
Management of black spot of rose (*Rosa chinensis*) caused by *Diplocarpon rosae* under field condition through fungicides

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In an experiment conducted during 1998-2000 five fungicides with a new one triforine in six doses were tested for management of black spot disease of rose (*Rosa chinensis*) caused by *Diplocarpon rosae*. Triforine reduced the disease and increasing the number of buds and flowers and their sizes, significantly with increasing the dose and maximum reduction was observed in 0.33%. carbendazim (0.1%) also showed good result in reducing the disease severity and increasing the number of buds and flowers but less effective than triforine (0.33%).

Key words : Rose, leaf spot, fungicides, *Diplocarpon rosae*, plant protection, buds, flowers

INTRODUCTION

Rose (*Rosa chinensis*) is an important cut flower sharing the major share of exports and domestic markets in India as compared to other cut flowers so the increasing trend of rose cultivation is fast emerging and suddenly the export oriented projects are developing both under field and green houses. In general commercial green house operations aim at supplying high quality, high value products to specific markets.

With the large introduction of planting materials and intensive cultivation 24 fungal diseases have been reported so far (Pal 1992) and becoming important and serious particularly black spot which caused spotting on leaf and ultimately defoliation. This disease was caused by *Diplocarpon rosae* reported by Bardoli and Ganguli (1963). They also reported that the disease caused heavy loss by leaf defoliation (24.2%) in a single week which result in size and number of flowers. This fungus also produced ethylene gas (Bardoli and Ganguli, 1963)

and abscisic acid (Wani *et al.*, 1980) which resulted in premature defoliation.

Several workers have tried to control the disease by screening of varieties for identifying source of resistance (Singh *et al.*, 1992 ; Xue and Davidson, 1998) and use of fungicides (Maljaja, 1997). To find out a suitable management an azole group of chemicals was tested to find out the dose and efficacy under field condition.

MATERIALS AND METHODS

The field experiment was conducted during 1998-2000 at Horticultural Research Station, Mondouri, Nadia. A highly susceptible variety "Mirandy" was used to grow in the field and allowed for natural infection. Recommended doses of N, P. and K and cowdung manure was applied on two split doses, soon after pruning and half during wintering 25th November and 17th January in each year respectively.

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Randomized block design was followed using 3 replications with 2.5 m × 2.5 m plot size covering 16 plants in each plot. Row to Row and Plant to Plant 60cm × 60cm were maintained and age of plant was 5 yrs earlier grafted on *Rosa multiflora*. There were 11 treatments of which 6 treatments were saprol (triforine) in six different doses like 0.13%, 0.17 %, 0.21%, 0.25%, 0.29%, and 0.33% and then four treatments were market available general fungicides like copper oxychloride 0.25%, mancozeb 0.25%, carbendazim, 0.1%, dinocap 0.13%, and one was untreated control (only water spraying). The fungicides were suspended in water according to the concentration at 15 days interval i.e. from the first appearance of the disease. Disease severity on individual plants were rated using 0-4 scale as 0= no disease, 1 = one leaflet infected and 10% area covered by the spots, 2 = two leaflets infected and 20% area covered by leaf spots; 3 = Three leaflets infected and 30% leaf area covered by spots, 4 = more than three leaflets infected and more than 40% leaf area covered by spots. Severity index was computed as

$$\text{Severity index (\%)} = \frac{\text{Sum of all numerical ratings}}{\text{Total no of leaves observed} \times \text{Maximum rating}} \times 100$$

Observation on, severity index (%) per plot, number of flowers and buds, diameter of flowers and length of buds were recorded before and after 30 days of spraying.

RESULTS AND DISCUSSION

Disease severity

All the fungicides and their different doses significantly reduced the severity of leaf spot as compared with the untreated control. They also showed difference in their efficacy in controlling leaf spot in field (Table 1). With increasing doses triforine there was a significant decrease in disease severity and lowest disease (1.23%) was observed in the plots treated with triforine (0.33%). The two years pooled mean showed that among the market available fungicides carbendazim (0.17%) was showed minimum disease severity (7.63%) and it was statistically at par with triforine (0.21%). No significant difference was observed among the treatments like triforine (0.21%), triforine (0.17%).

Copper oxychloride and mancozeb were also showed no significant difference among themselves in reducing the disease severity. The chemical triforine showed good result in reducing the disease severity irrespective of its doses as compared to other tested fungicides except carbendazim which is statistically at par with triforine.

Yield parameters

An increase in yield like number of buds, number of flowers, and size like length of buds, diameter of flowers were also increased with decrease in disease severity as compared with the untreated control (Table 1). The pooled mean of two years data showed that dinocap (0.13%), triforine (0.13%) and triforine (0.13%), mancozeb (0.25%) and triforine (0.21%), copper oxychloride (0.25%) did not differ significantly among themselves in producing the number of buds. Triforine (0.33%) showed maximum number of buds (18.18/plant) and triforine (0.29%) showed no significant difference in producing the number of buds. So the plots treated with carbendazim (0.1%) and triforine (0.33%) gave significant higher number of buds than those treated with other fungicides (Table 1). Increase in length of buds (cm) was also reflected in fungicidal treatment at different doses and highest length was observed in triforine (0.33%) (0.716 cm) treated plots where as no significant difference was observed in increasing the length of buds when the plots treated with triforine (0.25%), carbendazim (0.1%) and copper oxychloride (0.25%). Minimum length of buds was observed (0.113 cm) when the plots treated with triforine (0.13%).

