FIELD TESTS OF FOUR METHODS OF APPLYING CHEMICALS FOR CONTROL OF WIREWORMS ON POTATOES [1]

by
H. Harold Toba
Yakima Agricultural Research Laboratory
Agricultural Research, SEA, USDA
Yakima, Washington 98902

A. Application Methods.

Four methods of applying insecticides can be used for control of wireworms on potatoes. However, not all currently registered insecticides may be applied by all four methods. The methods and the insecticides that may be used with each method are as follows:

1. Preplant Broadcast (BCST) - Before planting, the material is broadcast evenly on the soil surface and incorporated into the soil immediately by discing or other suitable means. Granular or emulsifiable formulations of diazinon, fensulfothion (Dasanit), fonofos (Dyfonate), and parathion are registered for such use.

2. At-plant Sidedress (APSD) - At planting time, the material is shanked in narrow bands 3-4 inches to each side of and level with the seed pieces. Only granular formulation of diazinon, fonofos, and phorate (Thimet) are registered.

3. Seed-piece Furrow (FURR) - The insecticide is applied in the seed-piece furrow during the planting operation. Only granular formulations of fonofos and phorate are registered.

4. Postemergence Sidedress (PESD) - The insecticide is applied in a manner similar to at-plant sidedress, but after plant emergence, usually 4-6 weeks after planting. Only the granular formulation of phorate is registered. The user must wait 90 days after treatment before harvesting.

B. Conditions Considered in Wireworm Research.

1. Wireworm Species - The degree of control of wireworms may vary with the susceptibility of the species to insecticides; however, experience at the Yakima Agricultural Research Laboratory indicates that the three economically important species in Washington (Great Basin wireworm, Pacific Coast wireworm, sugarbeet wireworm) are equally susceptible.

2. Soil Type and Irrigation Method - They are generally the same in potato growing areas of Washington, and should have little influence on control.

3. Wireworm Distribution - Distribution can be very spotty in a field, which makes evaluation of control difficult. Although soil sampling prior to a test may show distribution in the test area, the sampling may not indicate whether the distribution is even throughout. Therefore, tests have to be designed with subblocks, and each subblock is further divided so plots can receive different chemical treatments and so there is an untreated check.

4. Evaluation - When chemicals are evaluated on the basis of percent of injured tubers, the analysis may show significant differences among the untreated checks of the various subblocks. This is an indication that wireworm distribution was not uniform. In that case, percent of tubers injured must be converted to percent control, on the basis of the percent injured in the check of the corresponding subblock.

5. Chemical Properties of a Compound - These may have a profound effect on the performance of a compound in controlling wireworms since they relate to persistance of biological activity in the soil.

C. Test of Application Methods with Dyfonate.

A summary of four field tests in which fonofos (as Dyfonate) was included revealed that at-plant sidedress application was inferior to broadcast, furrow, and postemergence sidedress applications (Table 1). However, in individual tests, there was a relationship between application method and percent of injured tubers in the untreated check (an indication of the density of wireworm populations). When the percent of injured tubers was low, all four methods controlled wireworms equally; however, when the percent was moderate to high, at-plant sidedress application was inferior to the other methods.

Table 1. Summary of percent control, (based on percent of potato tubers injured by wireworms) obtained when Dyfonate was applied by 4 methods.

Location	% Control (% injured)				% Injured
and year	BCST	APSD	FURR	PESD	in check
Pasco 76	96	61	76	67	59
Sunnyside 77	98	64	90	77	54
Pasco 78	94	46	90	94	38
Hermiston 78	95	92	92	72	18
Average[1]	96 A	66 B	87 A	78 AB	

[1] Means followed by the same letter are not significantly different at P=0.05.

D. Persistence of Biological Activity of Insecticides in Soil.

Persistence of biological activity of the chemical is governed largely by three factors: microbial decomposition, soil adsorption, and solubility. Of these, microbial decomposition has the major influence on the rate of degradation of the chemical in the soil. However, availability of the chemical is determined by soil adsorption and insecticide solubility, which are related inversely. The half-life of insecticides in soil has been found to be as follows: fonofos (as Dyfonate) 7 weeks, fensulfothion (as Dasanit) 6-7 weeks, diasinon 4-5 weeks, and phorate 3-4 weeks.

E. Test of Application Methods with Dyfonate, Dasanit, Diazinon, and Phorate.

A summary of field tests with these four compounds showed that at-plant sidedress gave the least control though the differences were not significant (Table 2). Control with Dasanit was generally poorer than control with Dyfonate, whatever the application method. Control with diazinon and phorate by broadcast, at-plant sidedress, and furrow application was generally poorer than control with Dyfonate, which may be a reflection of persistence.

However, postemergence sidedress application of diazinon and phorate gave more control than similar applications of Dyfonate and Dasanit. This may reflect the greater solubility of these compounds, which would make them more available at the time of highest wireworm activity.

Table 2. Summary of percent control (based on percent of potato tubers injured by wireworms) after 4 insecticides were applied by 4 methods.

Compound	No. Tests	% Control (% injured) BCST	APSD	FURR	PESD
Dyfonate	4	96	66	87	78
Dasanit	3	68	64	79	63
Diazinon	2	70	65	68	89
Phorate	2	72	71	67	94
Average		76	67	75	81

Footnotes

1 This paper reports the results of research only. Mention of a pesticide in this paper does not constitute a recommendation for use by the USDA nor does it imply registration under FIFRA as amended.