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# EFFECT OF FOUR PYRETHROIDS ON THE INSECT PESTS OF RAPE

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Cyahalothrin (PP 321 = Karate EC 2.5%), cypermethrin (Cymbush EC 10%), fenpropathrin (Danitol EC 10%), and fluvalinate (Mavrik EC 25%) were tested at their actual toxicant concentrations of 0.0017, 0.011, 0.011 and 0.033%, respectively, against the 3 pests of rape. The 2nd and 4th insecticides caused maximum reduction in the mustard aphid, *Lipaphis erysimi* (K.), population within 2 days of spray which were followed by the 1st and 3rd. Infestation levels of leaf miner, *Chromatomyia horticola* (Gour.), recorded 7 days post-treatment, were significantly lower in the treated than the untreated plots. All insecticides gave complete control of the cabbage butterfly, *Pieris brassicae* L., larvae within 1 day of spray.

## INTRODUCTION

The mustard aphid, *Lipaphis erysimi* (Kalt), attacks the leaves and growing portion of rape plants. Infested growing portion (and floral shoot) usually dry away and no seed formation occurs. It also excretes honeydew which forms a substrate for the growth of sooty mold fungi and thereby the photosynethetic function is adversely affected. The leaf miner, *Chromatomyia horticola* (Gour.), mainly attacks the leaves and feeds on chlorophyll whereby zigzag galleries are formed inside the epidermal layer of rape leaves. Photosynthetic function is, therefore, adversely affected. The cabbage butterfly, *Pieris brassicae* L., attacks the leaves, stem and growing portion (and floral shoot) and completely denudes the plants. It even attacks the seed pods if no leaves are left on plants. Keeping in view the ravages of these pests some fairly new pyrethroid insecticides were, therefore, tested from the control point of view.

In literature reports about the effectiveness of the four pyrethroids (cyahalothrin, cypermethrin, fenpropathrin and fluvalinate), tested in the present study against these pests, are very rare. Only cypermethrin has been reported to be effective against *L. erysimi* (2,5) and cabbage aphids [1, 4, 6] and cabbage butterfly [7].

Reported here are the results of a field experiment carried out during 1983-84 at the Agricultural Research Institute, Tarnab, Peshawar.

## MATERIALS AND METHODS

Rape variety ORO *(Brassica napus)* was sown in lines, 0.5 m apart, on December 28, 1983, in a randomised complete block design. Treatment and check plots measured 3.6 x 4 m and were replicated 4 times. Treatments and replicates were buffered with neutral plantation of rape. The pyrethroids, cyahalothrin (PP 321 = Karate EC 2.5%), cypermethrin (Cymbush EC 10%), fenpropathrin (Danitol EC 10%) and fluvalinate (Mavrik EC 25%) were sprayed with a compressed air sprayer at their respective actual toxicant concentrations (Table 1) against the pest complex of rape.

First spray operation was carried out against aphids on March 27, 1984 during the preblooming stage of rape. Five colonies of different measurements (large, medium, and small) were marked with a white string and their linear length (in cm) were recorded before spray operation in each treatment/replication. An average estimate of the linear measurement of five colonies of aphids was worked out in each treatment/replication as follows:

$$\frac{\text{Total measurement in cm of five colonies}}{5 \text{ colonies}} = \text{Measurement/colony}$$

Ten colonies of different measurements were selected from the buffered plantation in order to narrow down the precision of error and plucked from the apical region (unopened floral shoot) of the plants just after the spray was over. Their length was measured and each colony was brushed off gently on a white paper and densities were recorded accordingly. The linear length and density of 10 colonies were summed up and the number of aphids/1 cm colony was determined as:

$$\frac{\text{Total number of aphids in 10 colonies}}{\text{Total measurement of 10 colonies}} = \frac{\text{Number of aphids}}{\text{1 cm colony}}$$

Aphids/1 cm colony was used as an index sample (common multiple) for determining the size of an average colony of aphids in each treatment/replication as pre-and post-treatment countings (2 days):

= Number of aphids/average colony = Mean length of colony x common multiple.

Marked colonies were observed one-day post-treatment and the densities of living aphids were counted accordingly in the treated plots. In the untreated plots aphid colonies were living normally; only the measurements were noted and densities were recorded through an index sample. On the 2nd day of the spray, the length of five colonies and living aphids were recorded other than the marked colonies. On the 8th day of the spray five colonies were measured in each treatment/replication. A separate index sample (common multiple) of 10 colonies of different measurements was worked out from the buffered plantation in a similar fashion as earlier explained, and densities were noted on the treated and untreated plants.

Pre-and post-treatment countings were averaged per colony and the comparative effect of the insecticides was evaluated on this standard against the aphids.

There were no clear indications of the symptoms of the attack of leaf miner during the 1st spray application. On the 7th day of the 1st spray infested leaves were clearly apparent and these were counted accordingly in each treatment/replication. These were averaged/plot and the comparative effect of the insecticides sprayed was assessed on this standard.

A second spray was carried out on April 28, 1984 against the cabbage butterfly larvae. Pre-and post-treatment larval densities were noted per plot. These were averaged/plot and the comparative effect of the insecticides sprayed was evaluated on this standard.

Data expressed in countings (densities) were transformed into log x/log x + 1.5 and then analysed by the analysis of variance [3]. Means were compared through Duncan's multiple range test.

## RESULTS AND DISCUSSION

The results obtained regarding all the pests are collected in Table 1.

