

Short Research Article

Occurrence of grape phylloxera *Daktulosphaira vitifoliae* Fitch (Hemiptera: Phylloxeridae) in the state of Espirito Santo, Brazil

ABSTRACT

The phylloxera *Daktulosphaira vitifoliae* (Fitch 1856) (Hemiptera: Phylloxeridae) is one of the most important pests in grapevine cultivation. This specie is distributed in all continents and can attack the plant aerial part and the vine root system. In Brazil, phylloxera has been causing losses in most municipalities from the southern region that produce grape, and there is no evidence of *D. vitifoliae* in the State of Espirito Santo. The objective of this study was to record the occurrence of *D. vitifoliae* in the grapevine crop in the State of Espirito Santo. Between February and December of 2016, plant samples with typical pest regions were collected from grapevines crops in different production regions of the state. After analysis of the materials and taxonomic identification, the presence of phylloxera in grapevines was confirmed in Espirito Santo.

Keywords: grape leaf galls, 'Niagara Rosada', vine, Viticulture

1. INTRODUCTION

The grape phylloxera *Daktulosphaira vitifoliae* (Fitch 1856) (Hemiptera: Phylloxeridae) originates in North America and feeds on leaves and vine roots (*Vitis vinifera* L.) [1]. Due to its worldwide spread through plant material in the 19th and early 20th centuries, phylloxera has become one of the most devastating pests of viticulture, causing worldwide losses [2]. In Brazil, phylloxera has been found in practically all grape producing regions in south of the country [3], and has been recorded since the first cultivation of grapevine crop [4].

Phylloxera has a complex plant life cycle, where part of its life is in the soil infesting roots, and another part of its life is to form leaf galls under the vine leaves [5]. The leaves of the vine are relatively tolerant to feed on phylloxera, but its fine and structural roots are highly susceptible [6]. Feeding on the tip of young roots by phylloxera causes nodosities, while feeding on mature roots causes large tuberosities, which eventually will deform and crack [7]. Both forms of root damage allow soil fungi and bacteria, resulting in severe damage to the root, loss of yield and grapevine [8]. In addition, this metabolism behavior induces changes in the uptake and transport of water, minerals and photoassimilates [9].

The Brazilian viticulture occupies an area of approximately 79,000 hectares, with an annual production of 1,500 tons [10]. In the state of Espirito Santo, viticulture is distributed in only 200 hectares, however the culture presents a high incidence of pests and diseases. Although viticulture has become increasingly important in relation to the sustainability of rural properties in the State of Espirito Santo, few studies have been carried out regarding the occurrence of pests that may affect its production. Being aware of the great damages, phylloxera can occur in grapevines, and its records are important, in order to obtain information that allows the efficient control of the pest. In this sense, the objective of this study was to report the occurrence of phylloxera in grapevine crops in the State of Espirito Santo, Brazil.

2. MATERIAL AND METHODS / EXPERIMENTAL DETAILS / METHODOLOGY

The grape samples were collected from three growing regions in the state of Espirito Santo in the following municipalities: Santa Teresa (district of Caldeirao do São Jose, 19° 55'20" S, 40° 44'48.69" W), Santa Maria de Jetiba (19° 59' 25.47" S, 40° 42'16.58" W) and Mantenopolis (18° 51'6.89"S, 41° 7'55.354" W) (Figure 1).

In the period between February and December 2016, monthly sampling was carried out during different stages of grapevine plant and production development. The grape cultivar evaluated was 'Niagara Rosada', which is the result of a somatic mutation in 'Niagara Branca' (*Vitis labrusca* L. x *Vitis vinifera* L.) [11] and 'Isabel', an American grape cultivar [12]. The samples were randomly collected between the planting lines, in order to find leaves with a possible symptom typical of phylloxera galls. In regions where the farmers did not use rootstocks, nodosities in the roots of the plants were verified. The nodosities are characterized by increased root tissue, a typical symptom of phylloxera attack on susceptible materials [13].

