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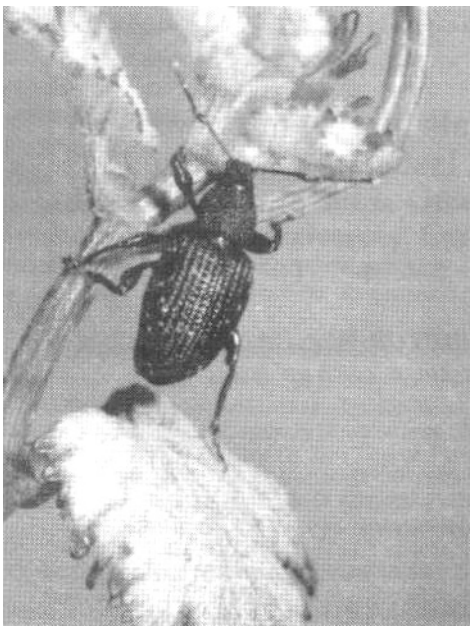
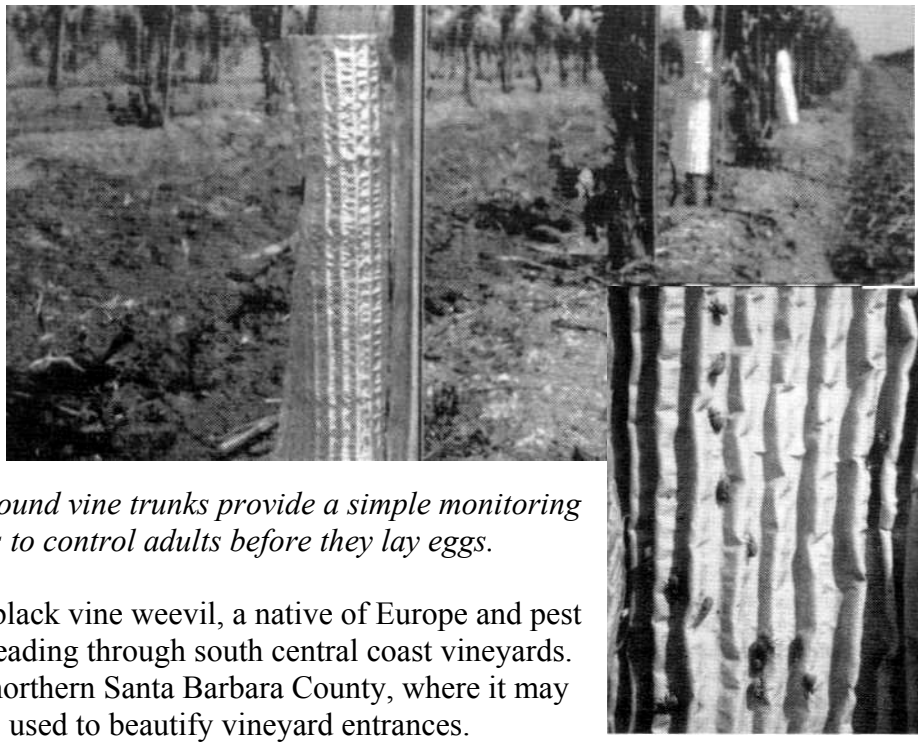
SIMPLE MONITORING OF BLACK VINE WEEVIL IN VINEYARDS



Adult black vine weevils feed on vulnerable buds and young shoots of grapevines, and later may damage flowers and young berry clusters. Researchers have found that emergence of the elusive, mainly nocturnal, adult beetles can be accurately monitored because they will hide during the day in corrugated cardboard tree wraps placed around vine trunks.



A well-known pest of woody ornamentals, the weevil is now found in some south central coast vineyards. Cardboard tree wraps around vine trunks provide a simple monitoring technique for timing selective sprays to control adults before they lay eggs.

Over the last ten years or more, the black vine weevil, a native of Europe and pest of woody ornamentals, has been spreading through south central coast vineyards. It has been of particular concern in northern Santa Barbara County, where it may have been introduced in potted roses used to beautify vineyard entrances.

The adult black vine weevil, *Otiorynchus sulcratus* Fabricus, is a roughened, hard shelled beetle, approximately a half inch long. It is black with small patches of white scales on the forewings. As is typical of weevils, the front of the head projects into a long, broad snout.

