SCIENTIFIC INNOVATION FACTSHEET

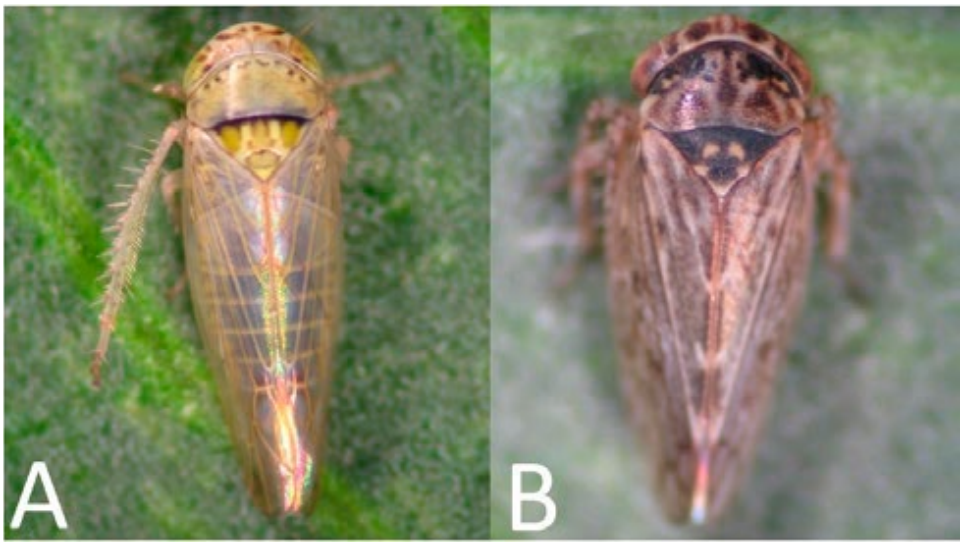
TRANSMISSION OF PHYTOPLASMAS BY LEAFHOPPERS IN CHILE

Paratanus exitiousus and *Bergallia valdiviana* are able to transmit the 16SrIII-J phytoplasma

■ THE PROBLEM ADDRESSED

Phytoplasma insect vectors in Chile

In Chile, grapevine yellows is associated with phytoplasmas belonging to diverse ribosomal subgroups. However, the phytoplasmas in the 16SrIII-J subgroup are prevalent in the vineyards of the country. This phytoplasma has been reported to infect various crops and spontaneous plant species. Phytoplasma dissemination in the field occurs with the use of infected plant materials and by insect vector transmission. The leafhoppers found in Chilean vineyards generally feed on weeds and only occasionally on grapevine, allowing the transmission of phytoplasmas to this species. In order to determine which insects are involved in transmission of the 16SrIII-J phytoplasma, an epidemiological study was carried out in symptomatic phytoplasma-infected vineyards. Transmission trials were carried out with two 16SrIII-J phytoplasma positive insects, *Paratanus exitiousus* and *Bergallia valdiviana*.



• Insect species used in the transmission trials: A) *Paratanus exitiosus*; B) B*ergallia valdiviana*

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■ LATEST RESEARCH RESULTS

How to determine the phytoplasma transmission capacity by an insect?

Insects were collected in a phytoplasma infected vineyard. They were captured by means of an entomological sweeping net. Adults of *P. exitiosus* and *B. valdiviana* were divided in two batches and released into two entomological cages to let them feed on three grapevine plants cv. Cabernet Sauvignon, and three periwinkle plants. For the transmission assays with *P. exitiosus*, 81 periwinkle and 81 grapevine plants were used. For the transmission trials with *B. valdiviana*, 27 periwinkle and 21 grapevine plants were used. All the plants were kept in a conditioned chamber. Each feeding period lasted until the death of all the insects released in a cage. Assays for phytoplasma detection in the plants used for the transmission trials were carried out every three months. All the leafhoppers from a single cage were also tested in order to confirm the phytoplasma presence in the insects.

• Survey of insects in vineyard using entomological sweeping net

• Entomological cages used to perform the transmission trials (left) and insects feeding on periwinkle plants inside the entomological cage (right)

