Journal Crop and Weed, 11(Special Issue):220-223(2015)

Evaluation of fungicides against alternaria blight disease of rapeseed-mustard in West Bengal

R. DAS

Pulses and Oilseeds Research Station,
Government of West Bengal, Berhampore,
Murshidabad, West Bengal, India.

Received:18-10-2014; Revised: 30-12-12014; Accepted:05-01-2015

ABSTRACT

Alternaria blight of rapeseed-mustard caused by the fungus Alternaria brassicae (Berk.) Sacc. is an economically important disease and occurs regularly during the winter season in West Bengal with an average loss in yield of about 47%. Therefore to manage this detrimental disease, an experiment was conducted during the winter season of 2013-14 at the Pulses and Oilseeds Research Station, Berhampore, Murshidabad, West Bengal. Different treatments namely, seed treatment with Metalaxyl 35% @ 6 g Kg^{-1} seed followed by one or two foliar spray of six different fungicides viz. Mancozeb 75% WP, Metalaxyl 8%+ Mancozeb 64% WP, Hexaconazole 25 EC, Difenconazole 25 EC, Propiconazole 25 EC and Trifloxystrobin 25% + Tebuconazole 50% ready mix compound were tested against the disease. All the fungicides are significantly effective in reducing disease severity and increasing seed yield. However, the lowest disease severity (9.6 % on leaf and 14.3 % on pod) and highest increase of seed yield (74.02 %) with maximum increase of test weight (16.30 %) were recorded from seed treatment with Metalaxyl 35% (6 g Kg^{-1} seed) followed by first spray of Mancozeb 75% WP (0.25%) and second spray of Trifloxystrobin 25%+ Tebuconazole 50% (0.1%).

Keywords: Alternaria blight, evaluation, fungicides, rapeseed-mustard

Rapeseed-mustard (*Brassica* sp.), a major group of oilseed crop of the world being grown in 53 countries across the six continents, with India being the third largest producer after China and Canada (FAO, 2009). It is also important *rabi* oilseed crop of West Bengal cultivated in about 410.793 thousand ha with total production of about 419.58 thousand tones and average productivity of 1021 kg/ha (Anonymous, 2011). Wide gap exists between the potential yield and the realized yield of rapeseed-mustard at the farmer's field, which is largely attributed to the number of biotic and abiotic stresses. Among biotic stresses, Alternaria blight has been reported to be most wide spread and destructive fungal diseases of rapeseed-mustard throughout the world which causes up to 47% yield losses (Kolte, 1985). Alternaria blight disease [*Alternaria brassicae* (Berk.) Sacc.] has been reported to affect most of the cruciferous crops throughout the world and is one among the important diseases of rapeseed-mustard with no proven source of transferable resistance in any of the hosts. The pathogen is greatly influenced by weather as the highest disease incidence is reported in wet seasons and in areas with relatively high rainfall. *A. brassicae* can affect host species at all stages of growth, including seed. Symptoms of the disease are characterized by formation of spots on leaves, stem and siliqua. This blight also reduces seed size and impairs seed color and oil content (Kaushik *et al*., 1984). Therefore, the present study was conducted to determine the effective chemical fungicide against Alternaria blight of rapeseed-mustard.

Investigations were carried out in November, 2013 to March, 2014 at an experimental site of the Pulses and Oilseeds Research Station, Berhampore (Lat. 24°50'N, Lon. 88°13' E, Alt. 66.69 m above msl, Soil type-clay loam and neutral pH), Murshidabad, West Bengal, India. Trials were conducted using a randomized block design with eleven fungicidal treatments (T_1-T_{11}) and a control (T_{12}) replicated thrice (Table 1) using Varuna (T-59), a highly susceptible variety of *Alternaria* blight. Seeds were sown on 27th November, 2013 and grown under prevailing epiphytotic condition for the disease. The experimental plot was divided into 36 sub-plots arranged in three blocks-R_1, R_2 and R_3, representing the three replications 1.5 m apart. The area of each sub-plot was 5 m x 3 m with plants arranged in 11 rows, 30 cm apart. Plant to plant distance was 10 cm. Nitrogen (N), Phosphate (P_2O_5) and Potash (K_2O) fertilizers were applied at the rate of 100:50:50 kg ha^{-1} in which nitrogen was used in two split doses. Irrigation was given thrice whenever required. Seed treatment was done with Metalaxyl 35% (Apron 35 SD) @ 6 g Kg^{-1} seed followed by one or two foliar spray of six different fungicides in all the treatments. First and second spray should be applied 45 and 60 days after sowing (DAS) respectively. The severity of the disease percent in leaf was assessed at 75 DAS while disease severity percent in pods was assessed at 15 days before harvesting (DBH) using 0-9

