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Evaluation of newer molecule fungitoxicants against *Alternaria* blight, 1000 seed weight and seed yield of oilseed Brassica in Bihar condition

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Abstract

To find out most suitable newer molecule fungitoxicants for minimizing *Alternaria* blight disease incidence of oilseed Brassica crop getting maximum yield a trial was carried out during *Rabi* 2019-20 in field condition at Tirhut College of Agriculture, Dholi, Muzaffarpur farm in RBD with three replications and eight treatments. Six different fungitoxicants namely, Carbendazim 50WP, Hexaconazole 5EC, Mancozeb 75WP, Propiconazole 25EC, Trifloxystrobin 50WG and Carbendazim12%+ Mancozeb 63% were evaluated for their efficacies on pathogen. Data on the yield measurements under different treatments shows that all the treated plots resulted in better crop and less disease incidence than the control plots. The plots given seed treatment with Carbendazim 50WP @2g/kg seed and foliar sprays of Trifloxystrobin 50WG @ 1g/l of water were found to be superior on all the other treatments. Least PDI (20.5%), maximum 1000 seed weight (4.1g), highest yield (1430 kg/ha), maximum yield increased over control (591.7kg/ha) and highest CB ratio of 1.71 was recorded from this treatment. This treatment was statistically at par with seed treatment with Carbendazim50WP @ 2g/kg seed and foliar spray with Propiconazole 25EC @ 1ml/l of water where 27.8% PDI, 3.8g per 1000 seed weight, 1343.3 kg/ha yield, 505.0 kg/ha increased yield over control and 1.60 CB ratio was recorded.

Keywords: Oilseed brassica, fungal diseases, *Alternaria* blight, fungitoxicants

Introduction

Rapeseed-Mustard are globally known as "Oilseed brassica", holds the position of third important oilseed crop after soyabean and palm with the production of about 72 million tonnes from 35 million hectares acreage. In terms of area and production, India stands third place after Canada and China, and fifth place in terms of productivity after Germany, France, Canada and China (Jat *et al.*, 2019) [6]. This crop is grown in both tropical and subtropical regions of India covering 6.23 million hectares of area producing 9.34 million tonnes with 1499 kg/ha average productivity. Bihar produces 0.11 million tonnes from an acreage of 0.08 million hectares with average productivity of 1305 kg/ha (Anonymous, 2019) [1]. The development of high yielding varieties coupled with improved production technologies has led to a considerable increase in the productivity of rapeseed- mustard in India during past decade. But despite this increase, the yields of oilseed brassicas in India are much below the global average (2047kg/ha). The wide gap between the potential and realized yields is largely because of the biotic and abiotic stresses. Among the biotic factors, fungal diseases alone are responsible for severe damages to the crop resulting in yield losses up to 70% on a world wide scale. The severe attack of many fungal diseases not only deteriorates the quality of the seed but reduces the oil content considerably in different oil-yielding Brassica species. *Alternaria* blight of rapeseed-mustard (*Brassica* spp.) caused by *Alternaria brassicae* (Berk.) Sacc., is one of the most important limiting factors, causing yield losses of up to 35–45% in mustard (*Brassica juncea*) (Saharan, 1992; Kolte 2002) [11, 10] and even more severe losses (up to 70%) in rapeseed (*Brassica campestris*). The blight also reduces seed size and impairs seed color and oil content (Kaushik *et al.*, 1984) [7]. The fungus, not only leads to yield reduction by causing foliar damage to the crop, but also damages siliqua in pod formation stage, severely deteriorating both seed and oil yield. (Choudhary *et al.*, 2018) [3]. *Alternaria brassicae* is the most catastrophic and pervasive disease of oilseed brassicas in Bihar also. The present study was aimed to determine a cost-effective management of *Alternaria* blight with using newer molecules of fungicides in Bihar.

