The need for a supply of high quality organic vegetable seeds

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Abstract – Production of high quality organic vegetable seeds encounters several challenges. Research is performed to support seed companies in producing vigorous and healthy organic vegetable seeds. Examples are provided with respect to research on seed vigour, determining critical control points to avoid disease transmission to the seeds, seed treatments with natural compounds, new seed sorting techniques and enhancement of the natural plant defence. It is noticed that the restrictions in EU regulation 2092/91 on organic production are at present blocking the use of promising natural and sustainable components for seed treatments. [1]

INTRODUCTION

The use of high quality seeds is one of the prerequisites for an efficient crop production. The seeds need to germinate well in the field and provide healthy seedlings. For organic crop production farmers are obliged to use seeds produced under organic conditions. Especially for biannual crops, seed producers encounter difficulties to produce healthy, vigorous seeds under organic conditions.

SEED VIGOUR

Emergence of seeds in cold soils with slow mineralising organic manure requires seedlings with a fast growing root system. Organic farmers will benefit from fast germinating vigorous seeds that provide a better competition with emerging weeds. To optimise the production of high vigour seeds, markers are being developed. We have shown for cabbage seeds that their vigour is correlated with the expression of certain genes, which play an important role in the stress tolerance of the seeds (Soeda et al., 2006). These genes may find applications as molecular markers to optimise (organic) seed production. Stress tolerance of the seeds is also important when it comes to physical sanitation treatments, increasing the window of opportunity to eradicate pathogens without harming seed vitality.

With crops as carrot and cabbages the seeds are often harvested at a single harvest, before shedding occurs. As a consequence, the seed lot may contain seeds of varying maturity. We have demonstrated that less mature seeds are more sensitive to hot water and aerated steam treatments (Fig. 1). Before applying a physical sanitation treatment, seed companies are recommended to remove the less mature seeds. To facilitate seed companies in this respect, we developed a seed sorter that can sort seeds based on their residual level of chlorophyll (Jalink et al., 1998).

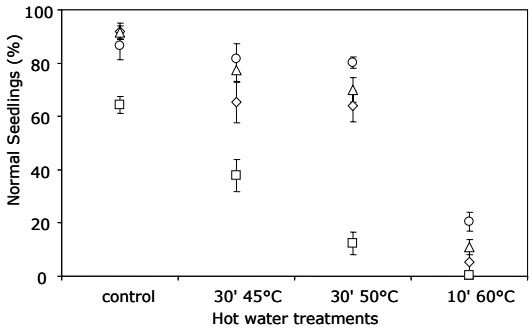

Figure 1. Increased sensitivity of less mature Brassica oleracea seeds to a hot water treatment, as shown by the frequency of normal seedlings (◊ non-sorted, □ less mature, Δ medium-mature, ○ full-mature).

SEED HEALTH

Transmission of diseases through the seeds to the seedlings will have a negative effect on emergence and field establishment of the young plants. It will also introduce diseases into the crop, with a negative effect on crop production and quality.

In the absence of chemical control methods, organic seed producers need other ways to prevent diseases during seed production. We study the epidemiology of several pathogens to determine the critical control points for reducing disease transmission. As an example, we demonstrated for carrot seed production, that the use of basic seeds that is free of *Alternaria radicina* is an essential step to prevent the occurrence of this pathogen in the next generation seeds (Langerak et al., 2004). Since the commonly used detection method is not sensitive enough, a more sensitive method was developed and handed to the seed companies. Similar research on critical control points is presently going on for cauliflower seed production, in relation to the pathogens *Alternaria brassicicola* and *Xanthomonas campestris* pv. *campestris*.

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Seed Sorting

Sorting is used by seed companies for upgrading the quality of seed lots. But with the present seed sorters it is often not possible to sort out diseased or low vigour seeds. We develop new sorting methods, based on hyper-spectral analysis of seeds. In combination with the development of dedicated software it is possible to analyse the spectral information of a single seed within milliseconds.

Seed treatments

Sanitation of the seeds may be needed when seed infection cannot be prevented. Physical treatments are often applied but may harm seed vitality. Additional treatments are developed, in accordance to the organic principle making use of natural components. Essential oils exhibit a potent antimicrobial activity both in laboratory and field tests (Fig. 2).

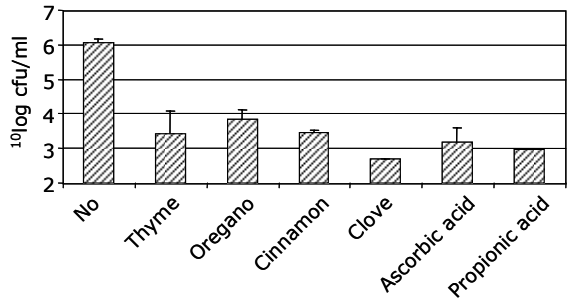

Figure 2. Effect of essential oils and organic acids (1%, 30') on populations of seed-associated bacteria with cabbage seeds.

Certain organic acids, which are used for food preservation, exhibit also sanitising effects when applied to organic seeds (Fig. 2). The number of bacteria and fungi strongly decreases after treatments with for instance ascorbic acid or propionic acid. Combination of mild physical treatments and natural components such as essential oils and organic acids can be effective without harming the vitality of the seeds.

Endogenous plant defence

An important strength of organic farming is the use of the endogenous self regulating defence system of the plants in relation to a vital ecosystem. This endogenous defence system can be stimulated by cultivation methods. Positive effects are found with stimulating natural components provided as seed treatments. These components increase the tolerance of cabbage plants to infection with downy mildew (*Peronospora parasitica*).

Regulatory restraints

When it comes to bringing research results into practice, all components used for seed sanitation or stimulating plant defence, should fulfil the national and European regulatory requirements for crop protectants. In the Netherlands both essential oils and several organic acids are allowed for use as crop protectants. When applied to organic seeds, the applications should also fulfil EU regulation 2092/91 on organic production methods. This regulation has an annex in which components are listed that may be used in organic production and for what purpose. Essential oils are listed in Annex IIB and are allowed to be used for crop protection. This enables the application of thyme oil for treatment of organic seeds. Several organic acids may be used in organic production, but only for preservation of food or feed (Annex IIC). Since they are not listed as authorized crop protectant (Annex IIB), producers of organic seeds are not allowed to use for instance vinegar for seed treatments.

The list in annex IIB is too limited for answering the challenges met in practice. The lengthy and cumbersome procedures hamper the development and implementation of new compounds. Only two years ago the list of allowed crop protectants was extended with three components. The power of organic farming is the system approach making use of natural buffering in combination with agricultural practises. Of course application of components should be limited. But the availability of natural crop protection compounds can be helpful to avoid serious disease outbreaks which incidentally may occur. It will also aid in providing organic farmers with healthy starting material.

The European commission and IFOAM are discussing a restructuring of EU regulation 2092/91. To our opinion, the limitations on the use of crop protectants could be restricted to general criteria for sustainability, in harmony with the organic principles and a restrictive list of components should in the future be abandoned.

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