EFFICACY OF INSECTICIDES THROUGH ULTRA LOW AND HIGH VOLUME SPRayers IN THE CONTROL OF SAFFLOWER PESTS

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ABSTRACT

Monocrotophos 40 EC @ 0.5 lit/ha with high volume sprayer gave significantly superior control of safflower aphid over ultra low volume sprayer and other insecticides. The next best treatment was dimethoate 30 EC @ 0.85 lit/ha using high and ultra low volume sprayer and both were at par. There was no significant difference between ultra low volume and high volume sprayers in controlling safflower caterpillar and capsule borer. However, insecticides differed in their efficacy where in dimethoate 30 EC @ 0.85 lit/ha gave better control of safflower caterpillar (87.0%) and capsule borer (84.3%). There was a significant difference between sprayers in controlling borer complex. Dimethoate 30 EC @ 0.85 lit/ha with high volume sprayer recorded lowest incidence of borer complex (16.8%) and was at par with dimethoate 30 EC @ 0.85 lit/ha with ultra low volume sprayer (17.5%). Irrespective of sprayers, dimethoate 30 EC @ 0.85 lit/ha recorded highest seed yield (2265.5 kg/ha) followed by monocrotophos 40 EC @ 0.5 lit/ha (2120.5 kg/ha) and methyl parathion 50 EC @ 0.5 lit/ha (2056.7 kg/ha). Dimethoate 30 EC @ 0.85 lit/ha with ultra low volume sprayer recorded highest benefit-cost ratio (32.7) followed by methyl parathion 50 EC @ 0.5 lit/ha with ultra low volume sprayer (28.4) and dimethoate 30 EC @ 0.85 lit/ha with high volume sprayer (23.9).

Safflower is mainly grown for its oil as sole or intercrop over 0.85 million hectares in semi-arid tropics of India. The most important production constraint in India is the damage caused by aphid and capsule feeding insects. Aphid, Uroleucon compositae Theobald alone is reported to cause 35 to 72 per cent loss in yield during heavy infestation periods (Suryawanshi and Pawar, 1980). The other pests like safflower caterpillar, Prosopalta conducta Walker and capsule borer, Helicoverpa armigera (Hubner) have also been reported to cause damage to foliage and capsules of safflower. Various insecticides viz., dimethoate, monocrotophos, malathion, phosphamidon, methyl demeton, quinalphos and BHC have been reported effective against aphids by Jagtap et al. (1985) and Chandrakar and Gupta (1989). In the present study an effort was made to evaluate the efficacy of insecticides when sprayed by ultra low volume and high volume sprayers against safflower pests.

A field experiment was conducted during the rabi season on deep black soils of Agricultural Research Station, Annigeri (Karnataka). The experiment was laid out in a factorial randomized block design with three replications. There were twelve treatment combinations i.e., six insecticides (methyl parathion 50EC @ 0.5 lit/ha, dimethoate 30EC @ 0.85 lit/ha, monocrotophos 40EC @ 0.5 lit/ha, formothion 25EC @ 1 lit/ha, oxydemeton methyl 50EC @ 1 lit/ha, and 20% sugar solution/ water spray) and two types of sprayers (ultra low volume and high volume sprayers). The A-1 variety of safflower was sown on 18.10.1988 in a plot of 5.0 x 4.5 m following spacing of 45 x 20 cm. While applying insecticides with ultra low volume sprayers, 20 grams sugar per liter of water was added to increase the bulk density of spray droplets to avoid drift. In case of untreated check, 20% sugar solution was sprayed using ultra tow volume sprayer and only water was sprayed using high volume sprayer. Only one application was given during pre-flowering stage.

Observations on aphid incidence were recorded on two apical twigs of 10 cm length on ten randomly selected plants from each
treatment before application and two weeks after application of insecticides. Absolute pre- and post treatment larval counts of safflower caterpillar (*Prospalta conducta*) and capsule borer (*Helicoverpa armigera*) were made on ten randomly selected plants per plot. And percent decline in the pest population was worked out. At harvest, total number of healthy and borer damaged capsules per plant were recorded on ten randomly selected plants in each treatment and percent infestation by borer complex was worked out. The percentage values were converted into arc sin transformations before statistical analysis. Seed yield was recorded separately at harvest and benefit-cost ratio was worked out.

The results are presented in the Table 1 and 2. Monocrotophos with high volume sprayer gave significantly superior control of aphids at two weeks after application over ultra low volume sprayer and other insecticides (Table 1). The next best treatment was dimethoate using high and ultra low volume sprayer and both were at par with each other. Monocrotophos 0.04%, dimethoate 0.03% and phosalone 0.03% have been reported to be effective against safflower aphid up to three weeks (Sood et al., 1981). Monocrotophos 0.05% was reported to be most effective against aphids by Ghorpade et al. (1994). The results of the present study are in conformity with these observations. There was no significant difference between ultra low volume and high volume sprayers in controlling safflower caterpillar and capsule borer (Table 1). However, insecticides differed in their efficacy where in dimethoate gave better control of safflower caterpillar (87.0%) and capsule borer (84.3%).

There was a significant difference between ultra low volume and high volume sprayers in controlling borer complex (Table 2).