Materials and Methods

The experiment was carried out during Rabi 2019-20 at experimental plot of Tirhut College of Agriculture, Dholi, Muzaffarpur. Trials were conducted using a Randomized Block Design with 8 treatments and 3 replications. The variety Varuna was sown with plot size 3 m x 3 m with row to row spacing 30 cm and plant to plant 10 cm. Recommended doses of N:P:K::80:40:40 (kg/ha) fertilizers were applied. Different treatments viz., seed treatment with Carbendazim 50WP @ 2g/kg seed + foliar sprays with Carbendazim 50WP @ 1g/l of water, seed treatment with Carbendazim 50WP @ 2g/kg seed + foliar sprays with Hexaconazole 5EC @ 1ml/l of water, seed treatment with Carbendazim 50WP @ 2g/kg seed + foliar sprays with Propiconazole 25EC @ 1ml/l of water, seed treatment with Carbendazim 50WP @ 2g/kg seed + foliar sprays with Trifloxystrobin 50WG @ 1g/l of water, seed treatment with Carbendazim 50WP @ 2g/kg seed + foliar sprays with Carbendazim 12% + Mancozeb 63% @ 2g/l of water, seed treatment with Carbendazim 50WP @ 2g/kg seed + foliar sprays with Mancozeb 75WP @ 2.5g/l of water, seed treatment with Carbendazim 50WP @ 2g/kg seed and control (no treatment) were tested.

For rating reaction of Alternaria blight 0-9 Scale were followed

(I) = Immune/No lesions

(HR) = Non-sporulating pinpoint size or small brown necrotic spots, less than 5% leaf area covered by lesions.

(R) = Small roundish slightly sporulating larger brown necrotic spots, about 1-2 mm in diameter with distinct margin or yellow halo, 5-10% leaf area covered by lesions.

(MR) = Moderately sporulating, non-coalescing larger brown spots, about 2-4 mm in diameter with a distinct margin or yellow halo, 11-25% leaf area covered by the spots.

(S) = Moderately sporulating, coalescing larger brown spots about 4-5 mm in diameter, 26-50% leaf area covered by lesions.

(HS) = Profusely sporulating, rapidly coalescing brown to black spots measuring more than 6 mm diameter without margins covering more than 50% leaf area.

The Per cent Disease index has been calculated by using the formula

$$\text{Per cent Disease index (PDI)} = \frac{\text{Sum of all Disease rating}}{\text{Total number of leaves examined} \times \text{Maximum rating}} \times 100$$

The yield of each plot was recorded after threshing. The per cent increase in yield over the control, net profit from additional yield and the economics of the foliar sprays were calculated. An economic calculation of the fungicidal treatments was based on the value of the additional yield obtained after foliar spray subtracting the cost of the fungicides.

Results and Discussion

The present investigations were carried out to find out the fungicidal effect of some newer molecule fungitoxicants for the management of Alternaria blight disease of oilseed Brassica. The investigation was carried out during Rabi 2019-20 with six different fungicides namely, Carbendazim 50WP, Hexaconazole 5EC, Mancozeb 75WP, Propiconazole 25EC, Trifloxystrobin 50WG and Carbendazim 12% + Mancozeb 63% and eight different fungicidal combination treatments along with one control were evaluated.

The data from table shows that during the study season Rabi 2019-20, all the treatments significantly controlled the severity of Alternaria blight over the control. All the treated plots resulted in better crop and less disease intensity than on the control plots. The plot given seed treatment with Carbendazim 50WP @ 2g/kg seed and foliar sprays of Trifloxystrobin 50WG @ 1g/l of water was found to be superior on all the other treatments. Least PDI (20.5%), maximum 1000 seed weight (4.1g), highest yield (1430 kg/ha), maximum yield increased over control (591.7kg/ha) and highest CB ratio of (1.71), was recorded from this treatment. This treatment was statistically at par with treatment seed treated with Carbendazim 50WP @ 2g/kg seed and foliar spray with Propiconazole 25EC @ 1ml/l of water where 27.8% PDI, 3.8g per 1000 seed weight, 1343.3 kg/ha yield, 505.0 kg/ha increased yield over control and 1.60 CB ratio was recorded. The treatment was followed by treatment i.e., seed treated with Carbendazim 50WP @ 2g/kg seed along with foliar sprays of Hexaconazole 5EC @ 1ml/l of water in which 31.5% PDI, 3.6g per 1000 seed weight, 1251.7 kg/ha yield, 413.4 kg/ha increased yield over control and 1.49 CB ratio was calculated. The control plot in which no any treatment was given recorded 64.7% PDI, 2.7g per 1000 seed weight and 838.3 kg/ha yield.

