SSSR*. 7:43-44.

SAS Institute Inc. 1989. *SAS/STAT users guide*, version 6, 4th ed. SAS Institute Inc., Cary, N.C.

Schneider, R. W. and D. M. Huber. 1982. The description and occurrence of suppressive soils. In: *Suppressive soils and plant disease*. Ed. R. W. Schneider. St. Paul, Minn.: Amer. Phytopath. Soc.

Sticher, L., B. Mauch-Mani and J. P. Metraux. 1997. Systemic acquired resistance. *Ann. Rev. Phytopathol*. 35:235-270.

Tsao, P. H. 1970. Selective media for isolation of pathogenic fungi. *Ann. Rev. Phytopathol*. 8:157-186.

van Bruggen, A. H. C. 1995. Plant disease severity in high-input compared to reduced input and organic farming systems. *Plant Dis*. 79:976 - 984.

Verberne, E. L. J., J. Hassink, P. De Willigen, J. J. R. Groot and J. A. van Veen. 1990. Modelling organic matter dynamics in different soils. *Netherl. J. Agr. Sci*. 38:221-238.

Voland, R. P. and A. H. Epstein. 1994. Development of suppressiveness to diseases caused by *Rhizoctonia solani* in soils amended with composted and noncomposted manure. *Plant Dis*. 78:5, 461-466.

Walker, M. A., J. Granett, A. Omer, H. Lin, L. Kocsis, A. Forneck and M. Porten. 1998. Are phylloxera feeding on 5C rootstock in Europe? *Practical Vineyards and Wineries*. March/April 21-26.

Weber, E., J. A. De Benedictis, R. Smith and J. Granett. 1996. Enzone applications do little to improve phylloxera-infested vineyards. *Calif. Agr*. 50:19-23.

Zhang, W., D. Y. Han, W. A. Dick, K. R. Davis and H. A. J. Hoitink. 1998. Compost and compost water extract-induced systemic acquired resistance in cucumber and *Arabidopsis*. *Phytopathology* 88:450-455.

Table 2.4. Proportions of fungal isolations from phylloxera feeding sites on grapevine roots from organically (OMV) vs. conventionally (CMV) managed vineyards.

Year	Manage-ment	*Fusarium oxysporum*	*Fusarium roseum*	*Pythium ultimum*	*Cephalo-sporium* sp.	*Tricho-derma* sp.	*Rhizoct-onia* sp.	*Macroph-omena* sp.	*Verticil-lium* sp.	*Cylindro-carpon*
1997										
	OMV	0.28[z]	0.13	0.25	0.04	0.10*	0.09	0.06	0	0
	CMV	0.35	0.10	0.25	0.12	0.02	0.1	0.02	0	0
1998										
	OMV	0.03*	0	0.05	0	0.06	0.05	0	0.03	0.06*
	CMV	0.23	0	0.06	0.05	0.11	0	0	0.05	0.22

[z] 28% of cultures of necrotic tissue from phylloxera feeding sites were *F.oxysporum*.
* Significantly different from CMV at $p \leq 0.05$.

Controlling Vine Powdery and Downy Mildews with the Urticum Preparation

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Keywords: *plant extract preparation, efficacy, grape yield.*

Abstract

Several vineyard diseases like the powdery (*Uncinula necator)* and downy mildews (*Plasmopara viticola*) frequently cause economic losses. In order to prevent these losses fungicides are used in conventional grape production whereas organic vineyard production has recognized a wide spectrum of useful tools which often make the use of any kind of biocides unnecessary. Significant importance is obtained by the use of soft fungicides and plant extract preparation under the framework of the new phytopathological and ecological direction in grape production.

Six years ago (1994) the expert team of agronomist conducted the project of organic grape protection. The intention of the project was to investigate whether the preparation URTICUM could replace fungicides in controlling powdery and downy mildews. The preparation is formulated by extraction bioactive materials (essential and aromatic oils) from a mixture of medicinal and spice types of *lumbrico humus*. The experiment was conduced on the variety of Riesling Italian in the vineyard region Fruska Gora on a site of 3 ha. The treatments included URTICUM (1%), a conventional reference treatment (Propiconazol (0.015 %) + Metalaxil with Mancozeb (0.25 %) + Hexoconazol (0.025 %) +Propineb (0.2 %)), as well as an untreated control. The disease severity (% infected leaf surface) was assessed two weeks after the last treatment (stage 81-83). The efficacy of the treatments was calculated according to the formula of Abbott.

Good results have been achieved in the efficiency against *U. necator* and *P. viticola* by applying the preparation URTICUM. The efficacy of URTICUM in the investigated years (1994-1999) was higher in the protection of downy mildews (from 90.80 to 97.10 %) than to powdery mildew (from 85.40 to 94.80 %). In comparison with standard combination of fungicides we assumed very good protection, specially taking into consideration unprotected grape plants which had high infestation levels with powdery mildew in six investigated years. The number of treatments varied from 7 to 13 with the preparation URTICUM and was directly dependent on rainfall during vegetation. The assessed organic grape yield in the variety of Riesling Italian decreased about 25 % in 1995 but increased to 4 % reduced yield in 1998 and 1999 in comparison to conventional grape yield.

We produced commercial grade organic grapes as raw material for organic wine. The winegrowers gave key note for winegrowers in our cellar for production of new wine type - Organic Wine.

Considering the possible importance of this preparation in organic vineyard protection programs of diseases it is necessary to study the possibility of stimulating the plant's defensive system and the way of action of the preparation URTICUM to the pathogens.

Side Effect of Pesticides Used in Organic Viticulture and Based on Copper, Sulphur and *Bacillus thuringiensis* on the Populations of the Predatory mite *Phytoseius finitimus*

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Abstract

Powdery mildew (*Uncinula necator*), downy mildew (*Plasmopara viticola*) and berry moth (*Lobesia botrana*) are the most important pests of grapevine in Greece causing in some years severe damages. For the control of powdery mildew, in biological viticulture, growers use mainly sulphur in wettable or powdery form. For the control of downy mildew, beside the measures recommended in the field praxis (e.g. destroying the leaves by plowing), the copper compounds are used extensively taking into consideration their content in Cu%. For the control of berry moth the programme is based on microbic compounds products *Bacillus thuringiensis* as active ingriedient.

The fluctuation of the populations of the beneficial organisms and especially of the predator mites of the family Phyroseiidae is a very important parameter which in the biological viticulture must be taken into consideration when different pesticides are applied to protect the grapes against diseases and insects A survey conducted during 1995-98 among 37 varieties in the main grapevine growing areas of Greece varieties showed that twenty species of the family Phyroseiidae are present. The most predominant species is *Phytoseius finitimus* Ribaga with a frequence of occurrence in the vineyards ranging between 75-100% on the majority of the varieties. The purpose of this study was to examine the influence of different phytosanitary spray programmes applied in the biological viticulture in different grape growing areas of Greece on the population dynamics of the predator *Ph. finitimus.*

The study was carried out in three biological vineyards occurring central and northern Greece (a.Tirnavos, b. Naussa, c. Saint Mount). In each of these areas the spray programmes were respectively as following:

a) copper hydroxide+sulphur WP (26 April and 10 May), sulphur WP (25 May), B. *thuringiensis* + sulphur WP (31 May and 10 June), copper hydroxide + B. *thuringiensis* + sulphur WP (20 June), B. *thuringiensis* + sulphur WP (29 June, 12 and 24 July), B. *thuringiensis (12 August).*
b) *b) sulphur* D (10 April),sulphur D+copper hydroxide (30 April and 10 May) , B. *thuringiensis* (8 June), copper hydroxide (25 Jyne), sulphur D (17 July), copper hydroxide (2 August), B. *thuringiensis* (10 August, and 8 Sept.).
c) c) sulphur D (23 April, 5 and 27 May, 19 June, 10 and 14 July), copper hydroxide *(5* August).

In addition, in an other experiment we examined the influence of six bio-insecticides based on *Bacillus thuringiensis* on the population dynamics of *Ph. finitimus.* From mid-April till mid-November samples were taken every fortnight. In each experimental plot

10 randomly picked vines were sampled, of which 10 leaves were taken, each resulting in samples made up of 10x10=100 leaves per plot. The leaves were usually taken from the centre piece of the shoots. In table 1 the results of the influence of the six microbic compounds on the population dynamics of the predator *Ph. finitimus* are shown. In figure 1 the results of the experiment in the area of Tirnavos are shown. Similar results were obtained in the other two experimental plots too. In all four experimental plots the density of the predator population remained low till mid-August. Peaks occurred mid-September and mid-October. The population dynamics followed the same trend in all four experiments. The application of the fungicides based on copper and sulphur products and the bio-insecticides based on *B. thuringiensis* had an indifferent to slightly negative effect on *Ph. finitimus*, which secured a normal development of the predator population. It is to note that among the six bio-insecticides tested there was a significant difference concerning their influence on the predator population. The products Bactecin and Bactospeine showed a more friendly behavior to the predator population as is shown in table 1.

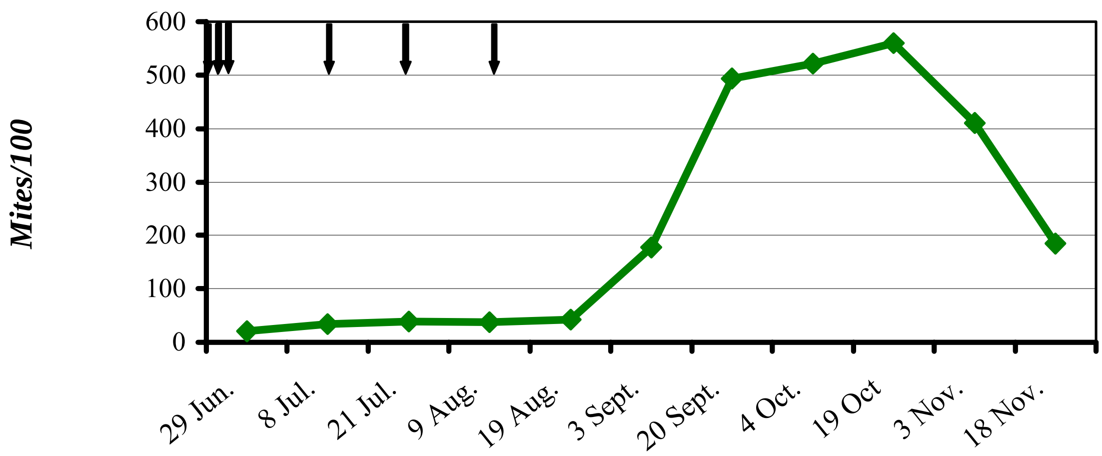
Table 1. Results of the effect of six microbic compounds based on *Bacillus thuringiensis* on the population fluctuation of the predator *Ph. Finitimus.*

Counts of moving forms of *Ph. Finitimus* on grapevine leaves[2]

Treatments[1]	**Before** treatments	5 days after first treatment	10 days after the second treatment	21 days after the second treatment
Xen-tari	201.00 a[3]	211.50 a	168.50 a	164.00 a
Bactospeine	205.75 a	189.00 a	154.25 a	169.50 a
Agree	172.50 a	166.25 a	114.25 b	148.75 a
BMP	189.25 a	182.25 a	135.25 b	171.50 a
Dipel	218.00 a	213.00 a	86.00 b	188.00 a
Bactecin	221.50 a	201.75 a	96.50 b	182.25 a
Control	200.25 a	201.25 a	115.00 b	168.75 a

[1]Spraying days: 14/7/99, 23/7/99, [2] Average of four repetitions of a sample of 32 leaves, [3] Levels of statistical significance are P=0.05

Figure 1. Effect of pesticides on the population fluctuation of the predator *Phytoseius finitimus* in a biological vineyard at the region Tirnavos.



Use of weather stations in organic viticulture

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Keywords: *Plasmopara viticola, downy mildew, forecaster, epidemiology*.

Introduction

Downy mildew of grapevine, *Plasmopara viticola*, is the most important pathogen of organic viticulture in Switzerland. There are only few plant protection agents available to organic farmers such as copper (limited to 4 kg/ha year) or acidified clay preparations. As both types of fungicides are purely preventive, the application scheme (timing and quantity) is of paramount importance for the success of crop protection strategies. As weather conditions are the primary driving factor for downy mildew epidemics, simple models have been developed and implemented in climatic weather stations in order to allow for more precise timing of sprays. Such disease forecasters have been in use successfully in conventional and integrated viticulture for several years (Siegfried *et al*., 1996). However, the use of weather stations has not been evaluated in Switzerland in organic vineyards, presumably because the models and crop protection strategies have been optimised for conventional systems in which curative fungicides are available. The aim of this study was to evaluate a commercial downy mildew forecaster in organic vineyards.

Materials & Methods

Between 1997 and 2000, crop protection strategies were evaluated on five pilot farms in Switzerland. The farms are situated in Frick, Peissy, Aubonne, Bremblens, and Sierre. In each site, a Lufft HP-100, equipped with a cellular data modem (Siemens M1), was placed within the vineyard. Data were retrieved 4 times a day from a NT-based PC from FiBL at Frick.

For each site, a basic plant protection strategy was defined at the beginning of the season, based on previous experience of the farmer as well as the strategy described by Häseli (1999). During the season, the timing of sprays as well the composition and quantity of compounds was adapted daily, depending on the local situation as and on regional weather forecasts.

Results and Discussion

Weather conditions and disease pressure varied considerably between sites and years. For instance, 1998 was a very dry year where sufficient crop protection was easily achieved, whereas 1999 was an extremely difficult year which resulted in serious disease outbreaks in Frick and elsewhere.

The calculated parameters of the Lufft HP-100, such as the completed sum of day-degrees for oospore maturation of downy mildew, were very useful tools to assess the risk situation on site. The risk indicators, however, need to be interpreted carefully. For instance, risks at or below 20% are negligible early in the season whereas similar risks may lead to heavy infections later in the season, depending on inoculum pressure (Siegfried, personal com.).

The reliability of the weather stations has proved to be one of the major bottlenecks of a forecaster-based strategy: During the four years, each of the HP-100 failed to work properly at least once a season. Usually, the problems could be solved by a master reset, thus indicating serious flaws of the software. Although cellular modems have been in use for four years, the technology is still not sufficiently reliable. Therefore, the maintenance of the equipment is still expensive.

The phytosanitary situation of the five pilot farms could be considerably improved as compared to neighbouring farms during the experimental phase. The availability of weather data and calculated risk indicators has proved to be a very useful tool not only during the season but also *a posteriori* when the chosen strategy was critically assessed in order improve the next year's strategy. Moreover, if curative fungicides such as phosphoric acid become available to organic viticulture (Speiser *et al*., 2000), disease forecasters will obtain further functionality and will contribute to an improved yield stability.

References

Häseli, A. (1999). "Krankheits- und Schädlingsregulierung im biologischen Rebbau,". Forschungsinstitut für Biologischen Landbau, Frick, Switzerland.

Siegfried, W., Holliger, E., and Meier, H. (1996). Forecasting Pseudopeziza tracheiphila and downy mildew of grapes. *Obst und Weinbau* **132**, 373-374.

Speiser, B., Berner, A., Häseli, A., and Tamm, L. (2000). Control of downy mildew of grapevine with potassium phosphonate: effectivity and phosphonat residues in wine. *Biological Agriculture and Horticulture* **17**, 305-312.

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Session 05

Varietes for Organic Viticulture an Quality

Chair: Pierre Basler

Pilzwiderstandsfähige Rebenneuzuchten - Ein möglicher Beitrag zum umweltschonenden Weinbau

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Schlüsselwörter: *Pilzkrankheiten, Resistenzzüchtung, neue Rebsorten, Verbraucherakzeptanz*

Zusammenfassung

Die Kreuzungszüchtung an Keltertraubensorten ist am Staatlichen Weinbauinstitut Freiburg seit 1952 ausschließlich auf die Schaffung pilzwiderstandsfähiger Neuzuchten ausgerichtet. Die Sorten Johanniter und Merzling sind seit Beginn des Jahres 2000 in Baden-Württemberg nach EU-Recht für den allgemeinen Anbau klassifiziert. Weitere Weißwein- und Rotweinsorten werden folgen. Zur Verbraucherinformation und Vermarktung der Weine sind besondere Bemühungen und neue Wege erforderlich.

Drei gefährliche Schadorganismen der Rebe, nämlich zwei Pilzkrankheiten (Echter Mehltau und Falscher Mehltau) sowie die Reblaus wurden in der zweiten Hälfte des 19. Jahrhunderts aus Nordamerika nach Europa verschleppt. Die europäischen Reben besitzen gegen diese Schädiger keine genügenden Abwehrkräfte. Die Reblaus konnte durch die Pfropfung unserer Kulturreben auf resistente amerikanische Wurzelunterlagen überwunden werden. Die Pilzkrankheiten müssen seit nunmehr über 100 Jahren durch regelmäßige Fungizidspritzungen bekämpft werden. Das Staatliche Weinbauinstitut Freiburg widmet sich seit langem der Züchtung Krankheits-widerstandsfähiger Rebsorten. Grundlage der Arbeit waren die gegen Ende des 19. Jahrhunderts geschaffenen Hybriden; das sind Kreuzungen zwischen Krankheits-resistenten amerikanischen Wildreben und europäischen Kultursorten.

Im Zug der Ökologisierung des Landbaus hat man in den zurückliegenden Jahren vielfältige Versuche unternommen, die beiden Pilzkrankheiten mit biologischen Mitteln zu bekämpfen. Immer wieder hat sich dabei gezeigt, dass Präparate wie Pflanzenextrakte und Kräuterbrühen keine sichere Wirkung haben. Mancher Winzer musste bei derartigen Experimenten bitteres Lehrgeld zahlen und schwere Ernteverluste hinnehmen. Auch diejenigen Rebbauern, die nach den Methoden des "Ökologischen Landbaus" wirtschaften, können auf chemische Pflanzenschutzmittel nicht ganz verzichten. Die Richtlinien der Verbände des "ökologischen Weinbaus" lassen deshalb notgedrungen synthetische Kupferpräparate und Netzschwefel zur Bekämpfung der Pilzkrankheiten zu. Der einzig derzeit gangbare Weg einer **biologischen** Bekämpfung der Pilzkrankheiten der Rebe ist die Züchtung resistenter Sorten.

