

Microbial Insecticides for GRAPE LEAF FOLDER CONTROL

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THE GRAPE LEAF FOLDER, *Desmia funeralis* (Hbn.) Pyralidae: Lepidoptera, requires treatment every year in some Tulare County vineyards. The amount treated varies from a few acres to perhaps a third of the total acreage in the peak years. Although carbaryl (Sevin) gives excellent control, it causes disruptions of natural control factors under some conditions. In an effort to find more innocuous controls, many preparations of *Bacillus thuringiensis* Berliner have been tested against grape leaf folder over the last 13 years. The new high potency strain of *Bt* gives promise of highly effective control. This strain, known as HD-1, was isolated by the U.S.D.A.

Controls with *Bt* preparations in recent years have been as effective as carbaryl or nearly so, but the applications required careful timing to coincide with the beginning of leafrolling activity of the young larvae. Applications directed against larger larvae already in the leaf rolls were largely ineffective.

Dusts and sprays

Both *Bt* dusts and sprays were compared with carbaryl in the fall of 1971 against third brood larvae. Two trials were established as randomized complete blocks with either three or four replications of each treatment. With sprays, adjacent rows were employed for each treatment; with dusts, guard rows separated the treatments. Although complete rows of about 80 vines

were sprayed or dusted, only 20 vines were counted to assess the value of the treatments because of the high numbers of leaf rolls. Both trials were established in early September before the third brood larvae began making leaf rolls. In mid-October after the completion of the third brood, the benefits of each treatment were assessed by counting all the leaf rolls on 20 vines. Each larvae makes at least two leaf rolls during its active feeding stage. Comparisons of number of leaf rolls has proved to be the simplest method of comparing treatments. All recognized leaf rolls are counted including some from the second brood. When the leaf roll count per vine reaches levels of one hundred or more, the numbers counted are probably below the actual number. Based on a number of years of observations, it is believed that Emperor vines of average vigor will tolerate infestations that result in about 200 leaf rolls per vine, although, perhaps not in consecutive years.

First trial

The results of the first trial established on September 2 shows no significant difference between the two *Bt* preparations and Sevin, all applied in the spray form, but all were significantly different from the check. The check was treated on September 21, because of the extremely heavy infestation which would have resulted in defoliation and fruit infestation by the larvae.

Two *Bt* dusts and one spray were compared with Sevin dust in a second trial established on September 8 and 9. Again, the results showed no significant differences between treatments, but all were significantly different from the untreated vines.

The potency of the *Bt* preparations are now stated in International Units rather than spore counts. The rates of *Bt* used varied from 3.3 billion International Units to 7.5 billion per acre. This variation in the amounts used per acre resulted from choosing the middle of the range given by the manufacturer on the label for grape leaf folder control.

Observation of the *Bt* preparations, not reflected in the trial results, indicate that timing is no longer critical. Applications may precede the beginning of leafrolling activity by at least a week and remain effective long enough to kill the larvae. The *Bt* preparations are also effective against larger larvae already in the leaf rolls. The kills are not as rapid as with Sevin, but the larvae cease feeding within hours after application, and the materials were effective at least for five weeks.

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TABLE 1 THIRD BROOD GRAPE LEAF FOLDER CONTROL WITH SPRAYS

Material, per 100 gals., applied Sept. 2	International Units per acre	Gals. per acre	Leaf rolls per vine October 14
1. 1 lb. Sevin 50 W	—	220	43.3 a*
2. 1/4 lb. Dipel	3.96 billion	220	63.3 a
3. 1 lb. Biotrol XK	7.48 billion	220	80.9 a
4. Check †	—	—	434 b

*Means not followed by a common letter are significantly different at the 1% level. Duncan's Multiple Range Test.

†Treated on September 21 with Dipel spray because of extremely heavy infestation.

TABLE 2 THIRD BROOD GRAPE LEAF FOLDER CONTROL WITH DUSTS AND SPRAY

Material, dust or spray	Date applied	International Units per acre	Leaf rolls per vine Oct. 15
1. 2% Dipel dust, 26 lbs. per acre	Sept. 8	3.7 billion	54.2 a*
2. Thuricide, 150 M dust, 22 lbs. per acre	Sept. 8	3.3 billion	86.0 a
3. 10% Sevin dust, 15 lbs. per acre	Sept. 9	—	105 a
4. 3/4 qt. Thuricide HPC per 100, 215 gals/acre	Sept. 9	6.4 billion	118 a
5. Check †	—	—	348 b

*Means not followed by a common letter are significantly different at the 1% level. Duncan's Multiple Range Test.

†Checks treated on Sept. 21 with Dipel spray because of heavy infestation.