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## Grape leaf roller insect

The grape leaffolder is a common and widespread species that is a minor pest grape in the United States. In California, severe outbreaks have occurred in restricted areas in a few years. These eruptions have linked the failures of parasites to reach their normal levels. In Florida the grape leaffolder did significant damage to grape leaves in September and October, when growers had discontinued their spray programs after harvesting. Excessive foliage loss may deplete the food reserves in the grapes enough to reduce the size of the next crop. Figure 1. Larvae in the grape leaf folder, *Desmia funerals* (Hübner). Photo of Warren Adlerz, University of Florida. The ability to control grape pests in Florida is becoming more meaningful with the rebirth of the grape industry. At one time, a lot of vineyards numbered thousands of acres in Florida and then nearly disappeared from the damaging effects of Pierce's disease. The development of a more resistant bouquet of grape varieties at the former University of Florida Central Florida Research and Education Center in Leesburg has spurred renewed interest. In 2012, a combined commercial muscadine and bouquet of grapes area in Florida estimated at about 1,500 acres (USDA Census of Agriculture, 2012). There are 26 agricultural wineries operating across the state ( . Grapes are also sold as fresh fruit and juice. Identification (Back to top) Eggs are small (about 1/32 inch long), flat, iridescent, elliptical structures set separately from the bottom of a leaf, often at the angles between the vein and the leaf surface. Larvae are 3/4 inch long when fully grown. They are bright, translucent yellow-green sides, and slightly darker above, scattered fine yellow hairs in each segment. The head and prothoracic shield are light brown, and there are light brown spots on the sides of the first two thoracic segments. Larvae move vigorously when disturbed and fall to the ground. Pupae is on average a little over 1/2 inch long; light brown, immediately after breastfeeding, but soon darkens. Adults have a wing expansion varying from about 4/5 inches to nearly 1 1/4 inches. The color of the wings is very dark brown, almost black, silvery or bluish iridescence. Wings in both sexes are two almost oval white spots. The hind wings of the male have a white rod, which is divided in part or completely into two places in the female. Each sex has different amounts of white on the rim of the wings and parts of the head, body and legs. The male's antennae are thickened and clamped in the middle, while in the female they are uniform and fiber-like. Adults of other species of *Desmia* and certain other similar species in Florida with white spots on the wings are much more linear, or obviously have different number of spots, or other Figure 2. Adult grape leaf folder, *Desmia funerals* (Hübner). Photo: Division of Plant Industry. Life History (Back to Top) Winter has passed the pupal stage of folded and fallen leaves. Moths appear in spring shortly after the grape foliage appears and lay their eggs on the leaves. In Florida, the earliest adult records are located in the Sarasota area in mid-February, but February records include settlements in the Indian River, Manatee, Osceola and Volusia counties. Adults were taken every month of the year in Florida, except in January. Relatively few larval records are available in Florida, but the earliest is one in May and the latest in December, with peak populations occurring from July to October. The number of first-time larvae is reported to be quite insignificant compared to the second spend. In the southern United States, a third brood also leads the overset pupal. Accurate data on the developmental stages of *Desmia funerals* in Florida are missing, but Smith and Stafford (1955) provide data from Fresno, California, which may approach development in Florida. The first spending flight period (in Fresno) lasted from 2 April to 24 May; Egg hatchery is required for 10-17 days. Total time larval stage was three to four weeks, time 1in the pupalis stage was 0-14 days, the total time egg appearance moth 6 1/2 7 1/2 weeks. The second spending moth flight period was from June 15 to July 15. It was necessary to hatch eggs for 4-5 days. In the larval stages, the total time was two to three weeks, in the pupal stage it is seven to 11 days, and from the egg to the appearance of the moth the total time of 4-5 weeks. The third spending moth flight period runs from August 3 to September 5; the eggs hatched in 4-5 days, the larvae needed 3-5 weeks for full growth, and the subsequent humps were full. The second and third brooding women lay most of their eggs on leaves rolled by larvae of a previous nesting. However, moths can fly to an uninfected vineyard in the middle of summer and start what can become a serious leaflet problem. AliNiazee (1974) studied the development of the leaf folder in the laboratory at 23.9 ± 1°C. It found that the average duration of the larval stages is as follows: first instar, 3.5 days; second instar, 3.9 days; third instar, 4.4 days; fourth instar, 4.3 days; fifth instar, 6.1 days. Leaffolders feed on both muscadine and bouquet of grape leaves. Young larvae connect several muscadine leaves and feed in a group. Each larvae begin to make leaf reeds after one week (AliNiazee 1974). They can also use coils made by an earlier generation. Larvae will throw rather than roll, bouquet of grape leaves, which are thicker than muscadine leaves (McGiffen and Neunzig 1985). Larvae make leaf reeds of silk which contract and contract the letter. Jensen (1966) each bundle of threads contains 200-300 individual threads, and about 10 such joints are required per coil, including some inside where they are not visible. The larvae feed on the free edge of the leaf inside the coil and make at least two of these rolls during their development. They always stay inside the coils or between leaves, unless (at night) they move from place to place. To create places of pupation, larvae make envelopes, often by cutting and folding through three sides of a small piece of leaf (AliNiazee 1974). At the end of the season, they fall to the ground with the leaves to which they relate. AliNiazee (1974) watched adult activity in the summer in California and found that moths were the most active from midnight to early morning. Detection and damage (Back to top) Damage