Fünf Jahrzehnte Kreuzungszüchtung

Anfang der 50er Jahre fasste der damalige Leiter der Freiburger Rebenzüchtung, Dr. Johannes Zimmermann, den weitblickenden Entschluss, die Kreuzungszüchtung an Keltertraubensorten ganz auf das Zuchtziel Pilzresistenz auszurichten. Zimmermann hat Hybriden der französischen Züchter Seyve-Villard, Joan Seyve, Coulondre, Ravat und Landot kollektioniert und die nach Pilzresistenz und Weincharakter als am besten erscheinenden Typen mit *Vitis vinifera*-Sorten und -Zuchtstämmen rückgekreuzt.

Seit dem Jahr 1952 wurden in Freiburg fast 1000 Kreuzungskombinationen ausgeführt und dazu rund 24.500 Gescheine (Blütenstände) kastriert sowie künstlich bestäubt. Rund eine halbe Million Sämlinge sind im Gewächshaus aufgezogen und bereits dort gezielt mit *Plasmopara* (Peronospora) infiziert worden. Rund 40.000 Sämlingspflanzen, die sich als genügend resistent erwiesen hatten, wurden im Freiland auf ihre weinbaulichen Eigenschaften geprüft. Somit konnten im Durchschnitt aller Jahre nur die rund 8 Prozent erwartungsgemäß resistenter Sämlingspflanzen für die weinbauliche Prüfung gepflanzt werden. Bei den Sämlingspopulationen des letzten Jahrzehnts erwiesen sich vielfach nur 2 bis 3 Prozent der Pflanzen als genügend Peronospora-resistent. Ca. 6.000 Weine von Sämlingsstöcken (Einzelstockernten) wurden in Kleinstgebinden von max. 3 Liter Inhalt ausgebaut, geprobt und bewertet.

Die Sorten Johanniter und Merzling sind seit Beginn des Jahres 2000 nach EU-Recht für den allgemeinen Anbau in Baden und Württemberg klassifiziert, Johanniter auch für die Rieslingsgebiete Rheingau und Hessische Bergstrasse. Weitere pilzwiderstandsfähige Rotwein- und Weißweinsorten werden folgen.

Weißwein-Neuzucht Johanniter

Kreuzungsabkunft: Riesling x (Seyve-Villard 12-481 x (Ruländer x Gutedel))
Der Sortenschutz zugunsten des Landes Baden-Württemberg ist in Deutschland erteilt und in der Schweiz beantragt.
Der Sortenname erinnert an Dr. *Johannes* Zimmermann, den früheren Leiter der Freiburger Rebenzüchtung. Die Sorte ging aus einer Kreuzung des Jahres 1968 hervor. Sie lässt in ihrem Erscheinungsbild viele Ähnlichkeiten mit der Muttersorte Riesling erkennen. Verglichen mit Riesling brachte Johanniter im Durchschnitt von 55 Versuchsernten etwas höheren Ertrag, eine um etwa 7 ^{o}Oe höhere Zuckerkonzentration der Moste und eine um 2,3 g/l geringere Mostsäure. Johanniter besitzt eine gute Resistenz gegen Peronospora (Falscher Mehltau) und eine ausreichende Resistenz gegen Oidium (Echter Mehltau).
Die Weine präsentieren sich kräftig, fruchtig und lassen Ähnlichkeit zu Riesling und zu Ruländer erkennen. In zahlreichen Proben wurden die Weine in anonymer Anstellung neben Weinen der gängigen Weißweinsorten von Fachleuten und auch Laien getestet. Bei fast all diesen Proben sind die Johanniter-Weine im Durchschnitt der Einzelurteile besser bewertet worden als die Weine der Standard-Vergleichssorten vom gleichen Standort und Jahr.

Weißwein-Neuzucht Merzling

Kreuzungsabkunft: Seyve-Villard 5-276 x (Riesling x Ruländer)
Der Sortenschutz zugunsten des Landes Baden-Württemberg ist erteilt.

Der Sortenname leitet sich von der am südlichen Stadtrand von Freiburg dem Institut benachbarten Gemeinde Merzhausen ab. Die Sorte Merzling ging aus einer Kreuzung des Jahres 1960 hervor.
Die Reifezeit ist früh, etwa wie bei Müller-Thurgau. Verglichen mit Müller-Thurgau brachte Merzling im Durchschnitt von 173 Versuchsernten etwa gleichen Ertrag, jedoch eine um 4,2 ^{o}Oe höhere Zuckerkonzentration und eine um 0,6 g/l höhere Mostsäure. Die Resistenz gegen Peronospora ist weniger ausgeprägt als bei Johanniter. In einem Versuch bei der Eidgenössischen Forschungsanstalt für Obst-, Wein- und Gartenbau in Wädenswil erwies sich die Peronospora-Resistenz beim dort klimabedingt meist hohen Infektionsdruck als nicht ausreichend.
Die Weine sind fruchtig, stoffig und weitgehend neutral. Bei den Weinproben der Vergleichenden Sortenprüfung des Bundessortenamtes, Hannover, wurden die Merzling-Weine etwa gleich wie die anonym eingeschobenen Weine der Sorte Silvaner bewertet.

Weißwein-Neuzucht Bronner

Kreuzungsabkunft: Merzling x Gm 6494
Merzling = Seyve-Villard 5-276 x (Riesling x Ruländer)
Gm 6494 = Saperavi severnyi x St.Laurent
Saperavi severnyi = Zuchtstamm aus der ehemaligen Sowjetunion
mit Erbgut südsibirischer Amurensis-Wildreben
Der Sortenschutz zugunsten des Landes Baden-Württemberg ist in Deutschland erteilt und in der Schweiz beantragt.

Bronner zeigt einen sehr kräftigen Wuchs, besitzt eine hohe Resistenz gegen die beiden Mehltaukrankheiten und eine hohe Botrytisfestigkeit der Trauben. Die Sorte braucht gute Lagen, verträgt allerdings keine zu trockenen Standorte.
Im Durchschnitt von 40 Versuchsernten brachte Bronner etwas höhere Erträge und etwa gleiche Zuckergrade und Mostsäuren wie Weißburgunder bzw. Grauburgunder auf der jeweils gleichen Versuchsparzelle. Der Wein ist kräftig, fruchtig, stoffig und lässt eine gewisse Ähnlichkeit zum Weißburgunder erkennen.
Die Klassifizierung für den allgemeine Anbau soll beantragt werden, sobald im Zuge der Reform der EU-Weinmarkt-Organisation die Zuständigkeit auf die Mitgliedstaaten übergegangen sein wird.

Weißwein-Neuzucht Solaris

Kreuzungsabkunft: Merzling x Gm 6493
Gm 6493 hat anders als Gm 6494 (s.o.) Muscat Ottonel zur Vatersorte.
Der Sortenschutz zugunsten des Landes Baden-Württemberg ist in Deutschland und in der Schweiz beantragt.

Solaris wurde wegen der sehr frühen Reife und der sehr hohen Zuckerkonzentration der Moste in die engere Wahl gezogen. Im Zuchtgarten in Freiburg erreicht sie alljährlich schon in der ersten September-Dekade eine Zuckerkonzentration der Moste von über 100 ^{o}Oe. Die Erträge liegen etwas unter denen des Müller-Thurgau. Solaris besitzt eine hohe Resistenz gegen Peronospora und Oidium und kann nach bisheriger Erfahrung ohne Fungizidbehandlungen angebaut werden. Aufgrund dieser interessanten Eigenschaften wurde die Sorte Solaris als Kreuzungspartner für viele weitere Kombinationen verwendet.

Solaris selbst wird in Versuchen gepflanzt zur Gewinnung von Neuem Süßem (Federweißer). Alljährlich werden nach Süddeutschland große Mengen Neuer Süßer aus südlicheren Anbaugebieten importiert. Mit der frühen Ernte der Sorte Solaris kann die heimische Weinwirtschaft dieses Marktsegment ebenso gut besetzen.

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Solaris - Grundlage der Züchtung pilzfester Rotweinsorten

Bei deutschen Weißweinen schätzt der Verbraucher das elegante Spiel von dezentem Bukett und feinfruchtiger Säure. Bei Rotweinen entwickelt sich die Verbrauchererwartung hin zu alkoholischer Wucht, kräftigem Tannin und dunkler Farbe. Bordeaux-Weine, allen voran die Weine des Cabernet-Sauvignon, verkörpern diesen Typus. Cabernet-Sauvignon reift jedoch in den nördlichen Gebieten zu spät und ist daher nur für ganz wenige, extrem günstige Lagen der deutschen Weinbaugebiete geeignet.

Aus der Kreuzung der sehr früh reifenden und gut pilzfesten Sorte Solaris mit Cabernet Sauvignon, aber auch mit Dornfelder und anderen heimischen Rotweinsorten, gingen sehr hoffnungsvolle pilzfeste Rotwein-Zuchtstämme hervor. Deren Weine besitzen ein hohes Potential von Alkohol und intensiver Farbe. Diese Zuchtstämme der 80er Jahre werden zur Zeit vermehrt, um in den nächsten Jahren Versuche in Praxisbetrieben aufbauen zu können.

Resistenzverhalten der neuen Sorten

Die Auswertung der Protokolle der am Versuchsanbau beteiligten Winzer ergab, dass die genetische Widerstandsfähigkeit der ungespritzten Neuzuchten in mindestens gleichem Masse gegen Infektionen durch Peronospora, Oidium und Botrytis geschützt hat wie die aufwendigen, aber vielleicht nicht immer termingerechten Fungizid-Behandlungen bei den Standardsorten auf der gleichen Parzelle. Bei Johanniter scheint bezüglich Oidium-Befall am Blatt die genetische Resistenz in einigen Fällen weniger befallshemmend als die Fungizidanwendung gewirkt zu haben. Bei Merzling ist die Peronospora-Resistenz schwächer ausgeprägt als bei Johanniter. In einem Versuch bei der Eidgenössischen Forschungsanstalt für Obst-, Wein- und Gartenbau in Wädenswil erwies sich, wie schon erwähnt, die Peronospora-Resistenz beim dort klimabedingt meist hohen Infektionsdruck als nicht ausreichend.

Verbraucherakzeptanz der Weine

Der Verbraucher ist im Falle deutscher Weine auf die Namen klassischer Rebsorten fixiert. Neue Sortennamen stiften Verwirrung, besonders, wenn der Kunde beim Einkauf vor der unübersichtlichen Vielfalt des Weinregals steht. Viele Mitbürger können zudem das Wesen einer Rebenkreuzung nicht begreifen. Hierzu fehlt in unserer technisch orientierten Lebenswelt meist das biologische Grundwissen. Auch schwingt im Hintergrund der Argwohn, dass die Schaffung der neuen Sorten doch etwas mit Gentechnik zu tun habe.

Bei Verkaufsproben nehmen Kunden das Angebot von Weinen pilzfester Neuzuchten mit großem Interesse zur Kenntnis. Die zunächst anonym vorgestellten Weine werden sogar für gut befunden. Bei der Kaufentscheidung bevorzugen die Kunden vielfach jedoch die Weine der klassischen Rebsorten.

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Sortencuvées aus Weinen pilzfester Rebsorten

Der sortengetrennte Ausbau und die Etiketten-Angabe der Rebsorte sind bei deutschen Weinen zwar üblich, aber nicht zwingend. In Frankreich und Italien werden die meisten Weine ohne Sortenangabe angeboten. Statt dessen werden das Anbaugebiet und der Produzent herausgestellt. Dass Bordeaux-Rotweine fast immer aus Trauben von drei verschiedenen Rebsorten gewonnen sind und dass Rotweine der Appellation Côtes du Rhone aus Verschnitten (Cuvées) von bis zu 12 Sorten bestehen, ist deutschen Weinenthusiasten keineswegs ein Ärgernis.

Das Staatliche Weinbauinstitut hat deshalb in diesem Jahr mit dem Etikett des "Staatweingutes Freiburg und Blankenhornsberg" eine Weißwein-Cuvée aus pilzfesten neuen Rebsorten vorgestellt und im Markt getestet. Im nächsten Jahr soll eine entsprechende Cuvée aus pilzfesten Rotwein-Neuzuchten folgen. Wegen der Verschiedenartigkeit der Verschnittpartner können so Weine von größerer Geschmackskomplexität entstehen. In diese Cuvées können dann im Lauf der Jahre weitere und evtl. noch bessere pilzresistente Sorten einfließen, ohne dass der Kunde immer wieder per Weinetikett mit irritierenden neuen Sortennamen konfrontiert werden muss.

The Development of Interspecific Grapevine Hybrids in Ontario, Canada

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Keywords: *complex interspecific hybrids, cold hardiness, flavour profiles*

Abstract

Interspecific hybrids have been used since 1913 in the grape breeding programme at the former Horticultural Research Institute of Ontario (HRIO) at Vineland Station, Ontario Canada. The parental material has changed from indigenous *labrusca* and greenhouse *vinifera* varieties to complex hybrids derived from Seibel/Seyve-Villard selections from France. Yield, winter hardiness and flavour were the key selection criteria, but disease and pest tolerance were rigorously scrutinized in second test field trials. New material is now being tested in the coldest regions of Canada as there is only moderate interest in hybrids in the main commercial districts.

History

As European colonists settled in eastern North America, they brought with them vines from their homeland. These were *vinifera* varieties and, with disappointing regularity, vines weakened and died from native pests and the cold. Eventually, native plant material was selected from the wild and commercial viticulture was established using *Vitis labrusca* L. in the north east (Cape/Alexander, 1806; Isabella, 1816; Catawba, 1823; Concord, 1854), *Vitis aestivalis* Michx. in central US (Norton/Cynthiana, 1835) and *Vitis rotundifolia* Michx. in the deep south (Scuppernong, 1817) (Hedrick, 1908; Munson, 1909).

In the latter part of the 19th century, amateur plant breeders such as E.S. Rogers of Massachusetts began introducing new hybrids using *labrusca* and *vinifera*, combining sturdiness with good berry texture and mild flavours. Further north, Arnold in central Ontario, and Suelter in Minnesota, used *riparia* because of its good health and resistance to extreme cold. Campbell, in southern Ohio, used both *labrusca* and *aestivalis* var *bourquiniana* for more disease resistance in the hotter climate. But, perhaps the most important North American breeder to use native species was T.V. Munson of Denison, Texas. He created over 60 new table grape varieties, actively pursuing hybridization with *candicans, champinii, lincecumii* and *rupestris*, recognizing the wide range of traits suitable for local growing conditions (Hedrick, 1908; Munson, 1909).

During the 20th century, grape breeding using native and European material for table grape improvement was very active all across North America. Grape breeding at public institutions is now concentrated in Arkansas, California, Florida, Minnesota, New York and Ontario, with a few private breeders active in California, Missouri, Washington, Wisconsin and Costa Rica (Reisch and Pratt, 1996).

Ontario

Ontario, like the north eastern United States, concentrated on indigenous *labrusca* varieties. The Ontario Department of Agriculture formally established a grape breeding programme in 1913 to improve shipping quality. Greenhouse v*inifera* varieties were used with existing *labrusca* table varieties, but the hybrids were too winter tender for commercial purposes.

As the wine industry became more important, the breeding programme focussed on colour stability but generally stayed within *labrusca* families. However, as fortified wine sales gave way to table wine, the available *labrusca* varieties with poor colour and strong flavours became unacceptable. The arrival of the Munson hybrids and a large collection of complex interspecific hybrids from the Seibel/Seyve-Villard nurseries in France marked a major turning point in the Ontario industry and the HRIO/UG breeding programme (Bradt, 1970).

Munson had successfully used many indigenous species and found the flavours of *labrusca* and other wild species interesting and not unpleasant for table grapes. The French breeders were not so charitable because they were interested in developing wine grapes. Seibel, in particular, used 1st and 2nd generation species crosses from earlier workers and crossed these with highly productive *vinifera* varieties. These he rigorously selected for flavour, disease resistance and high yield. He then intercrossed these hybrid families and selected again, using the same criteria. Seyve Villard used many of Seibel's intermediate hybrids, intercrossed them and proceeded similarly. As a result, their advanced selections had extremely complex genealogies but very low percentages of *labrusca* influence (Galet, 1988).

The breeding programme at Vineland has used French hybrids for one if not both parents in wine grape breeding since the late 1940’s. Although varieties introduced were hardy and disease tolerant - Vincent (1967), Ventura (1974), Veeblanc (1977), Vivant (1983) - their usefulness was short lived because of their *labrusca* lineage and mild *labrusca* flavours. In order to objectively determine the *labrusca* flavour profile, a chemical index was developed (Fuleki, 1982). The Vineland Grape Flavour Index (VGFI) measured methyl anthranilate and total volatile esters and calculated an index of relative *labrusca* flavour. Threshold organoleptic detection of *labrusca* flavour was VGFI=15. This value could be determined using fresh juice, eliminating the necessity of microvinification for first test seedlings. Rigorous use of this technique has resulted in selections with mean VGFI ratings of 0-1 and considered free of *labrusca* flavour. Back crossing advanced selections to *vinifera* is now used to reduce the “hybrid” nature of some selections and improve the colour profile (Fisher and Fuleki, 2000). Other chemical analyses are used to track anthocyanin and terpene levels and the presence of mono- or di-glucosides (Fuleki, 1990).

In addition to appropriate flavours, selections must have acceptable levels of winter survival. Artificial freezing techniques have been used to screen potential candidates (Fisher *et al.*, 1986; Fisher and Piott, 2000). Dormant canes are frozen through a range of temperatures to -25C and material with promise is sent to Quebec or eastern Ontario for test under extreme winters and a short, intense growing season.

Disease resistance/tolerance is also very important but specific screening techniques are not used at Vineland. Fungicide applications are halted after the second post-bloom spray, natural epidemics are allowed to develop and vines are then assessed after harvest. This skews the selection for powdery mildew (*Uncinula necator* (Schw.) Burr) tolerance and does not directly address downy mildew (*Plasmopara viticola* (Berk. &

Curt.) Berl. and de Toni), phomopsis (*Phomopsis viticola* (Sacc.) Sacc.) or black rot (*Guignardia bidwelii* [Ellis] Viala & Ravaz). However, selections are scrutinized for all diseases during evaluation.

Future

The Vineland grape breeding programme is based on classical breeding methods and has freely used many species in its crosses. The programme creates F1 populations based on the phenotype of the parents and then backcrosses to improve specific traits. It has not focussed on using specific species resistant to specific pests but has depended on natural epidemics to select for disease tolerance. Specific objective analytical criteria are, however, used for selection of flavours, colours and, to a degree, winter hardiness.