It is evident that cypermethrin and fluvalinate caused maximum reduction in the aphids population within 2 days of spray. Cyahalothrin and fenpropathrin were next in their effectiveness against aphids. From the 3rd day of spray onward there were occasional rains and recording of data was not possible. On the 8th day of spray densities of aphids were recorded in the treated and untreated plots. The densities of the aphids in cyahalothrin and fluvalinate treated plots were similar and lower than the fenpropathrin and cypermethrin treated plots in comparison to no treat-

Table 1. Population density of the mustard aphid *Lipaphis erysimi* (Kalt.), and cabbage butterfly, *Pieris brassicae* L., and infestation levels of rape leaf miner, *Chromatomyia horticola* (Gour.), following insecticidal treatment.

| S.No. | Treatment | Concentration | 1st spray: Mean aphid densities/colony in days: Before spray | 1st spray: After spray: 1 | 2 | 8 | 7 days post-treatment mean leaf miner infestation/plot | 2nd spray: Mean butterfly densities/plot: Before spray | 1 day after spray |
|---|---|---|---|---|---|---|---|---|---|
| 1. | Cyahalothrin EC (PP 321 = Karate 2.5%) | 0.0017 | 216.7 | 267.0b | 5.0b | 7.6 | 22.3a | 37.3 | 0 a |
| 2. | Cypermethrin EC (Cymbush 10%) | 0.011 | 196.3 | 0.6 a | 1.1a | 31.1 | 17.8a | 7.5 | 0 a |
| 3. | Fenpropathrin EC (Deritol 10%) | 0.011 | 198.0 | 75.0b | 12.4c | 29.0 | 40.0a | 11.8 | 1.5 a |
| 4. | Fluvalinate EC (Mavrik 25%) | 0.033 | 195.5 | 0.6a | 3.9ab | 8.3 | 28.0a | 36.8 | 0 a |
| 5. | Untreated | | 219.6 | 243.9c | 144.9d | 71.3 | 114.3b | 38.6 | 31.8b |
| Analysis of variance | | | ns | ** | ** | ns | ** | ns | ** |

ns = not significant ** = Significant at 0.05 and 0.01 levels of probability. Means followed by common latters are not significantly different.

ment. Since 8th day post-treatment countings in the treated plots are relatively higher than the one-day and two-days post-treatment countings it could, therefore, be assumed that rains may have affected the effectiveness of residual deposits or due to growth of the apical portion no residue left to check the establishment of the aphids.

Leaf miner infestation levels, recorded 7 days after the 1st spray, are significantly lower in the treated plots than in the untreated plots which indicated that these insecticides had an adverse effect on the abundance of leaf miner. Cypermethrin seems to be superior in its effect against the leaf miner followed by cyahalothrin and fluvalinate. It could be assumed that at the time of the first spray a major proportion of the ovipositing females might have been directly affected by the spray deposit, or that these insecticides might have been ovicidal in their action if they had laid eggs before or after the spray or the spray deposit may have killed the newly hatched larvae of the leaf miner through their translaminar penetrative action. All insecticides had a marked effect in reducing the incidence of the leaf miner.

During the 1st spray operation the larvae of the cabbage butterfly from an adjacent rape field were treated with these insecticides. Within a few minutes the larvae became restless and showed irritant movement and dropped to the ground. While recording the infestation of the leaf miner (7-day post-treatment of the 1st spray) 147 larvae (small and large) of the cabbage butterfly were seen in check plot of replication I while in the rest they were not observed.

A very rare occurrence of the butterfly larvae was noted 8-day post-treatment (1st spray) in some of the treated and untreated plots. Twenty eight plants were noted to be badly damaged by the butterfly larvae after 19 days of the Ist spray in the untreated plots of replication I. Similarly 10 and 31 plants were noted to be badly damaged in the buffer plantation of replication I in between the check and cypermethrin plots and in between replications III and IV (near fluvalinate and cyahalothrin plots) respectively. Up to about 3 weeks post-treatment (Ist spray) there were no uniform distribution of the attack of the cabbage butterfly larvae in the treated plots. It could be assumed that residually these insecticides kept away the incidence of the cabbage butterfly for relatively a longer time although adults were seen in the field visiting the plants. A second spray was carried out after 31 days of the Ist spray against the cabbage butterfly larvae. Cyahalothrin, cypermethrin and fluvalinate gave a complete kill of the larvae within one day of spray. These were followed by fenpropathrin. It may be noted that just after the spray was over, the larvae in the treated plots were noted to be restless and showed distressive movement and were seen dropping to the ground. In the untreated plots no such movements were noted and they were living normally. There has been some reduction in the larval population after one day of spray in the untreated plots. Since the adults of *Cantheconidea furcellate* (Wolff) were seen in the field, this reduction may have been due to the effect of this predator which is a principal enemy of the lepidopterous larvae.

Interestingly the four insecticides were noted to have a beneficial effect on the plant stand. Twelve days post-treatment (Ist spray) onward observations revealed that the treated plants showed earlier and maximum response of blooming in comparison to the untreated plants which showed late blooming response. Moreover, the plants in the treated plots were relatively taller than the untreated plants. Honeybees were seen in abundance visiting the flowers of the treated and untreated plants which were probably not affected by the residual deposits. It may be assumed that if pre-blooming spray is carried out against the aphids in rape fields, then the hazard of insecticides to honeybees could be eliminated or minimized. It is not certain whether this beneficial effect was due to the suppression of the pests or the insecticides themselves had a biochemical change in the physiological aspect of the plant. In our opinion both possibilities may have co-existed simultaneously.

Cypermethrin has been shown to have a pronounced effect against *L. erysimi* [2, 5] and other aphids [1, 4, 6] and butterflies [7]. There are no reports about the effectivess of the rest of the insecticides against these pests in literature. None of the insecticides have been reported against rape leaf miner in literature.

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