Studies on the Relative Toxicity of some Insecticides to Adults of *Dacus cucurbitae* (Coquillett) when used in Bait sprays*

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Among the various pests which attack cucurbitaceous crops in India, the melon fly, *Dacus cucurbitae* (Coquillett) is by far the most common and most destructive. In Kerala the damage it causes to these crops is considerable. Often it becomes absolutely difficult to obtain fruits which do not show blemishes caused by this insect.

Being a boring insect, it is very difficult to obtain an efficient control of it. Among the various methods used, application of bait sprays has proved effective for the control of the fruit flies. Several insecticides have been found to be useful in bait sprays. These include tartar emetic (Friend, 1949), sodium fluosilicate (Hepburn and Bishop, 1950), parathion (Steiner, 1952), D;D T, Methoxychlor (Peretz and Plant, 1953) and malathion (Frezal, 1960 and Gupta, 1960). The present paper reports the results of laboratory studies conducted to compare the effectiveness of D D T, BHC, parathion, malathion, dipterex and sevin when used in bait sprays, against adults of *Dacus cucurbitae*. The residual toxicity of these insecticides to the flies under field conditions also has been ascertained.

Materials and Methods

The insecticides used in the studies were DDT (Technical grade from Mysore Insecticides), BHC (Technical grade of ICI), parathion (46,7 % EC of Bayer), malathion (Technical of Cynamid India Ltd), dipterex (80 % SP of Bayer) and Sevin (50 % WP of Union Carbide India Ltd).

The bait sprays were prepared by adding 1 % yeast protein to emulsions of the insecticides. Emulsions were prepared from technical grades in the case of D D T, BHC and malathion, and from proprietory emulsifiable concentrates in the case of parathion.

Five graded concentrations of each insecticide were used in the experiments to assess the relative toxicity of the insecticides, while a standard concentration of each was used for assessing the residual effect in the field. Details of these are

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given in Figures 3 and 4 respectively. The yeast protein used was 'Bacto–Yeast Extract' manufactured by DIFCO Laboratories, U. S. A, 'Teepol' supplied by M/s Shell Chemicals was used as the emulsifier wherever necessary.

For obtaining the adult flies required in these studies, snake gourd fruits attacked by *D. cucurbitae* were collected from the field and adults reared out in the laboratory. The flies were exposed to the bait fluids in testing cages. These cages were open cylinders of wiregauze, 10 cm tall and 9 cm in diameter.

Two methods were followed to compare the toxicity of insecticides in bait sprays. In the first method fresh snake gourd leaves were sprayed on their under surface at 2 cc of the bait fluid on each leaf, under a Potter's spraying tower. The sprayed leaf was immediately placed spread out on the top opening of the testing cage containing tbe adult flies, with the sprayed surface facing inwards The leaf was kept in position by pressing a petri dish over it. (See Fig. 1). In the second method, twenty uniform-sized droplets of the bait fluid were put inside a clear petri dish from the tip of a glass rod. The petri dish with the droplets was inverted over the top opening of the test cage containing the flies (Fig. 2).

For assessing residual effect of the bait sprays under field conditions, they were sprayed on snake gourd leaves with an atomizer, giving a thorough coverage of the leaves. The sprayed leaves were periodically collected and again sprayed with 1% yeast solution in the laboratory and exposed to the fruit flies in the testing cages. The spraying of the leaves again with the yeast solution was done to stimulate the flies to feed from the surface of the treated leaves.

In all the experiments, the surface on which the bait sprays were applied was exposed at the top of the testing cages, because of the habit of the fruit flies spending a major part of their time on horizontal surfaces (Ebeling, 1953).

Results were assessed by observing the mortality among the flies exposed to the baits in 12-24 hours. The laboratory studies were made under the room temperature and humidity,

Results and Discussion

The log dose-probit mortality relationships between the different insecticides and adults of the fruit flies observed 12 hrs after exposure to the bait deposits applied by spraying the bait fluid as a fine spray or as droplets are represented in Fig. 3. It will be seen that parathion and dipterex are the most highly toxic insecticides to the adult flies followed in the descending order by malathion, BHC, sevin and DDT, Parathion and dipterex appear nearly equitoxic as also BHC and sevin. DDT appears to be far less toxic than the rest of the insecticides.

