prepared would be fumigated and left undisturbed for two weeks. After the period allowed for fumigation, the soil would need to be disked or harrowed to eliminate the weeds before the seed are planted, although the fumigant would inhibit some plant growth. Lange[1] reports that factors such as: " . . . soil temperature, soil type, soil texture, absorption, composition, compactness, and soil moisture, amount of fumigant used, correlation of time of treatment with the known behavior of the organism to be killed, the type of seal used following treatment and other factors" influence the effectiveness of treatments. The type, texture, composition, and compactness of the soil and the disposition of the cover crops are suspected as factors that need to be studied with regard to effective fumigation of the marl soils of South Florida.

[1] LANGE, W. HARRY. New development in soil insecticides. *Agr. Chem.* 2 (2): 20-23. 68-71. 1947.

The stronger dosage concentrations of DDT applied during the month of May provided measures of wireworm control. Those applications made just before or at the time the tubers were planted were comparatively ineffective. For marl soils, indications are that (1) heavier dosages such as 70 pounds of 50% DDT are required, and (2) it is slow acting, requiring weeks or even months to effect control.

SUMMARY

Partial control of wireworms was obtained by spraying soil with DDT about 6 months before planting potatoes, by treating soil with benzene hexachloride or by adding the chemical to the fertilizer and by fumigating with dichloropropane-dichloropropylene, or ethylene dibromide. The more promising results were obtained with the fumigants and benzene hexachloride.

THE USE OF SOME ORGANIC INSECTICIDES IN THE CONTROL OF EARWORMS ATTACKING SWEET CORN

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Ever since the oil + pyrethrum ear treatment has been in use for the control of earworms in sweetcorn, work has been in progress to find an easier but equally effective means of control. This paper discusses some of the newer organic insecticides and their possible use as controls for the earworms.

FIRST TEST

In the fall of 1946, 2 ear treatments, a 3 percent DDT dust and an oil + 0.2 percent pyrethrum injection were compared in a 2 acres block of Ioana sweetcorn. The dust plots received 4 applications directly to the silk, the first when the silks were well out and before pollination had taken place, and the others at 3 day intervals. The oil series received only 1 treatment when silks had wilted. There was a very heavy infestation of the fall armyworm, *Laphygma frugiperda* (A. & S.) amounting to 95 percent of the total worm population. The remaining 5 percent were the corn earworm, *Heliothis armigera* (Hbn.). This is not the usual proportion of species, but both of these worms commonly attack corn in Florida.

The entire field was dusted 1 time for budworm, using 3 percent DDT distributed with a crank duster when the corn was 12

to 15 inches high. It received 2 subsequent applications of 3 percent DDT dust applied with a puff duster when the tassels were forming.

The DDT killed small instar larvae of the fall armyworm, but was ineffective against 5th instar and mature fall armyworms. In fact, mature larvae were rolled in the 3 percent DDT dust and they pupated and produced normal moths.

Results.—There was practically no difference between the oil and dust treatments in the percentage of marketable ears produced, or in the number of absolutely worm free. The percentage of marketable ears for the dust treated plots was 96.4 percent as compared to 94.5 percent for the oil treated silks. The percentage of worm free ears for the dust treated was 85.9 percent and 83.3 percent for the oil treated silks.

when oiled, the tip 1 inch to 1 1/2 inch was not filled.

Second Test

Truckers hybrid sweetcorn was planted in the spring of 1947. A number of organic insecticidal sprays and dusts were compared with mineral oil + 0.2 percent pyrethrum. The data are given in Table 2. Practically all of the larvae attacking the ears in this test were the corn earworm, *Heliothis armigera* (Hbn.) All materials with the exception of mineral oil + 0.2 percent pyrethrum were applied 4 times at 3 day intervals. The oil + pyrethrum was applied once as an injection in the ear. All applications were directed on the ear. None of the materials affected the pollination of the ears.

Results.—So far as the number of marketable ears produced was concerned, the 3

TABLE 1

A Comparison of 2 Silk Treatments for the Control of Corn Earworms

	No. of Marketable Ears			Percent Worm Free	Percent Marketable	Wt. of Marketable ears lbs.
	Slight damage, tip only	No Damage	Total			
DDT—3% Dust	215	1761	2046	85.9	96.4	914
Mineral oil & 0.2% pyrethrum	242	1803	2164	83.3	94.5	917

The biggest difference was in the number of worms entering the ears through the husks at the base or side of the ear (fall armyworms). There was much less damage to the dust treated ears, which is a rather important factor when we consider the number of ears discarded because of sideworms.

There was no difference in the size or weights of the ears from the 2 treatments. The weight of the dust treated ears was 914 pounds, and the oil-treated 917 pounds.

However, dust-treated ears filled completely to the tip, indicating no damage from the treatment. Oil-treated ears which received the application at the proper time filled to the tips; if the silk was immature

percent DDT dust and 3 percent Methoxy DDT dust were oustanding even though the 3 percent DDT just missed being significantly better than the oil + pyrethrum. The highest percentage of worm-free ears was for the mineral oil + pyrethrum, Methoxy DDT 3 percent dust and DDT 3 percent dust. The percentage of sideworm injury was greatly reduced with the DDT and Methoxy DDT dust.

Of the materials tested Methoxy DDT was outstanding as a budworm control. Dusts were more effective than sprays.

Conclusions

DDT 3 percent dust and methoxy DDT 3 percent dust are good controls for the

corn earworm. DDT is not effective against the fall armyworm whereas methoxy DDT is. Since methoxy DDT is so effective as a budworm control when applied as a dust to leaf whorls, it should be considered as a control measure for those worms (corn earworm and fall armyworm) attacking sweet corn. A dust program of 4 applications spaced 3 days apart starting at the time the silks emerge should produce a high percentage of marketable ears.

Sprays were less effective than dusts of the same material.

Since these must be direct applications to the silk of the ears, airplane dusting is generally ineffective. Drifting of dust has proven of little value commercially.

As a final precaution, the Bureau of Entomology and Plant Quarantine still considers crop remains dusted with DDT unsafe to feed to livestock. This is true for the other organic materials. In this connection, the Bureau is guided in its policy by the findings of the pharmacologists, toxicologists, and workers in related fields.

TABLE 2

THE CONTROL OF EARWORMS* BY THE USE OF ORGANIC INSECTICIDES

Treatment	Source	Percent Marketable	Percent Worm Free	Percent free of Sideworm Infestation
1. Check		13.9	10.7	67.8
2. Mineral oil + 0.2% pyrethrin	John Powell	52.1	43.4	79.4
3. Syndeet 1-400 Spray	U. S. Rubber	44.0	11.9	87.0
4. Chlordane 50W 2 lb-100 spray	Velsicol	28.3	9.4	74.6
5. DDT 50W 3lb-100 spray	Dupont	43.0	20.4	85.0
6. Piperonyl butoxide 1-800 spray	Dodge & Olcott	19.7	4.1	75.0
7. Piperonyl cyclohexenone 1-800 spray	Dodge & Olcott	11.8	2.1	67.8
8. DDT 3% dust	Dupont	65.6	38.5	93.8
9. Chlordane 5% dust	Dow	34.4	10.0	88.2
10. Methoxy DDT 3% dust	Dupont	66.3	40.2	94.6
11. Methoxy DDT 2 lb.-100 spray	Dupont	27.1	8.6	74.1
12. Toxaphene 10% dust	Hercules	47.3	25.2	96.9
Difference necessary for significance		13.7	12.9	12.4

*Heliothis armigera (Hbn.)