

New Insecticides

effectiveness and limitations of chlorinated hydrocarbon insecticides not yet fully determined

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Of all the new chlorinated hydrocarbon insecticides, DDT has been the one investigated most thoroughly—and despite a vast amount of research, all of its limitations have not been ascertained.

In a large measure most of the other chlorinated hydrocarbons have many characteristics in common with DDT. Some may be safer than DDT in one way or another, but in general the same precautions as used with DDT should be followed. Like DDT they are effective against certain insects but not others, and some are effective against pests that are not controlled by DDT. Each has its advantages and disadvantages, but none serves as a cure-all.

Benzene hexachloride, also known as BHC, deserves some special mention. Its use is limited to a great extent by its odor. This material is composed of a number of compounds which have the same chemical composition but different physical properties. These are called isomers. The one having the greatest insecticidal activity is the gamma isomer which has relatively little odor. Products consisting largely of this isomer have been developed and have extended somewhat the use of this material as a household and dooryard insecticide.

Like DDT, benzene hexachloride accumulates in the soil and relatively light applications of benzene hexachloride containing a low gamma isomer content are likely to be picked up by the plant and cause vegetables and even fruits to have an off taste. It is an effective insecticide to use against earwigs and many other garden pests, but if a vegetable garden is planted in an area that has been over-treated, there is a real danger that the produce grown may not be fit to eat.

Benzene hexachloride also is likely to exhibit a greater plant toxicity than is DDT. Benzene hexachloride has unfortunately also shown considerably more toxicity than DDT to certain beneficial hemipterious predators, particularly on cotton.

Method of Insecticide Entry

The chlorinated hydrocarbons kill in several ways. All kill by contact and they serve as stomach poisons if they are eaten. Under certain circumstances some will also act as fumigants. The different meth-

ods of entering insects influence the effectiveness of the several insecticides when applied under different conditions. Insecticides having a fumigant action are likely to prove more effective when used in a greenhouse where there is little air movement than when applied out of doors.

Benzene hexachloride exerts a considerable fumigant action, and is closely followed by chlordane. Toxaphene has a slight fumigant effect while DDT has none. Thus a minimum dosage of benzene hexachloride necessary to give an adequate kill in a greenhouse would have to be increased if the same results are to be obtained under out-of-door conditions. On the other hand DDT, which has no fumigant action, should be equally effective at the same dosage both in and out of doors.

Conclusions

The most serious situations are likely to develop where the chlorinated hydrocarbon insecticides are used out of doors. Continued and frequent applications may result in their accumulation in the soil to a point where serious injury to plants will result.

Vegetables grown in areas treated with benzene hexachloride may develop an off taste.

Where applications of chlorinated hydrocarbons have been applied to ornamentals and other garden plants, there is always the danger of serious aphid, scale, red spider or other infestation developing. This is most likely to occur where such insecticides as DDT or DDD are applied.

Within certain limits the problems created are apt to increase in severity as the concentration of the active ingredients in the sprays or dusts is increased. Over-application of these insecticides should be avoided. However, they should not be applied at less than a minimum dosage that will insure satisfactory control.

In spraying a garden, only those plants that are infested should be treated and if possible an insecticide known to be effective against the particular pest concerned should be used.

Effectiveness of treatment can often be insured by using a combination of insecticides. For example, DDT can be used with either sulfur, parathion, organic

phosphates, benzene hexachloride or nicotine. A serious infestation of an unsuspected pest can frequently be avoided by the selection of a proper combination of insecticides.

Some plants that are susceptible to injury by DDT at higher dosages are stimulated where the insecticide is applied at a very low dosage.

Contamination of feed stuffs should be avoided because at relatively small dosages on feed, DDT, benzene hexachloride and some related compounds are secreted in the milk of dairy animals. Treatment of warehouses and structures housing animals should be applied with caution. Further, heavy deposits from residual sprays may result in the killing of pets such as cats.

Any particular chlorinated hydrocarbon is not effective against all insects and before treatment is applied, the species involved should be determined and an insecticide known to be effective selected. Because an insecticide is effective against one species, one cannot take for granted that it will be effective against a closely related species. Also, the fact that it kills one stage of an insect is no assurance that it is equally effective against all stages.

Precautions Necessary

Because no tolerance for insecticidal residue has been placed on a great majority of food products, every possible precaution should be taken to avoid contaminating materials intended for human consumption. Careless application should not be tolerated.

The selecting out of resistant strains of insects offers a serious problem. It is a matter that must be recognized by all who are interested in these insecticides. The performance of the insecticides must be carefully followed and the development of resistance by an insect detected as soon as possible. Every effort should be made to avoid placing blame for failure to control to the development of resistance when the real cause may be due to poor application or poor formulation or both. If resistance actually occurs, then other methods of control should be used or developed. It certainly would be unwise to continue increasing the dosage of an insecticide in an attempt to obtain

Continued on page 12

RAISINS

Continued from page 3

operation of selecting, grasping and cutting a grape cluster.