With every insecticide it is seen that the droplets are more effective in killing the flies than the fine sprays. This may be because the flies are able to ingest a larger dose of the bait fluid from droplets than from the fluid baitsapplied on the substrate surface as a fine spray. This observation also suggests that the toxic effect of the insecticide in bait sprays to the fruit flies may be more due to the ingestion of the poison and consequent stomach action rather than contact action alone. So in practical field control of the flies also, it may be more advantageous to apply the bait fluid as a coarse spray rather than as a fine spray.

Fig. 4. represents the survival of adult flies on snake gourd leaves sprayed with the baits containing different insecticides, when the flies are exposed for 24 hours at 1 hour, 3 days and 10 days after spraying. It will be observed that no flies survive when they are exposed for 24 hours to leaves sprayed with any of these insecticides 1 hour before exposure. But when the flies are confined on the leaves 3 days after the application of the bait sprays, the least survival (20%) is noted on the leaves with malathion and the highest survival (86.7%) on the leaves sprayed with DDT. Less than 50% survival is observed on residues of sevin (43.4%), parathion (33.4%) and diptere^{x} (33.4%). Survival of flies on BHC residue is 63.4%. Thus it is interesting to note that DDT which is ordinarily considered more residual than malathion, dipterex, parathion and BHC appears to be the least residual. This phenomenon may be due to the translocation of the residue away from the leaf surface. DDT is highly lipid–soluble and the cuticle of the snake gourd leaf has a high wax content. So the apparent loss of toxicity of DDT to the flies may be attributed to its being translocated within the cuticular wax.

It is also observed that none of the six insecticides persists on the leaves to any significant extent up to 10 days after application.

Application of bait sprays containing DDT and BHC causes scorching on leaves.

Summary

The relative toxicity of six insecticides in bait sprays, containing 1% yeasc protein as attractant, was ascertained by exposing the flies, (a) to snake gourd leaves sprayed with the bait fluid, and (b) to droplets of the bait fluid applied on glass surface.

The order of relative toxicity of the insecticides in both cases was parathion = dipterex > malathion > Sevin = BHC > DDT.

Coarse droplets of the baits were found to be more effective in killing the flies than the fine sprays.

The relative residual toxicity of the bait sprays 3 days after application on snake gourd leaves was in the order, malathion 0.1% > parathion 0.025% = dipterex 0 2% > sevin 0.1% > BHC 0.2% > DDT 0.2%. None of the six insecticides persisted on the leaves to any significant extent 10 days after application.

Application oF bait sprays containing DDT and BHC caused scorching on leaves.

It has been concluded that sprinkling or a coarse spray with a liquid bait containing 1% yeast protein and 0.1% malathion is an effective method to control the melon fly *D. cucurbitae* without risk of poison hazards or phytotoxicity.

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Fig. 1. Testing Cage.

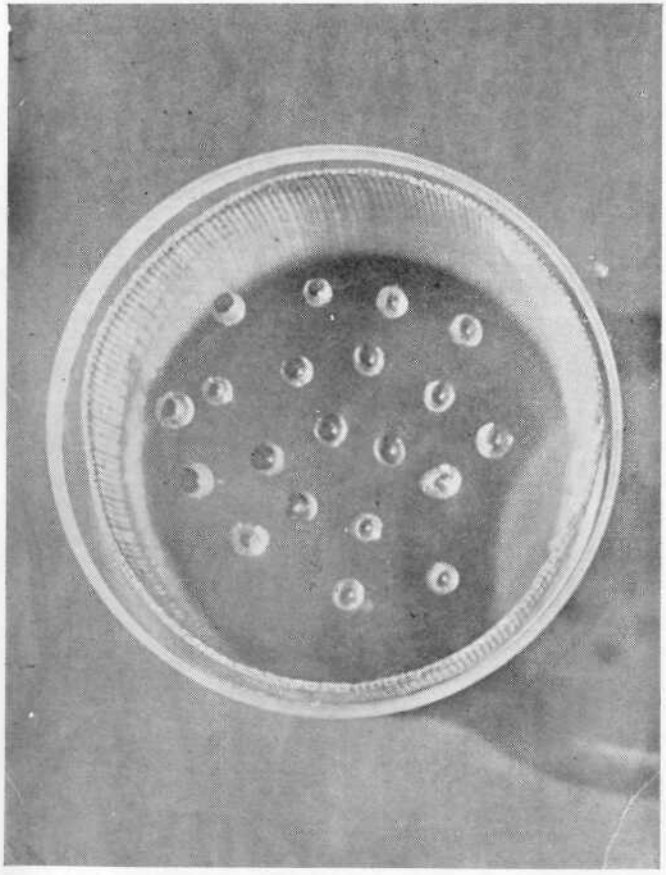


Fig. 2. Droplets of bait fluid inside a clean petri dish inverted over the testing cage.