to leaves is very characteristic and easily recognizable. As soon as the larva is large enough, folds the leaf, exposing it to the subsurface; the edge is held in place by silk-threaded ribbons. Under the protection of this shoot feeds on the larvae, skeleton of the leaves of the upper surface. When the number of larvae, the damage to the vine becomes striking, even at a considerable distance, because the light color of the lower surface of the folded leaves contrasts boldly with the dark green on the upper side usually presented, giving the grape a motted appearance. Larvae roll muscadine leaves, which are thinner than the bouquet of grape leaves. Figure 3. Pity that the bouquet of grape foliage is caused by grape leaf folder, *Desmia funeralis* (Hübner). Photo of Warren Adlerz, University of Florida. Figure 4. Pity that the muscadine grape leaf with a characteristic roll caused by grape leaf folder, *Desmia funeralis* (Hübner), also shows silk fibers. The larva is removed from the coils for photographic purposes. Photo: F.L. Jensen, Farm Advisor, Calif. The main hosts of the vine leaf folder (Back to page) are wild and grown grapes, *Vitis* spp. There are two types of redbud, *Cercis canadensis* and *C. chinensis*; Virginia creeper , *Parthenocissus quinquefolia*; and *Oenothera* have been reported as occasional hosts. Grape varieties are more prone to attack are those that are thinner, gentler and hairier leaves. Parasitoids (Back to top) Many parasitoids have been reported in the grape leaf folder. McGiffen and Neunzig (1985) raised larvae and found three species of tachynid fly, as well as a number of hymenopterous parasitoids. A total of three braconid wasps, two ichneumonid wasps and one eulophid wasp were found. Management (Back to Top) The standard insecticide used against the folder is The Scratch (Sevin). Grapes may not be harvested within seven days of the application. Avoid the use of a carbug if mites are present. Check the state recommendations before applying any insecticide. Tests in California and the use of *Bacillus thuringiensis* (Bt) products did not show a significant difference in control between carb bean and both provide good control. Home gardeners who do not want to use insecticides can get good results by thoroughly going through the grapes when folded or rolled leaves with evidence and crushing the larvae by hand. Since the insect passes through the pupalis stage of fallen leaves in the winter, it is a good idea to rake and destroy the leaves. Insect treatment guide for grapes selected references (Back to top) AliNiazee MT. 1974. Contribution of bionomics to the grape leaf folder, *Desmia funeralis* (Hübner): Laboratory testing of field observations. Pacific Coast Entomological Society Memorandum 50: 269-278. Jensen FL. 1966. Grape leaf folder regulation with *Bacillus thuringiensis*. California Agric. 20: 2-3. Kimball cp. 1965. Lepidoptera, Florida; a checklist that is not engaged to notes. Arthropods florida and adjacent land areas Vol. 1. Florida Department of Agriculture and Consumer Services, Plant Industry Department 363 pp. McGiffen KC, Neunzig HH. 1985. Guide to the identification and biology of insects feeding on Muscadine and grape clusters in North Carolina. North Carolina Agricultural Research Service Bulletin 470. page 93. Smith LM, Stafford EM. 1955. Grape pests in California. California Agricultural Testing Station Circular 445: 16-19. Stafford EM, Jensen FL. 1957. Grape leaf folder: field studies compared the effectiveness of insecticides in the control of grape pests. California Agric. 11: 4, 8, 10, 15. Strauss JF. 1916. The grape leaf folder. USDA Announcement 419: 1-14. USDA Agricultural Census. Florida. 2012 Census Volume 1, 1. U.S. Department of Agriculture. of 18 August 2014

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