CONTROL OF DOWNY MILDEW IN SUNFLOWER WITH A NEW METALAXYL FORMULATION APRON XL-35 E.S.

S.P. Shirshikar*

Oilseeds Research Station, Latur-413 512 (M.S.), India

Received: March 14, 2004
Accepted: November 22, 2005

SUMMARY

Sunflower (Helianthus annuus L.) is susceptible to diseases of various kinds. Downy mildew is a destructive disease in many sunflower-growing countries. The disease is mainly seed-transmitted in nature. Hence, in the period 2000-2003, a new emulsion form of metalaxyl fungicide, Apron XL-35 E.S., was evaluated for its efficacy as seed dressing in the management of sunflower downy mildew disease at Oilseeds Research Station, Latur (M.S.). The three years of experimentation revealed that Apron XL-35 E.S. when used for seed dressing at 3 ml/kg of seed could effectively manage downy mildew, without phytotoxic effects.

Key words: sunflower, downy mildew, Apron XL-35 E.S., management, phytotoxicity

INTRODUCTION

Downy mildew disease of sunflower (Helianthus annuus L.), incited by the fungus Plasmopara halstedii (Farl.) Berl. et de Toni, has been considered as a potential destructive disease. This disease had spread to all sunflower growing countries mainly through seeds (Viranyi, 1990).

Sunflower as a commercial crop was introduced in India around 1969 and it was free from downy mildew till 1985. Earlier than that, however, Rammath et al. (1981) registered the presence of oospores on sunflower seeds imported from Bulgaria. Later on, Mayee and Patil (1986) reported a field occurrence of the disease in Marathwada region in Maharashtra State of India, with yield losses up to 80%. Shirshikar (1997) conducted a major survey covering six sunflower-growing districts in this region to establish the status of downy mildew in farmers’ fields during 1995-96. The survey revealed that out of 60 fields visited, 22 fields (36.67%) showed downy mildew incidence with severity up to 30%.

* Corresponding author. Phone (office): +91 02382 245294, (res.) +91 02382 226615
In many crops like sorghum, maize, pearl millet etc., downy mildew has been managed by seed treatment with metalaxyl. This fungicide is specially toxic to oomycetous fungi (Venugopal and Safeeulla, 1978). Patil et al. (1992) have also reported the efficacy of Apron 35 W.S. (a powder form of metalaxyl) applied at the dose of 6 g/kg of sunflower seed.

Recently a new emulsion (liquid) form of metalaxyl, i.e., Apron XL-35 E.S. (N (2-6-dimethyl phenyl)-N methoxy acetyl)-D-alanine methyl ester (CA) was tested for downy mildew control by seed treatment at Oilseeds Research Station, Latur. The main objectives were to find the appropriate dose of the new formulation in comparison with the recommended Apron 35 W.S. fungicide and to observe phytotoxic effects, if any, of the new formulation.

MATERIAL AND METHODS

A field experiment in a sunflower plot infected by downy mildew was conducted at Oilseeds Research Station, Latur during the years 2000-01, 2001-02 and 2003-04. The experiment had randomized block design with five treatments, replicated four times with a net plot size of 2.40 x 3.0 m. The downy mildew susceptible variety Morden was sown and all standard recommended practices were followed during experimentation. Apron XL-35 E.S. (M/S. Syngenta (India) Ltd.) was evaluated as seed dressing at the doses of 1, 2 and 3 ml/kg of seed. One treatment with Apron 35 W.S. at 6 g/kg of seed was maintained for comparison purpose along with one control treatment. Details of the treatments are given below.

- **T1** = Apron XL-35 E.S. @ 35 g a.i./100 kg seed (1 ml/kg seed)
- **T2** = Apron XL-35 E.S. @ 70 g a.i./100 kg seed (2 ml/kg seed)
- **T3** = Apron XL-35 E.S. @ 35 g a.i./105 kg seed (3 ml/kg seed)
- **T4** = Apron 35 W.S. @ 210 g a.i./100 kg seed (6 g/kg seed)
- **T5** = Control

Data on percent disease incidence and yield in each treatment were recorded. The three-year data were analyzed and pooled results are presented in Table 1 and cost-benefit ratio in Table 2.

