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Productive parameters in Chardonnay and Vermentino grapevines infected with "bois noir" and recovered in Sardinia

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Abstract

Studies were carried out in north Sardinia (Italy) in Chardonnay and Vermentino grapevines infected with "bois noir" to verify productive performance of the yields of plants healthy, infected and in recovery for one or two years. Statistical significant differences were observed in the yield among the symptomatic and the healthy plants, and among the healthy plants and those in recovery for one year, but not always between healthy plants and those in recovery for two years. Not statistically significant was the comparison between the two recovered groups. Productive increase was progressive in plants recovered for one year and in those in symptomatic remission for two years.

Key words: Grapevine, "bois noir", phytoplasmas, productive reduction, recovery.

Introduction

Grapevine "bois noir" (BN) is spread in the main wine-producing countries (Martelli and Boudon-Padieu, 2006) linked to the presence of *Hyalesthes obsoletus* Signoret, natural vector of stolbur, the phytoplasma associated with the disease. The increased disease incidence in absence of this vector, coupled with new findings of Auchennorrincha species capable of carrying stolbur phytoplasmas (Sabatè *et al.*, 2003; Garau *et al.,* 2004), indicate that the disease cycle is more complex and geographically diversified. In Sardinia (Italy) BN is present in numerous grapevine cultivars causing prevalently late symptoms (Garau *et al.*, 2002). Comparison of productivity between symptomatic and not symptomatic plants of cultivars Chardonnay and Vermentino growing in north Sardinia was carried out.

Materials and methods

Chardonnay and Vermentino BN infected groups of plants were 14 year-old and grown double Guyot were examined. Symptoms observations were carried out yearly on 310 and 1,417 plants respectively, in the period 2004-2006. Samples were taken during harvesting from plants symptomatic, asymptomatic and in recovery for one year or more. Monitoring for production (weight, number of bunches) and for other qualitative was carried out. Comparisons carried out are shown in tables 1 trough 5. The results obtained were evaluated with statistical analysis (ANOVA) and multiple comparison LSD test to evaluate the significance of the mean value differences.

Results and discussion

In Chardonnay symptomatic plants increased by 5 units in 3 years; in 2005, plants in recovery for one year were 79%, and 27% in 2006, while 36% were recovered compared to those infected in 2004.

In Vermentino, in the same period, symptomatic plants increased by 41 units. In 2005, 41% went into recovery, in 2006 63% with respect to the previous year, while in 2006 33% of those infected in 2004 were considered recovered (2R). These results suggest that both varieties are subject to symptomatic remission for years and with variable proportions influenced by hard-to-define parameters. The results of the statistical analysis are shown in tables 1, 2, 3, 4 and 5. The values labelled with the same letter did not differ statistically in the Fisher test for P=0.05. Variance analysis carried out on some indexes showed highly significant differences in comparison between the output of 'healthy' and symptomatic plants and the respective clusters produced.

In groups of plants in recovery there is a productive increase from the first year of being asymptomatic, with very significant differences between 1R and healthy plants, but not significant with diseased ones. Comparing the data from 2006 on recovered plants a productive recovery of 2R, close to being significant, was observed in Chardonnay but not in Vermentino. When 1R was compared with the diseased plants the comparison was significantly advantageous in Vermentino, but not in Chardonnay; in both cases, symptom remission increases production in 2R plants. A similar trend exists in the number of bunches produced but not in the weight of Vermentino. The results confirm literature reports (Mutton *et al.*, 2002). Chardonnay production shows the heaviest decrease (-81%) in symptomatic plants in 2004 and its smallest (-32%) in 2005. Equally wide-ranging are the productive decreases in Vermentino.

Symptomatic plants suffer a drastic drop in yield, but symptom remission after a number of years brings production back to normal levels. In these cultivars it does not appear that glucometric value, pH and quantity of tartaric acid (g/l) in the must are affected by the disease. The limited range of the experiment and, in some cases, the small number of components in the group raise some doubts that we hope to clarify in the future.

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Table 1. Chardonnay 2004: comparison of quali-quantitative parameters carried out in 2004 surveys between plants with typical BN symptoms (S) and asymptomatic ones (H).

	no. of plants	Mean values Production Kg/plant	no. of bunches/plant	Bunch weight g	no. of wilted bunches/plant	° Brix	Productive descrease
H	32	6.603 A	38.6 A	171.2 A	0	20.8 A	
S	28	1.255 B	7.2 B	174.0 A	2	20.4 A	- 81 %

Table 2. Chardonnay 2005: comparison of parameters concerning groups of symptomatic (SS), asymptomatic (HH) and plants in recovery for more than one year (1R).

	no. of plants	Mean values Production Kg/plant	no. of bunches/plant	Bunch weight g	no. of wilted bunches/plant	° Brix	Productive descrease
HH	22	7.420 A	39.7 A	190.5 A	0	20.6 A	
1R	21	4.664 B	25.4 B	199.2 A	1	20.5 A	- 37 %
SS	12	5.070 B	27.6 B	172.4 A	4	20.3 A	- 32 %

Table 3. Chardonnay 2006: comparison of quanti-qualitative parameters concerning groups of plants that were symptomatic for at least two or three successive years (SSS), those in recovery for the years 2004-2005 (2R), for 2006 (1R), and those asymptomatic for at least three years (HHH).

	no. of plants	Mean values Production Kg/plant	no. of bunches/plant	Bunch weight g	no. of wilted bunches/plant	° Brix	pH	Tot. tartaric acid g/l	Prod. decrease
HHH	28	5.736 A	36.4 A	158.7 A	0	19.7 A	3.29 A	6.17 A	
2R	10	5.200 AB	29.2 AB	193.5 A	0	20.5 A	3.22 A	6.09 A	- 9 %
1R	6	3.725 BC	22.3 BC	165.3 A	0	20.4 A	3.25 A	6.58 A	- 35 %
SSS	23	2.657 CD	17.6 C	151.6 A	7	19.9 A	3.28 A	6.19 A	- 54 %

Table 4. Vermentino 2005: comparison of productive parameters among groups of plants that were symptomatic for two years (SS), those asymptomatic for the same period (HH) and those in recovery for one year (1R).

	no. of plants	Mean values Production Kg/plant	no. of bunches/plant	Bunch weight g	no. of wilted bunches/plant	° Brix	Productive descrease
HH	32	5.687 A	22.2 A	252.2 A	0	19.7 A	
1R	12	2.896 B	15.3 B	176.1 B	0	19.7 A	- 49 %
SS	11	2.449 B	14.4 B	177.9 B	3.0	19.7 A	- 57 %

Table 5. Vermentino 2006: comparison of quali-quantitative parameters among groups of plants symptomatic for at least two successive years (SSS), always asymptomatic (HHH) and in recovery for one (1R) or two years (2R).

	no. of plants	Mean values Production Kg/plant	no. of bunches/plant	Bunch weight g	no. of wilted bunches/plant	° Brix	pH	Tot. tartaric acid g/l	Productive descrease
HHH	25	6.266 A	24.0 A	254.8 A	0	20.28 A	3.39 A	5.50 A	
2R	11	4.313 B	20.3 B	214.7 A	0	19.67 A	3.36 A	5.54 A	- 31%
1R	13	3.996 B	16.1 BC	226.9 A	0.3	19.53 A	3.42 A	5.49 A	- 36%
SSS	21	1.705 C	7.7 C	200.1 A	6.0	19.38 A	3.48 A	5.79 A	- 73%

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