SEASONAL CONTROL OF INSECTS ON BURLEY TOBACCO WITH SOIL-APPLIED INSECTICIDES.

1 TOBACCO FLEA BEETLES

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Soil-applied insecticidal treatments were evaluated for control of the tobacco flea beetle, Epitrix hirtipennis (Melsheimer), in season-long field tests on burley tobacco during 1970, 1971, and 1972. Disulfoton at 4 lb Al/acre gave good control for 4 to 7 weeks depending on the year, while carbofuran at 3 lb Al/acre gave several weeks longer control. Applications of carbofuran at 3 lb Al/acre were as effective as the 4 lb rate and gave nearly season-long control. Of the other materials tested aldicarb at 10 lb Al/acre and phorate at 4 lb Al/acre were the most effective.

The tobacco flea beetle, Epitrix hirtipennis (Melsheimer), is considered by the growers of Kentucky to be the most damaging pest attacking burley tobacco. Jewett (3) showed that there are at least 3 generations of flea beetles per year in Kentucky; the first-brood adults appear in the middle of June, second-brood adults during the last week of July, and the third-brood adults which overwinter appear the first week of September. If a material could be applied at the time of transplanting in late May or early June which would reduce the number of first- and second-brood adults, season-long control might be achieved.

The effectiveness of soil-applied insecticides in controlling flea beetles has been reported on flue-cured but not burley tobacco. Dominick (1, 2) in Virginia and Mistic and Smith (5, 6, 7) in North Carolina reported on the control of flea beetles from the use of such materials. The cultural practices used for burley tobacco differ from those used for flue-cured tobacco, and these differences could influence the effectiveness of soil-applied insecticides. Burley tobacco fields are left flat and not bedded up as are flue-cured tobacco fields, making band treatments impractical, and few burley tobacco farmers have the equipment for infurrow application or side-dressing. Burley tobacco is also left in the field to ripen during the whole growing season (from 75 to 110 days), and the stalk is cut with all the leaves still attached, rather than the leaves being primed as for flue-cured tobacco. Most flea beetles are found on the lower third of burley plants on the undersides of the leaves, and most farmers or custom applicators do not have spray equipment with the drop nozzles necessary to treat these lower leaves. For these reasons, a broadcast soil treatment of systemic insecticides is the most practical method for the control of the tobacco flea beetle on burley tobacco.

This paper summarizes our field investigations with a number of materials applied to the soil for flea beetle control during 1970, 1971 and 1972. Comparisons of the control obtained with the two most effective materials, carbofuran and disulfoton, at different locations during the tobacco growing season are especially emphasized.

METHODS AND MATERIALS

All materials were applied as granular formulations with the exception of methomyl which was sprayed on the soil. After the insecticides were broadcast on the soil with a cyclone seeder, they were rototilled or disked in to a depth of ca. 3 in. Burley tobacco, 'Kentucky 12' in 1970 and 'Kentucky 14' in 1971, was transplanted in the plots the day after or the same day that the insecticides were applied. The soil was a silt loam at all locations.

All materials tested were applied the first week of June, except for one test in 1970 (Table 4) which was started during the first week of July. All treatments were replicated 3 to 4 times in a randomized block design. Five plants in each of the 2 middle rows in each replicate were examined for live flea beetles, and counts were made on the same plants throughout the test. The entire plant was examined for flea beetles during the tests. Counts were not made in plots of selected treatments because of lack of time and lack of effectiveness of these materials in two of the tests (Tables 1 and 2).

Plots at South Farm, University of Kentucky, Lexington, were 6 rows wide (21') by 20.7' long (1/100 acre), 26' long (1/80 acre), or 27' long (1/75 acre), Tables 1, 2 and 3, respectively. In the tests conducted at Spindletop Farm, University of Kentucky, Lexington, the plots were 8 rows wide (28') by 22.2' long (1/70 acre) or 4 rows wide (14') by 24' long (1/120 acre), Tables 4 and 5, respectively. Tests conducted at
the Western Kentucky Substation, University of Kentucky, Princeton, were on plots 3 rows wide (21") by 30' long (1 1/2 acre) (Table 6.)

