The Pharma Innovation Journal 2022; SP-11(7): 43-46

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; SP-11(7): 43-46

www.thepharmajournal.com
Received: 21-05-2022
Accepted: 24-06-2022

RN Sharma
Department Plant Pathology, College of Agriculture, Sri Karan Narendra Agriculture University, Jobner, Rajasthan, India

S Mureliya
Agricultural Research Station, Sri Karan Narendra Agriculture University, Jobner, Rajasthan, India

Corresponding Author
RN Sharma
Department Plant Pathology, College of Agriculture, Sri Karan Narendra Agriculture University, Jobner, Rajasthan, India

Control of prevailing diseases in rapeseed-mustard

RN Sharma and S Mureliya

Abstract
A field trial was laid out at Agricultural Research Station (Sri Karan Narendra Agriculture University, Jobner), Navgaon - Alwar (Rajasthan) to test the efficacy of fungicides against prevailing diseases (white rust and Alternaria blight) of rapeseed-mustard using highly susceptible variety 'Varuna' (*Brassica juncea* L.) during the crop season of rabi 2015-16. Five fungicides viz., mancozeb 75% WP (0.2%), metalaxyl 8% + mancozeb 64% WP (0.2%), hexaconazole 5% EC (0.05%), difenconazole 25% EC (0.05%) and propiconazole 25% EC (0.05%) were tested for their efficacy alone as single spray at 45 days after sowing (DAS) and in combination with mancozeb at 45 DAS followed by spray of other four fungicides individually at 60 DAS. The spray of different fungicides alone as single spray treatment or each fungicide in succession with mancozeb (0.2%) significantly reduced the both diseases over control, however, the level of efficacy varied among the treatments. The treatment containing single spray of mancozeb 75% WP (0.2%) followed by single spray of metalaxyl 8% + mancozeb 64% WP (0.2%) performed best in respect of white rust disease control as well as grain yield concerned, where, lowest white rust disease intensity (1.40%) and highest grain yield (13.48 q/ha) was recorded. Single spray of mancozeb 75% WP @ 0.2% followed by single spray of hexaconazole 5% EC (0.05%) was found to be the next in order of efficacy against the white rust disease, showed 2.77 per cent disease intensity (PDI) and 12.94 q/ha yield. In case of Alternaria blight disease, single spray of mancozeb 75% WP @ 0.2% followed by single spray of hexaconazole 5% EC (0.05%) proved most effective which allowed least disease intensity (2.07%) and differed non-significantly with the treatment of single spray of mancozeb 75% WP (0.2%) followed by single spray of propiconazole 25% EC (0.05%) with 2.10 PDI. However, maximum IBCR (9.57) was noted in treatment containing single spray of hexaconazole 5% EC @ 0.05% followed by the treatment of mancozeb 75% WP @ 0.2% followed by single spray of hexaconazole 5% EC @ 0.05% (5.42) due to low cost of hexaconazole fungicide.

Keywords: Rapeseed-mustard, white rust, Alternaria blight, PDI, efficacy, fungicides and spray

Introduction
Rapeseed-mustard is the second most important oilseed crop in India, next to groundnut, contributing nearly 25-30 per cent of the total oilseeds production (Anonymous, 2018) [2]. India occupies one fifth of global area under mustard contributing over one-tenth of production (Rana *et al*., 2020) [20]. It is grown over an area of 36.62 million hectares worldwide with total production of 72.41 million tones. Indian mustard's area, production and productivity is 7.20 million hectares, 8.0 million tones and 13.24 q/ha respectively (Anonymous, 2020a; DOAC, 2017) [3, 10], whereas in Rajasthan, mustard gives production of 43.03 lakh tones from an area of about 27.13 lakh hectares with productivity of 15.86 q/ha (Anonymous, 2020b) [4]. Though, India occupies premier place in terms of acreage as well as production but the difference between the average productivity of global (20.47 q/ha) and domestic (13.24 q/ha) still remains wide (Rana *et al*., 2019) [19].

Despite considerable increase in the productivity and production under Technology Mission, a wide gap still exists between the potential yield and the yield realized at the farmer's field. This gap is mainly due to prevalence of various biotic and abiotic stresses to which the rapeseed-mustard crop is exposed. Among the biotic stresses, diseases like white rust [*Albugo cruciferarum* S.F. Gray {*A. candida* (L) Kuntze}] causes yield losses up to 27 to 90% due to leaf (leaf stage) and systemic (stag head) infection (Lakra and Saharan, 1989) [14] and Alternaria blight [*Alternaria brassicae* (Berk.) Sacc.] causes up to 35-45% yield losses (Saharan, 1992) [21] have been reported to be the most wide spread and destructive fungal diseases of the rapeseed-mustard throughout the world (Kolte, 1985) [13].