The Ontario wine industry is presently 60% interspecific hybrids, but the proportion of pure *vinifera* is rising rapidly (OGGMB, 2000). There is no shortage of prejudice against hybrid varieties in Ontario and there is a keen desire to put the historical *labrusca* based wine industry far into the distant past. The newest hybrid material, even though technically *labrusca* free, is tainted with that past and only being used where profound cold is a barrier to *vinifera* production.

The classical breeding approach in the north east has made some improvements in disease tolerance (Table 2) but winter hardiness and yield were traditionally considered more important. Much more stringent criteria are being used to select hybrid lines today and the flavours are far superior to those of even 20 years ago. Now, more attention can be applied to disease tolerance along with flavour and winter hardiness. This material may still not find favour with those who believe that acceptable wine can only be made from *vinifera* varieties, but it will offer a viable alternative to others with more challenging growing conditions and more adventurous palates.

Selected References

Bradt, O.A. (1970). Grape breeding and selections in advanced trials at the Horticultural Research Institute of Ontario. Ontario Department Agriculture, Horticulture Experiment Station and Products Laboratory, Report for 1970, 37-45.

Fisher, K.H. and Piott, B. (2000). What is the primary influence on vine bud hardiness – yield, vine balance, clone or ….? American Society of Enology and Viticulture, 50th Annual Meeting, Abstract #V-5, 94.

Fisher, K.H. and Fuleki, T. (2000). Developing highly coloured grape selections for cool climates. Acta Horticulturae 528, 491-498.

Fisher, K.H., Wiebe, J., Hunter, D. and Stevenson, S. (1986). The use of freezing tests for selection in grape breeding programmes. Proceedings 4th International Symposium of grapevine genetics, Verona, Vignevini special issue, 111-113.

Fuleki, T. (1982). The Vineland Grape Flavour Index - a new objective method for the accelerated screening of grape seedlings on the basis of flavour character. Vitis 12, 111-120.

Fuleki, T. (1990). Anthocyanin composition of some highly pigmented grape cultivars. Proceedings XVth International Conference Groupe Polyphenols. Strasbourg, 37-40.

Gadoury, D. (1995). Controlling fungal diseases of grapevine under organic management practices. In: R.M. Pool (Editor), Organic grape and wine production. 3rd N.J. Shaulis Symposium, Special Report #69, New York State Agricultural Experiment Station, Geneva, NY, Insert unpaginated.

Galet, P. (1988). Cépages et Vignobles de France: Tome I Les Vignes Américaines. 2e Éd., Charles Déhan, Montpellier, 553 pp.

Hedrick, U.P. (1908). The grapes of New York. State of New York, Department Agriculture, 15th Annual Report, Vol. 3, Pt II: Report New York Agricultural Experiment Station for 1907. J.B. Lyon, Albany NY, 564 pp.

Munson, T.V. (1909). Foundation of American grape culture. T.V. Munson & Son, Denison, Texas, 252 pp.
Ontario Grape Growers' Marketing Board. (2000). 52nd Annual Report, Year ending Jan 31, 2000.
Ontario Ministry of Agriculture, Food and Rural Affairs. (2000). Fruit production recommendations. Bull. #360. Queens' Printer, Toronto, 99-101.
Reisch, B.I. and Pratt, C. 1996. Grapes. In: J. Janick and J.N. Moore (Editors), Fruit Breeding Vol. II: Vine and small fruit crops. John Wiley &Son, Inc. New York, 297-369.

Table 1. Species background for HRIO/UG grape vine introductions

Family name	Use[a)]	Percentage of *Vitis* species in complete geneology[b),c)]								VGFI[d)]
		lab	vin	rip	rup	aest/B	cin	Berl	champ	
Veeport	FW	50	38	-	-	12	-	-	-	30
Vincent	T	19	53	4	13	5	1	-	6	2
Ventura	TW	45	23	16	13	2	1	-	-	3
Veeblanc	TW	9	54	3	23	9	2	2	-	13
L'Acadie	TW	9	54	3	23	9	2	2	-	4
Vivant	TW	13	56	-	11	7	1	3	-	2
Vintinto	T	6	48	-	11	9	1	13	13	(2)
Vinered	D	59	23	-	-	1-	1	1	1	17
Festivee	D	22	45	-	10	9	1	13	-	4
Vanessa	D	51	43	-	-	6	-	-	-	n/a

a) Use: FW = Fortified wine; T = Teinturier; TW = Table wine; D = dessert fruit

b) Geneology sources: Bradt (1970), Galet (1988), Hedrick (1908), Munson (1909)

c) Species: lab = *labrusca*; vin = *vinifera*; rip = *riparia*; rup = *rupestris*; aest/B = *aestivalis* var *Bourquiniana*; cin = *cinerea*; Berl = *Berlandieri*; champ = *champinii*

d) VGFI scores Fuleki (1982); ( ) sibling value; n/a = not available

Table 2. Disease susceptibility[a)] of selected grapevine cultivars in Ontario and New York

Cultivar	Sp.[b)]	Eutypa	Phomopsis	Black Rot	D. mildew[c)]	P. mildew[c)]	Botrytis
Chardonnay	v	xx	xx	xxx	xx(xxx)	xxx	x
Gamay	v	x	x	x	xx	xxx	xx
Riesling	v	x	x	xxx	xx(xxx)	xxx	xxx
Baco noir	fh	?	xx	x(xxx)	x	xx	x(xx)
Chancellor	fh	?	x	x	xxx	xxx	xx(x)
Chelois	fh	xxx	xx	xx(x)	x	xxx	xx(xxx)
De Chaunac	fh	x	xxx	x	x(xx)	xx	x
Vidal	fh	?	x	x	xx	xx(xxx)	x
Concord	lab	x	xx	xx	xx	xx	x
Elvira	lab	xxx	xxx	xx	x	xx	xx
Niagara	lab	xx	xx	xxx	xxx	xx	x
Festivee	vh	?	x	?	x	xxx	xx
Vanessa	vh	?	x	xxx	xx	xx	x
Veeblanc	vh	?	x	xx	x	xxx	xx
Veeport	vh	x	x	?	?	x	?
Ventura	vh	xx	xx	xx	xx	x	(x)
Vincent	vh	x	x	?	?	xx	x
Vinered	vh	x	x	?	?	x	?
Vivant	vh	x	x	xx	xxx	x	x
Canadice	gh	?	x	xxx	xx	x	xx
Cayuga	gh	?	?	x	xx	x	x
Chardonnel	gh	?	?	?	xx	xx	xx
Melody	gh	?	?	xxx	xx	x	x

[a)] Scores: x = low; xx = moderate; xxx = high; ? = not observed or unknown. Scores in ( ) values from NY if different from ON; Source: OMAFRA (2000); Gadoury (1995)

[b)] Sp. = species: v = vinifera; fh = French hybrid; lab = labrusca; vh = Vineland introduction; gh = Geneva NY introduction. [c)] D. mildew = downy mildew; P. mildew = powdery mildew

Gegen Pilzkrankheiten resistente Traubensorten und ihre Qualität

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Einführung

Umweltverschmutzung ist die grösste Sorge unserer Tage in der Landwirtschaft und somit auch im Weinbau (Alleweldt, 1970; Becker, 1985; Becker, 1985). Im Weinbau sind es Mineraldünger und noch mehr die Pflanzenschutzmittel, die eine Verschmutzung in hohem Masse verursachen. Die Pflanzenschutzmittel werden immer teurer und teurer, erhöhen die Produktionskosten und schaden den Lebewesen, darunter auch den Menschen. Diese Umstände erfordern Sorten, die nur 2-3 Spritzungen benötigen und dadurch dir Verwendung von Pflanzenschutzmitteln auf ein Minimum senken (Lehoczky, 1987).

Auch die Ungarn haben sich der Reihe der Weinzüchter angeschlossen, die ihren Kreuzungszüchtungen die Resistenz der Traubensorten steigern. In Ungarn hat die institutionalisierte Traubenzüchtung nach dem zweiten Weltkrieg begonnen. Eine der Richtungen umfasst die Züchtung von Traubensorten, die gegen abiotische (Frost) und biotische (Pilzkrankheiten) Faktoren resistent sind (Csizmazia, 1977; Csizmazia – Bereznai, 1968).

Die Arbeit hat unter der Leitung des Forschungsinstituts für Weinbau und Kellerwirtschaft (Dr. D. J. Csizmazia) und der Universität für Gartenbau und Lebensmittelindustrie (Dr. P. Kozma und Dr. I. Tamássy) begonnen. Zur Vererbung der Resistenz wurden die Hybriden Seyve-Villard und die Art *Vitis amurensis* als Genquellen benutzt.

Verschiedene Kreuzungskombinationen wurden entwickelt. Die daraus entstandenen Hybridkombinationen wurden auf Tafel- und Keltertraubensorten bewertet und die Sämlinge streng nach Ertragssicherheit und Qualität selektiert (Füri – Szegedi, 1987). Die wertvollsten Kandidaten wurden für Qualifikation angemeldet. Seit 1970 sind mehrere davon staatlich zugelassen. Gegenwärtig warten mehrere Hybriden auf Anerkennung. In unserem Vortrag handelt es sich um resistente Sorten, die von der frankoamerikanischen Hybride Seyve-Villard 12375 (S.V. 12375) stammen.

Entstehung und Qualifikation des Züchtungsmaterials

Die wertvollsten Kombinationen entstanden am Ende der 50er und Anfang der 60er Jahre. Die aus Frankreich eingeführten Hybriden S.V. 12375 und S.V. 12286 wurden in Anbau genommen. Csizmazia hat aus diesen Pflanzungen in Eger die Klone E.1 und E.2 selektiert. Diese dienten als Genquellen für die Kreuzungen (Tabellen 1 und 2).

Tabelle 1 zählt die hervorragendsten resistenten Tafeltraubensorten und Kandidaten auf, mit Angaben des Kreuzungs- und Anerkennungsjahres. Aus den hier gezeigten Kreuzungskombinationen kann man gut sehen, dass immer S.V. 12375 als Resistenzquelle diente und sie immer als Mutter verwendet wurde. Als Kreuzungspartner wurden verschiedene frühreifende Tafeltraubensorten mit für die Hybridpopulation wertvollen Eigenschaften gewählt.

Bei vielversprechenden, resistenten Keltertraubensorten beschäftigen wir uns nur mit denen, die von der Hybride Seyve-Villard stammen und schon staatlich anerkannt sind. Die Kreuzungsangaben finden wir in Tabelle 2. Die Vatersorten reifen sehr früh (Csaba gyöngye) oder früh (Bouvier, Medoc noir). Beide Tabellen zeigen, dass vom Jahr der Kreuzung bis zur Anerkennung 13 bis 35 Jahre nötig waren. Es war so möglich die resistenten Tafel- und Keltertraubensorten in vielen Jahrgängen zu beobachten, prüfen und im Anbau ausprobieren.

Ertragssicherheit und Qualität der resistenten Traubensorten

Die resistenten Sorten wurden mit eurasischen Sorten von bekannter Ertragssicherheit und Qualität verglichen.
Unter unserem kontinentalen Klima, wo Winterfröste unter $-20^{o}C$ häufig sind, ist die Winterfestigkeit der Knospen sehr wichtig. Die Fruchtprimordien befinden sich in der Knospe, und wenn sie erfriert, ist wenig oder gar kein Ertrag zu erwarten. Die Winterfestigkeit und die Resistenz gegenüber Pilzkrankheiten wurde mit Punkten bewertet (Tabelle 3): 0 = resistent, 9 = sehr empfindlich. Die Angaben stammen von Feldversuchen. Zur Feststellung von Frostschäden haben wir die Knospen durchgeschnitten und die Krankheitsempfindlichkeit mit der Grösse des befallenen Pflanzenteils (Blatt, Stiel, Beere) gekennzeichnet.

Wir wollen hier bemerken, dass sich die Pflanzungen unter ariden Verhältnissen befinden. Der Jahresniederschlag beträgt 500 bis 550 mm. Es ist zu sehen, dass die Ertragssicherheit der resistenten Sorten grösser ist, als die der herkömmlichen Sorten. Eine Ausnahme hierzu bilden die Tafeltraubensorten, die im allgemeinen empfindlicher gegen Fröste sind, besonders Pölöskei muskotály. Gleichzeitig hat aber diese Sorte eine hervorragende Blattresistenz. Unter den R-Hybriden ist R.66 besonders winterhart. Die Ertragssicherheit der hier vorgestellten Sorten wird noch durch die frühe oder sehr frühe Reife der Beeren und des Holzes erhöht (Szegedi – Ésik, 1979).

Qualität der toleranten Sorten

Wird von der Qualität gesprochen, wird darunter meistens die Traubenernte, bzw. der Wein gemeint.
Viele Fachleute zählen ungerechtfertigterweise die pilzresistenten Sorten – ob Tafel- oder Keltertraubensorten – zu den Direktträgern, welche während der Phylloxeraseuche verbreitet waren.

Tafeltraubensorten

Die in Ungarn gezüchteten toleranten Traubensorten entsprechen in ihrem äusseren Erscheinen und im Geschmack der Qualität der bekannten eurasischen Sorten, und so ma-

chen die Verbraucher keinen Unterschied zwischen den gewohnten eurasischen und den neuen toleranten Sorten.
Bei Tafeltrauben spielen die Grösse und schönes Aussehen der Beeren eine grosse Rolle. Das Aussehen der Trauben hängt von ihrer Form und Dichte und auch von der Homogenität, Farbe und Reife der Beeren ab. Beeren, die reich an Geschmacks- und Aromastoffen sind, sind beliebt. Die in der Tabelle 3 vorgestellten Sorten und Sortenkandidaten entsprechen den Marktforderungen. Sie sind neutral, würzig oder muskatartig und frei von Fremdgeschmack. Wenn wir die Angaben der Tabelle 3 mit dem Kontrolle Chasselas vergleichen, können wir feststellen, dass:

- die Trauben und Beeren zwei- bis dreimal grösser sind,
- bei niedriger Knospenfruchtbarkeit der Ertrag höher ist,
- der Zucker- und Säuregehalt überwiegend höher ist und
- die Beeren weniger faulen.

Auch das Zucker- und Säureverhältnis (Glykoacidometrischer Index) kennzeichnet die Beeren und weist auf ihre Qualität und Genießbarkeit hin.

Die Farbe der Beeren verändert sich nach den Sorten. R.65 und Nero sind blau; R.66 ist fleischrot; Palatina ist bernsteingelb; Fanny und Pölöskei muskotály sind gelb; Teréz und Zalagyöngye sind gelbgrün. In der Sorte Chasselas kennen wir weisse und rosa Varianten. Die Beere faulen kaum oder gar nicht. Auch solche, die hinsichtlich Fäule etwas empfindlicher sind, faulen nur wenig, und wenn, dann nur bei Überreife oder in sehr niederschlagreichen Jahren (Tabelle 2).

Die Beerenhautstruktur und Beerenfleischkonsistenz bestimmen die Verpackungs- und Transportwerte. Die spät reifenden Sorten haben eine starke, zähe Haut (z.B. Teréz) und die frühreifenden eine schmelzende Haut (z.B. R.65, Nero). Die mehr oder minder dicke Wachsschicht erhöht ihr schönes Aussehen. In Ungarn haben die blauen Sorten besonders auffälligen Duft (R.65, Nero). Die Transportfähigkeit hängt von der Struktur der Beeren und dem Verhältnis zwischen den Beeren und dem Stiel ab. Die Pflückbarkeit und Druck-Toleranz der Sorten sind zufriedenstellend (Tabelle 3).

Das Fleisch der Beeren ist in der Phase der technologischen Reife knusprig, und breiig wenn überreif oder eingetrocknet.

In Kecskemét (Ungarn) reifen sie zwischen August und Anfang Oktober (Tabelle 4).

Keltertraubensorten

Die in Ungarn gezüchteten toleranten Keltertraubensorten sind befriedigend in Bezug auf Ertragssicherheit, Winterfestigkeit, Fäulnis- und Blattresistenz. Die Qualitätsangaben (Zucker- und Säuregehalt) sind günstig. Wie aus der Tabelle 5 zu sehen ist, weisen sie in jedem Jahr einen hohen Zuckergrad auf (min. 17,0 Mm^o = 88 Oe^o). Auch der Säuregehalt und die Feinheit der Säure ist zufriedenstellend. Sie sind reich in Geschmacks- und Aromastoffen und haben einen hohen Polyphenolgehalt. Wenn überreif, sinkt der Säuregehalt schnell und zerfällt in unangenehme Komponenten. Der Wein aus überreifen Trauben ist minderwertig. So müssen die toleranten Sorten erfahrungsgemäß zeitig in der technologischen Reife unter Berücksichtigung der Säure geerntet werden. Es wird kalt gegärt. Wenn die Massnahmen streng eingehalten werden, können wir auch aus toleranten Sorten feine Tafelweine bekommen.

Im Forschungsinstitut für Weinbau und Kellerwirtschaft werden durch Mikrovinifikation, ohne Zuckerzusatz, sortenreine, trocken vergorene Weine gemacht. Die Weine werden analysiert, und organoleptisch bewertet. Tabelle 6 umfasst Angaben zu Alkohol-, Gesamtsäure- und zuckerfreien Extraktgehalt. Zwischen 1995 und 1999 lieferten die toleranten Sorten dünne aber frische Weine im Vergleich mit der Kontrolle.

Den Wein von jedem Jahrgang bewerten wir blind, organoleptisch nach der 20-Punkte-Skala und mit mindestens 30 Personen. Die Tester erfahren die Namen der Sorten erst, nachdem sie ihre Meinung abgegeben haben. Durch reduktive Verfahren gewonnene Weine werden im allgemeinen positiv bewertet, durch oxidatives Verfahren hergestellte werden wegen des Aromaverfalls meistens abgelehnt. Leider ändern die Mitglieder häufig ihre Meinung, wenn sie den Namen der Sorte erfahren. Die Weine der toleranten Sorten haben eine kürzere Lebensdauer als die eurasischen Qualitätsweine. Sie sind Weine des Alltags.

Die Beeren der toleranten Sorten sind reich an Inhaltsstoffen, wie Zucker, Säure, Geschmacks- und Aromastoffe. In letzter Zeit hat sich die Aufmerksamkeit auf einen Stoff, Resveratrol, gerichtet. Wir wissen, dass er der menschlichen Gesundheit wohl tut.

