Substitutes for Vegetable Insecticides


Broadly speaking, a substitute insecticide is one that has come into use since Pearl Harbor to take the place of material formerly recommended. It may or may not be as effective as the insecticide that it replaces. The development of substitutes is a wartime measure made necessary by the scarcity of materials or equipment used in their manufacture or by labor shortages.

Perhaps most conspicuous in the vegetable-insecticide field is the scarcity of imported materials, such as derris and other rotenone-bearing plants. Prior to the war the principal sources of derris were the Malay States and the Dutch East Indies. Cubé and related species from South America were far from sufficient for our needs, although in the past year the situation has improved somewhat through increased importation. Owing to labor shortages the gathering of the roots must compete with the collection of natural rubber and other strategic materials.

There is also a scarcity of materials due to the requirements of the armed forces or of war industries. Pyrethrum, for example, is needed by the Army, and copper, arsenic, mercury, and lead are also channeled for military purposes. A chemical used in the manufacture of an insecticide, such as phenothiazine, may also be needed in the manufacture of munitions. Even if the ingredients of insecticides are not of military importance, labor and machines may not be available for their quantity production. Furthermore, the commercial production of promising organic chemicals requiring complicated procedures and skilled workers may be prevented by war priorities. All these factors have compelled us to seek substitute materials and simplified procedures in insect control.

The most likely substitutes for use on vegetable crops are: (1) Calcium arsenate for lead arsenate on potatoes, tomatoes, and eggplants; (2) within limits, cryolite for rotenone on crucifers and beans; (3) nicotine for some of the rotenone in mixtures used for the control of certain aphids; (4) calcium arsenate and cryolite for rotenone on cucurbits; (5) dusting sulfur instead of lime-sulfur against the potato psyllid; (6) sodium fluosilicate for Paris green in cutworm bait; and (7) dichloroethyl ether for mercury salts in control of cabbage maggots.

Other promising substitutes, if manufacturing facilities are available, include phenothiazine for rotenone in bean beetle and cabbage worm control, and dinitrocyclohexylphenol for pyrethrum against the potato leafhopper, especially on beans. 

The necessity of finding substitute insecticides has resulted in the resurrection of old remedies, such as the use of calcium arsenate-gypsum mixture instead of rotenone dusts for the control of the cucumber beetle, and of strong soap sprays against cabbage worms.

This situation has also forced entomologists to recommend alternates or remedies about which some data are on hand but not normally sufficient to warrant practical recommendations. It has been necessary to solve problems hurriedly—to attempt in one growing season what would normally be spread over several seasons. Results of such accelerated programs may not be very conclusive unless we are careful to compare results with workers in other states or areas. In this connection, I wonder if we should ever issue a recommendation without consulting the entomologists, not only in our own state, but in neighboring states as well. When possible, we should give alternatives. Progress in economic entomology would be greatly facilitated if small groups of states could pool experiences and agree on recommendations. For example, one of the most generally recommended substitutes for the arsenicals and rotenone mixtures is cryolite, but dosages recommended by different investigators vary widely. Probably the greatest contributions being made by the Committee on Coordination of Entomology with the War Effort are the fostering of an exchange of ideas and the encouragement of cooperation in the field.

The war emergency warrants what may

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be called trial, or tentative, recommendations based on favorable results, even though they are not checked so carefully as in normal times. For example, three years' experimentation with a dust containing 1 per cent of dinitroorthocyclohexylphenol (DN) and 50 per cent of sulfur, plus diluent, has given good control of the potato leafhopper on beans and potatoes. Without large-scale field trials we should normally hesitate to recommend this mixture, but in view of the shortage of pyrethrum we must now give growers any information that we have. The use of dichloroethyl ether against cabbage maggots has also been recommended without the usual amount of trial.

Again, present knowledge of its effectiveness would warrant the recommendation of at least one new compound, and possibly others, for the control of important species, but the difficulty of obtaining priority for manufacture makes it advisable to suggest its use. I refer to phenothiazine, which is useful as a stomach poison for the control of the Mexican bean beetle and cabbage worms, but is difficult to obtain in sufficient quantities for veterinary requirements.

An important saving of materials can be made by attention to methods of application. In applying dusts for the control of the Mexican bean beetle on green beans, the use of hoods behind the duster makes possible a 50 per cent reduction in dosage. All of us know that in our experimental work we usually obtain a higher degree of control than we can expect many growers to get. Care in making applications cannot be overemphasized. Our lack of efficient machinery for many purposes indicates a conspicuous need for much research in the construction of spraying and dusting machines. It is our task to show the engineer what we need, so that he can develop new machines.

Dusts may sometimes be substituted for sprays because less time, labor, and machinery are required in their application. If the increased tonnage required does not interfere with the war effort and satisfactory pest control is obtained, such a change may be beneficial. For example, state workers have learned that in Wyoming sulfur dusts are equal or superior to lime-sulfur and wettable-sulfur sprays for the control of the potato psyllid, and effect a saving in time and money.

Sodium fluosilicate is widely recommended as a substitute for arsenicals in poisoned baits for cutworms, mole crickets, and grasshoppers, but the material is not always available locally. In this connection, it appears that molasses is unnecessary in poisoned baits, and this material, of high value during a war period, can be omitted from baits. It is our duty as economic entomologists to aid in the distribution of necessary insecticides, and to explain to dealers the uses of materials that are unfamiliar to them.

Our story would be incomplete if we did not mention some of the shortcomings of our attempts to provide substitutes. Pyrethrum, which was recommended as a substitute for rotenone for control of the cabbage looper and the imported cabbage worm, was not always effective; during the past season its failure against these insects was reported in certain valleys in southern California. In some instances a dust containing 0.5 per cent of rotenone did not control the European corn borer on sweet corn. Again, in an effort to make available supplies go further, and possibly owing to a misconception of the value of additives to bolster the rotenone content, some processors sold dusts with such a low percentage of rotenone that they failed to control the Mexican bean beetle. If a ceiling is placed on rotenone content, a floor also appears to be necessary.

On the whole, the situation has been better than many of us anticipated, and the entomologists, manufacturers, distributors, and dealers have all earned commendation. The alertness of the investigators who have been searching for new insecticides is now appreciated, and the accomplishments may well be a further stimulus to continued diligent search for new and better remedies.

The value of a program of continuous testing of new materials on a wide variety of insects and plants is emphasized at this time, even though there may be no apparent need for a new insecticide to control the insect being used in the test.

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**LITERATURE CITED**