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PRESENCE AND SPREAD OF GRAPEVINE YELLOWS AND ESCA DISEASE COMPLEXES IN TWO CONTIGUOUS VINEYARDS (CV PINOT B. AND NOSIOLA) IN TRENTINO

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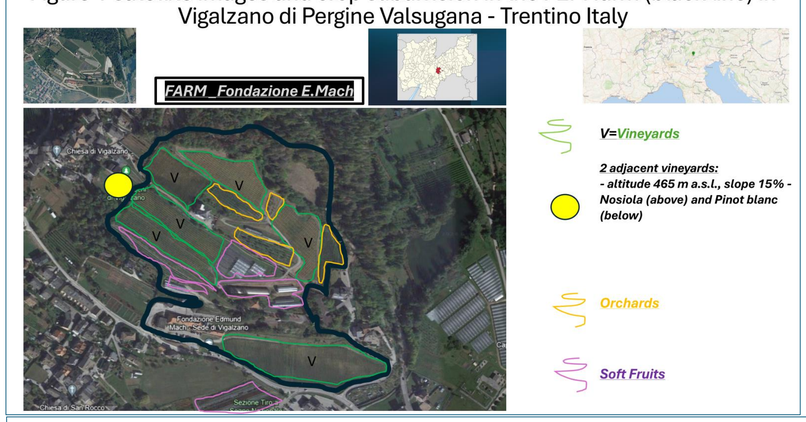
Introduction

Clonal (= individual) sanitary selection activities on materials from *Vitis* (*vinifera*, crosses or hybrids) have been implemented over time according to multi-year programs, protocols, regulations or conventions and international reference organizations (IPPC, EPPO). In a regulatory context entrusted to national services, some results are summarized from the multi-year control on "grapevine yellows" (GY) and Esca disease complex (ESCA) symptomatic plants and evaluation activities conducted in two adjacent Pinot blanc (Pb) and Nosiola (Nos) vineyards of the E. Mach Foundation (FEM).
As is known, the diseases investigated are characterized by a complex epidemiology, which includes many insect vectors and host plants in addition to the vine; these diseases are identified thanks to similar symptoms in the field (here on grapevine, in particular, with preliminary data in progress), but are caused by different //genetically distinct organisms, e.g. the phytoplasmas Grapevine *Flavescence dorée* (FDs) [quarantine organism] or Bois noir (BN), rather than the fungi referred to "grapevine trunk disease" (GTDs) including ESCA [Malembic-Maher S. et al., 2020; Mondello V. et al., 2018].

Figure 1 satellite images and crop subdivision in the FEM farm (black line) in Vigalzano di Pergine Valsugana - Trentino Italy



• Figure 2. Image and maps of Nosiola (above) and Pinot blanc (bottom) vinyards; «basic» material is colored [note left _ White edges (trees and shrubs)]

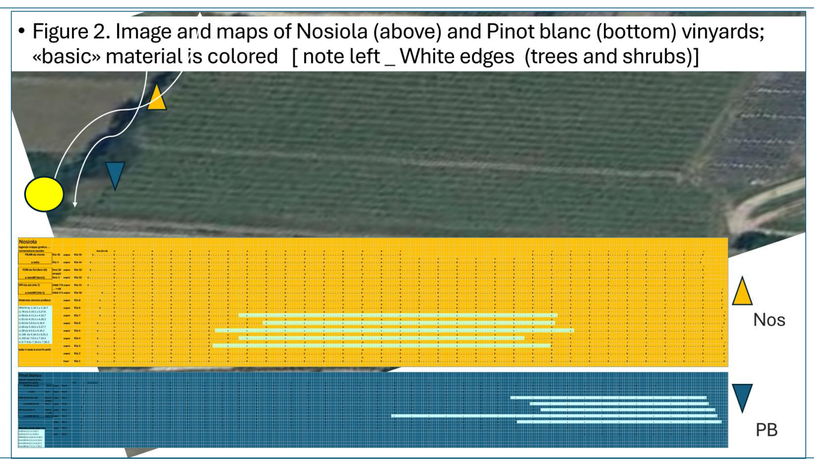


Figure 3 (left & right) «habitus» normal for Nosiola and Pinot blanc; (middle) pergola «trentina» trellis system