Three dosages of Apron XL-35 E.S. were also tested for phytotoxicity study. For this purpose the seeds of cv. Morden were treated with Apron XL-35 E.S. at the doses of 2, 4 and 8 ml/kg of seed as seed dressing before sowing. Phytotoxic symptoms such as leaf tip and surface injury, wilting, necrosis, etc. were recorded during plant growth.

RESULTS AND DISCUSSION

The pooled data presented in Table 1 indicated that the downy mildew incidence was evident in all the treatments with significant differences within the treat-
Table 1: Evaluation of Apron XL-35 E.S. new seed dressing emulsion (liquid) fungicide for the management of sunflower downy mildew disease in sick plot at ORS, Latur (2000-2003).

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Tr. No.</th>
<th>Treatment details</th>
<th>Mean disease incidence (%)</th>
<th>Yield kg/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>T1</td>
<td>Apron XL-35 E.S. 35 g a.i./100 kg seed (1 ml/kg seed)</td>
<td>18.8 (25.5)</td>
<td>20.0 (28.2)</td>
</tr>
<tr>
<td>2</td>
<td>T2</td>
<td>Apron XL-35 E.S. 70 g a.i./100 kg seed (2 ml/kg seed)</td>
<td>13.6 (21.3)</td>
<td>14.3 (22.1)</td>
</tr>
<tr>
<td>3</td>
<td>T3</td>
<td>Apron XL-35 E.S. 105 g a.i./100 kg seed (3 ml/kg seed)</td>
<td>7.4 (15.5)</td>
<td>5.1 (12.7)</td>
</tr>
<tr>
<td>4</td>
<td>T4</td>
<td>Apron 35 W.S. 210 g a.i./100 kg seed (6 g/kg seed)</td>
<td>12.8 (20.7)</td>
<td>7.2 (15.3)</td>
</tr>
<tr>
<td>5</td>
<td>T5</td>
<td>Control</td>
<td>90.0 (73.5)</td>
<td>84.1 (66.7)</td>
</tr>
</tbody>
</table>

S.E. + C.D. (5%) C.V. (%) (P.S.- Figures in parenthesis are angular transformed values).
ments. The lowest downy mildew incidence of 12.4% was recorded in the treatment with Apron XL-35 E.S. at 3 ml/kg of seed (T3). This treatment was on par with the treatment T4 where the seed treated with Apron 35 W.S. at 6 g/kg of seed recorded 15.2% disease incidence. These two treatments were found to be significantly superior over the other treatments. The control treatment (T5) recorded maximum disease incidence of 67%.

Table 2: Cost-benefit ratio of Apron XL 35 E.S. seed dressing fungicide for the management of downy mildew in sunflowers at ORS, Latur (2000-2003)

<table>
<thead>
<tr>
<th>Ser. no.</th>
<th>Tr. no.</th>
<th>Treatment details</th>
<th>Disease incidence (%)</th>
<th>Yield (kg/ha)</th>
<th>Gross monetary returns (Rs.)</th>
<th>Net monetary returns (Rs.)</th>
<th>Cost-benefit ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>T1</td>
<td>Apron XL-35 E.S. 35 g a.i./100 kg seed (1 ml/kg seed)</td>
<td>27.1</td>
<td>726</td>
<td>10890</td>
<td>4877</td>
<td>1.81</td>
</tr>
<tr>
<td>2</td>
<td>T2</td>
<td>Apron XL-35 E.S. 70 g a.i./100 kg seed (2 ml/kg seed)</td>
<td>22.8</td>
<td>861</td>
<td>12915</td>
<td>6890</td>
<td>2.14</td>
</tr>
<tr>
<td>3</td>
<td>T3</td>
<td>Apron XL-35 E.S. 105 g a.i./100 kg seed (3 ml/kg seed)</td>
<td>12.4</td>
<td>1106</td>
<td>16590</td>
<td>10552</td>
<td>2.74</td>
</tr>
<tr>
<td>4</td>
<td>T4</td>
<td>Apron 35 W.S. 210 g a.i./100 kg seed (6 g/kg seed)</td>
<td>15.2</td>
<td>1043</td>
<td>15645</td>
<td>9579</td>
<td>2.57</td>
</tr>
<tr>
<td>5</td>
<td>T5</td>
<td>Control</td>
<td>67.0</td>
<td>263</td>
<td>3945</td>
<td>-2055</td>
<td>0.65</td>
</tr>
</tbody>
</table>

