Control of Opium Poppy Downy Mildew by Dithane Flowable and Dithane M-45 in Rajasthan, India

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ABSTRACT Effects of dithane flowable and dithane M-45 on the control of opium poppy downy mildew were examined under field conditions. Application of these two fungicides significantly reduced the disease and increased latex yield, compared to other non-systemic fungicides.

Primary and secondary infections of downy mildew of opium caused by *Perenorbora arborescens*(Besk) de Bery considerably reduce latex as well as seed yield(Thokore, *et al.* 1982) and several workers have reported the effectiveness of dithiocarbamate group of fungicides against this disease (Kothari and Prasad, 1970; Alavil 1975; Thakore *et al.* 1982). Dithane flowable, a new formulation of dithiocarbamate has been developed recently by Indofil Chemical Ltd. Experiments were carried out to compare the efficacy of dithane flowable with other nonsystemic fungicides for the control of primary and secondary infection of downy mildew of opium poppy, results of which are presented here.

MATERIALS AND METHODS

All experiments were conducted at farmers' fields in village Maharaj Ki Khedi, near Udaipur where primary as well as secondary infections appear every year; this is on account of continuous cultivation of opium poppy in same fields for the last 10 years. Local susceptible variety 'Dholia' was used for all the experiments.

Effect of seed treatment of the fungicides on primary infection of downy mildew. Seeds were treated with dithane M-45 at the rate of 2, 3 and 4g/kg whereas dithane flowable was taken at 4, 5 and 6g/kg to achieve uniform coating seeds; slurry of fungicides was prepared in conical flask and seeds were shaken throughly and dried under shade before sowing. Observations of primary infection were recorded upto 3½ months after sowing.

Efficacy of different fungicides for the control of secondary infection under field condition. In one experiment, 5 non-systemic fungicides i.e. dithane M-45, dithane flowable, dithane Z-78, fytolan and cuman L. were tested. First spraying was done after the appearance of initial symtoms and subsequent two sprayings were done at intervals of 15 days.

In another experiment, effecacy of dithane flowable was compared with dithane M-45 at different levels of concentrations as well as intervals of sprays. The spraying was done after appearance of the disease at different concentrations of dithane M-45 i.e. 0.2, 0.3, and 0.4 per cent and dithane flowable at 0.4, 0.5 and 0.6 per cent. The spraying intervals of these treatments were 10, 15 and 20 days.

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RESULTS AND DISCUSSION

Primary infection. It is evident from the results (Table 1) that both the fungicides reduced the primary infection of the disease. But there was no complete control of the disease at any stage by the fungicides used. However, higher deses of dithane flowable(6g/kg) and dithane M-45(6g/kg) and dithane M-45(4g/kg) reduced the primary infection by 40.4 and 39.8 per cent, respectively.

Secondary infection. Among 5 non-systemic fungicides tested at farmers' fields, dithane M-45 significantly controlled the disease followed by dithane Z-78, the percentage efficiency of the secondary infection control being 71.4 and 45.7 respectively. All the fungicides increased the yields of latex and seeds. But, maximum latex yield was found in case of dithane M-45 sprayed plants; the per cent increase was 15.02. Nevertheless, dithane Z-78 also increased the yield of latex and seeds but increase was not significant over control, per cent increase being 6.9 and 4.2 respectively(Table 2).

It is evident from these results (Table 1~3) that higher concentrations of dithane flowable as well as dithane M-45 were highly effective in controlling the disease when sprayed at 10 days intervals whereas, lowest concentration and more gap between two sprays were less effective; the perce-

Table 1. Effect of seed treatment on primary infection of downy mildew of opium poppy

Treatment	Concentration (g/kg)	Infection percentage		Average infection (%)	Average per cent efficiency of disease control
		Field A	Filed B		
Dithane M-45	2.0	33.48(35.32)	19.75(26.38)	26.61	28.39
Dithane M-45	3.0	32.36(34.66)	19.39(26.12)	25.87	30.38
Dithane M-45	4.0	28.57(32.31)	16.15(23.87)	22.37	39.80
Dithane flowable	4.0	31.57(54.18)	21.28(27.48)	26.42	28.90
Dithane flowable	5.0	29.21(32.71)	19.62(26.27)	24.41	34.31
Dithane flowable	6.0	28.16(32.05)	16.12(23.67)	22.14	40.41
Control	—	46.06(42.74)	28.56(32.78)	37.16	—
	S. Em.±	0.497	0.512		
	C.D. at 5%	1.533	1.523		
	C.D. at 1%	2.150	2.086		

Figures in parentheses are angular transformed values

Table 2. Effect of different nonsystemic fungicides against downy mildew of opium poppy at farmers fields

Treatments	Concentrations(%)	Infection index	Per cent efficiency of disease control	Latex yield		Seed yield	
				Average per plot(g)	Increase in yield (%)	Average per plot(g)	Increase in yield (%)
Dithane M-45	0.2	20.75	71.47	49.75	15.02	1209.75	9.90
Dithane flowable	0.2	64.50	11.34	44.25	2.31	1139.75	3.54
Dithane Z-78	0.2	39.50	45.70	46.25	6.95	1147.25	4.22
Fytolan	0.2	58.25	19.93	45.75	5.78	1142.50	3.79
Cuman L	0.2	70.75	2.74	43.75	1.15	1150.08	4.48
Control	—	72.75	—	43.25	—	1100.75	—
	S. Em. ±	1.0559		1.2260		27.6270	
	C.D. at 5%	3.3270		3.9895		NS	
	C.D. at 1%	4.9964		NS		NS	