Short Communication
Email: rajudas05@gmail.com

scale (Anonymous, 2010). Ten plants were randomly selected and tagged after each treatment application, for disease assessment. The yield and test weight of grains of each plot was recorded after threshing. Finally the disease severity on leaf and pod, percent increase in yield over the control, net profit from additional yield and the economics of the foliar sprays were also calculated. An economic evaluation of the fungicide treatments was based on the value of the additional yield obtained after foliar spray subtracting the cost of the fungicides.

All fungicidal sprays significantly reduced alternaria blight severity (Table 2) and increased yield in comparison to the untreated control. Lowest Alternaria leaf blight (ALB) and Alternaria pod blight (APB) severity was observed in T_{11} (9.6%, 14.3%) followed by T_9 (14.7%, 16.3%) and T_{10} (20.1%, 17.8%). Maximum reduction of ALB and APB severity was reported in T_{11} (81.49%, 67.78%) followed by T_9 (71.73%, 63.33%) and T_{10} (61.16%, 60.00%). Maximum yield was obtained from T_{11} (1771 kg ha^{-1}) followed by T_9 (1664 kg ha^{-1}) and T_{10} (1593 kg ha^{-1}). Highest increase of yield was recorded from T_{11} (74.02%) followed by T_9 (63.54%) and T_{10} (56.55%). No significant difference in test weight was observed (Table 2). Maximum increase of test weight was reciprocated the same for the above mentioned treatments. The differences in seed yield with the different treatments could be attributed to the fungicidal treatment which essentially reduced the severity of Alternaria blight. Similar type of observation was also reported by Mondal *et al.,* 2007 and Kolte *et al*., 1987.

Different fungicidal treatments gave different net profits as well as different Incremental cost benefit ratio (ICBR) and Net incremental cost benefit ratio (NICBR). The profit or net monetary return varied from Rs. 2133.37 ha^{-1} to Rs. 19716.67 ha^{-1} in different treatments (Table 3). The net profit was obtained from the T_{11} (Rs. 19716.67 ha^{-1}), followed by T_9 (Rs. 18893.33 ha^{-1}) and T_{10} (Rs.16704.44 ha^{-1}). The economics of various fungicides revealed that the highest net realization over control was obtained from the treatment T_{11} (Rs. 26366.67 ha^{-1}), followed by T_9 (Rs. 22633.33 ha^{-1}) and T_{10} (Rs. 20144.44 ha^{-1}). In contrast to the net profits, a different trend was observed with ICBR and NICBR. ICBR was worked out for each treatment during 2013-14 by calculating prevailing market prices of fungicides, mustard seed and cost of labours (Table 3). Most favorable NICBR was registered from T_3 (1:6.7), followed by T_5 (1:5.8) and T_4 (1:5.4) while poor NICBR was observed in T_2 (1:1.2) and T_1 (1:1.3). This difference between the net profit and NICBR can perhaps be attributed to the cost of the fungicides involved. The observation was at par with Kolte *et al*., 1979 and Mansour, 1980. The economics of various fungicides used during 2013-14 revealed that T_3 *i.e.* seed treatment with Metalaxyl 35% (6 g Kg^{-1} seed) and Single spray of Hexaconazole 5% EC @ 1 ml/lt. of water at 45 DAS was the most economic fungicides with cost benefit ratio followed by T_5 and T_4 (Table 3). However, the lowest disease severity (9.6 % on leaf and 14.3 % on pod) and highest increase of seed yield (74.02 %) and maximum increase of test weight (16.30 %) were recorded from seed treatment with Metalaxyl 35% (6 g Kg^{-1} seed) followed by first spray of Mancozeb 75% WP (0.2%) at 45 DAS and second spray of Trifloxystrobin 25%+ Tebuconazole 50% (0.1%) at 60 DAS (T_{11}).