### Table 1. Efficacy of insecticides using ultra low and high volume sprayers in the control of safflower pests

<table>
<thead>
<tr>
<th>Insecticides</th>
<th>Dosage (L/ha)</th>
<th><em>Uroleucon compositae</em></th>
<th><em>Prospalta conducta</em></th>
<th><em>Helicoverpa armigera</em></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ULV</td>
<td>HV</td>
<td>Mean</td>
<td>ULV</td>
</tr>
<tr>
<td>Methyl parathion 50 EC</td>
<td>0.5</td>
<td>75.5 (93.7)</td>
<td>76.2 (94.3)</td>
<td>75.9 (94.0)</td>
</tr>
<tr>
<td>Dimethoate 30 EC</td>
<td>0.85</td>
<td>77.8 (95.5)</td>
<td>78.4 (96.0)</td>
<td>78.1 (95.8)</td>
</tr>
<tr>
<td>Monocrotophos 40 EC</td>
<td>0.5</td>
<td>81.3 (97.7)</td>
<td>82.8 (98.4)</td>
<td>82.1 (98.1)</td>
</tr>
<tr>
<td>Formothion 25 EC</td>
<td>1.0</td>
<td>75.4 (93.6)</td>
<td>75.9 (94.0)</td>
<td>75.7 (93.8)</td>
</tr>
<tr>
<td>Oxydemeton methyl 25 EC</td>
<td>1.0</td>
<td>75.6 (93.8)</td>
<td>75.3 (93.5)</td>
<td>75.5 (93.7)</td>
</tr>
<tr>
<td>2% Sugar solution/ water spray</td>
<td></td>
<td>2.8 (0.0)</td>
<td>8.5 (2.8)</td>
<td>4.7 (0.0)</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td>64.7 (79.1)</td>
<td>65.9 (79.6)</td>
<td>64.7 (79.6)</td>
</tr>
</tbody>
</table>

A = Sprayers, B = Insecticides, AxB = Interaction, N.S. = Non-significant
* Figures in the parentheses are original values and figures outside the parentheses are arc sin transformations.
Table 2. Efficacy of insecticides using ultra low and high volume sprayers on borer complex and seed yield of safflower

<table>
<thead>
<tr>
<th>Insecticides</th>
<th>Dosage (Lit/ha)</th>
<th>Per cent decline in pest population at two weeks after spraying</th>
<th>Seed Yield (kg/ha)</th>
<th>Benefit-cost ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% Infestation by borer complex</td>
<td>ULV</td>
<td>HV</td>
<td>Mean</td>
</tr>
<tr>
<td>Methyl parathion 50 EC</td>
<td>0.5</td>
<td>20.5</td>
<td>19.7</td>
<td>20.1</td>
</tr>
<tr>
<td>Dimethoate 30 EC</td>
<td>0.85</td>
<td>17.5</td>
<td>16.8</td>
<td>17.2</td>
</tr>
<tr>
<td>Monocrotophos 40 EC</td>
<td>0.5</td>
<td>18.3</td>
<td>17.5</td>
<td>17.9</td>
</tr>
<tr>
<td>Formothion 25 EC</td>
<td>1.0</td>
<td>21.1</td>
<td>20.4</td>
<td>20.8</td>
</tr>
<tr>
<td>Oxydemeton methyl 25 EC</td>
<td>1.0</td>
<td>21.5</td>
<td>21.0</td>
<td>21.3</td>
</tr>
<tr>
<td>2% Sugar solution/</td>
<td></td>
<td>(13.9)</td>
<td>(12.2)</td>
<td>(12.6)</td>
</tr>
<tr>
<td>Water spray</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td></td>
<td>(22.8)</td>
<td>(21.2)</td>
<td>(22.0)</td>
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<tr>
<td></td>
<td></td>
<td>(22.8)</td>
<td>(21.2)</td>
<td>(22.0)</td>
</tr>
</tbody>
</table>

ULV= Ultra low volume sprayer, HV= High volume sprayer, A= Sprayers, B= Insecticides, AxB = Interaction, N.S = Non-significant
* Figures in the parentheses are original values and figures outside the parentheses are arc sin transformations.

Dimethoate with high volume sprayer recorded lowest incidence of borer complex (16.8%) and was at par with dimethoate with ultra low volume sprayer (17.5%). Similarly formothion and oxydemeton methyl when sprayed with high volume and ultra low volume sprayers were at par. However monocrotophos and methyl parathion with high volume sprayer recorded significantly less infestation by borer complex (17.5 and 19.7% respectively) as compared to the same insecticides by using ultra low volume sprayer (18.3 and 20.5% respectively). There was a significant variation among the insecticides with respect to infestation by borer complex. Dimethoate recorded lowest infestation by borer complex (17.2%) and was at par with monocrotophos (17.9%) and differed significantly from rest of the treatments. The interaction effect was non-significant.

The seed yield was unaffected by the type of sprayers and interaction between sprayers and insecticides (Table 2). Irrespective of sprayers, dimethoate recorded highest seed yield (2265.5 kg/ha) followed by monocrotophos (2120.5 kg/ha) and methyl parathion (2056.7 kg/ha). Dimethoate with ultra low volume sprayer recorded highest benefit-cost ratio (32.7) followed by methyl parathion with ultra low volume sprayer (28.4) and dimethoate with high volume sprayer (23.9). The results of the filed trials carried out under AICORPO in India during 1984-85 culminated a recommendation at national level that one or two need-based sprays with dimethoate 0.05% were effective against safflower aphid (Anonymous, 1985). In the present study, dimethoate registered highest cost-benefit ratio and was in agreement with earlier workers.
REFERENCES