NS=Non significant

Table 3. Comparative efficacy of dithane M-45 and dithane flowable when sprayed at 10, 15 and 20 days intervals at different concentrations

Treatment	Concentration (%)	Interval	Infection index (%)	Percent efficiency of disease control	Latex yield		Seed yield	
					Average per plot(g)	Increased in yield(%)	Average per plot(g)	Increased in yield (%)
Dithane M-45	0.2	10 days	20.77	73.70	61.40	24.79	1215.60	22.68
		15 days	25.02	68.32	56.60	15.04	1156.60	16.73
		20 days	35.26	56.36	56.40	14.63	1096.93	10.71
Dithane M-45	0.3	10 days	16.50	79.11	60.00	21.95	1132.20	14.27
		15 days	22.75	71.20	59.80	21.54	1115.20	12.55
		20 days	33.25	57.91	59.60	21.13	1096.20	10.63
Dithane M-45	0.4	10 days	10.00	80.34	65.80	33.73	1364.00	37.66
		15 days	14.50	81.64	61.20	24.39	1327.60	33.99
		20 days	16.50	79.11	59.80	21.54	1270.80	28.25
Dithane flowable	0.4	10 days	26.00	67.08	62.20	26.42	1200.00	21.11
		15 days	32.25	57.17	57.20	16.26	1171.20	18.20
		20 days	38.50	51.26	37.00	15.85	1054.63	6.44
Dithane flowable	0.5	10 days	18.75	76.26	62.20	26.42	1158.40	16.91
		15 days	22.75	71.20	61.53	25.06	1130.40	14.08
		20 days	37.75	52.21	61.73	25.46	1112.87	12.32
Dithane flowable	0.6	10 . .	10.85	86.26	63.80	29.67	1366.60	37.92
		15 days	14.50	81.64	61.80	25.69	1365.20	37.78
		20 days	22.65	71.32	58.00	17.88	1334.47	34.68
Control	—		79.00	—	49.20	—	990.80	—
S. Em.±Fungicide			0.9155		0.8822		19.40000	
S. Em.±Days			0.6473		0.6238		13.7200	
S. Em.±Fungicide×Days			1.5857		1.5280		33.6000	
C.D. Fungicide at 5%			2.6412		2.5451		55.9689	
C.D. Fungicide at 1%			3.5539		NS		75.3131	
C.D. Days at 5%			1.8674		1.7996		39.5820	
C.D. Days at 1%			2.5128		NS		53.2612	
C.D. Fungicide×days 5%			4.5747		4.4082		NS	
C.D. Fungicide×days 1%			6.1557		NS		NS	

centage efficiency of disease control was 56.3 and 51.2 in dithane M-45 and dithane flowable sarayed at 0.2 per cent and 0.4 percent at 20 days interval. There was significant difference within the treatments of concentrations and different intervals used, *i.e.* 10, 15 and 20 days. Highest latex yield was also recorded in dithane M-45 sprays at 0.4 per cent followed by dithane flowable at 0.6 per cent concentration. When these were sprayed at 10 days interval, the increase was 33.7 and 29.0 per cent respectively. There was no significant difference between the latex yield, when both the fungicides were sprayed at 15 and 20 days interval at the lower doses, but significant difference was found when sprayed at 10 days intervals. Similarly, there was no effect of spraying interval on latex yield at higher concentration *i.e.* 6 per cent of dithane flowable when used at 10 and 15 days interval. The significant difference was also not found when dithane M-45 was sprayed at 0.4 per cent concentration at 15 and 20 days intervals.

Spraying of dith ane M-45 and dithane flowable at different concentration as well as at 10, 15 and 20 days intervals increased the seed yield significantly although best effect was found when dithane M-45 was sprayed at 10 and 15 days intervals at 0.4 per cent concentrations or when opium

plants weres prayed with dithane flowable (0.6%) at 10, 15 and 20 days interval. There was no significant difference between these treatments as far as seed yield is concerned.

It is apparent from these experiments that both dithane M-45 and dithane flowable significantly reduce the disease and also increase the seed and latex yields over control. But, the significant significant increase in latex yield between the treatments were found when dithane flowable was sprayed at 0.4 and 0.5 per cent at 10 days interval. Dithane M-45 increased the latex yield at 0.4 per cent significantly over other treatments, but the increase of seed yield was higher in this treatments wherease the highest seed yield was obtained at higher concentrations of dithane flowable sprayed at intervals of 10 or 15 days.

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적 요

다이센 수화제와 다이센 M-45, 비침투성 살균제를 공시하여 양귀비 노균병에 대한 약제 방제효과를 포장에서 조사하였다. 상기 다이센계통의 두약제는 타약제에 비하여 노균병의 방제에 효과적이었으며 라텍스 수량을 현저히 증가시켰다.

LITERATURES CITED

1. Alavi, A. 1975. How to prevent and control downy mildew of opium poppy. Iranian J. Pl. Path. 11 : 73~84.
2. Kothari, K.L. and N. Prasad. 1970. Downy mildew of opium poppy in Rajasthan. Indian Phytopath. 23 : 674~688.
3. Thakore, B.B. Lal, J.P. Jain, R.B. Singh, G.L. Khandelwal and Sneh Mathur. 1983. Losses due to downy mildew of opium poppy and its reduction by application of fungicides. Indian Phytopath. 30 : 462~464.