

# AGRONOMICAL AND ENOLOGICAL PERFORMANCES OF A “MARZEMINO” CLONE BEFORE AND AFTER VIRUS (GLRAV-1 AND GVA) ELIMINATION

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## Introduction

The most common methods to eradicate viruses are thermotherapy *in vivo*, *in vitro* and meristem culture (Gribaudo et al., 2003). The present work compares some physiological, agronomical and enological characteristics of a *V. vinifera* L., cv. Marzemino clone before and after elimination of GLRaV-1 and GVA achieved with the procedures detailed in a previous work (Malossini et al., 2003).

## Materials and Methods

Samples of the control (mother vine = MP) and the heat treated (HT) clone were tested from 1998 to 2005 by ELISA for GLFV, ArMV, GLRaV-1, GLRaV-3 and GVA, using a commercial kit (Agritest, Valenzano-Bari, Italy). MP and HT *ex-vitro* materials were propagated onto GLRaV-1 and GVA-free rootstock Kober 5BB. A simple pergola trained experimental vineyard with two blocks was planted in the year 2000 at Ala (South Trentino, Italy). During 4 years (2002-2005), leaves from MP and HT plants were sampled at veraison and at harvest. Physical and chemical analyses of blades and petioles were carried out, i.e. nitrogen (by Kjeldahl) and mineral elements' content (by ICP-OES), SPAD-index (by SPAD 502 Chlorophyll Meter, Minolta; Porro et al., 2000) and Chl fluorescence (PAM-2000 fluorometer; Walz, Effeltrich, Germany). Fertility of buds, yield and basic qualitative characteristics of grape were measured from 2004 to 2005. Promptly assimilable nitrogen (PAN) was measured in the juices according to Nicolini et al. (2004a,b). Polyphenols of the berry were quantified, both in skins and seeds, during 3 years according to Mattivi et al. (2002).

## Results and discussion

ELISA tests carried out on the HT vines proved the elimination of GLRaV-1 and GVA. Besides, differently from MP plants, no symptoms were observed in field for the rugose wood complex (KSG) in the HT vines (Credi, 2005).

Virus elimination resulted, both at veraison and harvest time, in significantly longer veins and petioles, and higher values of SPAD-index and Fv/Fm (Table 1). SPAD-values are deemed positively related with chlorophyll and N content in leaves (Porro et al., 2000), and the higher ratio Fv/Fm indicates a better potential quantum efficiency of PSII (Maxwell and Johnson, 2000).

The mineral composition of blades and petioles does not put in evidence any statistical difference between HT and MP, probably also as a consequence of the little number (4) of samples analysed (Table 2). Statistically significant differences, with higher values for HT, were observed for real and potential fertilities evaluated in the first 3 buds of each cane. A tendency towards higher fertility values *per vine*, statistically not significant, can be also deduced from the box plots in Figure 1. The parameters of quality and quantity measured at harvest, displayed in Figure 2 and Table 3, do not show certain and significant differences between MP and HT vines.

In conclusion, the sanitation of the GLRaV-1 and GVA infected clone did not change significantly most parameters analysed, while increased bud fertility, leaves colour and potential photosynthetic activity.

## Acknowledgements:

M. Rubinigg, P. Bragagna and R. Moscon are acknowledged for the technical support.

## References

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Table 1. Mean values  $\pm$  std. dev. of some characteristics of MP (GLRaV-1 and GVA infected) and HT (GLRaV-1 and GVA free) Marzemino clone leaves (vineyard Ala, 2002 to 2005).

|                      | No. /<br>treatm | MP              | HT              | sign. |
|----------------------|-----------------|-----------------|-----------------|-------|
| <b>veraison</b>      |                 |                 |                 |       |
| vein's length (mm)   | 80              | 136 $\pm$ 20    | 141 $\pm$ 17    | n.s.  |
| petiol's length (mm) | 80              | 110 $\pm$ 18    | 118 $\pm$ 19    | **    |
| SPAD index           | 100             | 38,7 $\pm$ 5,4  | 42,1 $\pm$ 5,1  | **    |
| Fv / Fm              | 50              | 0,79 $\pm$ 0,03 | 0,81 $\pm$ 0,03 | *     |
| <b>harvest</b>       |                 |                 |                 |       |
| vein's length (mm)   | 70              | 134 $\pm$ 17    | 140 $\pm$ 20    | *     |
| petiol's length (mm) | 70              | 101 $\pm$ 18    | 114 $\pm$ 18    | **    |
| SPAD index           | 70              | 37,1 $\pm$ 4,3  | 40,8 $\pm$ 4,3  | **    |
| Fv / Fm              | 55              | 0,75 $\pm$ 0,05 | 0,77 $\pm$ 0,05 | *     |

(n.s.) not significance, (\*)  $p > 0.05$ , (\*\*)  $p > 0.01$

Figure 1. Potential Fertility of MP (GLRaV-1 and GVA infected) and HT (free) Marzemino clone vines (vineyard Ala, years 2004-2005).

