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THE GRAPE PHYLLOXERA, *DAKTULOSPHAIRA VITIFOLIAE* (FITCH) (HOMOPTERA: PHYLLOXERIDAE)[1]

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INTRODUCTION: Fitch (1855) first described the grape phylloxera from grape leaf galls in New York state. He considered it an aphid and called it the grape leaf louse, *Pemphigus vitifoliae*. Shimer (1866) described a new genus, *Daktulosphaira* for the species *vitifoliae*. Walsh and Riley (1869) proposed the name *Phylloxera vitifoliae* (Fitch). From 1869 to 1959 there were at least 10 other genera in which *vitifoliae* was placed. For a complete synonymy see Russell (1974). She places the species in the genus *Daktulosphaira*. The grape phylloxera is a native of North America and was found in the Mississippi Basin region on wild grape vines. It was introduced into Europe about 1859 and spread rapidly throughout European grape vineyards (Federov, 1959). Much economic damage was caused in Europe until resistant rootstock from the eastern U. S. region was developed.

DISTRIBUTION: Australia, Europe, North America, North Africa, South Africa, South America, the Middle East, Morocco, Southwest and Northern Caucasus, and Transcaucasia.

HOST: The grape phylloxera is found only on *Vitis* spp.

ECONOMIC IMPORTANCE: It was introduced into France about 1859, and by the end of the century it had spread to all grape-growing areas, and at least 1.5 million hectares were destroyed. A similar situation occurred in California where it generally takes about 2 years for an infestation to affect the growth. The vines gradually decline over a period of years. It is believed that injury is caused by the decay that occurs in the lesions caused by the phylloxera rather than the withdrawal of sap from the roots (Ebeling, 1959).

CONTROL: Effective control of the grape phylloxera was brought about by grafting the European vines on American rootstock. The scion wood should not be planted below the soil level as it will root down and become infected. The leaf-infesting forms can be controlled with sprays. University of Florida, IFAS, does not give a control for the grape phylloxera since it has not been a problem in the past. With recent plantings of grapes and the scattered infestations developing, controls may be needed in the future for the leaf galls. The USDA Farmer's Bulletin No. 1893 recommends 2 lbs (0.9 kg) of 25% lindane wettable powder per 100 gallons (379 liters) of water when galls first appear on the leaves and a second application 7 to 10 days later. Do not use lindane later than 1 month after bloom. Plants in sandy soils were observed to be immune to the insect's attack of the roots in France and in North America as early as the late 1870s.

LIFE HISTORY: In California the complicated life cycle of this polymorphic species begins with the hatching of the eggs on the vine stock that gives rise to the fundatrix or stem mother. The immature stages developing from the fundatrix move on to the newly developing leaves, settle on the upper surface, and cause pocketlike galls to form (figs. 1 & 2). Two or 3 parthenogenetic generations develop on the leaves, and some of the immatures move down to the roots (figs. 3 & 4). A variable number of

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foliage and root forms produce winged migratory forms in the summer and fall. The migratory females lay their eggs on the leaves or bark. The overwintering eggs give rise to the fundatrix. The winter may be passed in 2 forms--the winter egg on the vine aboveground or as a hibernant on the roots underground (Davidson and Nougaret, 1921). Stapley and Gayner (1969) reported that the root form is virtually absent in eastern U.S., but the root form and leaf form occur in California. According to Ebling (1959), in California it overwinters on the roots and dissemination is not by winged forms but by wingless individuals seeking out new vines. The spread of this pest in California is naturally slow. There are no leaf-living forms on European vines, according to Stapley and Gayner (1969). If the winter eggs occur on the stock, the fundatrices are unable to successfully colonize the leaves. It lives predominately on the roots, where it reproduces parthenogenetically for at least one season. The first instar ranged from 11 to 22 days for an average of 13.3 days; the second instar ranged from 3 to 7 days, for an average of 3.6 days; the third instar ranged from 1 to 6 days, with an average of 3.8 days; the 4th instar ranged from 1 to 6 days with an average of 3.7 days in temperatures ranging from 58 to 65 F (15 to 18 C). There are up to 7 or 8 generations annually (usually less) ranging from 31 to 55 days per generation.

The individuals that become winged forms (alates) are termed prenymphs in the 3rd instar (fig. 5) and nymphs or pupae in the 4th instar. Hibernants molt into adults and oviposit for an average of 18.3 days with a maximum of 48 days. The average was 90 eggs per adult or 4 to 9 eggs per adult per day. The maximum number of eggs laid by an adult was 272 (Stevenson, 1964).