Square-root transformations (1) of numbers of live flea beetles were subjected to analysis of variance, and Duncan's multiple range test was applied to test the means. After statistical analysis, the square roots were converted back to actual counts for presentation in the tables.

The insecticides evaluated were carbofuran, aldicarb, methomyl, phorate, disulfoton, dimethoate, and the following proprietary compounds: 

- Cythion (P.P-Diethyl cyclic propylene ester of phosphonothioic acid)
- Cyclone (2-Diethoxyphosphinylimino)-1, 4-dithioline
- Dasanit (0,0-Diethyl O-[(methylsulfone)-phenyl] phosphorothioate)
- Dyfonate (0-Ethyl-S-phenylethylthiophosphorodithioate)
- M 3454 (0,0-Diethyl 0-(3,5,6-trichloro-2-pyridyl) phosphorothioate)
- Orthene (0,0-Dimethyl acetylphosphorothioate)
- Vydate (S-Methyl-1-di( methylcarbamoyl)-N-[ (methylcarbamoxy)oxyl] thioformimidate)

RESULTS AND DISCUSSION

Carbofuran was as effective as 3 lb as at 4 lb AI/acre and was much more effective than disulfoton at 4 lb AI/acre in controlling adult flea beetles in 1970 at South Farm (Table 1). Aldicarb at 10 lb AI/acre was not as effective as the 2 carbofuran treatments but was more effective than any of the other treatments. In counts on the 50th day after application, the numbers of live flea beetles on the carbofuran-treated plants were fairly high but dropped drastically in counts on the 67th day. The reason for this sudden increase and decline is not known, but it may have been caused by the dry weather for 2 weeks before the 59th day counts and the two heavy rainfalls (0.69 and 1.05 in.) which fell between the 59 and 67 day counts. It is not known whether the rainfall affected soil moisture or other effects of dry conditions may have on the effectiveness of carbofuran. It is possible that the rainfall facilitated the uptake of carbofuran by the plants, thus increasing its effectiveness.

The flea beetle populations in the untreated checks were lower in 1971 than in 1970, but carbofuran at 3 and 6 lb AI/acre were again highly effective (Table 2). Dasanit at 8, phorate at 4 and 8, and disulfoton at 4 lb AI/acre were as effective as carbofuran 30 days after application, but all except phorate and dasanit at 8 lb AI/acre were less effective for the rest of the season. Both carbofuran treatments gave good control for 71 days, but phorate and dasanit had less residual effectiveness. In a similar test in 1972 (Table 3), carbofuran at 3 lb AI/acre was the most effective material tested, with disulfoton being the next most effective material. Vydate was applied at 1/4 lb AI/acre 3 days prior to the 72-day counts. Populations in 1972 were even lower than in 1971.

In other tests in 1970 and 1971 at Spindletop Farm in Lexington and in 1972 at the Substation at Princeton, Kentucky, carbofuran at 3 or 4 lb AI/acre was superior to disulfoton at 4 or 8 lb AI/acre. In the 1970 test, carbofuran at 4 lb AI/acre gave highly effective control for 19 days and substantial control for the duration of the treatment (Table 4). Similar results were found in 1971, with carbofuran at 4 lb AI/acre being highly effective for 67 days while disulfoton at the same rate gave good control for 28 days (Table 5). In the test at the Substation in 1972, carbofuran at 3 lb AI/acre was highly effective against adult flea beetles for about 2 months, while disulfoton at 4 lb

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AI/acre was effective for about 2 weeks less (Table 6).

Disulfoton already has label acceptance for use on tobacco at transplant time and is now being recommended as a broadcast soil treatment for control of flea beetles in Kentucky. Of all the materials tested that do or do not have label clearance on tobacco, carbofuran has the greatest potential for use by burley tobacco growers. At 3 lb AI/acre, it gives better and longer control of flea beetles than does disulfoton at 4 lb AI/acre, and it would be priced in a range acceptable to and economical for the burley farmer. Residue studies are in progress to determine whether such a treatment will leave excessive residues in the cured tobacco leaf. Carbofuran soil treatments of carbofuran at 4 and 8 lb AI/acre did not cause an off-flavor in smoking evaluations of cigarettes.

LITERATURE CITED

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