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An updating about the performances of Pinot Gris and Traminer vines affected by the GPGV trichovirus-related grapevine disease

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Summary

This paper presents an update of a multi-year survey carried out in Trentino (North-east Italy) regarding Pinot Grigio and Traminer Aromatico grapevines, whether or not temporarily affected by a disease linked to the Trichovirus recently discovered (1), which was named ***Grapevine Pinot gris Virus*** (***GPGV***). Diseased plants show symptoms resembling mite infestations or Thryps. **Symptoms** occur in spring **at the bud-break** and are characterized by **leaf deformation**, **chlorotic speckling or mottling**, **stunting or poor growth of shoots and inflorescences**. Data regarding the number of buds, fertility and grape yield per vine are reported; and so for cluster, berry, stem, and pruning weigths. Symptomatic plants show a **significant drop of production** due to the lesser number and weight of cluster and berries. Seeds are also present in a fewer number. In few plants the **reduced vigor** affected also the choice of branches for pruning renewal, leading **sometimes** to **plants' death**. The chemical composition of the grape from vines with and without symptoms are also shown.


Symptoms on Pinot gris

INTRODUCTION

Symptoms of stunting, chlorotic mottling and leaf deformation were observed on the cv Pinot gris, in Trentino vineyards since 2003. After ruling out the involvement of other agronomic factors and pathological agents, the infection of several clostero-, ampelo-, nepo- and vitiviruses was also excluded. A biological indexing program demonstrated a graft-transmissible reproduction of symptoms and a NGS (Next Generation Sequencing) approach of metagenome investigation was performed. This allowed the description of a new Trichovirus closely related to *Grapevine berry inner necrosis virus* (GINV), which was named *Grapevine Pinot gris virus* (GPGV) (1, 6). Afterwards, similar symptoms were reported from Traminer and Pinot noir in Trentino (2), Friuli Venezia Giulia, in Apulia on the table varieties Black Magic and Supernova (10), in Emilia Romagna, in Veneto on Glera (4) and in Slovenia on Pinot gris, Sauvignonasse and Muscat blanc (8). GPGV was also found in Korea (7) on Tamnara, a table grape. Recently, GPGV was detected in Slovak and Czech Republics (9). All mentioned reports show that, although **GPGV is present in several regions**, **its association with symptoms is contrasting**, a finding noticed since the inception of its discovery (1), which showed that the **virus was found with a limited percentage also in symptomless vines**, **disclosing** therefore, **a latent behaviour**.

MATERIALS and METHODS

Materials

All the vines of 1 vineyard of Pinot gris (total 1053 vines) and 1 vineyard of Traminer (1106) were monitored. The presence of symptoms in the first year of the work and in 2013 is given in table 1 →

Table 1

	Pinot gris		Traminer	
	2009	2013	2011	2013
N° of vines with symptoms (A)	140	356	42	60
Mean intensity of symptoms (assessed on the same vines A in each year)	2	1.9	1.8	2.1
N° of vines without symptoms (N)	913	697	1064	1046
Mean intensity of symptoms (assessed on the same vines N in each year)	0.1	0.2	0	0.3

Methods

- Visual ranking of the symptoms (from 0 = symptomless to 3 = heavy) on shoots and vines; Figure shows an example on Pinot gris →
- biological indexing (indicators: Cabernet, Pinot gris, Traminer, V. rupestris, V. riparia) of cane;
- serological (DAS-ELISA) and molecular tests (RT-PCR multiplex & single RT-PCR) on wood and leaves.
- agronomical & oenological parameters.


0 = symptomless | Level 1 on shoots & leaves (left) (on right, unclear symptoms due to the presence of eriophyoid mites) | Level 2 | Level 3

RESULTS and DISCUSSION

- With time, the **number of symptomatic vines increased** from 13 to 30% in Pinot and from 3 to 6% in Traminer (see 2009 & 2011 vs 2013 in table 1).
- **Symptomatology in each vine is maintained** (table 1).
- Symptomatic vines showed a **reduced vigour & yield** (in Pinot gris: about **-30%** & **-50%** respectively; in Traminer: **-43%** & **-60%**) due to lower number and weight of clusters (Pinot gris: -30% for both parameters; Traminer: -44% & -20% respectively) (table 2).
- At harvest, in both varieties the chemical composition of A & N juices was not significantly different.
- Ravaz's Index mean values were lower in symptomatic vines.

Table 2

	PINOT GRIS			TRAMINER		
	Vines with symptoms (A)	Vines without symptoms (N)	*p*	Vines with symptoms (A)	Vines without symptoms (N)	*p*
N. of cluster / vine	13.0 ± 5.2	18.5 ± 6.0	0.001	16.7 ± 10.2	29.9 ± 9.2	0.001
grape yield/vine (Kg) [a]	1.329 ± 0.7	2.680 ± 1.3	0.001	1.840 ± 1.1	4.260 ± 1.5	0.001
cluster weight (g)	99 ± 34	142 ± 45	0.001	126 ± 58	158 ± 44	0.05
berry weight (g)	1.28 ± 0.2	1.38 ± 0.2	0.001	1.38 ± 0.4	1.62 ± 0.1	0.01
wood/vine (Kg) [b]	0.454 ± 0.2	0.653 ± 0.2	0.001	0.720 ± 0.3	1.260 ± 0.3	0.001
Ravaz's index [a/b]	3.6 ± 2.6	4.4 ± 2.4	n.s.	2.3 ± 2.1	3.4 ± 1.5	0.05
Brix degrees	21.85 ± 1.6	22.22 ± 1.6	n.s.	22.82 ± 1.4	22.91 ± 0.7	n.s.
total acidity (g/L)	6.36 ± 0.7	6.28 ± 1.0	n.s.	4.3 ± 0.6	4.4 ± 0.8	n.s.
tartaric acid (g/L)	6.67 ± 0.8	6.41 ± 1.0	n.s.	5.73 ± 0.9	5.79 ± 0.9	n.s.
malic acid (g/L)	3.42 ± 0.4	3.52 ± 0.5	n.s.	2.25 ± 0.4	2.34 ± 0.3	n.s.
pH	3.34 ± 0.1	3.33 ± 0.1	n.s.	3.57 ± 0.3	3.56 ± 0.3	n.s.
assimilable nitrogen (mg/L)	215 ± 66	219 ± 53	n.s.	133 ± 45	150 ± 44	n.s.
N. of seeds/vine	600 ± 372	1761 ± 647	0.001	551 ± 528	1295 ± 324	0.01


Effect of the GPGV-related grapevine disease on Traminer canopy & production

CONCLUSIONS

This GPGV-related pathology causes significant losses to the crops of sensitive grape varieties, in particular Pinot gris and Traminer.

The risk for the spread and establishment of this (sometimes latent) graft-transmissible plant disease suggests urgent research in cooperation with all the actors of the viticultural chain.

In this context, clonal and sanitary selection plays a non marginal role in prevention and control.

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