HELIA, **33**, Nr. 53, p.p. 63-68, (2010) UDC 633.854.78:632.1
DOI: 10.2298/HEL1053063S

SUNFLOWER NECROSIS DISEASE MANAGEMENT WITH THIOMETHOXAM

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Received: February 16, 2010
Accepted: August 10, 2010

SUMMARY

Sunflower necrosis disease (SND), observed during 1997 in India has now become established in all major sunflower-growing states and has assumed the status of disease of national importance, thereby threathening sunflower cultivation in general.

As it is a new disease, reliable resistance sources are still under investigation. A new insecticide thiomethoxam (Cruiser 70 W.S.) was tested for three years at Oilseeds Research Station, Latur (M.S.), India, to manage the necrosis disease in the current sunflower production.

The three-year data (2006-2008) revealed that the sunflower necrosis disease can be managed by treating seeds with thiomethoxam at 4 g/kg along with two sprays of the chemical at 0.05% 30 & 45 DAS.

Key words: sunflower, necrosis, thiomethoxam, management

INTRODUCTION

India is one of the largest vegetable oil economics in the world, next to USA, China, and Brazil. The diverse agro-ecological situations of the country favor the cultivation of seven edible oilseeds (Anonymous, 2008). Among these, the sunflower (*Helianthus annuus* L.), though a relatively new crop, is one of the fastest growing oilseeds in India. Presently it is cultivated at an area of 19.11 lakh hectares with production of 14.63 lakh** tons with productivity of 765 kg/ha (Anonymous, 2009).

More than 30 diseases have been reported on sunflower worldwise (Gulya *et al.*, 1994). However, under Indian conditions, only a few of them are of economic important, which includes *Alternaria* blight, rust and downy mildew. The problem of downy mildew has been solved to a great extent by identification of downy-mildew-resistant hybrids through extensive screening in downy-mildew-infected plots

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** A lakh or lac is a unit in the Indian numbering system equal to one hundred thousand (100,000; 10^5).

at Oilseeds Research Station, Latur, and subsequent release of these resistant hybrids in all parts of the country (Shirshikar, 2005).

Recently, a new viral disease, named the sunflower necrosis disease (SND) has emerged as a major disease of sunflowers in India. The disease was observed for the first time in 1997 in a seed production field near the village of Bagepally, Kolar District, Karanataka State, India (Singh *et al.,* 1977). In subsequent years, outbreaks of this disease in major sunflower-growing states of India, especially Andhra, Karanataka and Maharashtra, have virtually threatened the sunflower cultivation and yield losses ranging from 30 to 100% have been reported (Chander Rao *et al.,* 2000). The disease is of a new viral origin and reliable resistant sources have not yet been found. The disease is caused by the tobacco streak virus (Prasada Rao *et al.*, 2000; Bhat *et al.*, 2002) and it was found to be transmitted by thrips (Harvir Singh, 2005). Most of the sunflower hybrids currently under cultivation in India have shown various degrees of susceptibility to the disease. Attempts have been made to manage this new disease of viral origin. Recently, adjusting sowing date has been proposed for the management of the disease. Sunflower sowing in post-rainy season (September onwards) was found to be beneficial for minimizing the necrosis disease without any other plant protecting action (Shishikar, 2003).

Similarly, seed treatment with imidacloprod (Gaucho 70 W.S.) in combination with two sprays of the chemical and bordering sunflower crop with sorghum crop have also been found useful for the necrosis disease management (Shrishikar, 2008).

A new chemical thiomethoxam (Cruizer 70 W.S.) was tested for the management of the new disease at Oilseeds Research Station, Latur, for three years (2006-2008).

MATERIAL AND METHODS

A field trial was conducted during kharif season of 2006-07 to 2008-09 (three years) at Research Farm of Oilseeds Research Station, Latur, in a randomized block design. The experiment had five treatments replicated four times. Sunflower hybrid KBSH-44 was used in the trial. Net plot size of 3.60 x 3.60 m was maintained for each treatment with 60 cm distance between rows and 30 cm between plants. All standard agronomic practices were applied. The treatment details are given below:

- T_1 Seed treatment with imidacloprid (Gaucho) 70 W.S. at 5 g/kg + two sprays of imidacloprid (Confidor 200 S.L.) at 0.05% 30 and 45 DAS
- T_2 Seed treatment with thiomethoxam (Cruiser 70 W.S.) at 4 g/kg
- T_3 Seed treatment with thiomethoxam (Cruiser 70 W.S.) at 4 g/kg + two sprays of thiomethoxam at 0.05 % 30 and 45 DAS
- T_4 Spray of sorghum leaf extract (10%) at 30 & 45 DAS
- T_5 Control

Seed treatment and spray schedule were followed as described in treatment details and percent necrosis incidence was recorded at two-week intervals till the 60th day of crop stand. Mean percent of disease incidence was also calculated. Yield data were recorded separately for each treatment after crop harvest.

The cost of cultivation was worked out on the basis of prices mentioned below.