Federov (1959) gives a detailed account of the life history in the Black Sea coastal area and in Transcaucasia and Ukraine. Briefly 5 principal forms were recognized: 1) wingless forms on leaves--aptera gallicata; 2) wingless forms on roots--aptera radicicola; 3) nymphs; 4) winged sexerporae--alate; 5) sexual forms, males and females--sexuales. His observation showed that the characters for separating the leaf-gall form from the root-gall form such as the length of the proboscis, the knobbed setae on the tarsi, and the smooth dorsum or dorsum with tubercles are all variable. Riley (1871) reported that he could separate the leaf form by the smooth dorsum and that the root form had tubercles on the dorsum. Federov (1959) considered the tubercles to be an ecological adaptation among the radicicolae (root form). Furthermore, he transferred root-form nymphs to the leaf galls, and the nymphs produced smooth dorsums.

Newly molted nymphs average about 0.78 mm in length and mature nymphs (5 to 12 days) average about 1.1 mm. The adults (fig. 6) are slightly shorter than the nymphs, but the antennae are longer and bear 2 sensoria of equal size. The prothorax and abdomen remain orange, the head a grayish luster, and the thorax darkens until it is almost black (Davidson and Nougaret, 1921).

LITERATURE CITED:

Davidson, W. M., and R. L. Nougaret. 1921. The grape phylloxera in California. USDA Bull. 903. 127p.

Ebeling, Walter. 1959. Subtropical fruit pests. Univ. California, Div. Agric. Sci. 436p. + i-vi.

Federov, S. M. 1959. The biological basis of phylloxera (*Dactylosphaera vitifolii* Shimer, Homoptera, Phylloxeridae) control. Ent. Obozr. 38(1):82-87. (Translation Ent. Rev. 38(1):74-85.)

Fig. 1. Phylloxera infestation of grape leaf. (Photo: courtesy of Ohio Agricultural Research and Development Center, Wooster.)

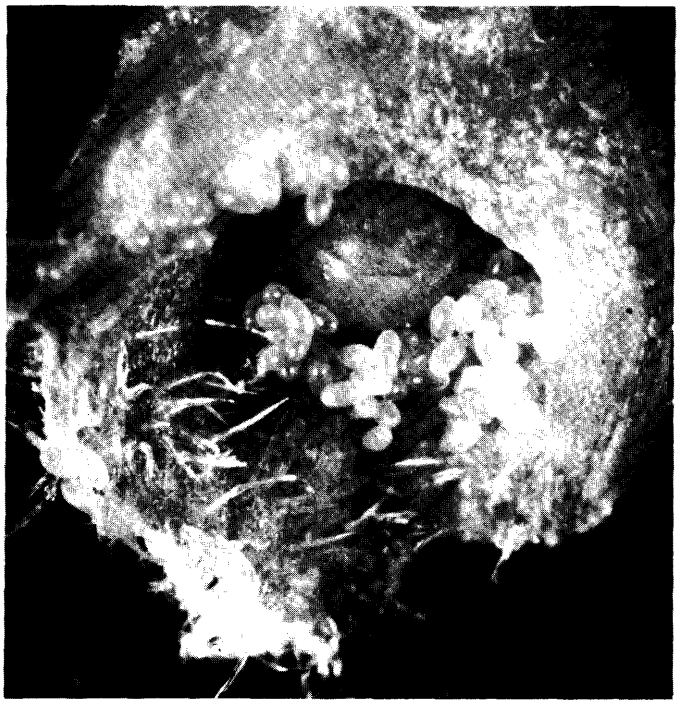

Fig. 2. Enlargement of leaf gall. (Photo: courtesy of OARDC.)