Neben der Verwendung der Beeren als Obst und Wein wird insgesamt zu wenig vom Most gesprochen. Der Most enthält die originalen Komponenten der Trauben, die vom menschlichen Organismus vollkommen genutzt werden können. Der Most könnte in Klein- oder Familienbetrieben hergestellt werden. Physikalisch konserviert (Hitzesterilisation) könnte der Most für Kinder, alte und kranke Leute und für jedermann sehr nützlich sein. Most, der aus rückstandsfreien Trauben hergestellt wird, bewahrt und ernährt unser Körper.

Zusammenfassung

Heute sind Umweltschutz und tolerante Sorten nicht voneinander zu trennen. Der ökologische Weinbau ruht auf resistenten Traubensorten. In Ungarn hat die organisierte, zielbewusste Züchtung von toleranten Sorten nach dem zweiten Weltkrieg begonnen. Heute haben wir 11 tolerante Sorten (Nero, Palatina, Pölöskei muskotály, Teréz, Bianca, Csillám, Kunleány, Viktória gyöngye, Zalagyöngye, Duna gyöngye und Medina), die staatlich anerkannt sind. Weitere Kandidate verdienen wegen ihrer Resistenz und Qualität unsere Aufmerksamkeit.

Hier handelt es sich um tolerante Sorten, die aus der franko-amerikanischen Hybride S.V. 12375 stammen. Versuchsangaben zeigen, dass sie in ihrer Anbaugebiete ertragssicher sind und auch ihre Qualität der gleichen Kategorie von eurasischen Sorten entspricht.

Die toleranten Sorten sind ebenso reich in Inhaltsstoffen wie die eurasischen Sorten. Als frisches Obst oder Most entsprechen sie den Markterforderungen. Die Weine, die durch reduktive Verfahren hergestellt werden, liefern frische, feine Getränke für jeden Tag.

Literatur

Alleweldt, G. (1970): Hat die Züchtung interspzifischer Kreuzungen eine Zukunft? Der Deutsche Weinbau. 24 (31) 1146-1148.

Becker, H. (1985): Einige Ergebnisse der Züchtung interspezifischer Rebsorten in Geisenheim. Deutsches Weinbau Jahrbuch. 36. 79-90.

Becker, N. (1985): Weibau ohne Fungizidspritzungen: Der Deutsche Weinbau. 40 (19) 879-887.

Csepregi, P. – Zilai, J. (1988): Szőlőfajta-ismeret és –használat. Mezőgazdasági Kiadó. Budapest. (508) 119-282.

Csizmazia, J. Bereznai, L. (1968): A szőlő Plasmopara viticola és a Viteus vitifolii elleni rezisztencianemesítés eredményei. Orsz. Szől. Bor. Kut. Int. Évkönyve. Budapest. 191-200.

Csizmazia, J. (1977): Peronoszpórarezisztens szőlőfajták előállítása és bevezetésük a termesztésbe Borgazdaság. Budapest. (2) 55-58.

Füri, J. – Szegedi, S. (1987): A rezisztencianemesítés eredményei Kecskemét-Katonatelepen. Szőlőtermesztés és Borászat. Kecskemét, 9 (4) 1-4.

Lehoczky, J. (1987): A rezisztens szőlőfajták helyzete a növényvédelmi gyakorlatban. Szőlőtermesztés és Borászat. Kecskemét. 9 (4) 4-6.

Szegedi, S. – Ésik, É. (1979): Csemegeszőlő-nemesítés eredményei Kecskemét-Katonatelepen. Szőlőtermesztés. Kecskemét. 1 (2) 2-6.

Tabelle 1. Kreuzungsdaten der Tafeltraubensorten

Sorte	Kombination Muttersorte x Vatersorte	Kreuzungs-jahr	Staatliche Anerkennung	Stelle der Züchtung
Tafeltraubensorten				
	Kandidatsorten			
R. 65 (Eszter)	S.V.12375 E.2 x Magaracsi csemege	1969	-	FVM SZBKI
R. 66 (Lidi)	S.V.12375 E.2 x Magaracsi csemegE II.	1969	-	FVM SZBKI
R. 78 (Fanny)	S.V.12375 E.2 x (Téli muskotály x Olimpia)	1970	-	FVM SZBKI
	Staatliche anerkannte Sorten			
Nero	S.V.12375 E.2 x Gárdonyi Géza	1965	1993	FVM SZBKI
Palatina	S.V.12375 x Szőlőskertek királynője muskotály	1966	1996	KÉE
Pölöskei muskotály	Zalagyöngye x (Glória x Erzsébet)	1967	1979	FVM SZBKI
Teréz	S.V.12375 E.2 x Olimpia	1969	1995	FVM SZBKI
Zalagyöngye	S.V.12375 E.2 x Csaba gyöngye	1957	1970	FVM SZBKI
Keltertraubensorten				
	Staatliche anerkannte Sorten			
Bianca	S.V.12375 E.2 x Bouvier	1963	1982	FVM SZBKI
Csillám	S.V.12375 c Csaba gyöngye	1966	1997	KÉE
Viktória gyöngye	S.V.12375 E.2 x Csaba gyöngye	1966	1995	KÉE
Zalagyöngye	S.V.12375 E.2 x Csaba gyöngye	1957	1970	FVM SZBKI
Medina	S.V.12375 E.1 x Medoc noir	1959	1984	FVM SZBKI

S. V. = Seyve – Villard; FVM SZBKI = Forschungsinstitut für Weinbau und Kellerwirtschaft; KÉE= Univeristät für Gartenbau und Lebensmittelindustrie

Tabelle 2. Infektion der Pilzkrankheiten an resistenten Rebsorten
OMMI - Helvécia, 1999.

Sorte	**Falscher Mehltau Pflanzenfläche %**	***Echter Mehltau* Blattfläche %**	**Botrytis Beerenfläche %**	**Frostfestigkeit bei –21 °C**
Tafeltraubensorten				
R. 65	2,5	2,0	1,5	-
R. 66	1,5	1,0	1,0	-
R. 78	3,0	2,5	1,0	--
Nero	3,0	1,5	2,0	4,5
Palatina	2,0	0,0	1,0	4,0
Pölöskei muskotály	1,0	2,0	1,5	7,0
Teréz	1,0	2,0	1,5	3,0
Keltertraubensorten				
Bianca	2,0	1,0	0,0	1,0
Csillám	2,5	2,0	1,5	2,0
Viktória gyöngye	2,0	2,5	0,5	1,5
Zalagyöngye	3,0	5,0	1,0	2,5
Medina	2,5	2,0	1,0	2,0
Kontrollsorten				
Chasselas	5,0	5,5	2,5	3,0
Chardonnay	5,5	6,0	5,0	3,5
Kékfrankos	4,5	3,5	1,5	3,0

Tabelle 3. Lesedaten der resistenten Tafeltraubensorten
Kecskemét-Katonatelep, 1994-1998.

Sorte	Traube Ertrag kg/m^2	*Grösse* mm x mm	Gewicht g	Beere *Grösse* mm x mm	Gewicht g	Zuckerg. Mm^o	Säureg. g/l	Zucker: Säure	Zerreiss- festigkeit	Druck g
Kandidatsorten										
R. 65 (Eszter)	1,44	169 x 120	347	17,5 x 14,8	3,8	18,4	4,9	3,8	312	952
R. 66 (Lidi)	1,38	148 x 136	341	19,0 x 16,9	3,7	17,5	5,8	3,0	303	986
R. 78 (Fanny)	1,54	209 x 137	428	21,0 x 18,8	5,5	13,9	5,2	2,7	298	1107
Staatliche anerkannte Sorten										
Nero	1,24	169 x 142	200	22,0 x 17,0	3,2	17,2	6,8	2,5	-	-
Palatina	1,17	165 x 115	210	19,0 x 17,6	3,0	16,2	6,3	2,6	-	-
Pölöskei muskotály	1,49	196 x 137	424	21,0 x 17,8	5,2	14,8	4,7	3,2	287	1207
Teréz	1,48	237 x 135	474	25,3 x 18,3	6,1	15,0	5,1	2,9	525	1556
Zalagyöngyye	1,68	198 x 116	380	17,4 x 16,4	3,2	17,7	5,3	3,3	309	1186
Kontrollsorte										
Chasselas	1,33	157 x 136	140	15,5 x 15,3	2,6	15,9	5,4	2,9	399	1100

Tabelle 4. Reifezeit der pilzwiderstandsfähigen Rebsorten
Kecskemét / Ungarn

Sorte	***Reifezeit***	**Sorte**	***Reifezeit***
Tafeltraubensorten		**Keltertraubensorten**	
R. 65	1. – 10. Aug.	Bianca	10-20. Sept.
R. 66	1. – 10. Aug.	Csillám	20-30. Sept.
R. 78	1. – 10. Aug.	Viktória gyöngye	15-25. Sept.
Nero	25. Aug. – 10. Sept.	Zalagyöngye	15-25. Sept.
Palatina	20-30. Aug.	Chardonnay	20. Sept. – 10. Okt.
Pölöskei muskotály	10-20. Sept.		
Teréz	25. Sept. – 10. Okt.	Medina	20-30. Sept.
Zalagyöngye	10-20. Sept.	Kékfrankos	1-10. Okt.
Chasselas	10-20. Sept.		

Tabelle 5. Lesedaten der resistenten, **Keltertraubensorten, (**Kecskemét-Katonatelep, 1995-1999)

Sorte (Ertrag t/ha*)	**Eigenschaften**	***Jahrgänge*** 1995	1997	1998	1999	**Durch-schnitt**	**Streu-ung**
Weißweinsorten							
Bianca (12,0)	Weinlese	09.14.	09.15.	09.24.	09.28.	09.20.	6,85
	Zuckergehalt im Most *Mm°*	17,5	19,5	17,2	21,0	18,8	1,79
	Titr.Säure im Most *g/l*	10,6	9,0	8,2	7,5	8,8	1,33
Csillám (12,7)	Weinlese	09.28.	10.11.	10.06.	10.05.	10.05.	5,35
	Zuckergehalt im Most *Mm°*	20,0	19,3	17,1	20,0	19,1	1,37
	Titr.Säure im Most *g/l*	7,6	10,4	7,7	5,8	7,9	1,90
Viktória gyön-gye (17,5)	Weinlese	09.28.	10.12.	10.06.	09.28.	10.03.	6,81
	Zuckergehalt im Most *Mm°*	19,0	19,0	16,7	19,6	18,6	1,28
	Titr.Säure im Most *g/l*	8,8	6,8	6,7	6,7	7,3	1,03
Zalagyöngye (16,4)	Weinlese	09.27.	09.16.	09.23.	10.06.	09.25.	8,35
	Zuckergehalt im Most *Mm°*	17,5	17,1	17,3	19,0	17,7	0,87
	Titr.Säure im Most *g/l*	10,2	8,4	7,5	7,3	8,4	1,32
Chardonnay (Kontroll) (8,3)	Weinlese	09.22.	09.23.	09.29.	09.30.	09.26.	4,08
	Zuckergehalt im Most *Mm°*	17,9	17,7	17,6	19,6	18,2	0,94
	Titr.Säure im Most *g/l*	5,2	12,1	9,3	9,8	9,1	2,87
Rotweinsorten							
Medina (12,0)	Weinlese	09.15	10.09.	10.11.	09.16.	09.27.	14,20
	Zuckergehalt im Most *Mm°*	20,0	18,7	15,1	17,8	17,9	2,07
	Titr.Säure im Most *g/l*	4,5	4,5	8,5	6,3	6,0	1,90
Kékfrankos (Kontroll) (12,3)	Weinlese	10.13.	10.09.	09.25.	10.13.	10.07.	8,54
	Zuckergehalt im Most *Mm°*	17,6	17,5	15,8	15,1	16,5	1,25
	Titr.Säure im Most *g/l*	8,1	6,0	9,5	9,1	8,2	1,56

(* Csepregi – Zilai, 1988)

Tabelle 6. Analytische Daten der resistenten, **Keltertraubensorten, (**Kecskemét-Katonatelep, 1995-1999)

Sorte	**Eigenschaften**		***Jahrgänge***				**Durch-schnitt**	**Streuung**
			1995	**1997**	**1998**	**1999**		
Weißweinsorten								
Bianca	Alkoholgehalt	*Mall °*	12,04	12,25	11,96	14,25	12,6	1,09
	Titr.Säuregehalt	*g/l*	8,12	8,78	7,66	6,06	7,66	1,16
	Zuckerfreier Extr.	*g/l*	21,85	21,25	20,65	20,50	21,1	0,62
Csillám	Alkoholgehalt	*Mall °*	11,73	11,01	11,05	12,21	11,5	0,58
	Titr.Säuregehalt	*g/l*	6,20	5,40	4,91	5,20	5,43	0,55
	Zuckerfreier Extr.	*g/l*	20,3	19,30	18,05	16,30	18,5	1,72
Viktória gy-öngye	Alkoholgehalt	*Mall °*	12,18	12,51	11,09	13,65	12,4	1,05
	Titr.Säuregehalt	*g/l*	5,80	5,70	5,71	6,09	5,83	0,18
	Zuckerfreier Extr.	*g/l*	21,2	20,75	16,4	18,85	19,3	2,19
Zalagyöngye	Alkoholgehalt	*Mall °*	11,20	10,92	11,17	12,51	11,5	0,72
	Titr.Säuregehalt	*g/l*	8,42	12,20	6,14	6,14	8,23	2,86
	Zuckerfreier Extr.	*g/l*	24,05	18,00	17,60	22,05	20,4	3,14
Chardonnay (kontroll)	Alkoholgehalt	*Mall °*	11,05	10,57	11,13	12,00	11,2	0,6
	Titr.Säuregehalt	*g/l*	11,00	11,00	7,26	8,77	9,51	1,83
	Zuckerfreier Extr.	*g/l*	25,65	26,40	21,25	24,25	24,4	2,27
Rotweinsorten								
Medina	Alkoholgehalt	*Mall °*	11,48	12,08	10,27	9,78	10,9	1,06
	Titr.Säuregehalt	*g/l*	7,20	4,19	4,83	5,12	5,34	1,3
	Zuckerfreier Extr.	*g/l*	21,50	17,65	16,95	19,05	18,8	2,01
Kékfrankos (kontroll)	Alkoholgehalt	*Mall °*	12,30	11,26	9,70	9,12	10,6	1,45
	Titr.Säuregehalt	*g/l*	6,30	7,50	6,30	5,72	6,46	0,75
	Zuckerfreier Extr.	*g/l*	23,25	23,00	19,30	20,75	21,6	1,89

Results From new Fungus-tolerant Grapevine Varieties for Organic Viticulture

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Abstract

Two red and three white new fungus-tolerant grape varieties were tested within a period of five years. REGENT, RONDO, JOHANNITER and Gf 48-12 show a better wine quality than PINOT NOIR or SILVANER and can be recommended for Organic Viticulture as well as conventional viticulture to reduce copper and fungicide applications.

Keywords: *fungus-tolerant grape varieties, environment protection*

Introduction

The breeding of fungus-tolerant grape varieties began in France after the introduction of *Phylloxera vastatrix* at the end of the last century. The first hybrides had a low wine quality and were not supported because the grafting method showed better results to combat the Phylloxera and delivered further wines of higher quality with the traditional varieties. In the last 50 years new varieties were combined and the tested grape varieties showed acceptable results in fungus tolerance and wine quality.

Material and methods

Five new selected varieties were tested in comparision to traditional varieties growing on a shell lime soil in Franconia, Germany. The trial was a split plot design with 3 replicates. The fungus-tolerant varieties were not treated with fungicides. Yield, sugar content, acid and the amount of fungus damage were investigated. The varieties were separately treated and fermented in 100 l steel barrels. The bottled wines were tested 2-3 times every year in Double-Blind-Tastings by 12-16 expert tasters. The new varieties were also tested in open tastings in the last two years by a panel of 248 winegrowers. All presented varieties in this study were pre-selected from the bulk of tested varieties and showed good results and therefore can be recommended for Organic Viticulture. All presented varieties have a very good winter hardiness and do not suffer from serious viticultural problems.

Results and discussion

Table 1 shows the results of the two new promising fungus-tolerant red varieties REGENT and RONDO in comparision to Pinot Noir in the mean of five years.
Both had a higher sugar accumulation than Pinot Noir and a lower content of acid. REGENT needs profund soils because of a lower vigor and needs more vigorous rootstocks.The expert panels and the winegrowers in the open tastings rated the wine quality of both fungus-tolerant varieties significantly higher than of Pinot Noir.

Table 1. New red fungus-tolerant varieties for Organic Viticulture (abc: P<0.05)

Criteriav Varieties	Regent	Rondo	Pinot noir
years	1995-99	1995-99	1995-99
yield kg/a	74.7 a	80.8 a	72.9 a
sugar content (°Oechsle)	93 a	88.6 b	85 b
acid (must)	7.2 c	10.7 b	13.7 a
quality number (DLG 1-5)	2.44 a	2.48 a	2.13 b
open wine tasting (n=248)	2.55 a	2.27 b	1.98 c
dominant flavor	***Blackberry***	Elder-berry	Cherry
dominant flavor	Elder-berry	Woodberries	Strawberry
bud break (mean)	01. May	25. Apr	29. Apr
days until flowering	46	46	50
days from flowering to harvest	124 a	111 b	121 a
Downy mildew – leaf (1-9)	1	1	1
Downey mildew - grape (1-9)	1	1	1
Powdery mildew – leaf (1-9)	1	2.2	2.6
Powdery mildew – grape (1-9)	1	3	1.4
Red fire disease – leaf (1-9)	4	2.5	1.5
Botrytis infection in %	16	7	10

*)1-9 infection index (1=very low infection; 9=very strong infection)

RONDO is a very early variety with early bud break, early flowering and earlier harvest maturity compared to REGENT and Pinot Noir. Only its powdery mildew resistence is lower than that of REGENT. The new fungus-tolerant varieties REGENT and RONDO shows higher sugar accumulation and creates deep coloured wines with high density. Best results are reached with barrique seasoning. Based on a higher acid value RONDO delivers a long-lasting wine with good ageing potential. Meanwhily REGENT is classified within five German wine regions.