1. Cost of sunflower produce at 2000/qt
2. Cost of sunflower cultivation Rs. 8000/ha
3. Cost of one spraying operation (Sprays) Rs. 150/ha
4. Cost of seed dressing chemical Rs. 350/ha
5. Cost of imidacloprid (Confidor) Rs. 2500/l
6. Cost of thiomethoxam Rs. 2800/kg
7. Cost of sorghum leaf extract Rs. 100/two sprays.

Treatment-wise mean percent necrosis incidence, yield and benefit cost (BC ratio) were analyzed and pooled results are presented in Table 1. Similarly, year-wise necrosis incidence and yield data are presented in Table 2.

Table 1: Effect of different treatments on necrosis incidence, yield and cost benefit ratio at ORS, Latur (2006-08 pooled data)

Tr. No.	Treatment details	Mean necrosis incidence (%)	Yield (kg/ha)	B:C ratio
T_1	Seed treatment with imidacloprid (Gaucho) 5 g/kg + two sprays of imidacloprid (Confidor) 0.05% 30 & 45 DAS	5.21 (12.92)	1492	3.09
T_2	Seed treatment with thiomethoxam (Cruizer) 4 g/kg	18.22 (25.02)	1152	2.75
T_3	T_2 + two sprays with thiomethoxam 0.05% at 30 & 45 DAS	4.18 (11.50)	1572	3.21
T_4	Two sprays with sorghum leaf extract (10%) 30 & 45 DAS	21.96 (27.61)	1123	2.67
T_5	Control	26.65 (35.03)	1061	2.65
	S.E. $\pm$	1.032	74	
	C.D. at 5%	3.367	243	

Numbers in parentheses are angular transformed values

Table 2: Year-wise necrosis incidence and yield of sunflower in necrosis management trial (2006- 08)

Sr. No.	Tr. No.	Necrosis incidence (%)			Yield (kg/ha)		
		2006-07	2007-08	2008-09	2006-07	2007-08	2008-09
1	T_1	5.07 (12.71)	7.02 (15.28)	3.55 (10.76)	995	1855	1666
2	T_2	12.64 (20.73)	23.16 (28.06)	18.88 (25.67)	760	1364	1331
3	T_3	4.24 (11.70)	5.55 (13.49)	2.76 (9.32)	1043	1938	1736
4	T_4	17.94 (24.97)	31.83 (34.30)	16.11 (23.55)	717	1226	1425
5	T_5	20.16 (26.61)	39.63 (51.97)	20.17 (26.52)	694	1184	1304
6	S.E. $\pm$	0.83	1.15	1.09	63	69	89
7	C.D.at 5 %	2.57	3.52	3.37	193	203	270
8	C.V. (%)	9.00	8.00	11.43	14.00	9.00	12

Numbers in parentheses are angular transfer values

RESULTS AND DISCUSSION

The pooled results presented in Table 1 revealed that statistically significant differences existed among the treatments. The lowest necrosis incidence of 4.18% was recorded in treatment T_3, *i.e.*, seed treatment with thiomethoxam @ 4 g/kg + two sprays with thiomethoxam at 0.05% 30 and 45 DAS. This treatment also recorded the highest seed yield of 1572 kg/ha. However, this treatment was found to be on par with treatment T_1, *i.e.*, seed treatment with imidacloprid 5 g/kg + two sprays with imidacloprid at 0.05% 30 and 45 DAS, which recorded necrosis incidence of 5.21% with 1492 kg/ha seed yield. These two treatments were significantly superior over the other treatments. The control treatment T_5 recorded highest necrosis incidence of 26.65% and the lowest yield of 1061 kg/ha. With regard to the beneficial cost ratio, the highest ratio of 3.21 was recorded in treatment T_3, *i.e.*, seed treatment with thiomethoxam + two sprays with thiomethoxam 30 and 45 DAS. The use of imidacloprid for seed treatment and foliar spray was found useful earlier (Shirshikar, 2008). However, the new chemical thiomethoxam (Cruiser 70 W.S.) showed better performance with regard to necrosis incidence, seed yield and the B:C ratio. Hence, based on the three years of experimentation, it can be concluded that for effective management of the sunflower necrosis disease the seed should be treated with thiomethoxam at 4 g/kg along with two sprays of the crop with thiomethoxam at 0.05% 30 and 45 DAS.

Earlier, use of imidacloprid for seed treatment along with imidacloprid foliar spray were found useful in the management of sunflower necrosis disease (Shirshikar, 2008). In the present study, imidocloprid was compared with thiomethoxam as seed dresser and foliar spray for the necrosis disease management. The three-year study revealed that thiomethoxam was superior over imidacloprid, achieving lower necrosis incidence (4.18%), higher seed yield (1572 kg/ha) and higher B:C ratio (3.21). Hence, thiomethoxam can be recommended for sunflower necrosis disease management.

ACKNOWLEDGEMENT

The author is grateful to Hon. Vice Chancellor Dr. S.S. Kadam, Director of Research Dr. G.R. More, M.A.U. Parbhani and Project Director Dr. D.M. Hegde for their encouragement and support.

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