Fungicides are primary means of controlling the diseases of rapeseed-mustard. Continuous use of selected agrochemicals led to the problem of resistance in pathogens against these chemicals.

The resistance of fungal pathogens to antifungal compounds necessitates the screening of new fungicides to manage the diseases. The present study was therefore, undertaken with a view to evaluate fungicides of different new groups and their combinations against the prevailing diseases of rapeseed-mustard like white rust [*Albugo cruciferarum* S.F. Gray {*A. candida* (L) Kuntze}] and Alternaria blight [*Alternaria brassicae* (Berk.) Sacc.].

Materials and Methods

A field trial was laid out at Agricultural Research Station (*Sri Karan Narendra Agriculture University, Jobner*), Navgaon-Alwar (Rajasthan) during the crop season of Rabi, 2015-16. The trial have ten treatments including an untreated control to test the efficacy of different fungicides and their combinations against the prevailing diseases (white rust and Alternaria blight) of rapeseed-mustard using highly susceptible variety 'Varuna' [*Brassica juncea* (L.) Czern & Coss.]. Five fungicides viz., mancozeb 75% WP @ 0.2%, metalaxyl 8% + mancozeb 64% WP @ 0.2%, hexaconazole 5% EC @ 0.05%, difenconazole 25% EC @ 0.05% and propiconazole 25% EC @ 0.05% were tested for their efficacy alone as single spray at 45 days after sowing (DAS) and in combination with mancozeb 75% WP (0.2%) at 45 DAS followed by spray of other four fungicides individually at 60 DAS. Plots sprayed with plain water served as check/control. The experiment was framed in randomized block design with three replications. All recommended agronomical practices were adopted for raising a good crop. White rust and Alternaria blight severity were observed at leaf stage (90 days) and calculated as per cent disease intensity (PDI) using 0 - 9 grades (DAS, 2016, Bisht *et al*., 2018) [8, 9]. The PDI was calculated as: (Sum of all numerical rating/Number of leaves examined x maximum disease grade) x 100 (Gaur *et al.*, 2012) [11].

The crop was harvested at maturity and threshed each treatment plot separately and individual plot yield was recorded. The individual plot yield was then converted into q/ha. Data were statistically analysed and finally incremental cost-benefit ratio (ICBR) was calculated for economic viability of different treatments based on prevailing market price (Gaur *et al*., 2012) [11].

Results and Discussion

White rust: The results revealed that all treatments were found significantly superior over untreated control in reducing the disease severity. The treatment comprising foliar sprays of mancozeb 75% WP @ 0.2% followed by metalaxyl 8% + mancozeb 64% WP @ 0.2% proved most effective among all treatments in controlling the disease, where least disease intensity (1.40%) and maximum disease reduction (90.43%) over control was recorded. The treatment containing foliar application of mancozeb 75% WP @ 0.2% followed by hexaconazole 5% EC @ 0.05% and foliar application of mancozeb 75% WP @ 0.2% followed by propiconazole 25% EC @ 0.05% which statistically at par with each other, were found next in order of efficacy against the disease, showed 2.77 and 3.23 PDI and 81.07 and 77.92 per cent reduction in diseases intensity over control, respectively. Rest of the foliar treatments exhibited low to moderate efficacy against the disease while sprays of alone mancozeb 75% WP proved least effective. (Table 1 and Fig. 1).

Present results are in conformity with earlier workers, who established the efficacy of metalaxyl 8% + mancozeb 64% WP (Ridomil MZ) in controlling the severity of white rust on leaves in mustard (Mehta *et al*., 1996, Khangura and Sokhi, 2000, Pandey *et al*., 2000, Singh and Singh, 2005, Bhatia and Gangopadhyay, 2008,) [16, 12, 17, 23, 7]. Similar to present findings, Abhishek *et al*., (2017) [1] and Basavaraj *et al.* (2020) [6] have also been reported the efficacy of hexaconazole and propiconazole in controlling the white rust of mustard.

