Agnote

677

No. K12

July 1996

Agdex No: 681

ISSN No: 0157-8243

Pesticides - Hazard to Honey Bees

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Pesticides which are used to kill insect pests on crops can be dangerous to honey bees as well as to other beneficial insects. Bee poisoning is a major problem for beekeepers world wide.

Growers recognise that many crops need to be pollinated in order to set fruit and that bees are often the most effective pollinators. It is in the farmers' best interest to co-operate with beekeepers to minimise the killing of bees. Beekeepers should be notified well in advance of an intention to spray toxic chemicals on crops where, or near where, bees are foraging. This enables the hives to be moved or covered until the pesticides become less hazardous to bees. Pesticides that are known to cause the least losses should be selected whenever possible.

The problem arises from the need to spray pests attacking crops in flower. Most pesticides will kill bees when applied directly to them. It is often possible to modify farming practices and remove the need to spray when flowers are present.

For example, both defoliators on cucurbits and red banded thrips on mangoes should be controlled prior to the flowering period of these crops. Caterpillars in mango inflorescences are frequently in low numbers and do not need control at that time. However, when mango caterpillars are in high numbers or the fruit set is low, growers may decide to control these pests. Chemicals which are less hazardous to bees such as formulations of Bacillus thuringiensis are ideally suited to these situations and should be chosen.

It should also be noted that the flowers attracting bees to a crop may not be those of the crop itself. Spraying the crop will contaminate most flowers in the vicinity. Before spraying it is wise to observe bee activity.

The formulation and application of pesticides will affect the degree of hazard to bees. Insecticides applied as dusts are almost always more hazardous than sprays. Spray

applications produced from wettable powders are often more dangerous to bees than emulsifiable or water soluble concentrate formulations. The more diluted a spray solution, the less hazardous it becomes and fine sprays are less toxic than coarse sprays. Pesticides applied over large areas or repeated several times are likely to cause heavier bee kills. If applied during the day, aerial sprays are more hazardous than ground applications.

PESTICIDE EFFECTS

The most serious problems to honey bee colonies occur when hives are directly sprayed with an insecticide or are covered by spray drift. However, bees commonly forage within a radius of 1-3 kilometres from the hive and can extend this distance to 11 km when food is scarce.

Field bees foraging at the time of spraying are directly contacted by the spray and , depending on the amount of chemical applied and the acute toxicity, a varying number of bees can be killed. If the pesticide is not fast acting, some will be carried back to the hive where it will be spread on contact and by feeding. Depending on the toxicity, other bees in the hive will be killed. Pesticides with some persistence can remain on plant surfaces for several days and can kill bees which alight. Bees that are not killed immediately can carry residues to the hive, as well as contaminated nectar and pollen.

SYMPTOMS OF POISONED BEES

(a) Large numbers of dead bees of the same age at the front of a hive. Ants can carry them away, so unless hives are inspected regularly, the effect can be missed.

The kill of bees can be classified as:

<100 per day - normal die off rate
200-400 per day - low kill
500-900 per day - moderate kill
>1000 per day - high kill

(b) Disappearance of large numbers of field bees.

(c) Aggressiveness and abnormal behaviour

(d) Slowing down of activity. Bees poisoned with carbaryl can take 2-3 days to die and appear inactive as if cold. These should not be confused with crawler bees which are incapable of flight.

(e) Dead or dying newly emerged worker bees. This can result from having been fed pollen contaminated with carbaryl, the toxic activity of which has been recorded even 6 months after collection.

(f) Dead brood in front of hives. If no disease is obvious, pesticides can be suspected.

(g) Poor egg laying patterns or abnormal supercedure of queens.

CATEGORIES OF PESTICIDES

The risk that pesticides pose to bees can be classified into four groups based on an overall effect. This is determined by three properties; direct toxicity to bees actually sprayed, persistence of the activity of residues to bees and time taken to kill bees. Other factors will influence the outcome such as temperature, amount of chemical applied to the crop, and the percentage of field bees foraging in the sprayed area.

Little information is available on some of the newer synthetic pyrethroids and until data suggests there is little risk, their use must be viewed with caution.

Some fungicides and herbicides can also affect bees and their use near foraging bees should be avoided.

GENERAL RECOMMENDATIONS

1. Both growers and beekeepers should exchange pollination contracts in writing, indicating their respective obligations.

2. Hives should be placed outside and upwind of the crop.

3. Flowering crops particularly cucurbits should not be sprayed unless absolutely necessary.

4. Whenever possible, use pesticides which are less hazardous to bees.

5. Growers should advise the beekeepers before spraying to enable the beekeeper to shift or close his hives.

6. Beekeepers should also contact neighbouring properties, leaving a contact phone number, for warnings of off-farm pesticide applications.

7. Any pesticide posing a threat to bees should be sprayed in the evening when bees are not foraging.

8. Observe bee activity before spraying.

9. Carbaryl is particularly dangerous to bees and should not be sprayed on flowering crops. Its residues remain active for 7-12 days on plants and contaminated pollen stored in the hive can kill bees after 6 months.

PESTICIDE RISK TO BEES

	Risk Rating	Chemicals	Remarks
1	High risk to bees foraging even 10 hours after spraying	Carbaryl, chlorpyrifos, diazinon, dimethoate, omethoate, methomyl, fenthion, methamidophos, methidathion, monochrotophos.	These should never be sprayed on flowering crops especially if bees are active and the crop requires pollination.
2	Moderate risk with some losses expected 10 hours after spraying	Acephate, demeton-s-methyl	
3	Some risk with low chance of losing bees 3-5 hours after spraying	Endosulfan, dicofol, pirimicarb, petroleum oils, most pyrethroid chemicals, trichlorfon.	There is little risk of losing bees if these chemicals are sprayed in the evening when foraging has ceased.
4	No risk even if sprayed over foraging bees	*Bacillus thuringiensis*, propargite, oxythioquinox	

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