## *PRELIMINARY SCREENING OF PESTICIDES FOR CONTROL OF BANANA ROOT BORER,* COSMOPOLIES SORDIDUS *GERMAR (COLEOPTERA: CURCULIONIDAE)*[1]

Banana and plantain crops in Puerto Rico produced an income in 1973 of $22 million. Both are attacked locally by the banana root borer, *Cosmopolites sordidus,* one of the most destructive insect pests attacking plants of the genus *Musa,* to which bananas and plantains belong. It is very difficult to obtain profitable yields from either unless this insect is controlled effectively.

*Cosmopolites sordidus* was introduced to the Island apparently by accident. It was observed first in Vega Alta, Puerto Rico in December 1921.[2] Since then it has spread throughout the local banana-growing areas. The pest also is distributed in most parts of the world where bananas are grown: Central and South America, the West Indies, Africa, Madagascar, southern India, Indonesia, Formosa, Australia, New Zealand, and Polynesia.

*Cosmopolites sordidus* is known commonly as the banana root borer, the banana borer, the banana corm weevil and the banana weevil. In Spanish it is known as "el gorgojo del guineo," "el picudo del guineo," and "el piche del guineo."

All developmental stages of the banana borer can be found simultaneously in an infested banana plantation. Infestation is readily detectable by symptoms expressed on the infested plants. On young plants, larval injury is expressed on the wilted and dead heart leaves. This condition is caused by the feeding larvae which dig tunnels ¼ to ⅓ inches in diameter in the corm, pseudostem and around the growing point. The presence of larval galleries and deteriorated tissue reduces the ability of the plant to translocate water and nutrients causing the leaves to turn yellow, wither and die prematurely. In cases of severe infestation the whole rhizome may be reduced to a blackened mass of rotten tissue. These factors probably are responsible for reduced production of infested plantations where bunches with few and small fruits predominate. An even more important factor is that heavily infested plants fall down easily and fail to produce fruit.

The life cycle, according to Ruiz G.[3] is as follows: The female lays its eggs singly at the base of the pseudostems or on the sheaths of old leaves. The larva after hatching enters the plant through an injury and tunnels into the tissues. The larval stage lasts from 20 to 165 days. The pupal stage

[1] Manuscript submitted to Editorial Board May 22, 1974.

[2] Wolcott, G. N., The insects of Puerto Rico, J. Agr. Univ. P.R., 32 (1-4): 1-975, 1948.

[3] Ruiz G. A., Insecticida Lorsban—efectivo y seguro para el control del picudo negro del banano, Biokemia 21: 13-15, 1973.

lasts from 5 to 8 days, and takes place in a cell in the feeding tunnel. After emergence, the adult remains in its cell for several days, then leaves the plant. The complete life cycle can take place in 30 to 40 days under normal conditions but may take as long as 178 days.

Cultural control[4] and paring and heat sterilization of the rhizome[5] were methods used for many years for the control of this insect in Puerto Rico until chlorinated hydrocarbon insecticides became available. Martorell and Medina[6] showed Aldrin, Dieldrin, and Heptachlor were the most

TABLE 1.—*Evaluation of candidate insecticides for the control of the banana root borer,* ***Cosmopolites sordidus***

| Insecticide | Treatment/plant | Average percentage of plants infested at the end of 6 months |
|---|---|---|
| 1. Dieldrin 15 E.C. | 5 cc | 0.0[1] |
| 2. Dasanit 15 Gr. | 7 g | 4.16 |
| 3. Dasanit 15 Gr. | 14 g | 3.12[2] |
| 4. Disyston 10 Gr. | 7 g | 10.93 |
| 5. Disyston 10 Gr. | 14 g | 6.76 |
| 6. Lannate 90S | ½ g | 12.49 |
| 7. Lannate 90S | 1 g | 8.85 |
| 8. Sevin 80 WP | 1 g | 11.95 |
| 9. Sevin 80 WP | 2 g | 9.37 |
| 10. Parathion 15 WP | 9.1 g | 9.37 |
| 11. Parathoin 15 WP | 18.2 g | 13.01 |
| 12. Furadan 10 Gr. | 10 g | 4.16 |
| 13. Furadan 10 Gr. | 20 g | 0.52[3] |
| 14. Check | | 16.66 |

[1] Significant difference at the 1 percent level over treatments 4, 6, 7, 8, 9, 10, 11 and 14; and at the 5 percent level over treatments 2 and 5.

[2] Significant difference at the 1 percent level over treatment 6, 11 and 14; and at the 5 percent level over treatments 4 and 8.

[3] Significant difference at the 1 percent level over treatments 6, 11 and 14; and at the 5 percent level over treatments 4, 7, 8, 9 and 10.

effective of a number of such insecticides for controlling this pest. Control has been achieved mainly by the use of Aldrin until recently. Because of their extended residual life, persistence in the soil and possible hazard to humans, chlorinated insecticides such as Aldrin are now under investigation by the Environmental Protection Agency, and possibly will be dis-

[4] Seín, F., Jr., Para combatir el gorgojo del plátano. Método de mondar la semilla, Est. Exp. Agr. Univ. P.R., Circular 103, pp. 5–11, 1934.

[5] Seín, F., Jr., Paring and heat sterilization of the corms to eliminate the banana root weevil, *Cosmopolites sordidus* Germar, J. Agr. Univ. P.R. 18 (3): 411–16, 1934.

[6] Unpublished data.

continued. Most growers rotate and/or intercrop plantains with root crops such as yam, cassava, tanier, and others for which these chlorinated hydrocarbon insecticides are not registered. It is thus advisable to evaluate other insecticidal materials for future recommendations.

A preliminary evaluation of insecticides for the control of the banana root borer was started in a field experiment at the Corozal substation December 15, 1970. The statistical design used in the experiment consisted of partially balanced incomplete blocks. There were 14 treatments replicated 4 times with 12 plants per plot. The insecticides tested and their dosages per plant are shown in table 1.

Clean seeds were peeled carefully with sharp knives and machetes to assure cleanliness at time of planting. The insecticides were placed in the planting hole and then mixed with the soil covering the seed.

One month after the seeds were planted and having already germinated the whole experiment was inoculated with two adult weevils per plant to assure prompt infestation. This procedure was repeated once a week for 3 consecutive weeks.

Weevil infestation was checked by uprooting four plants from each plot at intervals of 2, 4 and 6 months. The results at the end of a 6-month period also are shown in table 1.

The statistical analysis of the data indicated that Dieldrin 15 E. C. at 5 cc, Furadan 10 G. at 10 g and Dasanit 15 G. at 14 g per plant, respectively, were most effective. At the end of 6 months the average percentage of infested plants were 0.0, 0.52 and 3.12 percent, respectively, for the above-mentioned treatments. There were no significant differences among the three treatments although each was highly significant over the control and over other treatments.

Additional information was obtained in separate plots with Kepone 5D (2 oz./plot) and Diazinon 14G (8 g/plant). These plots were treated and inoculated in a manner similar to the above-mentioned experiment. At the end of a 6-month period the average percentages of infested plants were 1.04 for Kepone and 23.95 for Diazinon.

Furadan, Kepone and Dasanit appear to be good insecticidal substitutes for Aldrin and Dieldrin on the basis of the results of these experiments. Confirmation experiments are being conducted.

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