Table 1: Treatment, chemical name, strength, trade name and dose

Treatment	Chemical name, Strength and Trade name	Dose
T_1	Single spray of Mancozeb 75% WP (Dithane M-45)	2.5 g lt^{-1} of water
T_2	Single spray of Metalaxyl 8%+ Mancozeb 64% WP (Ridomil MZ 72)	2.5 g lt^{-1} water
T_3	Single spray of Hexaconazole 5% EC (Sitara)	1ml lt^{-1} of water
T_4	Single spray of Difenconazole 25% EC (Score)	1ml lt^{-1} of water
T_5	Single spray of Propiconazole 25% EC (Tilt)	1ml lt^{-1}. of water
T_6	Single spray of Trifloxystrobin 25% + Tebuconazole 50% readymix compound (Nativo)	1 g lt^{-1}. of water
T_7	T_1 followed by T_2	
T_8	T_1 followed by T_3	
T_9	T_1 followed by T_4	
T_{10}	T_1 followed by T_5	
T_{11}	T_1 followed by T_6	
T_{12}	Water spray (Control)	

Table 2: Alternaria leaf and pod blight severity and yield in different treatments during *rabi*, 2013-14

Treatment	ALB Severity (%)		Decrease of ALB Severity (%)	APB Severity (%)		Decrease of APB Severity (%)	Test weight (g)	Increase of Test weight (%)	Yield (kg ha^{-1})	Increase of Yield (%)
T_1	46.6	(43.1)	10.09	40.4	(39.5)	9.03	4.90	3.81	1124	10.48
T_2	44.3	(41.7)	14.48	38.4	(38.3)	13.69	4.93	4.45	1238	21.62
T_3	41.5	(40.1)	19.90	34.7	(36.1)	21.82	4.99	5.58	1304	28.17
T_4	35.4	(36.5)	31.67	29.2	(32.7)	34.23	5.07	7.27	1407	38.21
T_5	38.7	(38.5)	25.32	31.9	(34.4)	28.33	5.01	6.00	1373	34.93
T_6	33.2	(35.2)	35.86	25.1	(30.0)	43.61	5.14	8.82	1449	42.36
T_7	28.0	(32.0)	45.90	22.3	(28.2)	49.72	5.17	9.39	1482	45.63
T_8	24.4	(29.6)	53.02	19.3	(26.0)	56.67	5.31	12.35	1520	49.34
T_9	14.7	(22.5)	71.73	16.3	(23.8)	63.33	5.37	13.76	1664	63.54
T_{10}	20.1	(26.7)	61.16	17.8	(24.9)	60.00	5.35	13.27	1593	56.55
T_{11}	9.6	(18.0)	81.49	14.3	(22.2)	67.78	5.49	16.30	1771	74.02
T_{12}	51.8	(46.1)		44.4	(41.8)		4.72		1018	
SEm(±)	**0.34**			**1.11**			**0.30**		**0.05**	
LSD (0.05)	**0.97**			**3.20**			**0.89**		**138.79**	

Note: Figures in parentheses are angular transformed value; ALB- Alternaria leaf blight, PB- Alternaria pod blight

Table 3: Economics of various fungicides used for control of *Alternaria* disease during 2013-14.

