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Protecting Pollinating Insects from Insecticides and Herbicides

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In the past untold losses to beneficial insects have been caused by the improper use of most of the old insecticides. The wide use of the more powerful new pesticides and other agricultural chemicals in recent years has re-emphasized the potential dangers to the pollinating insects so necessary for the production of most of our seed and fruit crops.

By the term "pollinating insects" we refer not only to the honeybees, but to bumblebees and the many hundreds of solitary ground and other bees and flies which are of material help in the pollenizing of Oregon crops. All of these are equally subject to poisoning by chemicals.

Although there is still much to be learned relative to the dangers accompanying the uses of the various new insecticides and herbicides, studies have been carried far enough to show that some of these are less dangerous than lead arsenate, while others are just as dangerous or even more so when improperly applied. In most cases the danger of losses from poisoning by chemicals can be greatly reduced and in many cases eliminated by judicious application.

Information contained in this Circular of Information is based on research work carried on at other experiment stations.

General Precautions

- ▶ The insecticide whenever possible should be applied in such a way and at such a time that none of it will fall on open blossoms on which bees will be working. One should avoid allowing dust to drift onto fence rows or nearby fields in which bees may be working.
- ▶ When it is necessary to apply insecticides which will fall upon blossoms on which bees will be working, nearby beekeepers should be notified so they can take steps to prevent losses.
- ▶ In the case of some insecticides, such as DDT, there seems to be a minimum loss of bees if the insecticide is applied during the time of day when the bees are not actually working. There is less danger to pollinating insects if dust is applied in very early morning or late evening.

Insecticides

Aldrin

Eckert has found aldrin to be about five times as toxic to bees as chlordane but with less fumigant properties. Todd reports from work in Utah that it is about as toxic as benzene hexachloride and chlordane but "likely to do less damage than parathion or dieldrin."

Aramite

Aramite is a new chemical being used mostly for mite control. Webster, quoting from Menke, states that "Aramite has a low order of toxicity to honeybees as compared with organic phosphates."

Benzene Hexachloride (BHC "666")

Research in Utah has shown that benzene hexachloride acts on the bees both as a contact and as a stomach poison. It probably has a fumigating action also.

Chlordane

Research work both in Utah and California has shown that when chlordane is applied to fields in which bees are working, serious losses occur (50 to 80 per cent). Apparently chlordane does not repel bees as may be true with DDT. Bees visiting flowers up to 48 hours or more following application of chlordane may be killed. Eckert has shown that chlordane should not be applied in buildings where either bees or bee combs are in storage. Apparently there is some toxic effect even upon empty combs which are later placed in beehives. Chlordane seems to be far more dangerous to bees than is DDT.

Cryolite

Knowlton reports that Cryolite is seriously toxic to bees but appears to be less dangerous than calcium or lead arsenate.

DDD ("D-3," "Rothane," "TDE")

This new insecticide seems to be far less toxic to bees than Parathion, Chlordane or benzene hexachloride. Laboratory tests also indicate that DDD is less toxic than DDT.

DDT

In general, the increased use of DDT, where it has replaced the more dangerous lead arsenate, has resulted in reducing losses of pollinating insects. It has been found in Utah and California, however, that under certain conditions many of these insects are killed in the field by DDT. The loss is ten times as great when the application is made during the time the bees are on the blossoms as when the bees are not there. For this reason it is highly important to make the applications early in the morning or during weather conditions when bees are not flying. It is far better, if at all possible, to make the application before blossoms open in the field. It is also essential to prevent the drifting of dusts or sprays to other nearby blossoms or blossoms mixed with the crop on which bees are working.

We have found that for some undetermined reason bees are absent from the field dusted with DDT for several days. This may be due to some repelling influence of DDT or to the killing of the field force. After a few days they reappear in normal numbers. In Utah it was found that the control of Lygus bugs in alfalfa with properly applied DDT increased honey production as well as seed production. DDT often is a decided benefit to the beekeeper, as well as to the seed producer, by the resulting improvement in the amount of bloom.

In both California and Utah, where considerable research has been done on the effects of insecticides on pollinating insects, the recommendations are against the use of 10 per cent DDT when there is bloom in the field which is attractive to bees. Five per cent DDT is known to cause some loss in field bees, but when applied during a period when bees are not working the flowers the loss is not generally serious. Our observations would indicate injudicious use such as late morning dusting is more serious than the use of higher per cents of DDT.

