Susceptibility of olive cultivars to the *Camarosporium dalmaticum* (Thüm) infections

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Abstract

The C.R.A. Experimental Institute for Olive Growing has been performing for many years, the study of olive germplasm in order to identify genetic resistance sources to the olive parasites. Some pathogens are particularly noxious for olive table production for they attack and disfigure the outward appearance of the fruits. Camarosporium dalmaticum (Thum) is a pathogen widespread in Southern Italy determining the olive fruit rot in many genotypes particularly susceptible to its infection. The object of the present study is an investigation carried out in Calabria in an experimental field, analysing 25 cvs cultivated under the same environmental and growing conditions. The observations were performed on olive fruit samples (200 per thesis) and the infection percentage was determined. The obtained data were submitted to statistical test by analysis of variance. The results displayed a different susceptibility of the investigated cultivars. Ascolana tenera, Nostrana di Brisighella, Gordal sevillana and Ogliarola del Vulture showed an high susceptibility to the pathogen while Frantoio, Tonda di Strongoli and Ogliarola garganica turned to be less susceptible. The remaining cultivars showed intermediate values of infection percentage.

Keywords: *Camarosporium dalmaticum* (Thum), genetic resistance, organic farming, Calabria.

Introduction

Ecocompatible olive farming regimes, in consequence of community directives (CAP, Common Agricultural Policy) and the increased environmentalist culture of the Italian public opinion, also due to economic incentives, recently developed. Among them, organic farming earned great success determining a large expansion of invested areas or converted to this farming regime. Organic farming, in consequence of regulations concerning pesticides use, with exclusion of chemical pesticides, emphasizes the olive plant defence strategies as a problem determining the economical convenience of this farming regime. According this point of view, the possibility to make use of systems for parasites control, alternative to chemical pesticides treatments preferring if it is possible agronomic control regimes, turns out to be relevant.

Within the framework of these research themes, the CRA - Experimental Institute for Olive Growing has been performing for many years several investigation in large olive germplasm in order to identify genetic resistance sources to the main olive parasites. Initially, these researches concerned the main phytophagous and key-species of olive ecosystem (*Bactrocera oleae*, Gmelin) (Iannotta *et al.* 2001, 2002, 2006a) and, subsequently, the investigations were widened to main olive diseases caused by different aetiological agents as *Spilocaea oleagina* (Cast.) Hugh (Iannotta and Monardo 2003; Iannotta *et al.* 2006a) and *Pseudomonas savastanoi* pv. *savastanoi* (Smith) (Iannotta *et al.* 2006a, 2006b, 2006c). The use of less susceptible cultivars to prevent olive diseases (Bjeliš *et al.* 2003; MacDonald *et al.* 2000; Penyalver *et al.* 2006), turns out to be a question of great topical interest with promising implications due to the prohibition of cupper products use in the next future, according to the European Regulation. The prohibition to use cupper will require a valid solution in the cryptogamous disease control both in conventional farming, where cupper products are widely utilised, and in organic farming, where they represent the unique available control product.

In the present research, some investigations concerning a disease called fruit rot caused by aetiological agent *Camarosporium dalmaticum* (Thüm.), were carried out. This disease is very common in some Italian olive areas and causes a grave drupe depreciation, especially if they are utilised for table production. *C. dalmaticum* is transmitted by Cecidomyiid Dipter *Prolapsioptera berlesiana* (Paoli), a parasitoid of the *B. oleae* larvae, emphasising the direct correlation existent between fungal pathology and olive fly infestations.

This study has been performed in Southern Italy (Calabria) by evaluating the behaviour of 25 olive genotypes, cultivated in the germplasm conservation field of the CRA - Experimental Institute for Olive Growing in order to observe their susceptibility to fungal disease.

Material and Methods

The research has been carried out in 2005 in the experimental field of CRA - Experimental Institute for Olive Growing located in Mirto-Crosia (CS) which consist of 15-18 years old plants, cultivated in the same environmental and agronomic conditions. The observations concerned the infestation level of drupes (%) of samples made up by 200 drupes, randomly collected for each thesis (cultivar). For any sample, the olive fly active infestation level (eggs + larvae + pupae) and total infestation level (pre-imago stages: emergence holes and feeding tunnels) were furthermore determined in order to find a possible correlation in the attack severity of two parasites. All observations were performed in three different ripening times (end of September, end of October and end of November) on a group of 16 Italian cultivars and a group of 9 non-Italian cultivars. The obtained data were submitted to statistical test by variance analysis and the means compared by Tukey and LSD test.