Material and methods

A total of 5371 vines of Nosiola (Nos) and Pinot Blanc (PB) are cultivated by FEM in Valsugana (Vigalzano-Pergine) with simple Trentino pergola training system (with spacing of 3.00 m between rows and 0.70 m between vines, density of 4,761 vines/ha) in a hilly area - altitude 465 m a.s.l., slope 15/20 % - according to integrated production protocols (Figures 1, 2 and 3). The original materials used (2011) refer in part to the activities and clonal comparisons of the institution [Malossini et a., 2023]; the surveys on all the vines observed to evaluate their vegetative-productive and health status, from 2020 for PB and from 2022 for Nos, were carried out at least twice for each year, with periods varying from pre-budding (March-April) to the entire spring-summer period until autumn (from June-July to October) identifying the respective position on the map.
To simplify, we refer to 4 different classes; a) groups asymptomatic and productive vines corresponding to the plants of origin; b) drastically pruned / uprooted / dead vines; c) suspect and/or symptomatic GY vines; d) suspect and/or symptomatic ESCA vines. The pruning and possible elimination of materials (shoots or canes) from suspect GY vines at summer and at the end of the harvest was always anticipated compared to the farm one, particularly on some single vines - referred to below.
A smaller group of vines, including those definitely not symptomatic to GY especially since planting, was carefully observed, distinguishing the position of the shoots possibly symptomatic GY or definitely not on the pruning shoots for possible sampling for diagnostic purposes, in accordance with some significant publications [Osler et al, 1997; Casarin et al., 2023] and previous internal experimental evidence. The diagnostic method used is the one reported in the bibliography [Bull.EPPO, 2016; Ferretti et al. 2017] for the simultaneous diagnosis of phytoplasmas of the 16SrV group which includes FD and of the 16SrXII group which includes BN. The matrix is the phloem extracted mainly from the petioles of symptomatic shoots and not of the same vines about one or more subsequent sampling dates.

Results 1.

To summarize and simplify, the evaluations highlighted an early onset of GY symptoms that varied between years and, above all, between cv. Nos, unequivocally, is confirmed to be less subject to the symptoms of GY manifestations, but is particularly susceptible to ESCA [see pictures below], contrary to what reported for PB (tables 1, 2, 3). All the vines in figures 4-5 are highlighted with different colors (yellow for GY, red for ESCA, black/violet for death-uprooting and green for replacement) compared to the original or asymptomatic vines; they are mapped in their original positions in the vineyard, allowing important considerations on the nursery plots used. Furthermore, their position with respect to other shrubby, arboreal or herbaceous host plants present at the edges of the vineyards or in the inter-rows (grassing) can experimentally support the epidemiological interpretation of the "GY" phenomenon [Mori et al., 2015; Quaglino et al., 2013].

Figure 4. The rectangles represent the mapping of the surveys on the vegetative-productive and health status of all PB vines from 2020 (top) to 2023 (bottom); yellow for vines with GY symptoms, red for ESCA, black for death/uprooted and green for replacements.

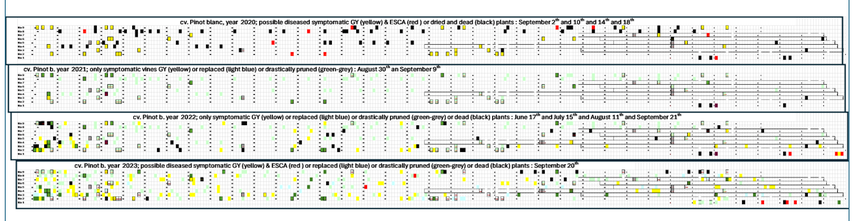


Figure 5. The two rectangles represent the mapping of the surveys on the vegetative-productive and health status of all Nos vines in 2022 (top) and 2023 (bottom); for each year the findings are reported only on GY (top) or on all the situations detected (bottom). In yellow the vines with GY symptoms, in red ESCA, black-purple the dead/dried ones.

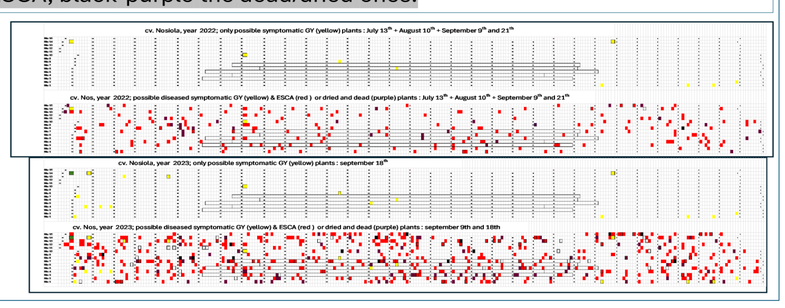


Table 1. Results of the surveys (see text) on the vegetative-productive and health status of all PB vines: year 2020 (on dates 2-10-14-18 September; vine elimination, 3 November) reported in number and % with reference to category of origin of the planting materials

Class	Origin materials (B=basic) (c=certificate)	Surveys 2020	
		n° vines	in % of total
a) asymptomatic and productive vines corresponding to the plants of origin	B	548	96,1%
	C	1274	89,3%
b) drastically pruned / uprooted / dead vines	B	10	1,8%
	C	120	8,4%
c) suspect and/or symptomatic GY vines	B	10	1,8%
	C	27	1,9%
d) suspect and/or symptomatic ESCA vines	B	2	0,4%
	C	6	0,4%