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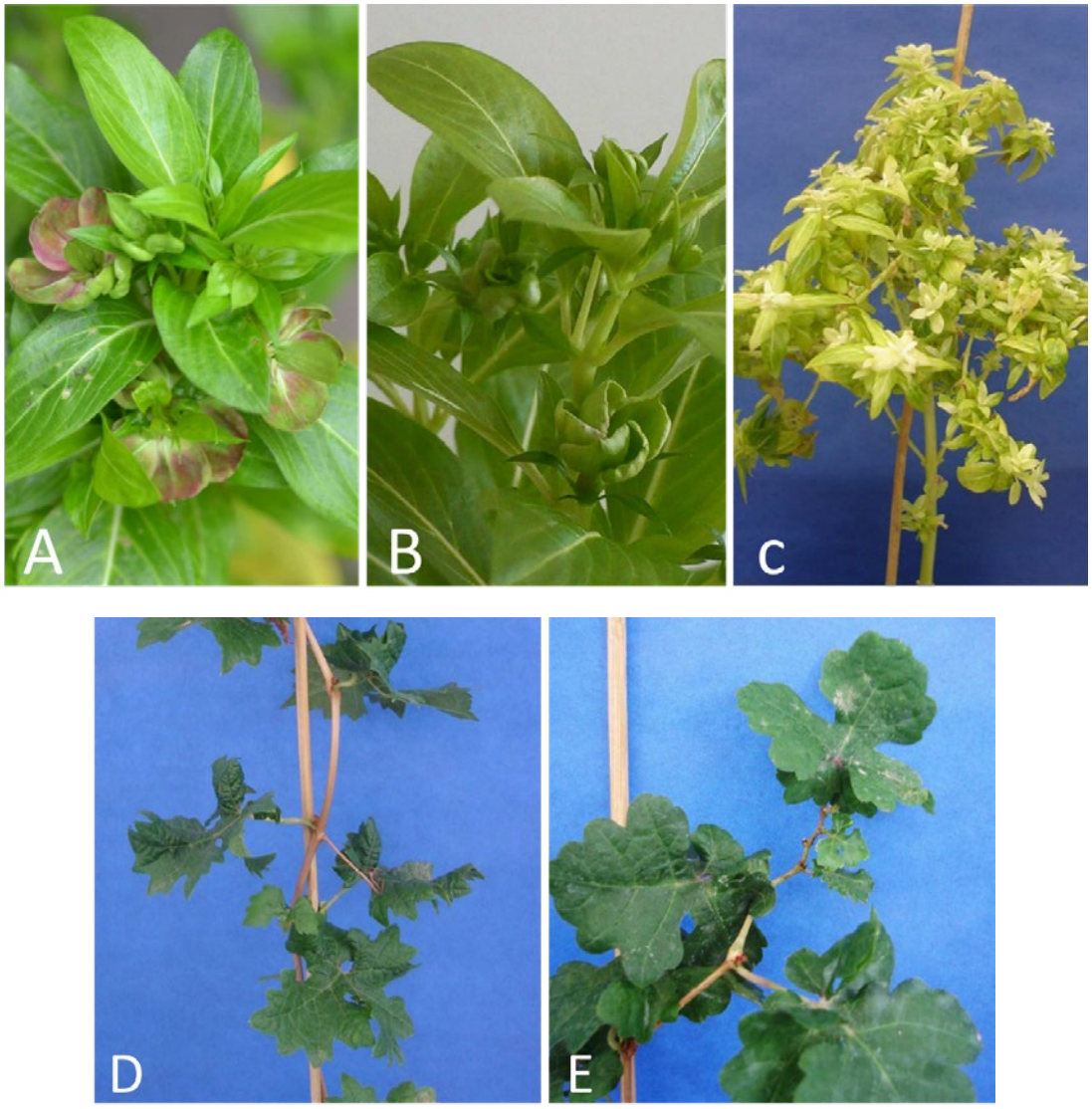
■ THE TROPICSAFE RESEARCH AND DEVELOPMENT ACTIVITY

Phytoplasma identification in plants and insects used in transmission trials

The phytoplasma detection in the plants after the transmission trials was obtained after one and two years from the transmission to periwinkle and grapevine plants, respectively. The phytoplasma presence was also detected in *P. exitiosus* and *B. valdiviana* specimens used for the transmission assays. Five grapevine and three periwinkle plants from the *P. exitiosus* transmission trials resulted positive for phytoplasma 16SrIII-J. Two grapevine and two periwinkle plants used in the transmission trials with *B. valdiviana* were also positive for phytoplasma 16SrIII-J. *P. exitiousus* showed 4.97% and *B. valdiviana* 8.3% of transmission. The16SrIII-J positive grapevine plants showed short internodes, and leaves with downward rolling, deformation, yellowing and necrosis, twenty-four months after the start of the transmission trials. The 16SrIII-J infected periwinkle plants showed witches' broom, virescence, leaf deformation and severe yellowing, fifteen months after the start of the transmission trials. All the results were verified by nested PCR on the 16S rRNA and *tuf* genes, sequences and RFLP analyses.



• Symptoms in periwinkle (above) and grapevine (below) after *P. exitiosus* and *B. valdiviana* transmission; A) flowers with virescence; B) flowers with virescence and phyllody; C) plant with witches' broom, small and yellow leaves; D) leaves with downward rolling and deformation; E) short internodes

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■ SCIENTIFIC DATA AND FIRST RESULTS

Implications of phytoplasma vectors insect's determination in Chile

Both insects live on weeds and only occasionally feed on grapevine or other crops. *P. exitiosus* has more abundant populations during spring and summer, while *B. valdiviana* has high populations during late summer, autumn and early winter. This could play a fundamental role in maintaining the phytoplasma population in the weeds during the vegetative recess of the grapevine. The phytoplasma 16SrIII-J and its newly identified insect vectors are widely distributed in Chile on different weed species and crops of agronomic interest (Hepp and Vargas, 2002; González *et al.*, 2011; Longone *et al.*, 2011). Taking into account the *P. exitiosus* and *B. valdiviana* transmission rates observed, if environmental conditions are favourable, there is a high likelihood to expect an outbreak of grapevine yellows in Chile due to 16SrIII-J phytoplasmas. The climate change could modify the habitat of these insects as well as increase their reproduction rate in the central zone of Chile (Quiroga *et al.*, 2017). The information that has been generated through this investigation allows to generate focused management plans for grapevine yellows in Chile.

KEY WORDS

Phytoplasma, Auchenorrhyncha, transmission trials

FURTHER INFORMATION

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AUTHORSHIP

Nicola Fiore, Nicolas Quiroga Universidad de Chile, Facultad de Ciencias Agronómicas, Departamento de Sanidad Vegetal. Santiago, Chile nfiore@uchile.cl, nicolasquirogabarrera@gmail.com
Assunta Bertaccini *Alma Mater Studiorum* - University of Bologna, Bologna, Italy assunta.bertaccini@unibo.it

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