In Table 2 three new fungus-tolerant white wine varieties of German breeders from the same field experiment are listed in comparision to the standard franconian variety Silvaner. JOHANNITER obtained a significantly higher yield, increased sugar content and a higher quality ranking than Silvaner. These result were confirmed by the winegrowers tastings. JOHANNITER has the same vegetation period as Silvaner, shows a high downy mildew resistence and was infected only insignificantly by powdery mildew in some years. The wine is crispy, aromatic and well balanced in acid and shows a higher acceptance than Silvaner. BRONNER, another new fungus-tolerant variety, achieved medium results in wine quality and does not reach the expression like JOHANNITER. The new fungus-tolerant variety MERZLING was not tested in this experimental trial but showed significant lower quality rankings than Silvaner or Müller-Thurgau within three experiments at three different sites and therefore can not be recommended in contrast to JOHANNITER. The new fungus-tolerant variety Gf 48-12 showed higher acid values but remarkable quality results. In winetastings, Gf 48-12 reached excellent high ratings by both the experts and winegrowers. This aromatic variety is not fully resistent against fungus, but reached the results without spraying. Sometimes powdery mildew is a little problem but in Organic Viticulture with less importance due to the possibilities of sulfur application. The intense aroma of Gf 48-12 is closely related to the traditional varieties BACCHUS and SCHEUREBE and is caracterized by Maracuja and black currant flavor. A moderate content of residual sugar (half-sweet) seems to be recommended concerning the higher amount of acid.

Table 2. New white fungus-tolerant varieties for Organic Viticulture (abc: P<0.05)

criteria/varieties	Johanniter	Bronner	Gf 48-12	Silvaner
years	1995-1999	1995-1999	1995-1999	1995-1999
yield kg/a	111.7 a	105.9 a	94.7 a	91.5 a
sugar content (°Oechsle)	86.0 a	85.6 a	83.4 ab	80.8 b
acid (must)	9.1 c	10.1 bc	11.1 b	9.5 c
quality number (DLG 1-5)	2.21 a	2.11 a	2.21 a	1.99 a
open wine tasting (n=248)	2.31 a	1.79 b	2.22 a	1.87 b
dominant flavor	Citrus	Green appel	Black currant	Citrus, Pear
dominant flavor	***Apple***	Citrus	Maracuja	Green appel
bud break (mean)	28. Apr	29. Apr	28. Apr	28. Apr
days until flowering	50	45	53	52
days from flowering to harvest	121	131	126	122
Downy mildew – leaf (1-9*)	1	1	1	1
Downey mildew - grape (1-9)	1	1	2	1
Powdery mildew – leaf (1-9)	1	1	2.6	1.8
Powdery mildew – grape (1-9)	2	2	3	3.4
Red fire disease – leaf (1-9)	3	4	3.5	1.5
Botrytis infection in %	9	3	12	14.4

*)1-9 infection index (1=very low infection; 9=very strong infection)

Neue Rebsorten und Sortenkandidaten im umweltschonenden Weinbau

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Im umweltschonenden Weinbau spielt die Widerstandsfähigkeit der Rebsorten gegen verschiedene Pilzkrankheiten eine sehr wichtige Rolle, um das Produktionsrisiko zu vermindern und eine gute Qualität zu erzeugen. Die Rebenzüchtung hat eine mehr als hundertjährige Tradition in Ungarn; die von pilzresistenten Sorten eine mehr als fünfzigjährige.

Diese Arbeit wurde am Institut für Weinbau und Weinwissenschaft (J. Csizmazia, L. Bereznai, S. Szegedi et al.), an der Universität für Gartenbau, Lehrstuhl Weinbau (P. Kozma, L.Sz. Nagy, M. Urbányi) und am Lehrstuhl Genetik (I. Koleda, J. Korbuly) mit Erfolg durchgeführt (Tabelle 1 und 2). In Ungarn hat man auf ungefähr 5.000 ha wertvolle neue resistente Sorten angepflanzt.

Die nordamerikanischen "Vitis"-Arten und die franko-amerikanischen Hybriden (SV. 12375, SV 12286) waren die wichtigsten Quellen der Pilzresistenzzüchtung. Die Quelle des Frostwiderstands war *Vitis amurensis*. Die Abkömmlinge von *Vitis amurensis* haben auch eine sehr gute Resistenz gegen Peronospora. Die neuesten Sortenkandidaten wurden durch die Kombination zweier Züchtungstendenzen entwickelt (Tabelle 3).

Die Sortenkandidaten wurden in internationaler Zusammenarbeit entwickelt. Die Sortenkandidaten "Viktor", "Ivan", EB11 sind Ergebnisse ungarisch-russischer, KE 4/1 und KE 11/1 aber ungarisch- jugoslawischer Zusammenarbeit.

Die Sorten, beziehungsweise Sortenkandidaten haben eine sehr gute Toleranz gegen Pilzkrankheiten (Tabelle 4). Die Sorten der Widerstandsfähigkeitsstufe 7 benötigen eine Pflanzenschutzbehandlung nur in epidemischen Situationen. Die Sorten Bianca, Viktória gyöngye, Pölöskei muskotály, Teréz und die neuen Sortenkandidaten KE 4/1, KE 11/1 besitzen eine komplexe Resistenz.

Literatur

Balogh I. - Víghelyi K. - Csulits K. - Gácsi Tibor (1999): Viktória gyöngye rezisztens szőlőfajta környezetkímélő védelme a járványos 1998. és 1999. esztendőben. Kertgazdaság 31(4):27-33.

Cindric P. - Korac N. (1997): Disease resistance breeding in Sremski Karlovci. International Workshop on The Importance of Varieties and Colones in the Production of Quality Wine. Abstracts. 27.

Csizmazai D.J. (1999): Ellenálló/interspecifikus szőlőfajták hazánkban. Kertgazdaság. 31(4)59-63.

Csizmazia, D. József (2000): Tafeltraube "Nero". Der Deutsche Weinbau No 1. 23 p.

Diófási L. - Bíró T. (1997): The role of Bianca grape variety in bio-grape production. International Workshop on The Importance of Varieties and Colones in the Production of Quality Wine. Abstracts. 25.

Hajdú E. - Tálas K. (1997): Wine quality testing of resistant varieties with micorvinification. International Workshop on The Importance of Varieties and Colones in the Production of Quality Wine. Abstracts. 67.
Hajdú E. (1997): Climate resistance in the background of yield reliability of vine varieties. International Workshop on The Importance of Varieties and Colones in the Production of Quality Wine. Abstracts. 22.
Korbuly J. (1997): Disease resistant table grape varieties as an opportunity to decrease enviromental pollution in viticulture. International Workshop on The Importance of Varieties and Colones in the Production of Quality Wine. Abstracts. 59.
Korbuly J. (1997): Increasing of growing safety in quality red wine production with nex frost and disease resistant varieties. International Workshop on The Importance of Varieties and Colones in the Production of Quality Wine. Abstracts. 26.
Korbuly, J. (1999): Fehér és vörösborszőlő fajtajelöltek. KÉE Genetikai és Növénynemesítési Tanszék. Budapest. Kézirat 8 p.
Korbuly, J. (1999): KÉE Szőlőtermesztési Tanszékének környezetkímélő termesztésre alkalmas szőlőfajtái. Budapest, Kézirat 4 p.
Kozma P. - Ésik É. (1997): Table grape varieties capable of environment-friendly cultivation. International Workshop on The Importance of Varieties and Colones in the Production of Quality Wine. Abstracts. 60.
Kozma P. (1997): Evaluation of fungus-resistant wine-grape varieties. International Workshop on The Importance of Varieties and Colones in the Production of Quality Wine. Abstracts. 24.
Szőke L. - Miklay, E. (1997): The present situation and future trends of bio-viticulture in Hungary. International Workshop on The Importance of Varieties and Colones in the Production of Quality Wine. Abstracts. 30.
Szőke, L. - P. Kozma (1997): Pilzresistentr Rebsorten aus Ungarn. Schweiz. Z. Obst.-Weinbau Nr. 19. 466-467 p.

Tabelle 1: Pilzresistente Rebsorten

Sorte	Zertifikat (Jahr)	Herkunft	Institut
Zalagyöngye	1970	SV 12358 x Csabagyöngye	Szőlészeti és Borászati Kutató Intézet, Egyer
Bianca	1982	SV 12375 x Bouvier	Szőlészeti és Borászati Kutató Intézet, Egyer
Medina	1984	SV 12286 x Medoc noir	Szőlészeti és Borászati Kutató Intézet, Egyer
Viktória gyöngye	1995	SV 12375 x Csabagyöngye	Kertészeti Egyetem Szőlészeti Tanszék
Csillám	1997	SV 12375 x Csabagyöngye	Kertészeti Egyetem Szőlészeti Tanszék
Dunagyöngye	1995	Seibel 4986 x Csabagyöngye	Kertészeti Egyetem Szőlészeti Tanszék
Kunleány	1975	28/19 (V.am x V.vinF_2) x Afuz Ali	Kertészeti Egyetem Növénynemesítési Tanszék

Tabelle 2: Pilztolerante Tafeltraubensorten

Sorte	Zertifikat (Jahr)	Herkunft	Institut
Pölöskei muskotály	1979	Zalagyöngye x 5917-8 (Gloria Hungariae x Erzsébet)	Szőlészeti és Borászati Kutató Intézet, Kecskemét
Teréz	1995	SV 12375 x Olimpia	Szőlészeti és Borászati Kutató Intézet, Kecskemét
Eszter (R65)		SV 12375 x Magaracsi korai	Szőlészeti és Borászati Kutató Intézet, Kecskemét
Fanny (R78)		SV 12375 x 658-215 (Téli muskotály x Olimpia)	Szőlészeti és Borászati Kutató Intézet, Kecskemét
Nero	1993	SV 12375 x Gárdonyi Géza	Szőlészeti és Borászati Kutató Intézet, Eger
Suzy	1996	SV 12375 x Pannónia kincse	Szőlészeti és Borászati Kutató Intézet, Eger
Palatina	1996	SV 12375 x Szőlőskertek királynője muskotály	Kertészeti Egyetem Szőlészeti Tanszék

Tabelle 3: Pilztolerante Sortenkandidaten (SzBKI, Eger)

Sortenkandidat	Herkunft	Resistenz		
		Peronospora	Oidium	Botrytis
Viktor (EB 9)	Zalagyöngye x Kazacska	6	6	9
Iván (EB 10)	Zalagyöngye x Kazacska	7	6	9
EB 11	BG2 x Sztyepnyak	6	7	9
KE 4/1	Petra x Bianca	7	7	9
KE 11/1	SK 77-4/5 x Bianca	7	7	9

Tabelle 4: Pilzresistenzstufen der Sorten

Sorte	Resistenzstufe			
	Peronospora	Oidium	Botrytis	Roter Brenner
Bianca	7	7	9	3
Zalagyöngye	6	5	8	4
Medina	4	7	8	2
Csillám	6	5	6	1
Viktória gyöngye	7	7	8	4
Dunagyöngye	4	6	9	4
Kunleány	6	3	9	6
Pölöskei muskotály	7	7	9	2
Teréz	7	7	9	2
Eszter	6	7	9	2
Fanny	5	5	9	3
Nero	6	5	8	3
Suzy	5	5	7	3
Palatina	6	3	9	3

The Autochthon Grape "Shesh" and the Potential for Organic Wine

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Keywords: *grape, wine, Shesh i bardhe, Shesh i zi, organic wine*

Abstract

The autochthon grape "Shesh" and its potential for organic wine
Albania can claim with some justification to be the cradle of European viticulture. The French historian Henry Enjalbert considers that Albania, together with the Jonian islands of Greece and southern Dalmatia (Bosnia Herzegovina), might well have been the last European refuge of vine after the Ice Age.
The autochthon variety "Shesh i bardhe (white)" and "Shesh i zi (black)" are the most important ones for wine making in Albania. The name comes from the hilly village Shesh, about 15 km near Tirana. From there it is spread in many littoral regions of Albania and represent about 35% of crushed grapes.
Small quantity of wines "Shesh i bardhe" and "Shesh i zi " from the hilly Shesh village, are bottled and sold in the unique shop of organic products in Tirana.

Introduction

Organic wines are little know in Albania, *Zigori V., Zigori K., (2000*) but the viticulture after 10 years of democratic transition is in rapid growth in the hilly parts of country, and autochthon grapes such as Shesh, Kallmet, Vlosh, Serine, Debine, etc. are planted.
In 1999 (from April until September) we studies some typical vineyard areas: Shesh, Rade, Baldushk, Gjokaj planted with Shesh variety, in the district of Tirana. We monitored all the growth phases and the agrobiological techniques of fertilisation and pest management.
Our aims is to focus the vineyards and to justify the production of organic wines in the areas using no agrochemicals.

Materials and Methods

The harvest is done on 25-30 of September, the transportation of grapes in plastic boxes of 20 kgs. White grapes are crushed with a small crusher, stemmer and mustpump, the mash is pumped in a vertical basket press.
The must is fermented in a stainless steel tank of 1500 litres by addition of 50 mg/l SO_2. The control of temperature at 20-22 C using a cooler. After 10-12 hours the clear must is pumped in an another tank of the same size. The alcoholic fermentation began spontaneously after 30 hours. The end of fermentation after 18-20 days. The racking with addition of 30 mg / l SO_2 in tanks of 500 litres. The ageing is done in the cellar at 14-15 C. There are done two other rackings in the end of November and in the end of January with addition of 30 mg / l SO_2.
Red grapes are crushed as above, but the mush is pumped directly in a tank of 1000 litres with addition of 40 mg/l SO_2.

The alcoholic fermentation began spontaneously after 24 hours. There are done 4 pumping over, after five days the must is drawing off with a specific gravity 1.015-1.018. The second alcoholic fermentation is finished after 8-10 days. The racking from lees is done with aeration and with addition of 30 mg/l SO_2. The ageing is done in the same condition as for the white wines.
The determination of analytical parameters according to Ribereau-Gayon J. Peynaud E (1976), Amerine M A. Ough CS (1980).
The sensorial evaluation of wines is done by experts and the authors of this paper according to the general rules of tasting.

Results and discussion

In the figures 1 and 2 are shown the variety Shesh i bardhe and Shesh i zi. You can see the big size of bunches.

Figure 1. Variety "Shesh i bardhe"

Figure 2. Variety "Shesh i zi "

In the figures 3 and 4 are shown the spraying pump for pest management in a vine-brunch treated hardly by pesticide in the end of august. You can see all the berries with a apparent spot of pesticide.

Figure 3. The spraying pump for pest management

Figure 4. Vine-brunch treated hardly by pesticide

In the tables 1 and 2 are shown the analysis of the wines. The analytical data of white wines of Shesh show that the alcohol content is high and the total acidity is average, pH, index FC are lower in the wines produced from the grapes of villages Shesh and Gjokaj, and relatively higher in the wine of village Rade. The metals as Fe and Cu are in low levels.

The sensorial evaluation show that the wines from grapes of Shesh village are harmonious, with floral flavour and of good freshness. We can classify this as organic wine based on the ecological area, agricultural production, wine making and analytical parameters. The wine of Rade village is with a dark yellow colour from over ripeness of grapes and the flavour is a little oxidised. The wine from Gjokaj village has a strange aroma of celery, thanks to tardy spraying by pesticide. The flavour is very stable and is not removed during the ageing.

Table 1. Analytical parameters of wines "Shesh i bardhe " in three typical vineyards of Tirana region.

	Villages			
Type of determination	Shesh	Shesh	Rade	Gjokaj
Specific Gravity at 20 C	0.9910	0.9900	0.9923	0.9924
Alcohol content by ebulliometer D-S	12.90	13.40	12.30	12.30
Total acidity as tartaric acid g/1	6.08	5.93	6.98	6.68
Volatile acidity as acetic acid g/1	0.29	0.19	0.32	0.28
Free sulphur dioxide mg/1	24	32	16	52
Total sulphur dioxide mg/1	96	128	60	176
Total extract g/1	20.60	18.60	24.00	21.80
Sugar- free extract g/1	18.82	17.42	22.00	20.02
Reducing sugars g/1	1.78	1.18	2.00	1.78
pH	3.08	3.20	3.05	3.25
Index of Folin-Ciocalteu	8	7	14	10
Absorbance at 420 nm, 10 mm pathway x 1000	147	124	224	124
Ash mg/1	1745	1965	2245	2250
Alkalinity of ash mg/1 as CO3	465	435	450	495
Iron mg/1	4.1	3.8	4.5	3.9
Cooper mg/1	0.41	0.53	0.78	0.92

Table 2. Analytical parameters of wines "Shesh i zi" in four typical vineyards of Tirana region.

Type of determination	Villages Shesh	Baldushk	Rade	Gjokaj
Specific Gravity at 20 C	0.9930	0.9940	0.9963	0.9935
Alcohol content by ebulliometer D-S	11.80	12.30	12.60	12.90
Total acidity as tartaric acid g/1	4.28	4.80	7.65	6.45
Volatile acidity as acetic acid g/1	0.29	0.19	0.32	0.28
Free sulfur dioxide mg/1	10	22	10	25
Total sulphur dioxide mg/1	80	64	64	108
Total extract g/1	26.80	26.40	34.00	27.40
Sugar- free extract g/1	25.26	24.13	31.16	25.79
Reducing sugars g/1	1.57	2.27	2.82	1.61
pH	3.59	3.61	3.08	3.39
Index of Folin-Ciocalteu	30	46	42	39
Absorbance at 420 nm, 1 mm pathway	0.239	0.304	0.298	0.316
Absorbance at 520 nm, 1 mm pathway	0.336	0.472	0.508	0.484
Colour intensity, D420 + D520	0.575	.0776	0.806	0.800
Colour of wine, D420/D520	0.711	0.644	0.586	0.653
Absorbance at 280 nm, 10 mm pathway	38	50	47	46
Anthocianins mg/1	277	384	181	281
Ash mg/1	3880	3645	2760	3135
Alkalinity of ash mg/1 as CO3	1020	990	750	885
Iron mg/1	3.2	4.1	5.2	2.8
Cooper mg/1	0.08	0.07	0.12	0.62

The analytical data of the red wines of Shesh show that the alcohol content is high. The wines of the villages of Shesh and Baldushk villages have a low content of total acidity and a high pH value. The wine of Rade village has a high content of total acidity and also a low pH value. The wine of the village of Gjokaj has an average content of total acidity and pH value.

The sensorial evaluation shows that the wines produced from the grapes of the villages of Baldushk and Shesh are extremely palatable and well balanced, warm with mellow taste, of bright ruby colour and with delightful scent and flavour. We can classify those as organic wines based on ecological areas, agricultural production, wine making and analytical parameters.