Number of flowers was also increased in different treatments in different doses significantly as compared with the untreated control. Maximum number of flowers was observed in the plots treated with triforine (0.33%) followed by carbendazim (0.1%) and triforine (0.29%). The pooled mean of two years data showed that triforine (0.25%) and copper oxychloride (0.25%) had no significant difference among themselves in increasing the number of flowers. Minimum number of flowers was observed in the plots treated with dinocap (0.13%) followed by triforine (0.13%) and their

Table 1 : Evaluation of fungicides for the management of black spot disease of rose.

Treatments	Disease severity (%)			No. of Buds / Plant			Length of buds (cm) / Plant No.			No. of flowers / Plant			Diameters of flowers (cm)		
	1998-99	1999-2000	Pooled mean	1998-99	1999-2000	Pooled mean	1998-99	1999-2000	Pooled mean	1998-99	1999-2000	Pooled mean	1998-99	1999-2000	Pooled mean
Triforine (0.13%)	12.97 (21.05)	12.02 (20.27)	12.45 (20.07)	8.33	9.33	8.83	0.107	0.113	0.113	8.57	9.37	8.97	0.106	0.113	0.109
Triforine (0.17%)	9.30 (17.76)	7.65 (16.11)	8.17 (16.95)	9.43	10.57	10.00	0.123	0.135	0.129	9.90	10.90	10.4	0.131	0.133	0.132
Triforine (0.21%)	7.64 (16.00)	6.96 (15.34)	7.30 (15.68)	11.37	12.03	11.70	0.160	0.168	0.164	10.67	12.23	11.045	0.148	0.155	0.151
Triforine (0.25%)	5.43 (13.44)	6.11 (14.30)	5.77 (13.94)	12.43	13.30	12.86	0.203	0.223	0.213	11.90	13.37	12.63	0.202	0.221	0.211
Triforine (0.29%)	4.12 (11.68)	4.25 (11.97)	4.18 (11.33)	14.57	15.67	15.12	0.241	0.243	0.242	13.90	15.03	14.46	0.217	0.243	0.230
Triforine (0.33%)	1.33 (6.55)	1.13 (6.02)	1.23 (6.29)	17.47	18.90	18.18	0.314	0.346	0.716	17.03	20.70	18.86	0.312	0.312	0.312
Copper oxychloride (0.25%)	13.89 (21.89)	13.77 (21.81)	13.83 (21.81)	11.43	12.43	11.93	0.205	0.228	0.216	10.90	13.37	12.13	0.187	0.207	0.197
Mancozeb (0.25)	14.92 (22.71)	14.55 (22.45)	14.73 (22.54)	9.70	10.57	10.13	0.190	0.203	0.196	9.37	10.37	9.87	0.151	0.179	0.165
Carbendazim (0.10%)	7.52 (16.11)	7.74 (16.00)	7.63 (15.89)	14.57	16.33	15.45	0.209	0.221	0.215	13.90	15.23	14.56	0.203	0.221	0.212
Dinocap (0.13%)	18.44 (25.40)	19.44 (25.91)	18.79 (25.70)	7.33	8.90	8.11	0.134	0.164	0.149	8.03	9.03	8.53	0.108	0.143	0.125
Control (Untreated)	40.28 (39.11)	40.07 (41.07)	41.67 (40.22)	2.57	4.57	3.57	0.100	0.100	0.100	4.43	4.43	4.43	0.096	0.101	0.098
SEm (\pm)	0.54	0.91	0.63	0.029	0.219	0.139	0.0049	0.0069	0.0040	0.293	0.309	0.213	0.0033	0.0026	0.0021
CD at 5%	1.59	2.69	1.80	0.505	0.646	0.397	0.0145	0.0205	0.0120	0.865	0.914	0.609	0.0096	0.0170	0.0059

Figure in the parenthesis are average angular transformed values.

difference are not statistically significant (Table 1). The size (diameter in cm) of flowers was also significantly differ among themselves in different fungicidal treatments and their doses increase significantly as compared with untreated control. Maximum size of flowers (0.31 cm) was observed in the plots treated with higher dose of triforine (0.33%) and minimum (0.109 cm) in low dose (0.13%). Among the conventional marketable fungicides carbendazim showed better result increasing the size of flowers than other tested fungicides.

Our result confirm the findings of Meeus (1980) and Rolim *et al.* (1990) that Black spot of rose can be controlled by application of triforine but they observed that triforine is less effective than carbendazim where our results contradicted. Malzaja (1997) reported that carbendazim (0.1%) can effectively control the black spot of rose than other tested fungicides. Our result showed that with higher dose of triforine reduced the black spot disease and increase the number of flowers, buds,

and also size of buds and flowers and it is more effective than carbendazim. But it was also observed that triforine when used in lower dose the reduction of black spot disease was also prominent than untreated control though carbendazim gave better result.

Thus triforine (0.33%) proved good for managing the black spot disease of rose and increase the number of buds and flower and their size followed by carbendazim (0.1%) in field condition.

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(Accepted for publication February 02 2004)