Alternaria blight: The data depicted in table 1 and fig. 1, revealed that the spray of different fungicides alone as single spray treatment or each fungicide in succession with mancozeb 75% WP (0.2%) significantly reduced the Alternaria blight disease over control, however the level of efficacy varied among the treatments. In general, the combinations of two fungicides spray i.e. mancozeb 75% WP at 45 DAS followed by other four fungicides each at 60 DAS have recorded lower Alternaria blight severity as compared to all single spray treatments. The treatment comprising foliar sprays of mancozeb 75% WP @ 0.2% followed by hexaconazole 5% EC @ 0.05% was found superior among all the treatments in controlling the disease, where least disease intensity (2.07%) and maximum disease reduction (75.44%) over control was recorded. It differed non significantly with the treatment contained foliar application of mancozeb 75% WP @ 0.2% followed by propiconazole 25% EC @ 0.05%, exhibited 2.10 per cent disease intensity and 75.09 per cent protection from the disease over control. Foliar application of mancozeb 75% WP @ 0.2% followed by difenconazole 25% EC @ 0.05% found next in order of efficacy against the disease, showed 2.33 PDI and 72.36 percent disease reduction as compared to control. Rest of the treatments exhibited low to moderate efficacy against the disease, allowed 2.33 to 4.63 PDI. Among the single spray treatments, spray of hexaconazole 5% EC @ 0.05% was found to be best in reducing the disease severity (67.14%) over the control.

Present findings are in consonance with those of earlier workers who stated that spray of mancozeb followed by spray of hexaconazole reduced the disease severity of Alternaria blight of mustard (Singh *et al*, 2006, Rakesh *et al*., 2018) [22]. Similar to present finding Bairwa *et al.*, (2015) [5] and Mahapatra and Das (2016) [9] reported propiconazole as effective fungicide in controlling the Alternaria blight of mustard.

Yield: The treatment comprised foliar sprays of mancozeb 75% WP @ 0.2% followed by metalaxyl 8% + mancozeb 64% WP @ 0.2% rendered maximum average produce of 13.48 q/ha which was 59.15 per cent higher than control, insignificantly followed by the treatment comprised foliar spray of mancozeb 75% WP @ 0.2% followed by hexaconazole 5% EC @ 0.05% where, 12.94 q/ha yield was noted. Foliar application of mancozeb 75% WP @ 0.2% followed by propiconazole 25% EC @ 0.05% found next in potential in providing yield of 11.90 q/ha (Table 1 and Fig. 1).

The highest incremental cost benefit ratio (ICBR) of 9.57 was achieved in the treatment of foliar spray with hexaconazole 5% EC @ 0.05% followed by the treatment comprised spray of mancozeb 75% WP @ 0.2% followed by hexaconazole 5% EC @ 0.05% and foliar application of mancozeb 75% WP @ 0.2% followed by propiconazole 25% EC @ 0.05% which provided incremental cost benefit ratio of 5.42 and 3.21, respectively (Table 1).

Present findings are supported by several earlier workers who reported the higher yield of mustard with foliar spray of mancozeb 75% WP followed by hexaconazole 5% EC and

mancozeb 75% WP @ 0.2% followed by propiconazole 25% EC (Rakesh *et al*., 2018) and metalaxyl 8% + mancozeb 64% WP (Khangura and Sokhi, 2000, Pandey *et al*., 2000, Yadav, 2003) [12, 17, 24].

Table 1: Efficacy of different fungicides against prevailing diseases of rapeseed-mustard under field conditions during rabi 2015-16.

Treatment No.	Treatment	White rust		Alternaria blight		Yield (q/ha)	Yield Increase over control (%)	ICBR
		PDI	Reduction over control (%)	PDI	Reduction over control (%)			
1	Single spray of mancozeb 75% WP @ 0.2%	10.70 (19.08)	26.86	5.40 (13.41)	35.94	9.51	12.28	1: 1.35
2	Single spray of metalaxyl 8% + mancozeb 64% WP @ 0.2%	4.17 (11.72)	71.50	4.63 (12.40)	45.08	10.87	28.34	1: 1.16
3	Single spray of hexaconazole 5% EC @ 0.05%	5.80 (13.87)	60.36	2.77 (9.54)	67.14	11.17	31.88	1: 9.57
4	Single spray of difenconazole 25% EC @ 0.05%	7.87 (16.32)	46.21	4.57 (12.44)	45.79	9.79	15.58	1: 0.64
5	Single spray of propiconazole 25% EC @ 0.05%	6.47 (14.71)	55.78	3.60 (10.86)	57.30	10.18	20.19	1: 3.21
6	T-1 followed by T-2	1.40 (6.16)	90.43	2.40 (8.87)	71.53	13.48	59.15	1: 2.22
7	T-1 followed by T-3	2.77 (9.55)	81.07	2.07 (8.26)	75.44	12.94	52.77	1: 5.42
8	T-1 followed by T-4	4.57 (12.29)	68.76	2.33 (8.72)	72.36	10.45	23.38	1: 0.59
9	T-1 followed by T-5	3.23 (10.33)	77.92	2.10 (8.33)	75.09	11.90	40.50	1: 3.03
10	Control (water spray)	14.63 (22.49)	-	8.43 (16.87)	-	8.47	-	1: 1.35
CD (*P*=0.05)		2.10		1.76		2.46		
CV (%)		8.97		9.33		13.20		