These exceptions are the focal points in the entire procedure and so additional analysis was undertaken to simplify them.

An analysis by means of an Operator Chart indicated that the bulk of the work in the operation of selecting, grasping and cutting, is now done by one hand while the picker's other hand remains idle for a good part of the time.

Cutting Device

A cutting device is being developed which will balance the work load equally between the hands and keep them both busy during the entire operation.

The method of picking grapes using the cutting device is to be identical with that of using the knife except for the cutting operation. In the cutting operation, a cluster is isolated and grasped in each hand. Each cluster is held in the cupped hand, supported by the lower three fingers. With each cluster thus supported, the thumb and index finger place the cutting device about each stem and cut the stem. The cut clusters are then deposited on the tray below the vine.

Factors such as the end of the season and insufficient time to train pickers in the use of the cutting device made it impossible to collect quantitative data on its efficiency. Additional data will need to be collected in the next harvest season.

From past experience in converting one-handed jobs to two-handed jobs, an increase in output of 30%-40% can be expected with such a change.

Recommendations

The adoption of the Tray Carrier is recommended as standard equipment to be supplied and maintained by the grower. Standardization of method and usage may be achieved if the grower supplies and maintains these trays and eliminates the continued use of the picking pan, supplied by the picker.

Trays should be placed in the aisles on both sides of the rows so that a picker can work down one row and up the next.

Working conditions in the very hot fields could be improved by a minimum remedy which would result in greater productivity—if the case of steel mills can be used as a guide—which is the provision of cold drinking water and salt-tablet dispensers in the main aisles of the fields. The cost is insignificant and the resulting increased productivity would compensate the grower by getting the crop off the vine more quickly.

The use of two-handed cutting-devices for cutting grape clusters needs more

study. Before specific recommendations can be made more investigations should be conducted on: 1, the Turning operations; 2, the purpose and need for Bundling or Rolling; and 3, the possibilities of combining Bundling and Boxing and of the methods of Boxing.

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BEANS

Continued from page 10

been conspicuous because of the chlorotic foliage in contrast to the dark green of the normal plants. By September 9th, this appearance was reversed as the normal plants were yellowed from maturity and the treated area was comparatively darker in color because of delay in maturity.

Zinc deficiency symptoms frequently are markedly accentuated in old corral sites within little leaf areas. In other areas this deficiency is often found only in corral sites or Indian camps. Trees in such areas have shown striking response to zinc.

Deficiency Suspected

Zinc deficiency has been suspected a few times in annual plants in San Joaquin County, but prior to the treatments on these beans, there had been no known recorded case of response to zinc applications in any California annual. Soils in which fruit and nut trees will become worthless if not supplied with zinc usually are excellent for a wide variety of annual crop plants, including those known to develop deficiency symptoms elsewhere.

The bean field under observation adjoins an orchard district where little leaf is not known to be a problem.

No abnormality in the previous bean crops had been noted, although it had been observed that previous plantings of barley lodged badly in the corral area and in some years were crowded out by excessive weed growth.

Beans had been planted on this field since 1941, with the exception of 1944 and 1945 when the field was planted to grain.

The history of the land is known back to 1850 when the barn and corral were constructed. In 1900 the barn and corrals were removed and until 1940 the land was cropped to hay, grain and pasture. It was levelled for irrigation in 1940.

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NUTRITION

Continued from page 8

an allowance of 18% seems wise, especially if the roughage is of low quality. Probably under most conditions a 16% or 18% mixture will be adequate. When the hay is largely nonlegume the higher level should probably be chosen. When good alfalfa hay is fed a mixture of farm-grown grains furnishing about 12% protein is probably adequate.

Calcium and Phosphorus

Milk is a rich source of both calcium and phosphorus. One pound of milk contains, on the average, 0.54 gm. of calcium and 0.45 gm. of phosphorus. Experimental work has shown that high-producing cows can not assimilate enough calcium and phosphorus to meet their needs during the early part of lactation. The needs for milk production are met by drawing minerals from the bones. This loss is made up during the lactation period and during the dry period. The heavy drain on the calcium and phosphorus reserves necessitates a liberal feed supply.

Considerable work has shown that furnishing approximately double the amounts of calcium and phosphorus in the milk is sufficient to cover the needs. This allowance is in addition to the maintenance requirement of 10 grams per 1,000 pounds.

In a number of cases accurate estimates of the nutritional requirements must await further research.

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INSECTICIDES

Continued from page 6

control. Such a practice is likely to be hazardous, because the disadvantages associated with the chlorinated hydrocarbons frequently become more pronounced as the amounts applied are increased.

With these new insecticides there are many problems that have as yet not been completely solved. They must be used with a degree of caution, and the most good, with resultant satisfaction, can be obtained if they are applied only where needed, and then at a concentration no higher than necessary to produce control.

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