Results

In table 1 data concerning Italian group cultivars are detailed. The obtained results show that some genotypes display a low susceptibility to *C. dalmaticum* infection as Frantoio, Tonda di Strongoli and Dolce di Rossano. On the contrary, Ascolana tenera and Nostrana di Brisighella, turn out to be the most susceptible while all investigated varieties register an intermediate infection level. The same table puts in evidence that the cultivars characterised by highest susceptibility to fungal disease are the same cultivars which display the highest susceptibility to olive fly infestations.

In the table 2, the fungal infection and phytophagous infestation percentages obtained in the three analysed times both increasing in the course of time but significantly different one from another, are reported.

Table 3 shows obtained results concerning non-Italian cultivars. Data display that Arbequina, Hojiblanca and Picual are the less infected cultivars while Gordal sevillana turns out to be the most infected. All the other varieties register intermediate infection percentages.

In the table 4, fungal infection and phytophagous infestation percentages obtained in the three analysed times, are detailed.

Discussion

The results on the whole obtained, in the environment in which investigations were performed concerning the observed genotypes, display a different level of susceptibility among different varieties also to *C. dalmaticum*, aetiological agent of fruit rot disease. In particular, a low susceptibility was observed for Frantoio, Tonda di Strongoli and Dolce di Rossano which turn out to be the less susceptible to the investigated pathogen in Italian germplasm observed in the present study. On the contrary, Ascolana tenera and Nostrana di Brisighella showed the highest susceptibility. Since the cultivars displaying the lowest susceptibility to the fungus are the same which show the lowest susceptibility to olive fly attacks, a direct correlation between two sub cited parasites attacks is proved.

Table 1. Mean values concerning active and total infestation caused by *B. oleae* and *C. dalmaticum* infection referred to each Italian cultivars.

Cultivar	*B. oleae*				*C. dalmaticum*	
	Active infestation	Tukey test	Total infestation	Tukey test	Infection	LSD test
Ascolana tenera	34.33	A	56.33	A	12.00	A
Cellina di Nardò	9.83	B	17.67	F	3.33	BC
Cima di Melfi	12.17	B	31.83	BCDE	4.67	BC
Dolce Agogia	18.67	B	40.67	B	3.17	BC
Dolce di Rossano	17.33	B	33.33	BCDE	1.67	BC
Frantoio	10.83	B	20.33	F	0.67	C
Moraiolo	16.83	B	27.83	CDEF	4.00	BC
Nera di Cantinelle	10.67	B	27.33	DEF	3.17	BC
Nolca	12.17	B	29.17	BCDE	4.33	BC
Nostrale di Fiano Romano	17.17	B	41.83	B	3.67	BC
Nostrana Brisighella	32.33	A	57.67	A	11.17	A
Ogliarola del Bradano	16.50	B	27.67	CDEF	4.50	BC
Ogliarola garganica	14.50	B	34.50	BCDE	2.83	BC
Ogliarola del Vulture	15.50	B	36.83	BCD	6.00	B
Termite di Bitetto	12.83	B	30.17	BCDE	3.67	BC
Tonda di Strongoli	11.50	B	24.67	EF	1.50	BC

Table 2. Data concerning the comparison among the different investigated ripening times, both for olive fly and pathogenic fungus referred to Italian cultivars.

Ripening time	*B. oleae*					*C. dalmaticum*	
	Active infestation	Tukey test	Total infestation		Tukey test	Infection	LSD test
26 Sept. 2006	12.38	B	28.81	c	C	3.13	B
26 Oct. 2006	15.69	B	35.88	b	B	4.38	AB
29 Nov. 2006	21.28	A	49.06	a	A	5.69	A

Table 3. Mean values concerning active and total infestation caused by *B. oleae* and *C. dalmaticum* infection referred to each non-Italian cultivars.

