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RETARDING EFFECT OF SOME INSECTICIDES ON CABBAGE SEEDLINGS

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Numerous observations have been published during the past few years concerning the toxic effects of organic insecticides on various plants. Since soil insecticides are increasingly coming into use, such observations deal not only with injuries resulting from the contact of insecticides with the above-ground parts of plants, but also with the adverse chemical behavior of insecticides in the soil.

The most common concern is in regard to burning, defoliating, or killing of plants. To less extent, the more subtle effects of poisons upon plants are observed and reported. DDT is known for stunting some varieties of bush lima beans (9) and for dwarfing some varieties of tomatoes and cucurbits (1, 4, 10); parathion is reported to have delayed "foliation" of some ornamental plants (7).

As to soil behavior of insecticides, it has been noted that DDT may suppress the growth of strawberry plants (2, 3), that BHC and parathion in the soil can retard sprouting and reduce growth of Irish potatoes (8), and that BHC may delay germination of seed and growth of cantaloupe plants (6). In experiments with cotton, octamethyl pyrophosphoramid has caused stunting of plants growing both in nutrient solution and in soil (5). It appears that stunting or similar defects may be inflicted upon certain plants by some organic insecticides.

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Information of this nature regarding cabbage seedlings is lacking. In this paper, therefore, are presented a few observations made in a preliminary inquiry into the effect of insecticides upon the growth of cabbage seedlings. The fall season of 1952 was favorable for investigating this problem because the insect populations remained low, and it was possible to obtain accurate figures on both the weights and the numbers of seedlings grown not only in treated plots but also in those which were not treated with insecticides.

The cabbage seedbed plots for this experiment were planted on October 31, 1952. Each plot consisted of two 20-foot sections in 2-drill-row seedbeds. The cabbage variety was Medium Copenhagen Resistant. The treatments were randomized, and four replications of each were made. The following insecticides were used: DDT alone, DDT with parathion, chlordane alone, chlordane with parathion, and parathion alone. All were emulsions. They were applied with a three-gallon hand sprayer, at the following rates of actual insecticide per acre: DDT alone—9.6 ozs.; chlordane alone—19.2 ozs.; and parathion alone —9.6 ozs. In the mixed applications of DDT or chlordane with parathion, each material was used at half the above rates. Three applications were made at the following intervals: 17 days after planting, two weeks later, and one week after the second. The plants were pulled two days after the third application.

Number and weight of large plants drawn from three feet of seedbed in each plot were used to determine the effect of the insecticides on plant growth. The pulled plants were sorted into "Large" and "Small." "Large" plants were those generally preferred by growers, namely, over 4-5 inches tall; "Small" plants were ones growers usually discard when they have a choice, or ones which are 3-4 inches tall or smaller. Since the grower's interest is in large seedlings, analysis of the results was made only in regard to this group.

A comparison of the average number and weight of large seedlings in four replicates of each treatment, Table 1, leads to the following conclusions:

1. The non-treated plots produced a greater number of large plants than the treated plots. The differences were highly significant.

2. The plots treated with DDT emulsion alone produced significantly more large seedlings than the plots treated with parathion alone.

3. Plots treated with a mixture of DDT and parathion emulsions produced significantly more large seedlings than the plots treated with parathion emulsion alone.

4. There were no significant differences between the numbers of large seedlings grown in plots receiving any two of the remaining treatments. Those pairs of treatments are:

DDT against DDT with parathion
DDT against chlordane
DDT against chlordane with parathion
Chlordane against DDT with parathion
Chlordane against chlordane with parathion
Chlordane against parathion
DDT with parathion against chlordane with parathion
Chlordane with parathion against parathion

Table 1.—Yield of Large Cabbage Seedlings Grown in Plots Treated with Different Insecticides. Each Treatment Replicated Four Times.

Treatment		Number	Weight in Grams
DDT		641	3287
Chlordane		613	3179
DDT with Parathion		635	3275
Chlordane with Parathion		620	3299
Parathion		593	2876
Check		710	3784
LSD	19:1	37.2	220.6
	99:1	51.4	305.1

Similar relationships were observed in the figures for the weights of large seedlings. Those relationships are summarized as follows:

1. The non-treated plots outproduced by weight of large seedlings all plots receiving any of the insecticides singly or in combination. The differences were highly significant.

