

# Grapevine Yellows in Chile

**Author:** Nicola Fiore

Universidad de Chile, Facultad de Ciencias Agronómicas, Departamento de Sanidad Vegetal, Avenida Santa Rosa 11315, La Pintana, Santiago, Chile

## Introduction

Grapevine (*Vitis vinifera* L.) is widely grown in Chile where the vineyards cover 145,873 and 52,234 hectares of wine and table grape varieties, respectively. The main wine grape varieties are Cabernet Sauvignon, Merlot, Carménère, Chardonnay, Sauvignon blanc and Syrah, whereas the prevailing table grape cultivars are Thompson Seedless, Red Globe, Flame Seedless, Crimson Seedless and Superior (CIREN 2014; ODEPA 2016). The relatively rapid expansion of the acreage given over to grapevines and a limited health certification program have resulted in the extensive spreading of various diseases including those associated with the presence of phytoplasmas known as grapevine yellows (GY).

## Grapevine Yellows disease

The presence of GY disease in *V. vinifera* in Chile was reported in 1971 based on observation of symptoms; however, the first laboratory evidence for the presence of phytoplasmas in grapevine occurred in the early 2000's by electron microscopy and molecular tools (Gajardo *et al.*, 2003; Herrera and Madariaga, 2003; Bertaccini *et al.*, 2004). To date phytoplasmas belonging to six ribosomal subgroups have been identified in grapevine in Chile (16SrI-B, 16SrI-C, 16SrIII-J, 16SrV-A, 16SrVII-A and 16SrXII-A) (Gajardo *et al.*, 2009; Fiore *et al.*, 2015b), but there is no information about their prevalence in vineyards. The symptoms generally observed are downward rolling of leaves, incomplete shoot lignification, drying up of bunches and plant decline, with reddening and yellowing of leaves in red and white varieties, respectively (Figures 1 and 2). The 16SrIII-J subgroup is the most widespread phytoplasma in Chile, infecting not only grapevine but also several other woody and herbaceous species (González *et al.*, 2011; Fiore *et al.*, 2015b; Quiroga *et al.*, 2015; 2017a), and its draft genome sequence is now available (Zamorano and Fiore, 2016).



**Figure 1. Reddening and downward rolling of leaves in Cabernet Sauvignon**

Transmission trials have shown that *Paratanus exitiosus* and *Bergallia valdiviana* can transmit this phytoplasma to both periwinkle [*Catharanthus roseus* (L.) G. Don] and grapevine (Quiroga *et al.*, 2018). *P. exitiosus* and *B. valdiviana* are widely distributed throughout the country, and they are commonly captured on weeds in Chilean vineyards and occasionally feed on grapevine plants (Fiore *et al.*, 2015a; Quiroga *et al.*, 2015). *Scaphoideus titanus* has never been found in Chile; however, recent studies have indicated that both current and projected climate change conditions in the central zone of Chile are appropriate for its survival and settlement (Quiroga *et al.*, 2017b). The leafhopper *Amplicephalus curtulus*, detected harboring 16SrI-B and 16SrXII-A phytoplasmas, has been frequently captured in weeds present in Chilean vineyards, but it has not been possible to determine whether it transmits these phytoplasmas to the grapevines (Longone *et al.*, 2011).

Some weeds present in or around the vineyards have been found positive for some phytoplasmas also detected on the grapevine. Specifically *Galega officinalis* infected with 16SrVII-A phytoplasma, *Convolvulus arvensis* (16SrI-B, 16SrVII-A and 16SrXII-A), and *Polygonum aviculare* (16SrI-B and 16SrVII-A) (Longone *et al.*, 2011). It is important to note that *C. arvensis* plays a fundamental role in the epidemiology of the 16SrXII-A phytoplasma, responsible for “bois noir” disease, which in Europe is mainly transmitted by the Cixiidae *Hyalesthes obsoletus*, not reported in Chile.