Conclusions

It is observed that the vine-growers of the above mentioned areas, that have not used fertilisers for at least last 6 years, have realised generally lower yields, but significantly higher quality of grapes, expressed in ratio sugar-acidity, which results in a high quality of wine.

On the other side in cases of pesticide treatments the quality of wine is deteriorated in terms of floral flavours and typical taste of "Shesh " variety.

References

Zigori V. Zigori K. (2000). Vererat biollogjike. AgroBioAlba, Nr 3,11-12.

Ribereau-Gayon J,Peynaud E (1976). Traite d'oenologie.Sciences et techniques du vin.Tome 1.Analyse et controle des vins, Dunod.Paris

Amerine M.A.,Ough C.S.(1980). Methods for analysis of musts and wines . *John Wiley&Sons.N.Y.*

Session 06

Determining Wine Quality

Chair: Norbert Drescher

Quality of Organic Wines

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When one talks about quality of organic wines the first step is to try to understand the process which permits a plant to reach its maturity, how "non matter" becomes matter through photosynthesis. Only certain processes of life permit to achieve a perfect world. Nature knows how to do that work¸ we just have to bring the best conditions and to compensate for disturbance processes that human beings have created on the weather etc.

A vine, as most plants is going through two main movements from spring to the solstice. It "jumps" into the space, it builds many leaves, branches etc. Then the flower comes. From the flowering to the fruit the vine is contracting itself into its seeds, into its fruit (growing inward and not outward). This was developed in my book. (Joly, 1997).

It is essential when you see a vineyard abroad to know when the vine is flowering. If it is too early it will be difficult to make a real outstanding wine, the "second" taste of the wine will be short with less expansion etc. The vine is extremely linked to the sun, and it achieves a perfect development of its fruit when it flowers when the sun is at its highest point in the sky (summer solstice). The vine has this wisdom to make its flower for the days where the sun has its optimum potential on the earth with the longest days of the year. All this is then taken "in" by the vine and concentrated in July and August into the grape. The colour, the aromas, the structure, the fatness of the wine is the result of the phenomenon. There is no point to force or rebuilt an appearance of quality through technologies like osmosis, enzymes, fruity yeast, arabic gums etc. It will never be quality, it will always lack the harmony and the ageing potential that quality naturally gives. The only way to achieve quality (and therefore the best expression of all the subtleties that each appellation controllé has) is to help the vine to receive its life sources at best and to bring it closer to its archetypes.

If the preparations and dynamisations are used properly, bio-dynamics is of course a great improvement in that direction but may not be sufficient if one takes into account all the disturbances that a plant has to face today. I mean that everything which is alive has a frequency. And we are filling our homes, ourselves and the atmosphere with other frequencies: satellites, mobile phones, microwaves, electricity etc., which work against or disturb the reception of the frequencies of the solar system on earth. Therefore this isolates the earth from its source of life, and the plants receive less of the forces of the solar system. The magnetic field of the earth (its life body maybe) has changed; the magnetic poles have moved! All this is very serious and could lead to an inversion of the poles which happens over long periods of time to rejuvenate the earth: A plus becomes a minus. Everything we do accelerates this phenomenon.

It is important to understand this and to see what actions can bring more "youth", more strength to the vines, especially when a place has been carrying wines for centuries (more than 900 years non-stop here at the Vignoble de la Coulée de Serrant).

To achieve this step the wine grower has to achieve a better understanding of the plants which grow around him. One does not need a materialistic knowledge in counting vitamins etc, but search like Goethe did: what is the movement of the plant, where does it express itself at its best, where does it concentrate its forces? In the leaves (rhubarb, nettle, etc.), or in its flowers (lilies)? How does it separate its flowers from its leaves? How much heat does it catch and where? In the branches, in the sap, etc? Look at the surprising affinity of the maple tree with heat. Look how it can concentrate heat in its sap in spring when at that time most plants can barely make a flower! A vine achieves the sugar process much later. Look how a pine tree can resist very cold temperature! All these observations are key factors to find out which plants can help us with a specific problem. An *appellation* has a certain quality and quantity of heat, of light, of humidity and a certain soil. Their combination contributes to its originality. We have to help our vines to catch it through its roots (work on the soil) or through its leaves (microclimate) with photosynthesis.

In using specific plants we can compensate certain excesses of the climate and may help the vine to incarnate some specific characteristics of the *appellation* more deeply. The way to do it differs with the nature of each plant - either a tea, or a maceration or a decoction. Some teas can go through a dynamisation, others one should not got though that process, which would become to strong.

Some plants can be used before the flowering of the vines and not after, for others it is the reverse. One should not go against the work achieved by the vine.

Most wine growers are fighting against the diseases of their vines without considering at all the effect of their treatment against <u>the health of their vines or the taste of their grape!</u>

In weakening a vine we open the door to the so called new diseases which have always been there potentially but which were kept under control by the health of the vine.

We also have to define what we call quality: quality belongs to the world which <u>cannot be measured in grams or cubic centimetres!</u>

What is the weight of beauty or of a nice landscape, of a beautiful music? How can you measure the feeling you have for your family? Tests for quality have to change. It is only through approaches like morphochromatography or crystallisation that you can really visualise how life forces express themselves in a plant.

Quality belongs to a different world that matters. It belongs to an intangible world which in spring "lands" into matter to give it a shape, a specificity. Look at all those different forms of leaves, of flowers, of fruits. Where do they come from? Attributing this to a gene is like looking for a speaker in a television set.

Each time a wine grower acts on his vines he should ask himself three questions: What are the effects on diseases, the effects on health, the effects on taste?
This will lead him to quality. Many products used currently affect the metabolism of the vine and therefore photosynthesis; its capacity to incarnate sun forces has decreased. This is also true for some organic products. Rotenone is a natural but dangerous poison, which affects precious chains of life. Of course being natural, nature will cope with it in a much better way than with a molecule manufactured by humans. An tea of brown tobacco will have just as much effect. *Bacillus thuringienis* cannot be spread on thousands of hectares forever. This bacteria was not made by nature for that purpose. Organic farming can not limit itself to take from nature a fungus here and a bacteria there, and multiply it to spray it everywhere. It may help for a while, but for the sake of its survival organic farming needs to understand the broad system of life which permits a qualitative world to incarnate itself properly into matter in spring and in summer.

For example it is useless to spray masses of bacteria on a soil. On the opposite – one should bring to a soil the conditions which should permit the self development of bacteria.

One cannot "steal" a component of nature and put it somewhere else, without having understood the system in which it was active.

It is not really genetic engineering as such which is dangerous, but the lack of knowledge of the people who use it. And this knowledge cannot only be achieved with intellectuality but also with the perception with your heart of the work that nature does. This leads to a "green thumb". A plant cannot perceive our intellect, but it can most probably be reached with our feelings. You cannot approach nature as you approach an engine. Life is not made of components, it is a process. This understanding leads to quality. Each part of nature should rather be considered as a note of music which contributes to a melody.

Let us take another example. We all know how salt can destroy a plant. Then let us look at the way a seaweed copes with this problem. We then meet these extraordinary colloids which can be so precious to a vine if the weather is too hot or if the vines were planted on spots which force them to flower to early. Some plants bring growth forces (prunus, ivy, nettle, rubus fructicocus); others act against fungi, others activate maturity etc.

Basically to achieve quality the wine grower has to help the vine to make, to "manufacture" matter from spring to solstice and to grasp heat and light from summer to fall. Quality for a wine should always avoid too rich soils which generates too many leaves and branches. A vine is like us; it should not be fully satisfied. It is in its nature to fight.

One should try to use plants which grow around the vineyards if weedkillers have not destroyed them all. There is an affinity between plants which naturally grow under the same climate. Nature often brings into each vineyard the plants which are needed. It is not 100 % true of course.

If you want to bring some heat to your vineyards and if you do not live in the South it would maybe be more appropriate to bring nettle or valerian rather than rosemary or sage, which do not really belong to your own climate. The vine may receive it as an outsider.

All these lines in short to explain that: Quality belongs to nature: it is within the deep process of nature: it has been lying there for thousands of years. We need to interfere and help the vines mainly because of mistakes that we made as human beings. Just think that most feet of vines before reaching your field were brought up by millions together in a sterile atmosphere. Does it prepare the wine to perform its work properly?

We have a fantastic diversity of plants around us, which can help us to cope with many problems. It is free, not polluting and goes in the direction of quality.
But who would accept to finance research on something that does not generate a market?

One day we will have to admit that the health of a human beings and their creativity is linked to a large extent to their food; and that quality is mainly made of life forces that can not be seen with microscopes.

Reference

Joly, Nicolas: Le vin, du ciel à la terre. Paris, 1997

Quality is More Than Actual Natural Sciences can Define

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Abstract

The spiritual concepts of human self-understanding determines the concepts of food quality.

Introduction

Since the bloom of materialism in the nineteenth century the nutrition of plants and of man was looked upon as question of the care for nutrients in the sense of chemical stuff. Since this time Ludwig Feuerbach (1804 – 1872) is quoted regularly with his sentence: „Man is, what he eats“ („Der Mensch ist, was er isst.“). Since this time man was not content with this approach. Since this time man developed many approaches to nutrition and quality on this materialistic basis.

Theses for discussion

1. Nutrition – especially the consumption of wine - helps man to find his identity. It even helps him have communion with high spiritual reality.
2. Nutrition – especially the consumption of alcohol – endangers man to find his identity. There is an important human culture prohibiting its members to drink alcohol.
3. Main problem of contemporary nutrition is „the threefold too much“: too much sugar, too much fat, too much protein. There are also many people enjoying too much alcohol.
4. The relation man to nature proves to be a relation man to the spiritual order of the organic world, which supports him, too. His acknowledgement of a natural autoregulation which he has to support is the basis for further development.
5. Different kinds of soil cultivation provoke different food quality.
6. The discussion of food quality is endangered by the threat of reductionism. A scientific method can only reproduce one parameter or one level of existence. Holism is not a concept of completeness but of openness.
7. The development of man is thoroughly bound to the development of his nutritional culture. In the evolution of earth a human impulse can be observed.
8. The wonder of nutrition is the principle of „well-directed extraneous utility“ („Fremd dienliche Zweckmäßigkeit“). A product of a healthy organism gives up its quality to serve a consumer’s organism as basis for its health.
9. Entropy of food – in the sense of its physiological-energetic order - and its importance to human nutrition should be investigated furthermore.

10. On an old Greek vase Triptolemos (as a representative of man) receives the culture of land. Man and the spiritual world find their dignity in the acknowledgement of each other. This development has its aim in the development of Jakchos, the future man to come. This is a sign, that man regenerates by regenerating nature and finds his destination by developing both sides with oneanother.
11. Modern ideas of nutrition and fertilisation include the aspect, that their path undergoes a change. Within this change there is an openness for impulses helping the spiritual energies which shape the world.
12. Man can improve his culture to support natural autoregulation.

Conclusions

The development of man and the nature feeding him show a co-evolution.
Philosophy („love of wisdom“) of an era reflects the anticipation of wisdom man can have about himself and nature.
Actual natural science is bound, thus limited to dealing with symptoms.
Actual natural science has to collect all symptoms of proper autoregulation as a sign of good quality.
Organic cultivation methods can be optimised in their influence on food quality.

References

Jacob, H.E. (1985). Sechstausend Jahre Brot
Müller, A. (1967). Das Problem der Ganzheit in der Biologie, Freiburg
Steiner, R. (1981). Die Wege zu den verlorengegangenen wirksamen Kräften der Natur (17.06.1924)
Teilhard de Chardin, P.: Das Herz der Materie, Olten 1990

Verknüpfung von Tradition und Moderne im ökologischen Weinbau am Beispiel des Mondes - Praktische Umsetzung von längst genutzten sowie neueren wissenschaftlichen Parametern.

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Mittels chemoanalytischer, physiologischer und biophysikalischer Methoden können ganzheitliche Reaktionen des pflanzlichen Organismus auf Umweltveränderungen meßtechnisch nachgewiesen werden. Streßärmere Produktionsverfahren lassen sich signifikant belegen. Selbstregulationsmechanismen der Pflanze sowie die Heterogenität der Produktionsbedingungen erschweren jedoch einheitliche Meßergebnisse, ent-sprechend werden neben Erfahrungswerten naturwissenschaftlich nachvollziehbare Methoden mit anschließender Qualitätskontrolle angestrebt.

Deutlich zu machen gilt, wie unauflösbar Pflanze und lunares System (lineare Ab- und Zunahme mit Phasen stagnierender Aktivität) miteinander verbunden sind, um die daraus resultierenden Austauschvorgänge zu erkennen und zu nutzen. Ziel von Beobachtung und Messung ist unter anderem, dem Weinstock die Fähigkeit zu umfassender und wirksamer Antioxidation zu vermitteln.

Durch Nutzung und Verstärkung vorgegebener (lunarer) Impulse werden Energien freigesetzt. Die so geschaffenen Antioxidationsbedingungen optimieren den Photosyntheseprozeß sowie die Bodenpflege. Sie setzen Mechanismen in Gang, Schädlinge und Krankheiten zu beseitigen und gleichzeitig Wachstum sowie die Verbreitung von Nutzinsekten zu fördern.

Unter Einflußnahme auf das amorphe Erscheinungsbild des Wassers in Erde, Pflanze und Frucht anhand der Mondrhythmen lassen sich Wachstumsrhythmen erkennen und nutzen; so läßt sich ohne systemische Mittel der Säftekreislauf regulieren (z.B. Vitalisierung gegen Eutypiose). Über die Leitfähigkeit des Wassers kann die Pflanze vielfältige elektronische Informationen aufnehmen, fixieren und binden.

Die unter Zuhilfenahme lunarer Steuerungsmechanismen gesteigerte Antioxidations-Aktivität stoppt die Oxidations-Reduktions-Reaktion, entsprechend besitzen die Rohstoffe (=Wein) die mehr als dreifache Elektronenkapazität zur Neutralisierung von freien Radikalen. Gaschromatographieanalytik, Kristallographie und elektrochemische Untersuchungen bestätigen die gesundheitlich relevanten Daten.

Alternative Methoden der Weinbewirtschaftung zu entwickeln zielt auch auf eine nachweisbare Verbesserung der Produktqualität, Wahrnehmung und Messung der Mondrhythmen wird als authentische Technologie künftig auch Grundlage eines historischen Paradigmenwechsels werden können.

References

- Bouma J., Rao, P.S.C., Brown, R.B. (1982). Basics of Soil-Water Relationships. Part I: Soil as a Pouros Medium, Part II: Retention of Water, Part III: Movement of Water. Gainesville, FL
- Bourguignon, C. (1995). Le Sol, la terre et les champs. Paris
- Brown L.R., Renner M., Flavin C. (1998). The environmental trends that are shaping our future. Detroit
- Endres, K.-P., Schad, W. (1999). Die Biologie des Mondes-Mondperiodik und Lebensrhythmen. Witten
- Glaesel, K. (1986). Heilung ohne Wunder und Nebenwirkungen. Konstanz
- Higa, T. (1994). An Earth Saving Revolution. Tokyo
- Ders. (1995). Die industrielle Revolution mit EM. Tokyo
- Hoffmann, M. (Hrsg.)(1997). Vom Lebendigen in Lebensmitteln – Die bioelektronischen Zusammenhänge zwischen Lebensmittel qualität, Ernährung und Gesundheit. Holm
- von Hohenheim, T. (1941). Geheimnisse. Leipzig
- Ingels C., Bugg R., McGourty G., Christensen, P. (1998). Cover Cropping in Vinyards. Los Angeles
- Joly, N. (1997). Le Vin-du ciel à la terre. Paris
- Kolisko, Dr. E und L. (1994). Agriculture of Tomorrow. Bornemouth
- Lampkin, N.H. (1990). Organic Farming. Ipswich
- L'Eglise, M. (1992). Les méthodes biologiques appliquées à la vinification et à l'oenologie. Paris
- Lungegardh, H. (1957). Klima und Boden in ihrer Wirkung auf das Pflanzenleben. Stockholm
- Schultz, J. (1952). Rhythmen der Sterne. München
- Sivak, R. (1998). Agriculture Today. New York
- Thun, M./Heinze H. (1988). Anbauversuche über Zusammenhänge zwischen Mondstellungen im Tierkreis und Kulturpflanzen. Stuttgart
- Watzl, B./Leitzmann C. (1995). Bioaktive Substanzen in Lebensmitteln. Stuttgart

Production of Wine Without Sulphur Dioxide Using Appropriate Processing Technology

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The food industry continues to give more attention to the production of food products which do not contain additives or coadjuvants which may place the consumer's health at risk. In this context, for several years the wine production industry has moved to adopt better processing technology in order to reduce to a minimum or even eliminate the use of sulphur dioxide.

Currently almost all the wine produced in the world involves the use of sulphur dioxide in various stages of the wine making process to exploit the numerous effects of this additive, particularly the antioxidase, antioxidant and antimicrobial functions.

In the present paper, several modern wine making techniques which allow the production of wine in the complete absence of sulphur dioxide are evaluated. The trials were performed in several Italian regions and involved the use of hyperoxygenation of the musts in the prefermentative phase combined with sterilising membranes during the wine stabilization phase before bottling. The work was conducted using yeasts which had been selected for their low production of sulphur dioxide in order to reduce to a minimum the presence of SO_2 which, in this case, cannot be considered to be an additive but a metabolic product of the yeast.

The experimental results demonstrated that the combination of oxygenation of the must as a method for stabilizing oxidation and the membranes for microbiological stabilization allowed the production of stable wines which were organoleptically acceptable. Factors which condition the proposed technology are the health status and acidity of the grapes, while during the vinification phases the correct management of the temperature is a determining factor for the production of the desired wines.