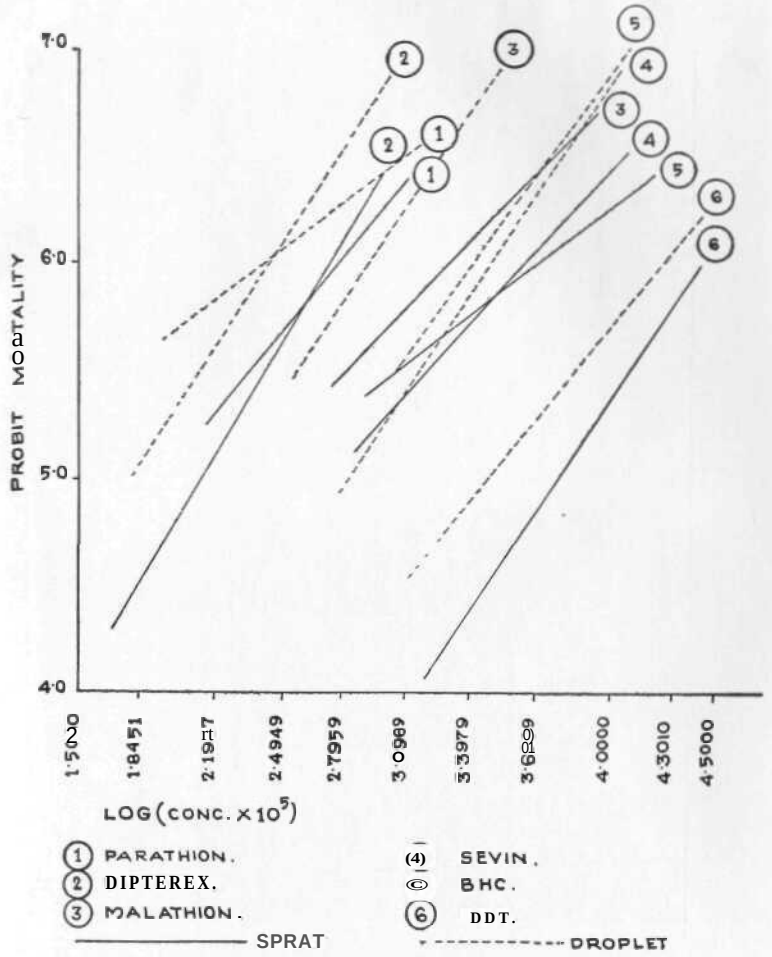
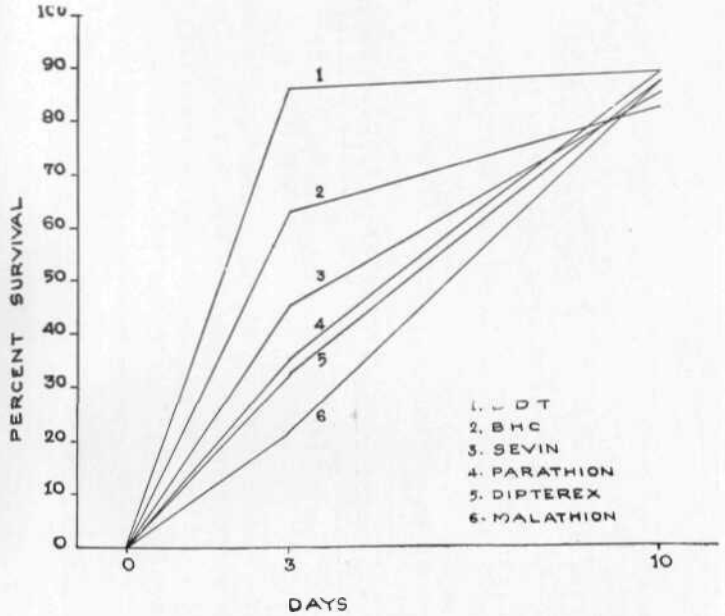


Fig. 3. Relative toxicity of different insecticides to the fruit flies.



Fig, 4. Percent survival of adult flies on snake gourd leaves sprayed with baits containing different insecticides.

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