**Figure 2. Drying up of a bunch in Cabernet Sauvignon**

## REFERENCES

- Bertaccini A, Botti S, Fiore N, Gajardo A, Montealegre J (2004) Identification of a new phytoplasma(s) infecting grapevine with yellows in Chile. In: Abstract of XV Meeting of IOM, Athens, GA, USA 37:63-64.
- CIREN (2014) Evolución superficie frutícola nacional y sus principales especies. <http://bibliotecadigital.ciren.cl/handle/123456789/1226>
- Fiore N, Longone V, Gonzalez X, Zamorano A, Pino AM, Quiroga N, Picciau L, Alma A, Paltrinieri S, Contaldo N, Bertaccini A (2015a) Transmission of 16SrIII-J phytoplasma by *Paratanus exitiosus* (Beamer) leafhopper in grapevine. *Phytopath Moll* 5:S43-S44.
- Fiore N, Zamorano A, Pino AM (2015b) Identification of phytoplasmas belonging to the ribosomal groups 16SrIII and 16SrV in Chilean grapevines. *Phytopath Moll* 5:32-36.
- Gajardo A, Botti S, Montealegre J, Fiore N, Bertaccini A (2003) Survey and phytoplasmas identified in Chilean grapevines.- In: Extended abstracts 14th Meeting of the International Council for the Study of Virus and Virus-like Diseases of the Grapevine (ICVG) - Locorotondo (BA), Italy, pp 85-86.
- Gajardo A, Fiore N, Prodan S, Paltrinieri S, Botti S, Pino AM, Zamorano A, Montealegre J, Bertaccini A (2009) Phytoplasmas associated with grapevine yellows disease in Chile. *Plant Dis* 93:789-796.
- González F, Zamorano A, Pino AM, Paltrinieri S, Bertaccini A, Fiore N (2011) Identification of phytoplasma belonging to X-disease group in cherry in Chile. *Bull Insectol* 64(Suppl):S235-S236.
- Herrera G, Madariaga M (2003) Evidencias inmunológicas, microscópicas y moleculares de la presencia de fitoplasmas en vides. *Agricultura Técnica* 63: 15-22
- Longone V, González F, Zamorano A, Pino AM, Araya J, Díaz V, Paltrinieri S, Calari A, Bertaccini A, Picciau L, Alma A, Fiore N (2011) Epidemiological aspects of phytoplasmas in Chilean grapevines. *Bull of Insectol* 64(Suppl):S91-S92.
- ODEPA (2016) Catastro Vitícola Nacional SAG. <https://www.odepa.gob.cl/wp-content/uploads/2018/03/catastro-vides-2017.pdf>
- Quiroga N, González X, Zamorano A, Pino AM, Picciau L, Alma A, Paltrinieri S, Contaldo N, Bertaccini A, Fiore N (2015) Transmission of 16SrIII-J phytoplasma by *Bergallia valdiviana* Berg 1881 leafhopper. *Phytopath Moll* 5(1-Suppl):S47-S48.
- Quiroga N, Bustamante M, Gamboa C, Molina J, Zamorano A, Fiore N (2017a) 16SrIII-J phytoplasmas infecting lettuce and Swiss chard crops in Chile. *Phytopath Moll* 7(2), 91-94.
- Quiroga N, Ivlic D, Lagos J, Saavedra M, Sandoval-Rodríguez A, Infante R, Morales L, Fiore N (2017b) Risk analysis of the establishment of *Scaphoideus titanus*, vector of "flavescence dorée" phytoplasma in grapevine, under current and estimated climate change conditions in Chile. *Phytopath Moll* 7 (1), 39-44.
- Quiroga N., Longone V, González X, Zamorano A, Pino AM, Picciau L, Alma A, Paltrinieri S, Contaldo N, Bertaccini A, Fiore N (2018) Transmission of 16SrIII-J phytoplasmas by *Paratanus exitiosus* (Beamer) and *Bergallia valdiviana* Berg 1881 leafhoppers. *Phytopath. Medit.* (submitted).
- Zamorano A, Fiore N (2016) Draft genome sequence of 16SrIII-J phytoplasma, a plant pathogenic bacterium with a broad spectrum of hosts. *Gen Announc* 4(3):e00602-16.