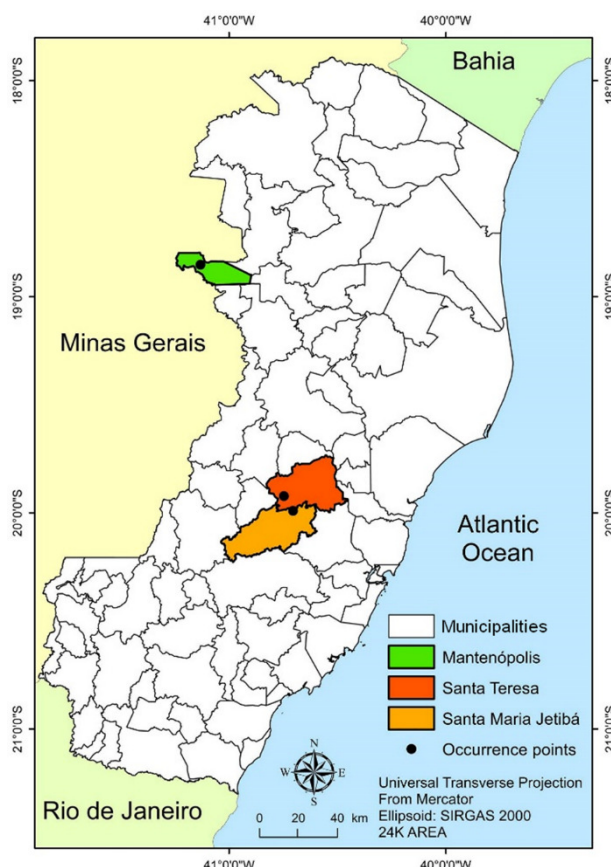


Figure 1. Location of collection of *Daktulosphaira vitifoliae* in municipalities of Espirito Santo State, Brazil

The collected vegetative materials were packed in hermetically sealed thermal boxes (44x25x37 cm) and transported to the Entomology Sector of the Nucleus of Scientific and Technological Development in Phytosanitary Management of Pests and Diseases of the Center of Agrarian Sciences and Engineering of the Federal University of Espirito Santo. In the laboratory, the leaves and vine roots were cut with scalpel to remove the insects, which were placed in glass tubes containing alcohol (70% v/v). The insects were identified by the researcher Marcos Botton in the Brazilian Agriculture Research Corporation (EMBRAPA) Grape and Wine, Bento Gonçalves, RS, Brazil.

3. RESULTS AND DISCUSSION

The materials analyzed were collected in the three different municipalities and it was verified that all the samples presented phylloxera in the leaves and in certain roots of rootstocks plants. In all the collected material, leaf galls were the predominant symptom (Figure 2), allowing to record the occurrence of phylloxera *D. vitifoliae* for the first time in the State of Espirito Santo, Brazil.