2. The plots treated with DDT emulsion alone or with DDT and parathion emulsion outproduced by weight of large seedlings the plots treated with parathion alone. The differences were highly significant.

3. The plots treated with chlordane, both with and without parathion, outproduced by weight of large seedlings the plots treated with parathion alone. In the case of chlordane alone against parathion alone, the difference in weight was significant; in the case of chlordane with parathion against parathion alone, the difference in weight was highly significant.

4. There were no significant differences between the weights of large seedlings grown in plots receiving any of the remaining treatments.

Since the emulsions used in this experiment had a retarding effect on cabbage seedlings, it is important to know which ingredient was responsible: the insecticide, the solvent, or the emulsifying agent. In the preliminary trials reported here, an attempt to answer this question was not made. Further experiments are planned with a view of obtaining some information on that question.

Summary

1. Numerically, or by weight, plots of cabbage seedlings treated with DDT, chlordane, and parathion emulsions produced less "large" seedlings than plots which were not treated with any insecticides during the period of seedling development, suggesting a growth-retarding effect of the insecticides.

2. Among the three emulsions, DDT seemed to have the least retarding effect on seedling development, chlordane emulsion next, and parathion emulsion the greatest.

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FUNGICIDES FOR THE CONTROL OF EARLY BLIGHT ON CELERY

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Industrial expansion of agricultural research during the last decade has made available to Experiment Station pathologists many new synthetic organic fungicides for testing against a varied group of fungi affecting a wide range of crops. Many excellent fungicides are on the market today. Nevertheless, it is the aim of all research personnel concerned with pesticides to obtain a material that has a greater fungicidal potential, costs less, is easier to apply and has greater residual value. These are the basic reasons for an existing program which involves the testing and evaluation of pesticides.

Before presenting experimental results of the use of fungicides for the control of early blight on celery, it seems advisable to mention factors which influence the development of this disease. At no time during the past five years has the disease become severe during December or January. The question immediately arises, "why has the disease failed to develop during these months?"

It is well known that such factors as inoculum, temperature, susceptible host, moisture and many others influence the development of the disease. However, a review of the data concerning these factors showed moisture to be the most important. It seems apparent, therefore, that the number of fungicide applications necessary to control early blight is largely determined by available moisture. At best, only a tentative spray schedule for disease control can be suggested. The responsibility of adjusting a disease control program to conform with existing conditions is the individual grower's problem.

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During the past two years, thirty-five fungicidal formulations were compared for the control of *Cercospora apii* Fr., the organism causing early blight of celery. Data reported herein are the results of several experiments conducted during that period.

Methods and Results

Celery seedlings, of the variety Abbott & Cobb Early Fortune, were transplanted from seedbeds to the field on November 20, 1951. The planting was divided into six blocks, with each block being subdivided into plots. A plot consisted of three rows, 40 feet long with 30 inch spacing. Each was randomized and replicated six times, and data were obtained from the center row. Cultural methods, including fertilizer and irrigation practices, were representative of those in the area. Insecticides were applied in combination with the fungicides, as needed. Beginning on December 7, 1951 fungicides were applied with a power sprayer and continued weekly thereafter for a period of fifteen weeks. Three Tee Jet, fan-shaped nozzles with an opening of 6503 and a 50 mesh screen were used per row. These were so placed that one sprayed directly over the row and one on either side at a 90° angle. The side nozzles were suspended on a flexible rubber hose approximately 3 inches above the soil line. One hundred gallons of spray mixture was applied per acre.

Disease incidence was rated on a scale of 1 through 7, with 1 indicating little or no disease and 7 a severe infestation. For example, a treatment rated 4 had a considerable number of lesions on the lower half of the plant and a few lesions on the top foliage. Three ratings were averaged for the final disease score. Materials, formulae, disease ratings, yield and number of stalks infected with *Sclerotinia sclerotiorum* (Lib.) Mass. are presented in Table 1.