

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

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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, Ramnath *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%.

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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).

Sr. No.	Tr. No.	Treatment details	Mean disease incidence (%)					Yield kg/ha				Pooled Mean
			2000-2001	2001-2002	2002-2003	Weighted mean	2000-2001	2001-2002	2002-2003			
1	T ₁	Apron XL-35 E.S. 35 g a.i. / 100 kg seed (1 ml / kg seed)	18.8 (25.5)	20.0 (28.2)	22.5 (28.2)	27.1	624	827	1005	861		
2	T ₂	Apron XL-35 E.S. 70 g a.i. / 100 kg seed (2 ml / kg seed)	13.6 (21.3)	14.3 (22.1)	16.7 (24.0)	22.8	751	1057	1308	1106		
3	T ₃	Apron XL-35 E.S. 105 g a.i. / 100 kg seed (3 ml / kg seed)	7.4 (15.5)	5.1 (12.7)	3.9 (11.2)	12.4	955	1053	1247	1043		
4	T ₄	Apron 35 W.S. 210 g a.i. / 100 kg seed (6 g / kg seed)	12.8 (20.7)	7.2 (15.3)	5.7 (13.4)	15.2	829	249	400	263		
5	T ₅	Control	90.0 (73.5)	84.1 (66.7)	82.5 (65.4)	67.0	142	67	85	106		
		S.E. $\pm$	3.1	1.7	1.7	1.1	39	205	262	326		
		C.D. (5%)	9.4	5.2	5.2	3.4	121	17	18	--		
		C.V. (%)	20	12	12	--	12					

(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 (T_3). This treatment was on par with the treatment T_4 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 (T_5) recorded maximum disease incidence of 67%.

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

Ser. no.	Tr. no.	Treatment details	Disease incidence (%)	Yield (kg/ha)	Gross monetary returns (Rs.)	Net monetary returns (Rs.)	Cost-benefit ratio
1	T_1	Apron XL-35 E.S. 35 g a.i./100 kg seed (1 ml/kg seed)	27.1	726	10890	4877	1.81
2	T_2	Apron XL-35 E.S. 70 g a.i./100 kg seed (2 ml/kg seed)	22.8	861	12915	6890	2.14
3	T_3	Apron XL-35 E.S. 105 g a.i./100 kg seed (3 ml/kg seed)	12.4	1106	16590	10552	2.74
4	T_4	Apron -35 W.S. 210 g a.i./100 kg seed (6 g/kg seed)	15.2	1043	15645	9579	2.57
5	T_5	Control	67.0	263	3945	-2055	0.65
		S.E. $\pm$	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/qr

Significant differences within the treatments were also evident in yield performance. The maximum yield of 1106 kg/ha was recorded in T_3 treatment (Apron XL-35 E.S. at 3 ml/kg of seed). This treatment was found to be on par with T_4 (Apron 35 W.S. at 6 g/kg of seed) and T_2 treatments (Apron XL-35 E.S. at 2 ml/kg of seed), which recorded 1043 and 861 kg/ha, respectively. The control treatment (T_5) 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 T_3 treatment (Apron XL 35 E.S. at 3 ml/kg of seed), followed by T_4 treatment (Apron 35 W.S. at 6 g/kg of seed) which recorded the ratio of 2.57. The lowest ratio of 0.65 was recorded in the control treatment (T_5).

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.

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PROTECCIÓN DEL GIRASOL CONTRA TIZÓN POR UNA NUEVA FORMULACIÓN DE METALAXIL APRON XL-35 E.S.

RESUMEN

El girasol (*Helianthus annuus* L.) es atacado por numerosas enfermedades. El tizón es una de las enfermedades más destructivas de girasol en muchos países. En las condiciones naturales, la enfermedad se transmite generalmente por la semilla. La eficacia de la nueva forma de fungicida Metalaxil en forma de emulsión, bajo el nombre de Apron XL-35 E.S., ha sido evaluada desde el punto de vista de protección de girasol contra el tizón en la Estación de Investigaciones de Cultivos Oleaginosos (Oil Seeds Research Station), Latur (M.S.), en el período comprendido entre 2000 y 2003. La investigación de tres años de duración mostró que el fungicida Apron XL-35 E.S., cuando se utiliza para el tratamiento de la semilla en la dosis de 3 ml/kg de semilla, eficazmente combate el tizón, sin cualquier tipo de efectos fitotóxicos.

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.