

Effects of Pesticides on Bees

laboratory and field tests study the effects of agricultural pesticides on highly important pollinators of state's crops

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Important losses to beekeepers—and to agriculture in general—have been caused by certain pesticides appearing on the market during the last few years.

Several thousand Californians—representing more than 500,000 colonies of honey bees worth several million dollars—are actively engaged in apiculture. In addition, the honey bees have been estimated to be far more valuable as pollinators of agricultural crops than as a source of honey and beeswax.

In the past, certain agricultural pesticides have caused severe losses to the apiculture industry but those losses have been reduced by legislation and by corrective measures. However, a great number of new pesticides—many of them highly toxic to bees—have appeared on the market.

To study the pesticide problem, research studies have been in progress since 1950. Precision laboratory test methods were devised for studying, primarily, the contact effect of pesticide dusts on honey bees, and—during the past eight years—more than 100 pesticides and nearly 100 pesticide diluents have been compared. In addition to laboratory tests, over 25 large scale field tests were made during the past five seasons with commercial

applications of pesticides in blooming seed alfalfa fields.

Results of the laboratory and field tests—showing the relative toxicity of many of the new pesticides to honey bees—are given in the table on the next page.

The toxicity rating of each material was based on the normal dosage recommended for field application.

The materials included in Groups 1, 2 and 3 are primarily contact poisons, but they may also act as stomach poisons to bees; therefore, special care must be taken to avoid contaminating water or food available to bees. That same problem may exist with Dylox and Systox in Group 4. In the presence of water Dylox changes to DDVP, a more toxic compound. Arsenicals are stomach poisons to honey bees and may be stored in the colonies, causing continued killing of brood and bees. Some of the chemicals not only kill many bees but also disorganize surviving bees to a point where they neglect their duties to such an extent that death of the brood results.

The materials in Group 2, although highly toxic, can be used around honey bees because of certain characteristics they have. TEPP and Phosdrin have such short residual activity they kill only the



Placing cages of bees in an alfalfa field where spray will be applied.

Counting honey bees in an alfalfa field. All bees visiting blossoms or flying under the pole and between the strings are recorded, while the counter walks 60' in one minute, covering 200 square feet.



bees contacted at treatment time; thus these materials are safe to use when the bees are not present in the field. Thimet and Di-Syston are used as seed and soil treatments and therefore do not present a problem. Sabadilla is used in such low dosages, particularly on citrus, that it presents no problem. Malathion is inconsistent in toxicity to bees. Many thousand acres of blooming alfalfa have been treated with malathion without serious loss to colonies, but occasionally heavy losses do occur, particularly under extremely high temperatures. Thus, its use around bees is questionable.

Recent observations indicate that bee losses are low when highly toxic materials are used no closer than one quarter mile to colonies or blooming fields. When pesticides toxic to honey bees are used in the field, they should be applied in the early morning or late evening, when the fewest bees are present. Pesticides should not be applied over colonies when the bees are hanging outside as they may do during hot weather. The exact time of day for treatment depends on many vari-

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ables—such as crop attractiveness, time of year, weather conditions, behavior of bees, and so forth—and must be determined for each particular case.

In California, a problem with pesticides and bees may exist:

In alfalfa and other legume seed crops; In cotton throughout the season because of attractiveness of blossoms and of nectaries on the leaves;

In melons, cantaloupes, cucumbers, squash, and similar crops, when in bloom;

In vegetable-seed crops when in bloom;

In blooming cut-flower and flower-seed crops;

In citrus and deciduous fruit crops during blooming;

In cover crops when in bloom under orchard trees, a condition that may be corrected by cutting or disking cover crops before treating the orchard with pesticides;

In crops—and weeds in fields, along ditches, and so forth—in bloom near non-blooming crops that are receiving pesticide treatments;

In pastures or other crops in bloom near apiaries;

At water tanks, puddles, ponds, streams, irrigation water, and other places where bees might drink; and, at mixing and disposal areas where there is pesticide waste material.

Collecting honey bees from the colony for laboratory and field insecticide toxicity studies.



Toxicity of Pesticides to Honey Bees			
Group 1			
Highly toxic materials that should not be used when there is a possibility of poisoning bees at treatment time or within a few days thereafter			
Aldrin	DDVP	DNOSBP (DN-211)	Lindane
BHC	Diazinon	EPN*	Metacide*
Calcium Arsenate*	Dibrom	Guthion*	Methyl Parathion*
Chlordane	Dicaphon	Heptachlor	Parathion ^{1,2}
Chlorfenthion	Dieldrin ¹	Lead Arsenate*	Sevin ¹
Group 2			
Highly toxic materials that can be used around bees when certain precautions are used			
Di-Syston*	Phosdrin ^{1,2}	TEPP*	
Malathion ¹	Sabadilla	Thimet*	
Group 3			
Moderately toxic materials that can be used around bees if timing and dosage are correct, but should not be applied directly on the bees in the field or at the colonies			
Chlorobenzilate	DDT ¹	Korlan	Thiodan ¹
Co-Ral	Endrin ¹	Parthane	Toxaphene ¹
Cryolite	Ethion (Nialate) ¹	Tartar Emetic	Trithion ¹
DDD (TDE)	Isodrin	Tedion	
Group 4			
Relatively nontoxic materials that can be used around bees			
Allethrin	Dilan	Methoxychlor	Ryania
Aramite	DMC	Mitox	Sulfur
Bordeaux Mixture	DNOCHP (DN-111)	Monuron (CMU)	Sulphenone
Captan ²	Dylox (Dipterex) ¹	Nabam ²	Systox (Demeton)* ¹
Copper Oxochloride	Ferbam ²	Neotran	Thiram ²
Sulfate	Genite 923	Nicotine	Zineb ²
Copper Sulfate (Monohydrated)	IPC ²	OMPA	Ziram ²
Cuprous Oxide ²	Karathane	Ovex (Ovotran)	2,4-D* ²
Cunilate	Kelthane ¹	Phostex	2,4,5-T* ²
Delnav ¹	Maneb ²	Pyrethrins	
	MCP ²	Rotenone	

* Permit required by State regulation for most uses of these materials. Permit for 2,4-D and 2,4,5-T as weed treatments but not as hormone sprays on citrus.
¹ These materials field and laboratory tested; all others just laboratory tested. Further field testing may change the group location of some of the materials.
² Data obtained from other research workers.

Pesticides are essential and frequently needed to produce profitable crops, as are the pollinating activities of honey bees. Therefore, cooperation of farmer, apiculturist and the pest control industry is needed to reduce the hazard of pesticide toxicity to honey bees to the minimum.

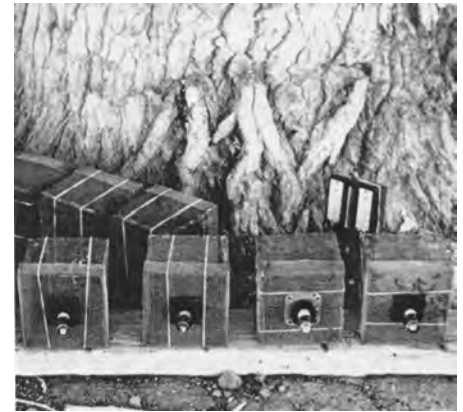
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Cages of treated bees being held for mortality or survival records.



Screen trays for collecting dead bees which appear in front of the colonies.