Cultivar	*B. oleae*				*C. dalmaticum*	
	Active infestation	Tukey test	Total infestation	Tukey test	Infection	LSD test
Arbequina	16.00	AB	28.83	B	3.33	b
Gordal sevillana	14.33	B	28.83	B	7.50	a
Hojiblanca	15.00	AB	32.00	AB	3.83	b
Kalamata	19.17	AB	28.50	B	5.00	ab
Konservolia	21.17	A	37.17	A	5.50	ab
Koroneiki	17.83	AB	29.83	B	4.50	ab
Lucques	16.67	AB	31.33	AB	5.50	ab
Manzanilla	17.83	AB	27.00	B	5.00	ab
Picual	18.83	AB	31.33	AB	3.00	b

Table 4. Data concerning the comparison among the different investigated ripening times, both for olive fly and pathogenic fungus referred to non-Italian cultivars.

Ripening time	*B. oleae*				*C. dalmaticum*	
	Active infestation	Tukey test	Total infestation	Tukey test	Infection	LSD test
26 Sept. 2006	11.56	C	28.44	C	3.83	b
26 Oct. 2006	17.17	B	35.83	B	6.28	a
29 Nov. 2006	23.56	A	43.39	A	4.28	b

Also data concerning non-Italian genotypes observations display a different behaviour of cultivars. Among them, Arbequina, Hojiblanca and Picual are the less infected and Gordal sevillana the most affected by mycosis.

The study proves the utility of further investigations in order to characterize the different cultivars behaviour in relation to their parasites, so as to define their specific susceptibility. The present study concerning cultivar behavioural observations in relation to *C. dalmaticum* infection, confirms the importance of biodiversity conservation and the acquirement of profound genotypes knowledge in olive farming.

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References

Bjeliš, M., Pelicarić, V. and Radunić, D. 2003. Resistance of olive table cultivars to olive fruit fly - *Bactrocera oleae* Gmelin (Diptera, Tephritidae). 1st European meeting of the IOBC/WPRS Study Group Integrated Control in olives. Chania, Crete: 28.

Iannotta, N., Monardo, D., Perri, E. and Perri, L. 2001. Comportamento di diverse cultivar di olivo nei confronti degli attacchi di *Bactrocera oleae* (Gmel.) e correlazione con la quantità di oleuropeina presente nelle drupe. Atti Convegno Biodiversità e sistemi ecocompatibili. Caserta: 649-653.

Iannotta, N., Monardo, D., Fodale, A.S., Mulè, R. and Spatola, S. 2002. Osservazioni sulla suscettibilità di una cultivar di olivo siciliana (Turdunazza antimosca) nei confronti di *Bactrocera oleae* (Gmel.). Atti Convegno Internazionale di Olivicoltura. Spoleto: 439-443.

Iannotta, N. and Monardo, D. 2003. Suscettibilità di cultivar di olivo a *Spilocaea oleagina* (Cast.) Hugh e correlazione con il contenuto di oleuropeina nelle foglie. Atti del Convegno nazionale Germoplasma olivicolo e tipicità dell'olio. Perugia: 216-220.

Iannotta, N, Belfiore, T., Monardo, D., Noce, M.E., Scalercio, S. and Vizzarri. V. 2006a. Indagine nel germoplasma dell'olivo sul comportamento di numerosi genotipi in relazione alla loro suscettibilità agli attacchi parassitari. Atti del XVII Conv. del gruppo per l'Ecologia di base G. Gadio Connettività e biodiversità in ecosistemi naturali ed antropizzati. Cetraro: 30.

Iannotta, N., Monardo, D., Noce, M.E. and Perri, L. 2006b. Susceptibility of olive genotypes to *Pseudomonas savastanoi* (Smith). IOBC Bulletin: in press.

Iannotta, N., Noce, M.E., Scalercio, S. and Vizzarri, V. 2006c. Behaviour of olive cultivars to catch the knot disease caused by *Pseudomonas savastanoi* (Smith). Atti del XIII Congresso della Società Italiana di fitopatologia. Foggia: 67.

MacDonald, A.J., Walter, M., Trought, M., Frampton, C.M. and Burnip, G. 2000. Survey of olive leaf spot in New Zealand. New Zealand plant protection 53: 126-132.

Penyalver, R., García, A., Ferrer, A., Bertolini, E., Quesada, J.M., Salcedo, C.I., Piquer, J., Pérez-Panadés, J., Carbonell, E.A., del Río, C., Caballero, J.M. and Lopez, M.M. 2006. Factors affecting *Pseudomonas savastanoi* pv. *savastanoi* plant inoculations and their use for evaluation of olive cultivar susceptibility. Phytopathology 96(3): 313-319.