Adults feed on foliage of grapevines, as well as any portion of the flower cluster or stems of the grape cluster, especially just before unfertilized berries drop. Foliar feeding is characterized by

distinctive notching along leaf margins. On later developing grape varieties, such as Cabernet Sauvignon, where bud break coincides with adult weevil emergence, a large percentage of primary buds and new shoots may be destroyed. The potential for crop loss is thus of concern to commercial vineyardists.

Black vine weevils are elusive, being primarily nocturnal and tending to hide beneath loose trunk bark or in debris at the base of the vine during the day. The adult is flightless, since its forewings are fused together. It is also parthenogenetic, there being no males known, and it has only one generation per year (univoltine). When ample food is present, the weevils tend to migrate very little. However, they have been known to move 180 feet in 3 days.

In preparation for development of an integrated pest management (IPM) program, studies were conducted in northern Santa Barbara County from 1984 through 1986. The objectives were to determine: (1) a practical technique for monitoring black vine weevil; (2) adult emergence patterns; (3) the required pre-egg-laying period; and 4) a selective spot treatment.

Methods

Adult weevils were monitored on 20 individual Cabernet Sauvignon vines in a portion of a 20-acre commercial vineyard known to have black vine weevil activity. The loose bark was first stripped from the vine to be monitored, then a corrugated cardboard tree wrap was placed around the vine trunk and secured with a plastic vine tie or paper clamp. Vine wraps were checked for weevils and the weevils removed each week.

In determining the pre-egg-laying period for the local population, weevils collected from the monitor vines each week were placed in a plastic cage containing fresh grape foliage and a strip of sponge (1/8x 3/4 x 5 inches). The adults readily lay their spherical eggs in the cells of the sponge, a technique used by Michael Stimmann and co-workers at UC Davis in their studies of black vine weevil in potted nursery plants. The eggs are thus easily counted beneath a dissecting microscope.

The caged weevils were placed inside a weather station next to the vineyard. Each week a new set of collected beetles was caged in this fashion, and caged weevils from previous weeks received fresh foliage and a fresh sponge strip. Weekly egg-laying records were kept for each week's caged weevils.

In evaluating a possible selective spot treatment to control the weevil, a low-volume, low-pressure weed sprayer equipped with hand wands was used to apply a solution of Sevimol (carbarvl in molasses). The solution (7.5 gallons Sevimol per 250 gallons water) was spot-sprayed onto the vine trunks on May 2, 1984, in an area of the Cabernet vineyard away from the monitor vines. Two weekly pre-treatment and ten weekly post-treatment population estimates were made on 20 control and 20 treatment vines using the monitoring technique described above.

TABLE 1. Results of spot treatment of vine trunks against black vine weevil, 1984

Treatment	Before treatment	After treatment	Change %	Net reduction%
Check	165	283	+172	-
Sevimol	393	182	-53.7	85.2%

*Sevimol applied May 2, 1984. at 2 pt. acre. 3 gal. 100 gal. water dilution.

Accumulation number of weevils for two pre-treatment (April 25 and May 1) and 10 post-treatment counts (May 8 – July 18: counts went to zero after July 18) on 20 vines per treatment.

§Net reduction corrected for pre-treatment population differences between control and treatment vines.

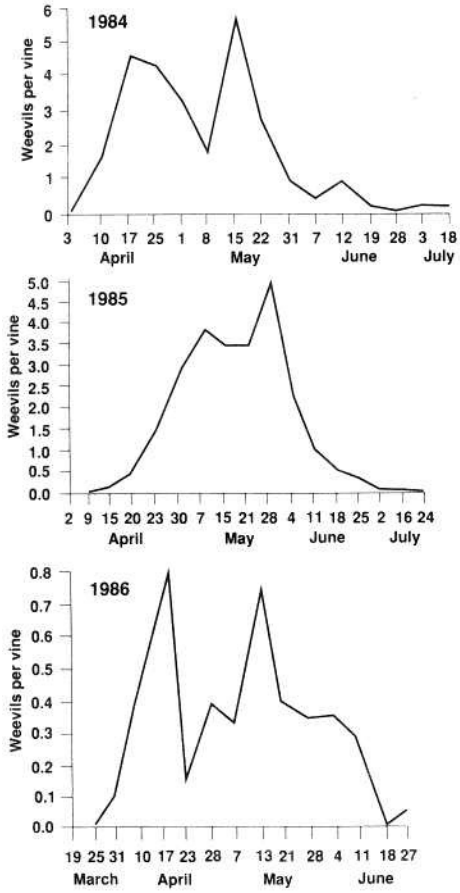


Fig. 1. Adult black vine weevil emergence was generally from early April through May.