Table 2. Results of the surveys (see text) on the vegetative-productive and health status of all Nos vines: year 2023 (April 19, July 3, August 24, September 18 and November 8) reported in number and % and with reference to category of origin of the planting materials

Class	Origin materials (B=basic) (c=certificate)	Surveys 2023	
		n° vines	in % of total
a) asymptomatic and productive vines corresponding to the plants of origin	B	491	83,2%
	C	2289	82,2%
b) drastically pruned / uprooted / dead vines	B	32	5,4%
	C	142	5,1%
c) suspect and/or symptomatic GY vines	B	3	0,5%
	C	16	0,6%
d) suspect and/or symptomatic ESCA vines	B	64	10,8%
	C	337	12,1%

Table 3. Results by year and cv of symptoms of GY or ESCA complex detected on vines (in %) compared to the total present in two adjacent vineyards of PB and Nos

cv and disease	2020	2021	2022	2023
PB symptoms GY	1,9 %	1,1 %	1,3 %	4,2 %
PB symptoms ESCA	0,4 %	0,0 %	0,1 %	0,1%
Nos symptoms GY	n.e.	n.e.	0,5 %	0,6 %
Nos symptoms ESCA	n.e.	n.e.	4,7 %	11,9 %

Note: n.e. means surveys not carried out; acronyms as reported in the text

Results 2.

Table 4 shows an example, not exhaustive but illustrative, of the complex "management" of the controls referred to some diagnostic tests carried out on single vines (petiole matrix) from which the position of the sample characterized as symptomatic GY (infected) from the normal (healthy) one was distinguished. The test result in this case was considered for the positivity (presence) of FD or BN phytoplasmas or for their absence in the portions of the same vines affected or not by the symptoms. The localized presence on the same vine of positive and negative samples to the tests (for only one of the two phytoplasmas and not for both) confirms previous experimental evidence related to the presence or absence of symptoms, in particular on cv considered more sensitive such as Chardonnay or Pinot Blanc.

Table 4. Results of diagnostic tests (see text) carried out on 4 PB vines and 5 Nos vines distinguishing the position of the symptomatic GY sample (infected) from the normal one (healthy) on shoots of the same vine on three dates in 2022

Date	sign of PB and Nos vines	Test results on symptomatic samples	Test results on healthy samples
06.17.2022	PB vite α	3 positive FD	1 negative
07.15.2022	PB vite α	1 positive FD	1 negative
08.11.2022	PB vite β	2 positive BN	1 negative
08.11.2022	PB vite γ	1 positive BN	1 negative
08.11.2022	PB vite δ	1 positive FD	1 negative
07.15.2022	Nos A	3 negatives	n.d.
07.15.2022	Nos B	1 negative	n.d.
08.11.2022	Nos C	4 positive FD	n.d.
08.11.2022	Nos D	1 negative	n.d.
08.11.2022	Nos E	1 doubt FD / LN	n.d.

Note: n.d. means test not performed, sample not determined

Discussion and conclusion

Future activities intends to verify the distribution of phytoplasmas in the plant according to the symptoms and their conservation and/or transmissibility with propagation materials, investigating what is improperly defined as the "recovery" phenomenon.

Acknowledgements
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References

- EPPO (2016) Grapevine flavescence dorée phytoplasma, Bulletin, 46, 78–93.
- Casarin S., et al. 2023. A successful defence strategy in grapevine cultivar 'Tocai friulano' provides compartmentation of grapevine Flavescence dorée phytoplasma. BMC Plant Biology (2023) 23:161
- Ferretti L et al., 2017. Protocollo diagnostico per i fitoplasmi agenti della flavescenza dorata della vite Protocolli di diagnosi di riferimento. Progetto Finalizzato. "ASPROPI 2017
- Malembic-Maher S et al., 2020. When a Palearctic bacterium meets a Nearctic insect vector: Genetic and ecological insights into the emergence of the grapevine Flavescence dorée epidemics in Europe. PLoS Pathogens 16(3): e1007967
- Malossini U. et al., 2023. La selezione di cloni in varietà di vite identitarie del territorio (Trentino). In (ACTA ITALUS HORTUS), 202
- Mondello V. et al., 2018. Grapevine Trunk Diseases: A Review of Fifteen Years of Trials for Their Control with Chemicals and Biocontrol Agents. Plant Disease 2018 102:7, 1189-1217
- Mori N. et al., 2015. Investigation on 'bois noir' epidemiology in north-eastern Italian vineyards through a multidisciplinary approach. Annals of Applied Biology 166 (1), 75–89.
- Quaglino F. et al., 2013. 'Candidatus Phytoplasma solani', a novel taxonassociated with stolbur -and bois noir-related diseases of plants. International Journal of Systematic and Evolutionary Microbiology 63, 2879-2894.
- Osler R. et al., 1997. Possibilità di propagazione del giallume della vite (legno nero) a mezzo del materiale vivaistico. Informatore Fitopatologico, 47 (11), 61-63.