S.E. ± 1.1 106 -- -- --
C.D. (5%) 3.4 326 -- -- --

* Cost of Apron XL 35 E.S. at Rs. 2500/l
* Cost of Apron 35 W.S. at Rs. 2200/kg
* Cost of sunflower cultivation at Rs. 6000/ha
* Sunflower yield price at Rs. 1500/qt

Significant differences within the treatments were also evident in yield performance. The maximum yield of 1106 kg/ha was recorded in T3 treatment (Apron XL-35 E.S. at 3 ml/kg of seed). This treatment was found to be on par with T4 (Apron 35 W.S. at 6 g/kg of seed) and T2 treatments (Apron XL-35 E.S. at 2 ml/kg of seed), which recorded 1043 and 861 kg/ha, respectively. The control treatment (T5) recorded the lowest seed yield of 263 kg/ha.

The cost-benefit ratio for all the treatments was worked out. The highest cost-benefit ratio of 2.74 was recorded in T3 treatment (Apron XL 35 E.S. at 3 ml/kg of seed) and T4 treatments (Apron XL-35 E.S. at 2 ml/kg of seed), which recorded 2.57. The lowest ratio of 0.65 was recorded in the control treatment (T5).

With regards to phytotoxicity, no phytotoxic symptom of any kind were noticed during plant growth even in the highest seed treatment dose of 8 ml/kg of seed indicating the security of the new formulation as far as seed treatment in sunflower is concerned.

In the present investigation, the new emulsion metalaxyl formulation Apron X.L. 35 E.S. was found to be effective in controlling downy mildew in sunflower
with as little as 3 ml/kg of seed, as compared with the earlier recommended dose of 6 g of Apron 35 W.S. per 1 kg of seed.

Apart from the effectiveness in lower dose, the new formulation, being in liquid form, has other advantages like ease of application, uniform coating of seed and quick absorption by the seed after application, without signs of phytotoxicity.

Hence, based on the three years of experimentation, it can be concluded that Apron XL-35 E.C. at the dose of 3 ml/kg of seed can be used for seed dressing in the management of sunflower downy mildew.

ACKNOWLEDGEMENT

The author is grateful to the Director of Research MAU, Parbhani (M.S.), and Dr. D.M. Hedge, Project Director, DOR Hyderabad, India, for their encouragement during experimentation.

REFERENCES

PROTECTION DU TOURNESOL CONTRE LA MALADIE DE LA ROUILLE PAR UNE NOUVELLE FORMULATION APRON XL-35 E.S.

RÉSUMÉ

De nombreuses maladies attaquent le tournesol. La rouille est l’une des maladies les plus nuisibles dans plusieurs pays. Dans des conditions naturelles, la maladie se transmet surtout par la semence. L’efficacité d’une nouvelle forme du fongicide metalaxyl sous forme d’émulsion, sous le nom de Apron XL-35 E.S. pour la protection du tournesol contre la rouille a été évaluée à la station de recherche pour les cultures oléagineuses (Oil Seeds Research Station), à Latur (M.S.) entre les années 2000 et 2003. Les trois années de recherche ont démontré que le fongicide Apron XL-35 E.S. luttait efficacement contre la rouille sans effet phytotoxique quand il était utilisé pour traiter les semences à une dose de 3 ml/kg de semences.