Results and discussion

Along the coast, adult emergence generally begins the first week in April and continues through May (fig. 1). Adult activity between the soil and the vine generally peaks in mid-May to late May and tapers off by early July.

During the day the adults hid between the wrap's corrugations and the smooth vine trunk, generally clinging to the wrap as it was removed for inspection. It was easy to count and discard the weevils and replace the wrap. Inspections twice a week from mid-March to late March were effective in detecting first emergence, after which weekly inspections were sufficient to monitor activity.

Based on research reported in the literature, the local weevil population was suspected to have a lengthy pre-egg-laying period. This was confirmed by studies of caged weevils within the vineyard. The season's first newly emerged weevils in mid-April had a pre-egg-laying period of approximately 4 weeks (fig. 2). As a result, egg-laying in the vineyard doesn't begin until 4 weeks after the first emergence, or in mid-May. Weevils emerging later, under warmer conditions, have a shortened pre-egg-laying period. Egg-laying then continues for 6 to 8 weeks (fig. 3). A single adult may lay as many as 500 eggs in the soil.

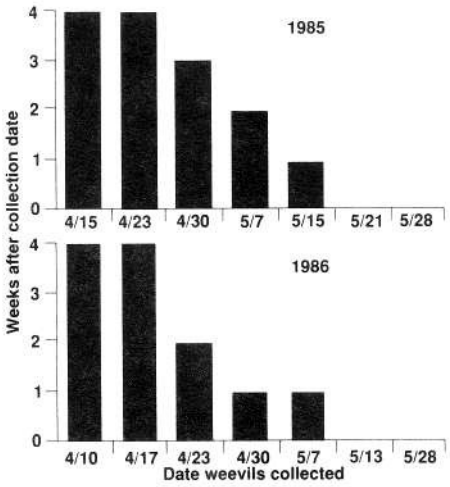


Fig. 2. Early in the season, the time between adult emergence and egg-laying was about 4 weeks but shortened with warmer weather.

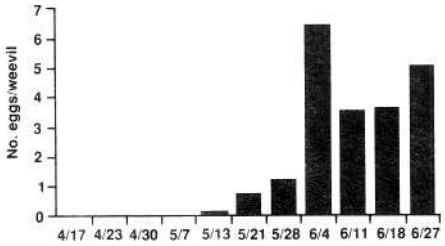


Fig. 3. Egg-laying continued for 6 to 8 weeks after beginning in mid-May.

The eggs hatch into legless white grubs, which feed on the roots. This larval stage requires approximately a year of development before pupation. The pupal stage occurs in the soil during late winter, lasting until adult emergence with rising temperatures in the spring.

Other researchers have investigated biological control of the black vine weevil by parasitic nematodes (see Stimmann et al., California Agriculture, January-February 1985). This technique is currently not economically feasible for large commercial vineyards; it is restricted to smaller operations with container-grown plants, such as nurseries.

Because there is considerable weevil movement between the vine canopy and the soil, control measures targeting the vine trunk and/or soil just around the trunk are most effective in vineyards. Although relatively expensive, a broadcast soil application of Furadan (carbofuran) has been a standard practice in other states. Also, granular insecticides placed on the soil surface at the base of the vine just before emergence may effectively control the adults. However, since most grape growers use pesticide sprayers at some point during the year, this study investigated spot treatment of vine trunks. Sevimol as a trunk spray early in May gave good results, suppressing 85% of newly emerging adult black vine weevils (table 1).

Conclusions

With the simple and accurate monitoring method used in this study, it is possible to determine when black vine weevil emergence starts and peaks each year and to apply a pesticide before the adults lay eggs. Since there is a 2- to 4-week period between adult emergence and egg-laying, and this species has only one generation a year, the grower has a "window" during which to apply a selective pesticide treatment. An application may be directed at the trunk and soil around the trunk, preventing weevil access to vulnerable buds, young shoots, and, later, the flower and young berry clusters. It is crucial to avoid whole-vine foliar treatments, because they are likely to disrupt biological controls on other pest species.

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