Treatment	Yield(Kg/ha)	Total cost of fungicides and labours (Rs. ha^{-1}) (P)	Grossrealization over control (Rs. ha^{-1})	Net realization over control (Rs. ha^{-1})	Net Profit (Rs. ha^{-1})	ICBR(A/P)	NICBR
T_1	1124	1600	39355.56	3733.33	2133.33	1 : 2.3	1 : 1.3
T_2	1238	3475	43322.22	7700.00	4225.00	1 : 2.2	1 : 1.2
T_3	1304	1300	45655.56	10033.33	8733.33	1 : 7.7	1 : 6.7
T_4	1407	2140	49233.33	13611.11	11471.11	1: 6.4	1 : 5.4
T_5	1373	1840	48066.67	12444.44	10604.44	1 : 6.8	1 : 5.8
T_6	1449	5050	50711.11	15088.89	10038.89	1 : 3.0	1 : 2.0
T_7	1482	5075	51877.78	16255.56	11180.56	1 : 3.2	1 : 2.2
T_8	1520	2900	53200.00	17577.78	14677.78	1 : 6.1	1 : 5.1
T_9	1664	3740	58255.56	22633.33	18893.33	1 : 6.1	1 : 5.1
T_{10}	1593	3440	55766.67	20144.44	16704.44	1 : 5.9	1 : 4.9
T_{11}	1771	6650	61988.89	26366.67	19716.67	1 : 4.0	1 : 3.0
T_{12}	1018		35622.22				
Sem(±)	**0.05**						
LSD(0.05)	**138.79**						

Note: Labour charge per ha Rs. 1000 for 5 labours, Mustard seed @ Rs.35 per kg, Water necessary for spray 600 lt. ha^{-1}, ICBR- Incremental cost benefit ratio, NICBR- Net incremental cost benefit ratio.

From the above results it may be concluded that the highest NICBR was registered in the treatment *i.e.* seed treatment with Metalaxyl 35% (6 g Kg^{-1} seed) and Single spray of Hexaconazole 5% EC @ 1 ml/lt. of water at 45 DAS. Whereas, maximum disease control and highest yield was recorded in the treatment *i.e.* seed treatment with Metalaxyl 35% (6 g Kg^{-1} seed) followed by first spray of Mancozeb 75% WP @ 2.5 g/lt. of water at 45 DAS and second spray of Trifloxystrobin 25% + Tebuconazole 50% @ 1g/lt. of water at 60 DAS with low NIBCR ratio.

REFERENCES

Anonymous. 2010. Planning and Review Session Proc. All India Coordinated Research Project on Rapeseed-Mustard, Directorate of rapeseed and Mustard, Sewar, Bharatpur, Rajasthan.

Anonymous. 2011. *Estimates of area and production of principle crops in west Bengal*. Published by the Evaluation Wing, directorate of agriculture, Government of West Bengal, Kolkata, pp. 44.

FAO. 2009. Agriculture production database. Food and Agricultural Organization.

Kaushik, C. D., Saharan, G. S. and Kaushik, J. C. 1984. Magnitude of loss in yield and management of Alternaria blight in rapeseed-mustard. *Indian Phyto.*, **37** : 398.

Kolte, S. J. 1985. *Diseases of Annual Edible Oilseed Crops Vol. II. Rapeseed-mustard and Sesame Diseases.* CRC Press Inc., N.W., Boca Raton FL, USA, pp. 127.

Kolte, S. J., Ealasubrahmanyam, N., Tewari, A. N. and Awasthi, R. P. 1979. Field performance of fungicides in the control of the Alternaria blight of sunflower. *Ind. J. Agril. Sci.*, **49** : 555–59.

Kolte, S. J., Awasthi, R. P. and Vishwanath. 1987. Assessments of yield losses due to *Alternaria* blight in rapeseed and mustard. *Indian Phyto.*, **40** : 209–11.

Mansour, K. 1980. Chemical control of leaf spots of field bean (*Vicia faba* L.). *Agril Res. Rev.*, **58**: 49–56.

Mondal, L., Bhunia, C. K., Mukhopadhyay, A. and Biswas, A. 2007. Bioefficacy of some new fungicides in management of *Alternaria* blight disease of rapeseed-mustard. *Pestology*, **31**: 33-41.