Dieldrin

Todd says "----we should fear dieldrin more than any of the other new insecticides." From Utah comes the report that bees continue to die for 5 days after exposure to dieldrin. The brood apparently is not affected.

EPN

This compound acts largely as a stomach poison and contact insecticide. It is a dangerous insecticide where bees are concerned. Eckert considers it more dangerous than DDT, BHC and chlordane as bees are more apt to bring poisoned pollen into the hive where it will later kill both brood and hive bees.

Lead Arsenate

In the past, lead arsenate has caused more loss to beekeepers and has poisoned more of our solitary bees and bumblebees than any other insecticide. It will probably continue to be used in many cases in the future. Lead arsenate kills bees in two different ways. First, field bees may be killed as they take poisoned nectar from open blossoms which have recently been dusted or sprayed with lead arsenate. Second, this poison often gets on the pollen and is carried to the hives by the bees where it is a potential danger to the brood for months or even years later. The only general rule to follow is to prevent arsenate of lead from falling upon blossoms frequented by bees. The information on lead arsenate will apply, in general, to any other arsenical insecticides.

Lindane

Studies in Utah indicate lindane is more toxic to bees than chlordane but slightly less toxic than aldrin.

Methoxychlor

From limited tests methoxychlor appears to be less toxic to bees than most insecticides. It is highly toxic to bees when they are forced to crawl on surfaces dusted with methoxychlor.

Nicotine Dusts

Nicotine dusts are undoubtedly far less dangerous to pollinators than the arsenicals and probably have some repelling effect, according to Knowlton.

Parathion (3422)

From Utah and California come reports that the new insecticide, parathion, is extremely toxic to bees, as well as to many other insects. It acts both as a stomach and as a contact poison. Since it is so extremely toxic to bees, it should be applied with considerable caution.

Pyrethrum

No losses from Pyrethrum are known to have occurred in Oregon, but it should be used with caution. It is probably not as toxic as the arsenicals.

Rotenone

Although toxic to bees, Rotenone seems to be far less dangerous than the arsenicals. We have had no positive evidence of losses from it in Oregon.

Sabadilla

Knowlton of Utah reports that Sabadilla is toxic to bees for several hours following its application, as well as at the time of application.

Tetraethyl Pyrophosphate (TEPP)

Knowlton reports that Tetraethyl pyrophosphate is very toxic to bees but loses its toxicity within 24 hours.

Toxaphene

Toxaphene has proven to be one of the least toxic to bees but should be used with due cautions. There is a growing tendency to use it when possible as a substitute for the more toxic chemicals when crops attractive to bees are in bloom. It also should be applied, however, when the bees are not in the field.

Herbicides

2,4-D

There is still some doubt about the effect of 2,4-D on bees. Reports from New Zealand indicate there is no damage from 2,4-D while reports from Sweden and Denmark (Am. Bee Journal 91:463) indicate extensive poisoning to bees when the herbicide is applied to blossoming plants on which bees are working.

When injudiciously applied over large areas 2,4-D may materially decrease the available numbers of secondary honey plants upon which both honeybees and wild bees depend for food to build up their population for effective pollination purposes.

Recent References of Interest

- (1) "Bees and the Newer Insecticides" by George F. Knowlton. Mimeograph Series No. 738, March 1948. Utah State Agricultural College.
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- (3) "Determining Toxicity of Agricultural Chemicals to Honey Bees" by J. E. Eckert. Jr. Ec. Ent. Vol. 42, pp. 261-265.
- (4) "New Insecticides. What is Their Effect on Bees When Applied to Flowering Alfalfa?" by G. F. Knowlton, W. P. Nye, F. V. Lieberman, F. E. Todd, G. E. Bohart. Farm and Home Science, Utah Agricultural Experiment Station, Vol. 11, March 1950, pp. 1, 18-20.
- (5) "Chemical Weed Killers and the Beekeeping Industry" by T. Palmer-Jones, New Zealand Journal of Agriculture, Vol. 80, 129-132.
- (6) "New Insecticides: Their Use, Limitations and Hazards to Human Health" by R. L. Webster. Station Cir. 64 (1951), Washington Agric. Exp. Sta., Pullman, Washington.
- (7) "New Insecticides are Disastrous to Bees" by E. E. Leppik, American Bee Journal 91:462-463, 1951.