Table 1: Evaluation of newer molecule fungitoxicants against Alternaria blight disease under field condition during Rabi 2019-20

Treatments	PDI %*	1000 Seed Weight (g)*	Yield (Kg/ha)*	Yield Increased over control (kg/ha)	CB Ratio
Seed treatment with Carbendazim 50WP @ 2g/kg seed + foliar spray of Carbendazim 50WP @ 1g/l of water	41.4	3.0	1108.3	270.0	1.32
Seed treatment with Carbendazim 50WP @ 2g/kg seed + foliar spray of Hexaconazole 5EC @ 1ml/l of water	31.5	3.6	1251.7	413.4	1.49
Seed treatment with Carbendazim 50WP @ 2g/kg seed + foliar spray of Propiconazole 25EC @ 1ml/l of water	27.8	3.8	1343.3	505.0	1.60
Seed treatment with Carbendazim 50WP @ 2g/kg seed + foliar spray of Trifloxystrobin 50WG @ 1g/l of water	20.5	4.1	1430.0	591.7	1.71
Seed treatment with Carbendazim 50WP @ 2g/kg seed + foliar spray of Carbendazim 19% + Mancozeb 47% @ 2g/l of water	35.3	3.3	1220.0	381.7	1.46
Seed treatment with Carbendazim 50WP @ 2g/kg seed + foliar spray of Mancozeb 75WP @ 2.5g/l of water	37.3	3.0	1136.7	298.4	1.36
Seed treatment with Carbendazim 50WP @ 2g / kg seed	45.5	2.9	1033.3	195.0	1.23
Control (no treatment)	64.7	2.7	838.3	-	1.00
SE(m) ±	1.4	0.1	41.35		
C.D. (p<0.05)	4.2	0.3	126.65		

* Average of three replications

Similar investigations in testing the fungicides in the field conditions were conducted by earlier workers, i.e. Khan *et al.* (2007)^[8] reported the maximum reduction (32%) in severity of *Alternaria* blight of mustard disease by Ridomil MZ in field condition and found similar results in managing the pathogen of *Alternaria* blight disease of oilseed brassica. They also reported to obtain the highest net profit as well as the highest cost-benefit ratio with Bavistin +Indofil Z-78 (1:3.2), followed by Bavistin + Captaf (1:1.3). Singh *et al.* (2017) found Carbendazim + Mancozeb combination fungicide as more effective in controlling the intensity of *Alternaria* blight disease of mustard by 49.2% in field condition with the maximum seed yield of 2530.0 kg/ha which was 28.4% increase over control. Biswas and Ghosh (2018)^[2] have also found the Mancozeb 75% WP @ 0.2%) as most effective in reducing disease severity (81.23%) in the field. Choudhary *et al.*, (2018)^[3] found the highest yield of 1,233.8 Kg/ha and highest (1:10.4) incremental cost-benefit ratio (ICBR) with lowest disease intensity of 34.2% and 32.1% on leaf and pod stage, respectively in the treatment when the applied single spray of Mancozeb 64% WP @ 0.2% followed by single spray of Difenconazole 25 EC @ 0.05%. Subhani *et al.* (2018)^[13] also found the more effectiveness of combination fungicide Metalaxyl 8%+ Mancozeb 64% using 0.25% spray to reduce the severity of *Alternaria* blight of mustard in field condition. Jackson and Kumar, (2019)^[5] also found new generation fungicides like Azoxystrobin and Propiconazole as highly efficient in controlling foliar pathogen *Alternaria brassicae*.

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