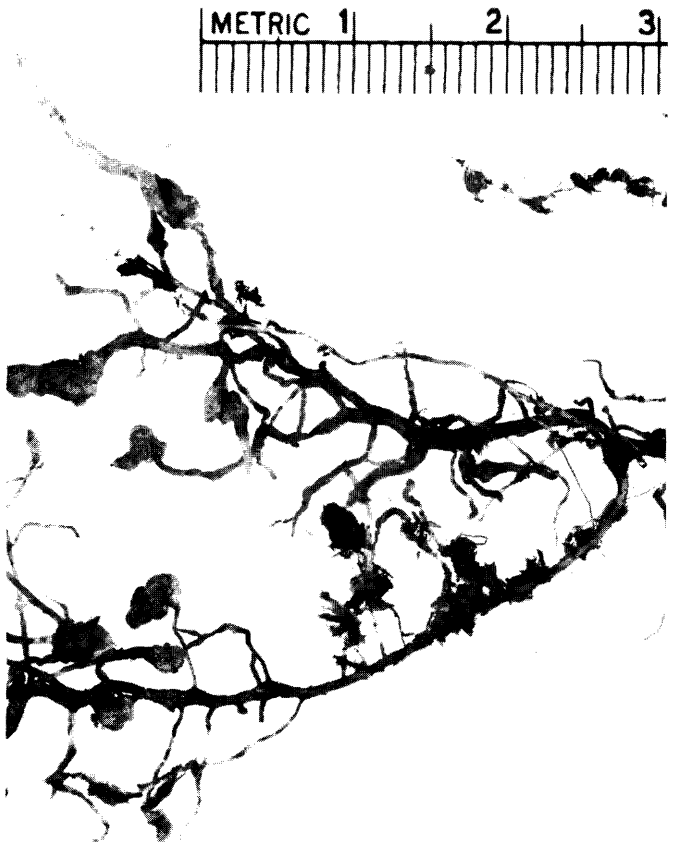

Fig. 3. Phylloxera infestation of roots of grape vine. (Photo: courtesy of OARDC.)

Fig. 4. Enlargement of root galls. (Photo: courtesy of OARDC.)

Fitch, A. 1855. Report [on the noxious, beneficial and other insects of the State of New York]. 14(1854):705-880.

Riley, C. V. 1871. The grape-leaf gall-louse, *Phylloxera vitifoliae* Fitch (Homoptera, Aphidae). Pages 84-96 *in* Third Ann. Rpt. on the noxious, beneficial, and other insects of the State of Missouri.

Russell, Louise M. 1974. *Daktulosphaira vitifoliae* (Fitch), the correct name of the grape phylloxeran (Hemiptera: Homoptera: Phylloxeridae). J. Washington Acad. Sci. 64(4):303-308.

Shimer, H. 1866. "Grape leaf louse"--*Daktulosphaira vitifoliae*. The Prairie Farmer 34(18):365.

Stapley, J. H., and F. C. H. Gayner. 1969. World Crop Protection CRC Press, Cleveland, Ohio. 270p.

Stevenson, A. B. 1964. Seasonal history of root-infesting *Phylloxera vitifoliae* (Fitch)(Homoptera: Phylloxeridae) in Ontario. Canadian Ent. 96(7):979-987.

Walsh, B. D., and C. V. Riley. 1869. Grape-vine leaf-gall. The American Ent. 1(12):248.

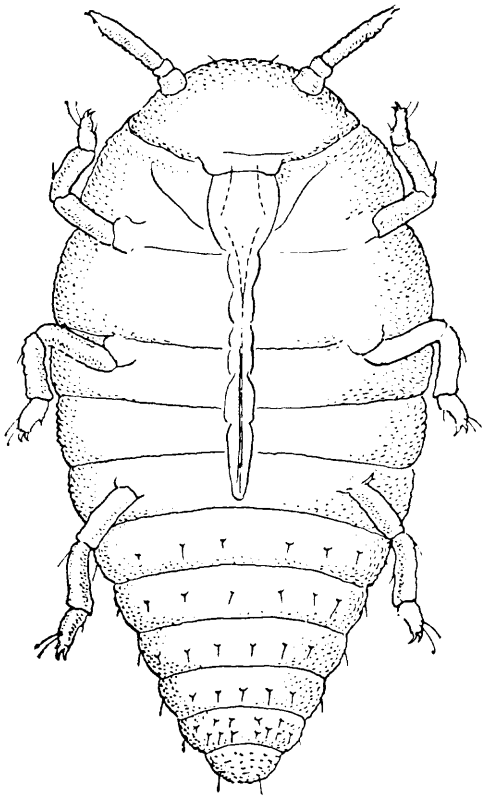

Fig. 5. Prenymph (3rd instar of winged form); ventral view.

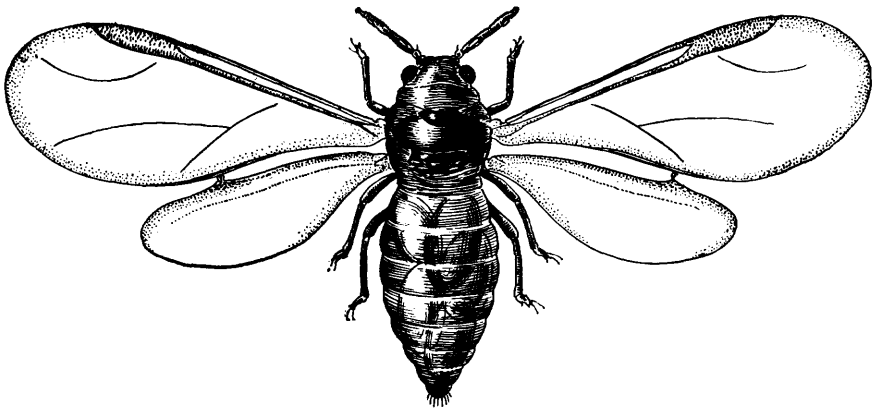

Fig. 6. Adult grape phylloxera, *Daktulosphaira vitifoliae* (Fitch).