Differentiation of Wines Produced by Organic or Conventional Viticulture According to Their Sensory Profiles and Aroma Composition

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Kurzfassung

Diese vergleichende Studie untersuchte 91 deutsche Weißweine, die entweder nach den Richtlinien des ökologischen Weinbaus oder konventionell erzeugt wurden. In dem experimentellen Design wurden die folgenden fünf Faktoren kontrolliert: 1) Produktionsweise (ökologisch oder konventionell), 2) Unterschiede zwischen Weingütern innerhalb derselben Produktionsweise (2 Weingüter je Region und Produktionskategorie), 3) geographische Herkunft (4 Regionen innerhalb der zwei größten deutschen Weinanbaugebiete Pfalz und Rheinhessen), 4) Jahrgang (1995, 1996 und 1997) und 5) Rebsorte (Riesling, Silvaner, Weißburgunder).
Die Studie belegt, dass der Verzicht des ökologischen Weinbaus auf organische Pflanzenschutzmittel und bestimmte Düngerformen generell keine sensorischen Nachteile hervorbrachte. Andererseits konnte aufgrund der naturnäheren Bewirtschaftungsform auch keine höheren sensorischen Intensitäten festgestellt werden. Eindeutig übertraf der Einfluss der geographischen Herkunft den der Produktionsweise, während der Einfluss individueller weinbaulicher und oenologischer Faktoren in den Weingütern geringer ausfiel als erwartet.
Die sensorischen Eigenschaften der Weine wurden mittels Quantitativer Deskriptiver Analyse untersucht. Die Varianzanalyse der sensorischen Daten wies nur die Attribute grüne Bohne / Buchsbaum und Kräuter als signifikant aus. Im Durchschnitt wurden jedoch die konventionell erzeugten Weine als etwas fruchtiger, blumiger und auch vegetativer bewertet. Einer Diskriminanz Analyse zufolge hat die geographische Herkunft einen stärkeren Einfluss auf die sensorischen Eigenschaften als die Produktionsweise. Gleiches traf auch für die Aromenzusammensetzung zu, wo zusätzlich der individuelle Einfluss der Weingüter einen großen Effekt ausübte.

Abstract

This comparative study focused on the differentiation of 91 German white wines produced either by organic or conventional viticulture. The following factors were controlled in the experimental design: 1) style of production (organic or conventional), 2) differences between wine estates for the same style of production (two wine estates for each style per area of production, vintage and grape variety, 3) the area of production (four local areas within the two biggest producing regions of Germany – Pfalz and Rheinhessen), 4) the vintage (1995, 1996, 1997) and 5) the grape variety (Riesling, Silvaner, Pinot blanc).

The wine sensory characteristics were evaluated by Quantitative Descriptive Analysis. Analysis of variance revealed that only attributes green bean / beeches and herbaceous yielded significant difference among conventionally and ecologically produced wines. However, in average conventional wines tended to be fruitier, more floral and vegetal than their organic counterparts. Further discriminant analysis showed that the area of production had a stronger impact on the wine sensory properties than the style itself. The same observation applied for the wine aroma compound composition at the difference that the impact of the wine estate was as well significant.
It could therefore be concluded that the quality of organically grown wines did not in general suffer from strongly limited use of pesticides and reduced fertilisation. However, organic viticultural practices did not yield an overall higher intensity of aroma compounds. Clearly, the area of production had a stronger impact on sensory properties than the applied production style whereas the individual winemaking practices had a smaller impact than expected.

Material and methods

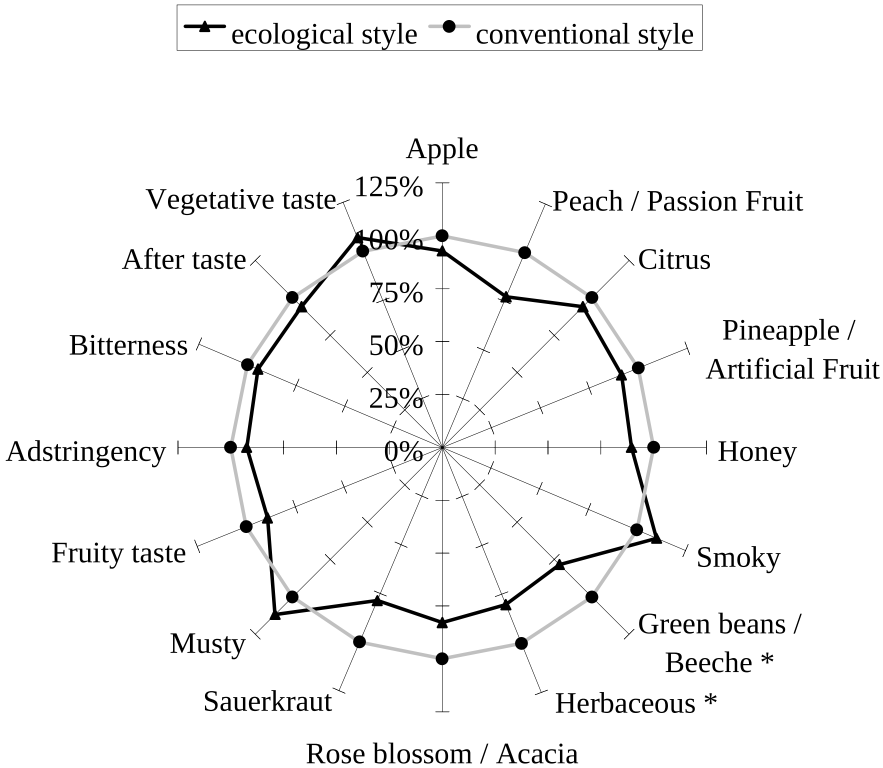
Wine selection: Wines from the *Vitis vinifera* cultivar were coming from two German wine producing regions, namely Pfalz and Rheinhessen and within each region from two local areas, respectively Bad Dürkheim and Landau for the Pfalz, and Ingelheim and Dienheim for Rheinhessen. Wine estates in each region were selected according to the good winemaking practices of the winemaker. Each set of wines (13 sets for Riesling, 5 for Silvaner and 3 for Pinot blanc) was composed of at least 2 ecological and 2 conventional wines from the same local area, of the same quality level (QbA, Kabinett or Spätlese) and vintage. A tasting of the pre-selected wines was conducted in order to remove and replace wines showing faults such as sulfur defect or ageing character.
Sensory protocol: At first, a panel of 21 external judges discussed and selected aroma and taste attributes which best described wines and their differences. After extensive training (four sessions of 2.5 hours) with the attributes selected as standards, a final total of 14 judges tasted wines in duplicate in a randomised order over ten sessions of tasting. The judges standardised their senses using freshly prepared standards and rated the intensity of each attribute on a non structured 10 cm scale anchored by the descriptors not perceivable and strong.
Data analysis: All data were analysed using SAS/STAT for Windows 6.12 (SAS Institute Inc., NC, USA, 1997) except for the discriminant analysis which was performed on Statistica 5.1 for Windows (Statsoft, USA). As not each judge was present at each session of tasting, means were calculated over all judges. Mixed model analysis of variance (ANOVA) using GLM procedure was conducted with style, area and area*style being fixed effects and with wine estate(area*style) as a random effect. The last effect represented the variability in between wine estates in terms of technological differences and winemaking practices. As the calculated error term for wine(wine estate) was not very high (data not shown), this effect was removed from the final ANOVA model.
Aroma composition: wine compounds were extracted using the Kaltron method adapted from Ferreira et al. (1993). In 10 mL glass centrifuge tubes, 9 mL of wine plus 100 µL of Freon 113, 5 µL of 2,6-Dimethylhepten 5-ol-2 (internal standard) was added to 2 g of NaCl. After 15 min of shaking on automatic shaker, the mixture was centrifuged (4000 rpm, 5 min) and the organic phase recovered. Around 60 compounds were identified and quantified by gas chromatography (HP 6890 Series) on an Innowax col-

umn (25 m x 0.32 mm i.d., 0.25 µm film thickness) with a FID detector using a set of calibration solutions.

Results and Discussion (presented here only for Riesling wines)

Impact of the style of production on Riesling wine sensory profile: The mean ratings for the taste and aroma attributes of all ecological wines (28) was plotted against those of all conventional wines (28) (Figure 1). The ecological mean ratings showed a tendency to be lower for all attributes except for musty, smoky and vegetative taste. The analysis of variance revealed that for the style effect only the characters green beans / beeche and herbaceous were significantly different ($p<0.05$) (Table1). This analysis pointed out that the area effect is more important than the style effect (more attributes were significant for area effect) and that the differences between areas applied for both ecological and conventional styles as almost no interaction between area and style (see area*style column) was noticeable. The impact of the wine estate on the wine sensory properties was shown to be minimal because only two attributes were significant.

Figure 1: Sensory aroma profile of the means of Riesling wines produced organically or conventionally (n=14 judges x 2 reps x 56 wines) (* indicates significance level $p<0.05$)



Nevertheless not all ecological wines are less aromatic than the conventional ones. Principal component analysis (Figure 2) did not show any clustering of wines according to the style. Some ecological wines are fruitier than conventional wines (scores located on the positive side of PC1) or with a stronger vegetal character (scores on the positive side of PC2) whereas some conventional wines are extremely musty or smoky. Nevertheless the two styles could be easily discriminate: A discriminant analysis using the attributes herbaceous, peach/passion fruit, bitterness and vegetative taste could classifiy 83% of the wines according to the style with a crossvalidation of 76% (data not shown).

Table 1: F-test (F) and associated probability (p) values from the mixed model analysis of variance conducted on 56 Riesling wines.

1.1.1 Attribute	Area		1.1.2 Style		Area*Style		Wine estate (Area*Style)	
	F	p [a)]	F	p [a)]	F	p [a)]	F	p [a)]
Degree of freedom	3		1		3		22	
Vegetative taste	8.44	**0.0005**	0.57	0.4559	2.92	**0.0539**	1.43	0.1884
Fruity taste	7.18	**0.0011**	0.76	0.3904	0.79	0.5103	1.02	0.4769
Peach/Passion fruit	6.03	**0.0029**	2.73	0.1100	0.14	0.9320	1.00	0.4936
1.1.3 Apple	3.92	**0.0206**	0.45	0.5101	0.08	0.9705	2.03	**0.0427**
Bitterness	3.85	**0.0219**	0.49	0.4910	0.58	0.6349	1.75	0.0864
Rose blossom/Acacia	3.31	**0.0352**	3.32	0.0790	2.07	0.1291	0.88	0.6147
After taste [b)]	3.18	**0.0395**	1.5	0.2308	0.2	0.8956	0.7	0.7971
Green beans/Beeche	2.75	0.0663	3.98	0.0579	0.84	0.4875	4.54	**0.0002**
Sauerkraut	2.74	0.0635	2.13	0.1558	0.18	0.9088	1.08	0.4186
Honey	2.37	0.0898	0.09	0.7606	0.53	0.6626	0.5	0.9476
1.1.4 Pineapple /Artif. Fruit	2.29	0.1025	0.82	0.3728	0.26	0.8504	1.2	0.3266
Citrus	2.07	0.1290	0.54	0.4681	0.42	0.7394	1.12	0.3843
Musty	1.92	0.1529	0.27	0.6096	0.13	0.9432	1.61	0.1228
Herbaceous	1.68	0.1976	6.17	**0.0200**	1.19	0.3362	1.79	0.0788
Smoky	1.24	0.3154	1.54	0.2250	0.32	0.8097	1.02	0.4792
Adstringency	0.68	0.5703	0.77	0.3889	0.79	0.5096	0.88	0.6183

[a)]Significant probability tests at p=0.05 are bold,
[b)]After taste defines the lasting period of the flavour sensorial perception in the mouth after swallowing the wine (rated in secondes)

Impact of the local area of production on wine sensory properties: As observed with the results of the analysis of variance, differences in wine sensory properties were more important between the local area of production than for the style. A canonical variate analysis (Figure 3) illustrated clearly this results. Through a single gradient, from vegetative to fruity taste, the four local areas could be differentiated: Bad Dürkheim and Landau were producing wine higher in floral and fruity characters whether the wine was ecological or conventional whereas the wines from Rheinhessen (Ingelheim and Dienheim) had a stronger adstringency, bitterness and vegetative taste. For those two local areas, the differentiation according to the style was easier to visualize than for the local areas from the Pfalz. As the wine estate impact was minimal, this differentiation may be linked to the differences in soil nature and microclimate existing between the Pfalz and Rheinhessen.

Impact of the style on wine aroma composition: The analysis of variance carried out on the 60 identified and quantified compounds showed that the mean ratings of 11 of them, mainly terpene alcohols and acetates, were significantly higher for conventional style (data not shown). In parallel, around 20 of those compounds were also significant for the wine estate(area*style) effect which means that through the technology used by the wine estate in addition to the differences induced by the viticultural style, the wine-maker can influence the aroma composition of his wines.

Concluding remarks:

The wines produced according to the organic viticultural practices tended to be in average less aromatic (less fruity and floral characters, and weaker taste attributes) than the conventional ones as well as being significantly lower for the vegetal character (herbaceous, green beans / beeche attributes). The most powerful attributes to differentiate the two styles were herbaceous, peach/passion fruit, bitterness and vegetative taste. This study revealed as well to what extent the style effect was less important than the area effect: wines of both styles from Landau or Bad Dürkheim had similar sensory properties which were different (more fruity and floral attributes) than those from Ingelheim or Dienheim. Both styles could be well differentiated through the wine aroma composition, the impact of the wine estate being in this case significant.

Acknowledgements

We wish to thank Anette Schormann, SLFA Neustadt for her precious help during the sensory evaluation of the wines. This project was made possible through the financial help of the ministry of Economy, Traffic, Agriculture and Viticulture from Rheinland Pfalz and the support of the wine estates involved in this project.

Reference

Ferreira V., Rapp A., Cacho J.F., Hastrich H., Yavas I. 1993. Fast and quantitative determination of wine flavor compounds using microextraction with freon 113, J. Agric. Food Chem., 41,1413-1420.

Figure 2: Principal component analysis of Riesling wines: Projection of sensory attributes on principal components PC1 and PC2. Attribute loadings (vectors) and mean factor scores for ecological and conventional wines.

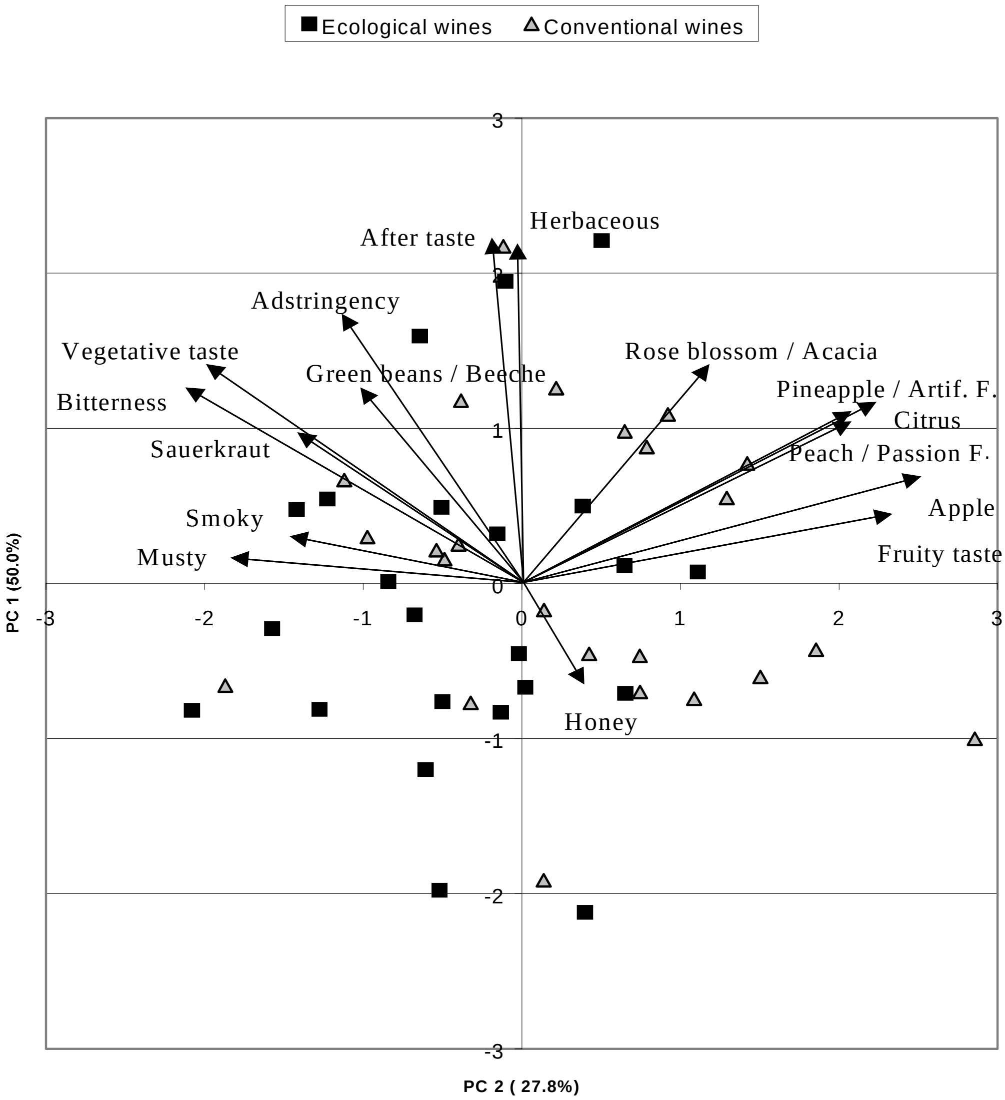
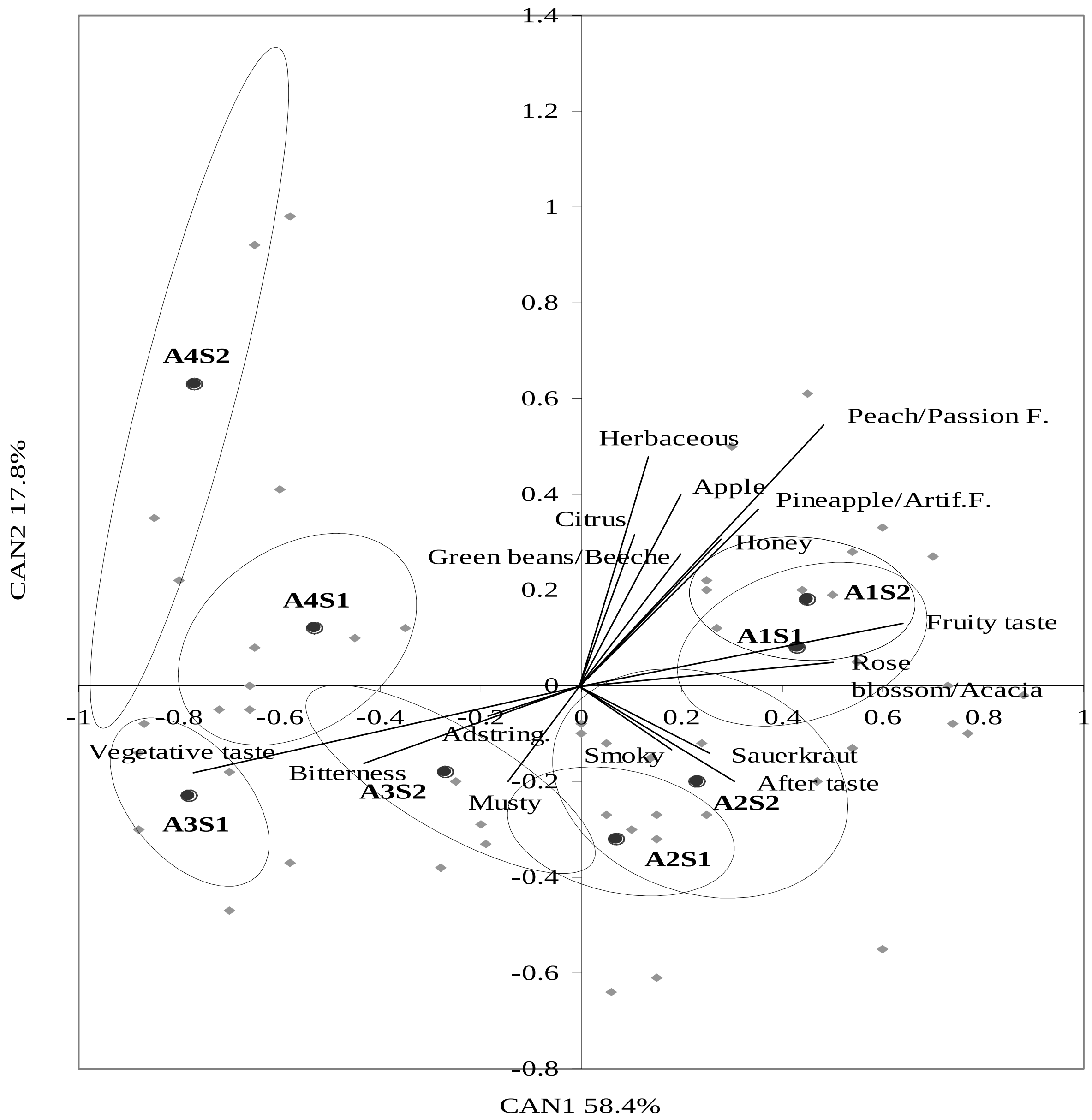


