

**TOLERANCE OF SOME GRAPEVINE ROOTSTOCKS TO *Tylenchulus semipenetrans* Cobb 1914 IN CHILE**

**Tolerancia de algunos portainjertos de vid a *Tylenchulus semipenetrans* Cobb 1914 en Chile**

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**ABSTRACT**

Grapevine (*Vitis vinifera* L.) rootstock resistance to *Tylenchulus semipenetrans* Cobb 1914 was tested in a field trial carried out in a pre-established grapevine crop. Tested rootstocks included VR O39-16, 420 A, Kober 5BB, 110 Richter, Harmony, Couderc 1613, Ramsey and SO4. Cultivar Cabernet Sauvignon was used as a control. A soil analysis was made at planting in 1995, and a second soil and root analysis was made in 2000 to assess the presence of juveniles and adult females. The most resistant rootstocks were Ramsey and 110 Richter; the others were similar to the control.

**Key words:** rootstocks, grapevines, *Tylenchulus semipenetrans*, resistance, parasitic nematodes.

**RESUMEN**

La resistencia de algunos portainjertos de vid (*Vitis vinifera* L.) a *Tylenchulus semipenetrans* Cobb 1914 fue evaluada en un ensayo desarrollado en un predio donde existió una viña establecida en ese sector. Los portainjertos utilizados fueron VR O39-16, 420 A, Kober 5BB, 110 Richter, Harmony, Courdec 1613, Ramsey y SO4. La variedad Cabernet Sauvignon se usó como control. Se realizó un muestreo y análisis de suelos al momento de la plantación en 1995 y un segundo muestreo de suelos y raíces el año 2000 para determinar la presencia de juveniles y hembras adultas. Los portainjertos más resistentes fueron Ramsey y 110 Richter; los otros se comportaron en forma similar al testigo.

**Palabras clave:** portainjertos, vid, *Tylenchulus semipenetrans*, resistencia, nematodos parásitos.

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## INTRODUCTION

Among the most important plant parasitic nematodes attacking grapevines in Chile are *Xiphinema index* Thorne & Allen, 1950, *X. americanum sensu lato*, *Meloidogyne* spp. Chitwood 1949, *Mesocriconema xenoplax* (Raski), Luc & Raski, 1981 and *Tylenchulus semipenetrans* Cobb 1914 (Aballay *et al.*, 1998). Most of the control of these parasites has been carried out with nematicides. However the introduction of rootstocks in recent years is becoming a good alternative, being relatively successful against the first two genus mentioned, but as the resistance or tolerance developed by a rootstock is not complete against all the nematodes, the possibility of species selection or pathotypes is always present (McKenry *et al.*, 2001).

*T. semipenetrans* is a nematode normally associated to citrus, but its presence is frequent in vineyards, being detected in about 16% of the soil samples coming from vines (Valenzuela *et al.*, 1992), with high populations in some cases. There has been no study in Chile about the tolerance of the rootstocks being used against this pest. This is still more complex in replants, since farmers are specially introducing the use of rootstocks, trying to avoid the use of fumigant nematicides.

The purpose of this study was to assess the resistance of some rootstocks used in Chile to *T. semipenetrans* under field conditions.

## MATERIALS AND METHODS

This study was conducted at a farm located in the central zone of Chile, Panquehue (32°50' S lat, 70°55' W long) Region V, devoted to wine grape production, in a 4 ha block, which was naturally infested with the citrus nematode *T. semipenetrans*.

The assay was established in the spring of 1995 using eight rootstocks. Rooted cuttings were planted in five plant-plots and grafted with the Cabernet Sauvignon variety. Plantation density was 3,333 plants per ha. Final evaluation was undertaken during summer 2000.

Rootstocks evaluated were: VR O39-16 (*Muscadinea rotundifolia* Small x Almería); 420 A (*Vitis berlandieri* Planch. X *Vitis riparia* Michx.); Kober 5BB (*Vitis berlandieri* X *Vitis riparia*); 110 Richter (*Vitis berlandieri* X *Vitis rupestris* Scheele); Harmony (Dogridge, *Vitis champini* Planch. X C 1613); Couderc 1613 (*Vitis solonis* Hort. Berol. ex Planch. X Othello); Ramsey (*Vitis champini*); SO4 (*Vitis berlandieri* X *Vitis riparia*) and Cabernet Sauvignon (*Vitis vinifera* L.) as a control.

The soil at the research site was a clay loam, a member of the family euc, termic of the Typic medihemists (Histosol) (CIREN, 1985) with drip irrigation. Initial population of second stage juveniles (j2) of *T. semipenetrans* was assessed in soil before planting. After five seasons, the final soil sampling was made from each plant of the plot, two subsamples per plant, 30 cm deep, near to the root zone, obtaining a ten-core soil sample from each plot and a composite sample of 250 cm<sup>3</sup> was processed by a Cobb sieving/Baermann funnel to estimate j2 populations (Hooper, 1986).