Figures in parentheses are arc sine transformed values

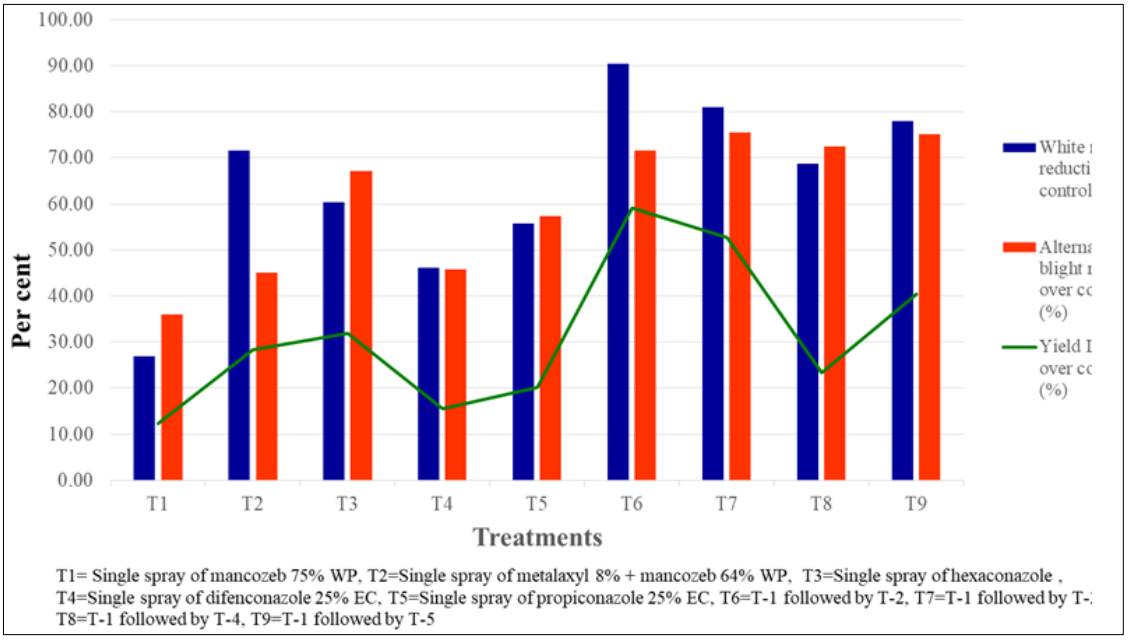

Fig 1: Effect of different fungicidal sprays on white rust and alternaria blight diseases and yield of repressed-mustard

Conclusion

Conclusively, this study demonstrated that prevailing diseases of the rapeseed-mustard (White rust and Alternaria blight) can be effectively and economically managed by foliar spray of mancozeb 75% WP @ 0.2% followed by metalaxyl 8% + mancozeb 64% WP @ 0.2% or foliar spray of mancozeb 75% WP @ 0.2% at 45 DAS followed by hexaconazole 5% EC @ 0.05% at 60 DAS.

Acknowledgement

Authors gratefully acknowledge AICRP on Rapeseed and Mustard and Director Research, S.K.N. Agriculture University, Jobner for providing facilities and support for this research.

References

1. Abhishek Prasad R, Kumar D, Kumar V, Kumar M, Kumar D. Symptoms and management of white rust/blister of Indian mustard (*Albugo candida*). International Journal of Current Microbiology and Applied Sciences. 2017;6(10):1094-1100.
2. Anonymous. Ministry of Agriculture and Farmers Welfare, GoI. Pocket-Book of Agricultural Statistics New Delhi, 2017, 128.