Figure 3: Canonical variate analysis discriminating for area by style for Riesling wines: Projection of sensory attributes on canonical variates CAN1 and CAN2. Attribute loadings (vectors) and mean factor scores for wines. The 90% confidence intervals are shown by ellipse around the area by style means (●) (A1= Area of Bad Dürkheim, A2= Landau, A3= Ingelheim, A4=Dienheim ; S1= ecological style, S2= conventional style.



Öko-Weine elektrochemisch betrachtet

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Elektronenströme beeinflussen Lebensqualität

Selbst in naturheilkundlich orientierten Publikationen wird dem Gläschen Rotwein eine gesundheitsfördernde Wirkung zugeschrieben, auch wenn zur Freude der Alkoholverächter zwischenzeitlich auch dem Traubensaft angeblich eine ähnliche Wirkung wie dem Wein wissenschaftlich zugeordnet werden kann. Zurückgeführt wird diese positive Wirkung auf eine Reihe von Stoffen, die eines gemeinsam haben: sie wirken alle reduzierend. Was versteht man darunter? Viele Verbindungen in unserem Körper sind in der Lage Elektronen an andere Verbindungen zum Zwecke der Energiefreisetzung abzugeben. Verbindungen, die also elektronen(energie)reich sind, nennt man reduziert und jene, welche diese Elektronen aufnehmen können, oxidiert. Eine ungestörte Elektronenwanderung von einer Verbindung zur anderen ist ein Geheimnis eines gesunden und langen Lebens. Wodurch kann nun ein derartiger Elektronenenergieaustausch gestört werden? Zum einen dadurch, dass über die Nahrung in ihren reduzierten Verbindungen, vorwiegend den sekundären Pflanzenstoffen, nicht mehr die erforderliche Zahl von Elektronen zur Verfügung gestellt wird und zum anderen dadurch, dass ein überhöhter Bedarf an Elektronen im Konsumentenorganismus auftritt.

Sekundäre Pflanzenstoffe und freie Radikale

Wenn wir zunächst den ersten Fall betrachten, so geht es um die sekundären Pflanzenstoffe, jene Verbindungen, die die Pflanze zu ihrem eignen Schutz gegen Krankheiten und Schädlinge anlegt und die meist unter den Sammelbegriffen Polyphenole, Antioxidantien, Enzyme und ACE-Vitamine geführt werden. Jede Pflanze entwickelt ein eigenes typisches Bouquet davon. Diese Stoffe sind aber zunächst nicht für uns als Konsumenten der Lebensmittel bestimmt, sondern zum eigenen Schutz angelegt. Jede Stress-Situation im Pflanzenleben (lange Trockenheiten, Hunger- und Überfütterungszeiten, Krankheiten, Pflanzenschutzmaßnahmen, falsche Sortenwahl) reduziert jedoch diesen Vorrat an sekundären Pflanzenstoffen, so dass für uns als „Nahrungs-Verbraucher" weniger übrigbleibt. Eine artgerechte Pflanzenproduktion schafft somit die besten Voraussetzungen für eine elektronenreiche, also reduzierte Ernährung. Diese aber ist wichtig, denn schon der Altmeister der ganzheitlichen Ernährungslehre, Werner KOLLATH erkannte: „Nahrung, die ihre Reduktionsfähigkeit verloren hat, ist tot". Damit besitzt der Öko-Winzer die denkbar besten Voraussetzungen für eine optimale elektrochemische Produktqualität, und eine Vielzahl von Messungen an Weinen zeigen, dass die Öko-Proben im Vergleich zu konventionellen keineswegs den Vergleich scheuen müssen. Wenn einmal von witterungsmäßigen Besonderheiten (Wasserversorgung) abgesehen wird, sind die Öko-Proben den konventionellen meist überlegen.
Kommen wir zum zweiten Fall, dem steigenden Elektronenbedarf bzw. der besonderen gesundheitlichen Bedeutung reduzierten Weins für den Körper. Durch Luftverschmutzung, Pflanzenschutzmittelrückstände, industrielle Chemikalien und Lösungsmittel in

Haushalt und Beruf, Konservierungsmittel und Farbstoffe, übertriebenes Sonnenbaden und Zigarettenkonsum beispielsweise wird unser Körper immer stärker mit sogenannten freien Radikalen kontaminiert. Dabei handelt es sich um Verbindungen, denen ein oder zwei Elektronen für ein neutrales Verhalten fehlen. Sie entreißen begierig intakten Verbindungen diese Elektronen, um sich selbst zu neutralisieren. Die dadurch entstandenen Lücken in den beraubten Verbindungen sollten aber möglichst rasch geschlossen werden, um keine gesundheitlichen Schäden zu verursachen. Am natürlichsten geschieht dies über ein Elektronenangebot aus einer reduzierten Nahrungsmittel-Verbindung.

Elektrochemie und Öko-Weinbau

Was macht die Elektrochemie deswegen heute so aktuell in der Ernährungsszene? Einerseits weiß man, dass die Radikalenkrankheiten (vorzeitiges Altern, Allergien und Überempfindlichkeiten, arthritische Gewebeschäden, einige Herz-/Kreislauf- u. Krebserkrankungen, Immunschwächekrankheiten und Umweltkrankheiten) zunehmen und durch reduzierend wirkende Nahrungsergänzungsmittel positiv beeinflusst werden können. Anderseits kann nachgewiesen werden, dass sich jede Stressbelastung in der Lebensmittelerzeugung elektrochemisch negativ auswirkt.

Wegen der grundsätzlich begünstigteren Ausgangslage des Öko-Weinbaues wäre es ein Akt der Klugheit, neben den bereits anerkannten Produktvorzügen auch noch diesen neuartigen elektrochemischen Ansatz zu nutzen. Eine Vielzahl von Messergebnissen belegen bereits, dass durch eine gezielt stressarme Produktionstechnik im Weinberg und eine diesbezügliche Kellerwirtschaft gesundheitsrelevante Qualitätsparameter im Öko-Wein sichergestellt und werblich genutzt werden könnten. Erfreulicherweise nutzen bereits einige Öko-Winzer zur privaten Produktoptimierung diese Möglichkeiten und zur Zeit geht es bereits darum, Fachkliniken therapiebegleitend ein elektrochemisch optimiertes Ernährungssortiment zusammenzustellen, in welchem der Öko-Wein nicht fehlen sollte!

Literatur

Burgstein L.: Handbuch Nährstoffe - Vorbeugen und heilen durch ausgewogene Ernährung, Haug-Verlag, Heidelberg

Hoffmann M., Wolf G., Staller, B.: Redoxpotentiale in Lebensmitteln und deren Gesundheitsrelevanz für die Umweltmedizin. In: Zeitschrift f. Umweltmedizin, H 2/2000

Hoffmann, M. (Hrsg.): Vom Lebendigen in Lebensmitteln - die bioelektronischen Zusammenhänge zwischen Lebensmittelqualität, Ernährung und Gesundheit, Ökologische Konzepte 92, Deukalion Verlag, Holm

Novel Methods to Characterise Wine Quality - Examinations with Wines from Exact Field Experiments (Organic Viticulture – Integrated Viticulture).

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Keywords: *organic viticulture, wine quality, Electrochemical method, Biophotonics, chemical analysis, sensory evaluation*

Abstract

Authentic musts and wines from defined production systems were examinated by common and novel methods for quality assessment. The results show, that it is necessary to refine some of the novel methods and to examine more musts and wines to obtain a larger databank.

Introduction

Quality of food is a main request in organic agriculture. Currently, organic wines, as processed products, can not be distinguished from conventionel wines by the usual methods. Aim of the present project was to start new examinations with authentic wines based on novel, alternative methods for quality assessment.

Materials and methods

Productionsystems

Experiments were conducted with Riesling at the State Research Institute at Geisenheim, Germany (50° North, 8° East). The experimental vineyard had been converted to an organic viticulture system in 1996. In 1997 and 1998 the following production systems and wines were compared:

I:	Organic Viticulture (EEC 2092/91 and ECOVIN Standart)	(OV)
II:	Organic Viticulture without sulfur:	(OVwS)
III:	Organic Viticulture without copper:	(OVwC)
IV:	Integrated pest management system (IPM):	(IPM)

Evaluationmethods:

The wines, (vintages 1997 and 1998, exact mikrovinifikation) were evaluated by the following methods:

- Electrochemical method (EQC-GmbH, D-Weidenbach)
- Biophotonics (International Institute of Biophotonics e.V., D-Neuss)
- Chemical analyse (Department of wine analytics, D-Geisenheim)
- Sensory evaluation (Department of viticulture, D-Geisenheim)

Results

Electrochemical method

Measurements of pH, redox potential (E_HmV), electrical conductivity (mS) and the calculation of the P-factor (Nernst-equation), were not sufficient to clearly differentiate the wines from the different production systems. On the basis of different vinification strategies and influencing factors, like cask material, added SO_2, malolactic fermentation and variation of the redox potential during wine aging, the use of the method to describe wine quality of commercial wines needs to be seen critically. The influence of the different vinification methods on the electrochemical values of wine and must should be submitted to a step-by-step evaluation to better characterise the results of the method.

Table 1: P-factors and sensory ranking of Riesling -wines (vintage 1997 and 1998)

	P-factor		Sensory ranking (Nov.99)	
	1997	1998	1997	1998
OV	175,1 b	155,1 a	3,45 a	2,20 a
OVwS	216,4 a	142,7 b	2,95 a	3,15 a
OVwC	198,8 ab	135,4 b	2,05 ab	2,60 a
IPM	215,2 a	136,7 b	1,95 b	2,60 a

(Sensory ranking scale: 1 – 5 points, numbers with different letters are significantly different, * $P<0,05$)

Biophotonics

Initial biophotonic examinations of wines showed, that the stimulation of the wines by an electrical potential was more effective than the stimulation by light radiation to obtain a biophotonic response from the wines. Currently and based of the small amount of examined wines, it appears necessary to test more wines to obtain a larger databank. Further investigations need to be done with must or grapes to interprete the results of biophotonic mesurements and their relationships to quality.

Chemical analyse

Quality of the must (1997, 1998), expressed as sugar content and total acidity, was not significantly different. Because of the replacement of sulfur by sodiumbicarbonate (treatment II), musts and wines showed residues of sodium (84 mg/l – 130 mg/l). Only the musts (1998) from treatment I and II had copper residues (2,4 mg/l and 2,1 mg/l) caused by the copperapplication (2,8 kg/ha and 1,8 kg/ha). Because of clarification and fermentation, the copper content in the wines was not increased (0,1 – 0,4 mg/l). 35 other components in musts (1998) and wines (1997, 1998) showed no distinct differences.

Sensory evaluation

Sensory evaluation by triangle test, rankings (table 1) and descriptive sensory analysis resulted in clear differences between the wines from the different production systems.

Acknowledgements

Thanks are due to the Departments of viticulture, wine analytics, enology and wine technology of the Geisenheim Research Institute.
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References: A list of references can be requested from the author.

Preliminary Results on Contents of Resveratrol in Wine of Organic and Conventional Vineyards

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Keywords: *phytoalexine, stilbene*.

Introduction

Phytoalexins are compounds synthesised by plants in response to various stresses. In grapevines, these compounds belong to the stilbene family. Several studies have shown that resveratrol is usually triggered by infection of berries by Botrytis cinerea. In organic viticulture, grapevines are usually more stressed by attempted or successful infections of various pathogens than in conventionally grown grapevines. Furthermore, crop protection agents such as acidified clays or copper may trigger defence reactions of the plants. The aim of this study was to verify if differences between organically and conventionally produced wines exist. The preliminary results will be used as a starting point for further research of quality aspects of organic grape-vine production.

Materials & Methods

Sample wines (vintage 1997) were taken from six sites in western Switzerland (Sierre, Geneve, Aubonne, Morges, Bremblens, Neuchatel, and Ligerz). In each site, one sample was taken from wines grown organically and one from a conventionally maintained vineyard. In all but one sample, neighbouring vinyards were chosen in order to compensate for diffences in soil properties.

Wine samples were analysed for contents of resveratrol by means of high performance liquid chromatography at the university of Dijon as described by (Adrian *et al*., 2000).

Results and Discussion

Contents of resveratrol varied between 0 and 32,8 ppm depending on variety, site, and production type. There was a clear distinction between white and red wines: In samples from Neuchatel, for instance, white wines had resveratrol contents of 0,3 (organic) and 0,2 ppm (conventional), whereas samples from Pinot noir contained 12,7 ppm (organic) and 13,7 ppm (conventional), respectively. Organic wines showed higher resveratrol contents rather constantly: in 7 cases, resveratrol content in organic wine was higher whereas in 2 cases resveratrol contents were inferior.

These preliminary results indicate that there may be substantial differences between organic and conventional wine. However, further research is needed to verify if differences of resveratrol contents occur on a regular base. If such differences exist, further research is needed to identify other primary or secondary metabolites as well as an assessment of the impact of such substances on wine quality and human health.

Table 1. Contents of resveratrol in wine samples. Wine samples (vintage 1997) were from neighbouring vineyards in all cases except Neuchatel.

Site	production type	variety	resveratrol (ppm)	Site	production type	variety	resveratrol (ppm)
Neuchatel	organic	Pinot Noir	12,7	Neuchatel	organic	Chardonnay	0,3
Neuchatel	conventional	Pinot Noir	13,9	Neuchatel	conventional	Chardonnay	0,2
Morges	organic	Gamay	32,8	Aubonne	organic	Chasselas	0,13
Morges	conventional	Gamay	23,6	Aubonne	conventional	Chasselas	0,1
Morges	organic	Pinot Noir	17,6	Neuchatel	organic	Pinot gris	0,8
Morges	conventional	Pinot Noir	13,5	Neuchatel	conventional	Pinot gris	0,9
Peissy	organic	Pinot Noir	11	Sierre	organic	Chasselas	5,3
Peissy	conventional	Pinot Noir	8	Sierre	conventional	Chasselas	0
Ligerz	organic	Pinot Noir	14,9				
Ligerz	conventional	Pinot Noir	8				

References

Adrian, M., Jeandet, P., Breuil, A. C., Levite, D., Debord, S., and Bessis, R. (2000). Assay of resveratrol and derivative stilbenes in wines by direct injection high performance liquid chromatography. *Am. J. Enol. Vitic.* **51**, 37-41.

Appendix

Conference proceedings of the Organic Viticulture Congresses

3^{rd} Organic Viticulture Congress

Bundesverband Ökologischer Weinbau & Stiftung Ökologie & Landbau (Hrsg.): Aktuelle Beiträge zum ökologischen Weinbau, Vorträge des 3. Ökologischen Weinbaukongresses des Bundesverbands Ökologischer Weinbau e.V. 1989, SÖL-Sonderausgabe Nr. 31, Bad Dürkheim 1990

4^{th} Organic Viticulture Congress

Karlheinz Hillebrecht (Hrsg.): Wein aus ökologischem Anbau - Das schlüssige Produkt. Vermarktung eines schlüssigen Produkts im Rahmen der EG-Verordnung. Überarbeitete Vorträge, gehalten anläßlich des 4. ökologischen Weinbaukongresses des Bundesverbandes Ökologischer Weinbau e. V., in Würzburg am 6./7.3.1992; 1993, Ökologische Konzepte 84, Bad Dürkheim 1994

5^{th} International Organic Viticulture Congress

Hampl, Ulrich, Uwe Hofmann et al. (Hrsg.): Öko-Weinbau, Boden- und Pflanzenpflege, Weinqualität und Betriebswirtschaft. Vorträge des 5. Ökologischen Weinbaukongresses; veranstaltet gemeinsam von Stiftung Ökologie & Landbau, Ecovin, Bioland und Naturland in Bad Dürkheim, 2.-4. November 1995. SÖL-Sonderausgabe 64, Bad Dürkheim 1995

6^{th} International Organic Viticulture Congress

Willer Helga und Urs Meier (Eds.): Proceedings 6^{th} International Viticulture Congress held in Basel, 25^{th} and 26^{th} August 2000. SÖL-Sonderausgabe 77, Bad Dürkheim 2000

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