Adult females were extracted from 10 g roots, with 1% NaOCl. Values were expressed as number per gram of root.

Shoot weights and yields are not shown because of the presence of some plants with virus, especially "Leafroll" and "Grape fan leaf" virus were detected.

A completely randomized experimental design was used, with nine treatments and four replicates each. Each replicate was a five-vine plot. Data were subjected to analysis of variance (ANOVA) and means were compared using Duncan's Multiple Range Test. A significance level of 5% was used in all the results.

For j2 larvae comparison between initial (Pi) and final populations (Pf), a Reproductive Index (R (Pf/Pi)) was used, with a previous logarithmical transformation to Ln (P+1) for data normalization (Noe, 1985).

## RESULTS AND DISCUSSION

The number of juveniles and females per gram of root are presented in Table 1. The j2 population was variable at the planting time and an important increase was not observed during the five seasons of growth. It might be due to the planned scarce irrigation that the plants received during summer to avoid an excessive vigour and a poor wine quality.

The final analysis after five years growth showed that Ramsey was the rootstock with the most important j2 reduction, significantly different from the control Cabernet Sauvignon and most of the other rootstocks. These results concur with those of Wachtel (1986), and Edwards (1988, 1989). Besides the resistance of this rootstock, it is known for its high vigour as well as other *Vitis champini* rootstocks, which means that damage to the root system has lower impact on the growth of the cultivars (Baettig, 1996, Aballay *et al.*, 1998, McKenry *et al.*, 2001).

Cultivars Harmony and 110 Richter also presented a low reproductive index ( $R < 1$ ), meaning that final populations decreased, despite there not being significant differences with the other more susceptible cultivars, which showed an  $R > 1$ . Edwards (1988, 1989) and Watchel (1986) pointed that these two rootstocks are tolerant and McKenry

*et al.* (2001) found that Harmony was susceptible to this nematode but 99 Richter, a rootstock closely related to 110 Richter, was resistant. Edwards (1988, 1989) and Baettig (1996) have also evaluated the growth of these two rootstocks, and classify them as vigorous, being recommendable their implementation in citrus nematode infested soils.

None of the other *Vitis* cultivars tested showed a similar degree of resistance, since an increase in the final population of juveniles occurred, resulting in a higher reproductive index ( $R > 1$ ). Most of these cultivars have a low or medium vigour (Edwards, 1988; Baettig, 1996; McKenry *et al.*, 2001) which may collaborate to an earlier declining of young plants under higher initial populations.

The number of females per gram of root (Table 1) showed a similar tendency to that shown by the juveniles. It is an important confirmation of the major resistance of some rootstocks, since this parameter is considered of more value for *T. semipenetrans* and endoparasites, in general, than soil population levels (McKenry *et al.*, 2001). Cultivar Ramsey and 110 Richter presented the lowest population and were different from the other cultivars, confirming the answer for the first and showing that the latter may be an alternative in infested soils.

**Table 1. *Tylenchulus semipenetrans* population in soil, roots and normalized reproductive indices.**

**Tabla 1. Población de *Tylenchulus semipenetrans* en suelo, raíces e índices reproductivos normalizados.**

Cultivar	Initial population N° j2 250 cm <sup>-3</sup> soil (Pi)	Final population N° j2 250 cm <sup>-3</sup> soil (Pf)	Reproductive index normalized (R) <sup>1</sup>	Females g <sup>-1</sup> of root
VR 03916	141.0	445.1	1.22 bcd	38.2 b
420 A	202.3	449.8	1.21 bcd	31.3 b
Kober 5BB	151.5	665.7	1.31 bcd	33.3 b
110 Richter	186.5	73.6	0.83 ab	11.4 a
Harmony	1,450.0	363.5	0.80 ab	25.2 ab
Courdec 1613	76.0	642.3	1.58 d	29.8 b
Ramsey	95.5	7.1	0.41 a	5.2 a
SO4	155.0	188.6	1.36 cd	35.7 b
Cabernet Sauvignon	479.3	1,845.0	1.33 bcd	45.3 b

Values are the average of four replicates.

Means in each column followed by a different letter are significantly different Duncan's multiple range test ( $P \leq 0.05$ ).

<sup>1</sup> R = Normalized reproductive index,  $R = \ln(Pf + 1) / \ln(Pi + 1)$ .

## CONCLUSIONS

Rootstocks cultivar Ramsey and 110 Richter presented the best performance in naturally infested soils with *T. semipenetrans* and may be a good alternative in new vineyards under this soil condition.

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