3. Anonymous. World Agricultural Production. United States, Department of Agriculture. Foreign Agricultural Service, 2020a.
4. Anonymous. Agriculture Statistics. Department of Agriculture, Government of Rajasthan, Jaipur, 2020b.
5. Bairwa SK, Prasad D, Shekhawat US, Rai PK, Ramswaroop K. Disease management in Indian mustard (*Brassica juncea*) through integrated approaches. Annals of Agricultural Research New Series. 2015;36:251-257.
6. Basavaraj K, Rathi AS, Gurav NP, Punia R, Kumar A. Evaluation of selected fungicides for the management of white rust of Indian mustard. Journal of Oilseeds Research. 2020;37(2):99-103.
7. Bhatia JN, Gangopadhyay S. Studies on chemical control of white rust disease of mustard. International Journal of Pest Management. 2008;42(1):61-65.
8. Bisht KS, Rana M, Upadhyay P, Awasthi RP. Disease Assessment Key for White Rust Disease Caused by *Albugo candida*, in Rapeseed-Mustard. Plant Pathology Journal. 2018;17:11-18.
9. DAS R. Identification of resistant source against Alternaria blight disease of rapeseed-mustard. Journal of Crop and Weed. 2016;12(2):134-136.
10. DOAC. Agricultural Statistics at a Glance. Directorate of Economics and Statistics, Department of Agriculture and Cooperation. Ministry of Agriculture, Government of India, 2017.
11. Gaur RB, Sharma RN, Chattopadhyay C. Integrated disease management in rapeseed mustard using bioagents, plant products and fungitoxicants. Indian Journal of Plant Protection. 2012;40(3):175-181.
12. Khangura R, Sokhi SS. Efficacy of Ridomil MZ and protectant fungicides to control white rust (*Albugo candida*) and their effect on seed yield, oil content and fatty acid composition in mustard. Animal Production Science. 2000;40(5):699-706.
13. Kolte SJ. Diseases of annual edible oilseed crops, vol. II, rapeseed-mustard and sesame diseases. CRC Press Inc. Boca Raton, Florida, USA, 1985, 135.
14. Lakra BS, Saharan GS. Correlation of leaf and stag head infection intensities of white rust with yield and yield components of mustard. Journal of Mycology and Plant Pathology. 1989;19:279-281.
15. Mahapatra S, Das S. Evaluation of fungicides against Alternaria leaf blight of mustard. Indian Journal of Plant Protection. 2016;44(1):99-103.
16. Mehta N, Saharan GS, Kaushik CD, Mehta N. Efficacy and economics of fungicidal management of white rust and downy mildew complex in mustard. Indian Journal of Mycology Plant Pathology. 1996;26:243-247.
17. Pandey RK, Tripathi ML, Singh R. Efficacy of fungicides in the management of white rust and Alternaria blight of mustard. Crop Research (Hisar). 2000;20(1):137-139.
18. Rakesh Kumar A, Rathi AS. Management of Alternaria blight in Indian mustard through fungicides under field conditions. International Journal of Chemical Studies. 2018;6(2):2042-2044
19. Rana K, Singh JP, Parihar M. Manifestation of improved cultivars, irrigation and sulphur in mustard growth, productivity, quality and profitability: A review. Journal of Pharmacognosy and Phytochemistry. 2019;8:2778-2782.
20. Rana K, Singh JP, Singh RK, Parihar M. Variation in dry matter accumulation and growth indices of different mustard (*Brassica juncea* L.) hybrids as influenced by irrigation scheduling and sulphur fertilization. Journal of Oilseed Brassica. 2020;11(2):103-109.
21. Saharan GS. Management of rapeseed and mustard diseases In: Advances in Oilseed Research, P. Kumar and M. Rai (eds.). Science Publication of India, 1992;1:152-158.
22. Singh N, Srivastava AK, Narain U. Efficacy of fungicides against Alternaria blight of mustard. International Journal of Plan Sciences. 2006;1:311-12.
23. Singh RB, Singh RN. Fungicidal management of foliar diseases of mustard in mid-eastern India. Indian Phytopathology. 2005;58:51-56.
24. Yadav MS. Efficacy of fungitoxicants in the management of Alternaria blight and white rust of mustard. Journal of Mycology and Plant Pathology. 2003;33:307-309.