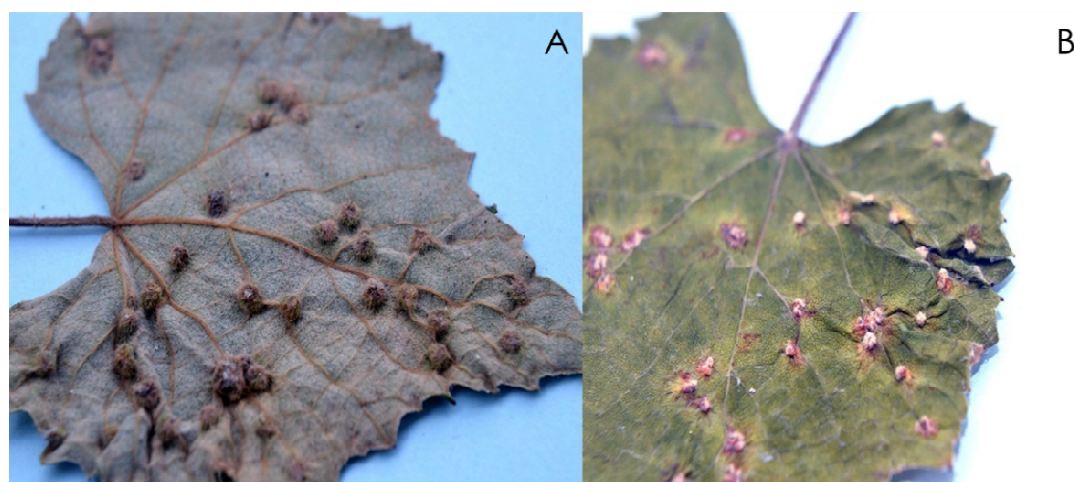


Figure 2. Injuries (galls) on vine leaves var. 'Niagara rosada' caused by *Daktulosphaira vitifoliae* in Espírito Santo State, Brasil. Surface view of leaf, adaxial (A) and abaxial (B)

The occurrence of phylloxera in grape producing regions in the State of Espírito Santo may be related to the contaminated vegetative material and climatic conditions favorable for the development of phylloxera. The presence of phylloxera in both leaves and the vines roots in Espírito Santo is due to the evaluated materials being from American origin. In American grape vines, phylloxera grows in both aerial and subterranean stages, while in European grape vines (*V. vinifera*), phylloxera lives in the roots and is continuously reproduced by parthenogenesis [14,15]. Generally, the common sites of oviposition, nutrition and mating of phylloxera are the roots, therefore not all forms or phases of the life cycle occur in certain regions, since the cycle stages are associated with the climate conditions and host susceptibility [16]. Insects induce a feeding site within the meristematic zone of the root tip, where they remain attached to the root, feeding inter and intracellularly [17]. Overall, the pest found on the leaves and roots can paralyze the development of the plant and may cause its death. In addition, the rootstocks affected by pests in field, may not be large enough to perform winter grafting in the next harvest [16]. Thus, the control of phylloxera in grape plantations is indispensable to guarantee the vigor of the plants, ensuring a good production.

One of the control techniques of phylloxera is the use and adoption of the grafting technique of the cultivars of economic interest on rootstocks of American cultivars (*Vitis cordifolia*, *V. rupandi*, *V. berlandieri*, *V. riparia*) or hybrid, resistant or tolerant to phylloxera [18]. The use of resistant rootstocks is the most common form of phylloxera management, worldwide, since the late 19th century [19]. Another way to manage this pest is to prevent it, since the phylloxera can easily disperse next to the seedlings. Certified and suitable nurseries and avoiding the purchase of ungrafted *V. vinifera* plants [20] is preferred. Biological control methods for phylloxera have been tested with arthropods, nematodes and entomopathogenic fungi, but few researches have been successful and validated in field [21, 22]. Regarding insecticides, several of them has been reported for suppression of phylloxera populations, therefore their record as a control agent is limited worldwide [23]. In addition, the use of insecticides to control phylloxera in the roots has not been recommended because of the cost of treatment and the need for annual applications, as well as the high toxicity of the active ingredients used in the soil [24]. In Brazil, there are no products registered in the Ministry of Agriculture, Livestock and Supply for the control of phylloxera in grapevine plantations [25].

It is noteworthy that the early detection of phylloxera in the vineyard is more important than the control method. Developing detection techniques capable of evaluating the suspected infiltration of phylloxera is crucial to obtain a successful implementation of phytosanitary treatments [23], and consequently the economic damages will be as minimum as possible.

The occurrence of phylloxera in grapevine plantations in the state of Espírito Santo is worrisome, since the areas of grapevine crops are growing and there is a possibility of dispersion of phylloxera through infected seedlings. Consequently, significant economic losses could occur in grape producing regions, affecting viticulture and vintners. Therefore, it is of fundamental importance to monitor phylloxera in

grapevine plantations and nurseries and to inform the farmers about the risks, and showing them ways to control and manage this recent pest of vines in the state of Espírito Santo, Brazil.

4. CONCLUSION

It was identified the occurrence of phylloxera in vine plantations in the state of Espírito Santo. The occurrence of phylloxera in vineyards in the state of Espírito Santo can lead to economic losses.

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