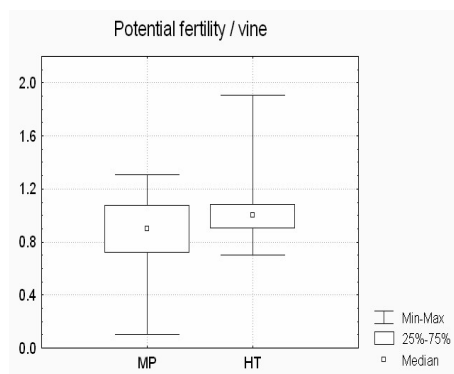


Table 2. Mean values  $\pm$  std. dev. of mineral contents of MP (GLRaV-1 and GVA infected) and HT (free) Marzemino clone leaves at veraison (2002 to 2005).

|                     | MP               | HT               |
|---------------------|------------------|------------------|
| blade's weight (g)  | 4,25 $\pm$ 0,50  | 4,21 $\pm$ 0,94  |
| petiol's weight (g) | 1,09 $\pm$ 0,11  | 1,25 $\pm$ 0,30  |
| % s.s.              | 33,4 $\pm$ 2,2   | 32,8 $\pm$ 4,1   |
| N blade (% s.s.)    | 2,44 $\pm$ 0,11  | 2,51 $\pm$ 0,22  |
| N petiol (% s.s.)   | 0,67 $\pm$ 0,14  | 0,69 $\pm$ 0,16  |
| P blade (% s.s.)    | 0,22 $\pm$ 0,04  | 0,21 $\pm$ 0,03  |
| P petiol (% s.s.)   | 0,54 $\pm$ 0,16  | 0,43 $\pm$ 0,10  |
| K blade (% s.s.)    | 1,50 $\pm$ 0,22  | 1,38 $\pm$ 0,23  |
| K petiol (% s.s.)   | 4,76 $\pm$ 0,83  | 4,60 $\pm$ 0,48  |
| Ca blade (% s.s.)   | 2,55 $\pm$ 0,34  | 3,00 $\pm$ 0,38  |
| Ca petiol (% s.s.)  | 2,03 $\pm$ 0,36  | 2,27 $\pm$ 0,46  |
| Mg blade (% s.s.)   | 0,34 $\pm$ 0,06  | 0,36 $\pm$ 0,07  |
| Mg petiol (% s.s.)  | 0,69 $\pm$ 0,15  | 0,73 $\pm$ 0,20  |
| Fe blade (mg/Kg)    | 76,3 $\pm$ 14,1  | 82,0 $\pm$ 16,5  |
| Mn blade (mg/Kg.)   | 181,5 $\pm$ 47,4 | 146,0 $\pm$ 45,0 |
| Bo blade (mg/Kg)    | 28,5 $\pm$ 8,2   | 29,8 $\pm$ 8,3   |

Figure 2. Yield and musts characteristics of MP (GLRaV-1 and GVA infected) and HT (free) Marzemino clone vines (vineyard Ala, years 2004-2005).

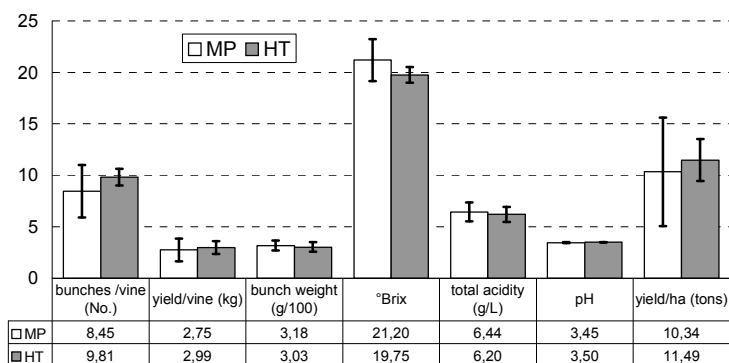


Table 3. Oenological characteristics of MP (GLRaV-1 and GVA infected) and HT (GLRaV-1 and GVA free) Marzemino clone (vineyard Ala, 3 years)

| year                    | 2003 |     | 2004 |     | 2005 |     |
|-------------------------|------|-----|------|-----|------|-----|
|                         | MP   | HT  | MP   | HT  | MP   | HT  |
| PAN (mg/L)              | 166  | 231 | 155  | 185 | 206  | 188 |
| TA (mg/Kg berries)      | 604  | 615 | 589  | 597 | 847  | 857 |
| TP skin (mg/Kg berries) | 767  | 627 | 655  | 683 | 940  | 817 |
| TP seed (mg/Kg berries) | 527  | 438 | 699  | 676 | 762  | 935 |
| % TP_seed/TP_total      | 41   | 41  | 52   | 50  | 45   | 53  |

Legend: PAN = Promptly Assimilable Nitrogen, TA = Total Anthocyanins, TP = Total Polyphenols