

THE SIGNIFICANCE OF 1966 STUDIES OF WIREWORMS,
LIMONIUS SPP., IN WASHINGTON

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The short-lived organophosphorus insecticides, parathion and diazinon, were first recommended for control of wireworms on potatoes in Washington in 1964. Since then, the recommendations have been refined each year as more information becomes available. For 1967, different dates of application are suggested for parathion or diazinon, depending on the amount of insecticide applied and the number of wireworms present.^{1/} I would like to share with you some of the thoughts and facts upon which these recommendations are based.

First, we should review two valuable contributions made by other entomologists. This information was discussed at this conference in previous years, and has been reproduced in detail for the benefit of Washington's potato growers (Onsager, 1965, 1966). The seasonal movements of "wetland" wireworms were studied by Jones and Shirck (1942) who found that wireworms spend the winter deep in the soil. In the spring, the majority will not have moved back up near the soil surface until about May 15. Thus, short-lived organophosphorus insecticides must be applied so treatments remain effective until May 15. Also, when Gibson (1939) studied the relationship between the number of wireworms present and the amount of damage they cause to potatoes, he found that wireworm populations of 0.09 or fewer per square foot of soil surface will cause only a trace of damage. As populations increase to 0.1, 0.2, 0.3, or 0.4 per square foot, damage increases to 4, 15, 22, or 26 percent, respectively. Therefore, if we know the initial wireworm population in a field, we can use Gibson's data to predict the degree of control that must be achieved to insure adequate protection of potatoes.

In recent tests at Yakima, Washington, we prepared tubs containing 14 inches of soil, broadcast granular parathion or diazinon on the surface, and mixed it to a depth of 8 inches. The treated soil was sampled periodically and tested for toxicity to wireworms. Parathion at 4 lb. of actual toxicant/acre gave nearly 100% kill for about 3 weeks; diazinon at 4 lb. of actual toxicant/acre gave nearly 100% kill for about 4 weeks and at 3 lb./acre gave 100% kill for about 2 weeks. About 6 to 7 weeks after application, the 4 lb. of parathion/acre killed only about 50% of the wireworms. The 50% level of kill was reached about 8 weeks after application of 4 lb. of diazinon/acre, and after about 5 weeks for the 3 lb. acre diazinon treatment.

By combining information about the seasonal movements of wireworms in soil, the number of wireworms needed to cause a significant damage, and the time that parathion or diazinon treatments remain effective in soil, we can predict the success that will be obtained from

^{1/} See Potato Insect Calendar, Page 137

applications of either insecticide. For example, if 4 lb. of parathion/acre is applied on April 8, it will kill nearly 100% of the wireworms that move upward into treated soil before about April 30, that is, about 60% of the wireworms present. During the next 2 weeks, another 25% of the wireworms will move up and become exposed, but the kill will drop to about 75%. If the last 10% of the wireworms to enter treated soil suffer only 50% kill you will have killed a total of about 90% of the initial infestation. This is assuming that sound methods of application are followed. With uneven application, shallow incorporation, or low soil moisture, kill will be much lower.

We have applied this information on the decline of effectiveness of insecticides in soil to the results obtained in field experiments during the last 3 years. From our records of initial wireworm populations, the amounts of insecticide applied, and the dates of application, we predicted the degree of success that was expected. Our predictions compared favorably with the actual results obtained.

If wireworm populations in potato fields are less than about 0.1/square foot of soil surface in the spring, tuber damage at harvest time will not exceed about 2%. Therefore, 90% control will suffice for any population that is lower than 1 wireworm/square foot. With increasingly higher populations, an increasingly higher degree of control must be achieved.

A potato grower can increase the effectiveness of parathion or diazinon treatments for control of wireworms in 2 ways: (1) he can apply more insecticide if it is legal to do so, or (2) he can delay application. Both procedures have the same effect - they increase the amount of insecticide that will remain until mid-May when the last few wireworms become exposed to the treatment. Our data show that waiting 2-3 weeks in the spring before treating with parathion or diazinon is equivalent to adding about 1 extra lb. of insecticide/acre. The reverse is also true. However, the maximum registered rates of 6 lb. of parathion or 4 lb. of diazinon/acre should not be exceeded under any circumstances. If wireworms are so numerous that these amounts will not give adequate control, then either delay application or plant potatoes elsewhere.

In the 1967 Potato Insect Calendar, (See Page 137) the recommended dates of application for various rates of parathion or diazinon have been adjusted to the wireworm population. If estimates of the wireworm population are reasonably accurate, the recommended practices should provide adequate protection, usually with a comfortable margin for safety. Significant damage should occur only when insecticide is applied at the lowest rate and the earliest date recommended for a given wireworm population, for example, if 3 lb. of diazinon/acre is applied April 1 to a population of 0.99 wireworms/square foot. In such marginal cases, optimism might not always be rewarded.

References Cited

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