

# EFFICACY OF FUNGICIDES FOR THE MANAGEMENT OF STEMPHYLIUM BLIGHT IN LENTIL

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## ABSTRACT

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The efficacy of six fungicides was evaluated against the Stemphylium blight disease of lentil at the Pulses Research Centre, Ishurdi, Pabna during three consecutive cropping seasons in 2015-16, 2016-17 and 2017-18 to find out the effective and economic fungicide in controlling the disease. The susceptible variety BARI Masur-1 was used in the experiment and Stemphylium blight disease severity was measured on a 0 to 5 rating scale. The lowest disease

severity and highest seed yield was observed in Nativo 75 (Tebuconazole 25%+ Trifloxystrobin 25%) sprayed plots which were statistically similar to Folicur EW 250 (Tebuconazole) treated plots. Three times application of Folicur EW 250 @ 1 ml/L and Nativo75 @ 0.5 gm/L at an interval of seven days could be a new recommendation for the management of Stemphylium blight disease of lentil in Bangladesh.

**Key words:** fungicides, management, stemphylium blight disease, lentil

## INTRODUCTION

Lentil (*Lens culinaris* Medik.) is the most popular pulse crop in Bangladesh with annual production of 0.17 Million ton from 0.14 Million hectare land (FAO 2019). A wide range of fungal pathogens infect lentil plants, which are responsible for decreasing yield. Foot and root rot and Stemphylium blight disease are serious threat for lentil production. *Stemphylium* fungus is necrotrophic in nature which is liable for Stemphylium blight disease and can pose a serious threat to lentil production over the whole country in the recent years. The disease has already gained much more importance and reported to incur 80-92.3% of crop loss (Bakr and Ahmed 1992). In India, the incidence of the disease was 82.5% and the loss incurred was recorded as 93.4% (Singh *et al.* 1990). The development of the disease during the cropping season is influenced by various meteorological factors such as atmospheric temperature, relative humidity, precipitation, cloudy cover, etc. (Bakr and Ahmed 1992). Plant resistance is the best option to management the disease but if

the host's resistance is reduced, fungicide treatment is the only option to overcome the disease. Few research reports are available covering control methods for stemphylium blight in lentil. Bakr and Ahmed (1992) reported that the disease was controlled most effectively by a foliar spray of Rovral 80WP (Iprodione) @ 2g/l which gave 35% higher grain yield over control (check). Apart from this research no new fungicides being recommended with intensive study till to date. The present study was conducted to search for new fungicides for the management of stemphylium blight of lentil.

## MATERIALS AND METHODS

The field trials were conducted at the Pulses Research Centre, Ishurdi, Pabna, during 2015-16, 2016-17 and 2017-18 cropping seasons. The experiment was carried out in randomized complete block design with three replications. The plot size was 5 m x 4 m and distance between the two rows was 30 cm. The susceptible variety BARI Masur-1 was sown continuously in rows on 20 November

2015, 18 November 2016 and 26 November 2017, respectively. Six fungicidal treatments viz. T<sub>1</sub> = Rovral (Iprodione 10%) @ (2g/L), T<sub>2</sub> = Secure (Mancozeb 50% + Fenamidone 10%) @ (2g/L), T<sub>3</sub> = Folicur EW 250 (Tebuconazole 25 %) @ (1ml/L), T<sub>4</sub> = Nativo (Tebuconazole 25 % + Trifloxystrobin 25%) @ (0.5g/L), T<sub>5</sub> = Companion (Mancozeb 63% + Carbendazim 12%) @ (2g/L), T<sub>6</sub> = Indofil (Mancozeb @ (2g/L) and water spray was considered as T<sub>7</sub> = control (check).

Intercultural operations were done in order to maintain normal hygienic condition of the crop. Weeding was done at 20 days and 50 days after sowing. Fungicides were sprayed three times starting from the first appearance of the disease and continued at an interval of 7 days. Stemphylium blight (SB) disease was assessed weekly starting from the appearance of SB and continued until maturity. Disease severity scale (0-5) was used for rating of Stemphylium blight as 0 = No infection, 1 = Few scattered leaf infections but no twig blighted, 2 = 5–10% leaflet infection and/or few scattered 1% twigs blighted, 3 = 11–20% leaflet infection and/or 1–5 % twigs blighted, 4 = 21– 50% leaflet infection and/or 6–10 % twigs blighted and 5 = 51% leaflet infection and/or = 10% twigs blighted developed by Bakr and Ahmed (1992). Disease and seed yield data were subjected to analysis of variance (ANOVA) using R programming language ([www.r-project.org](http://www.r-project.org)). The least significance difference (LSD test) at 5% probability level was used to separate significant treatment means.

To determine the economic benefit of fungicide usage, the following market prices were used to calculate gross revenue and total cost of fungicide spray: Rovral 50 WP @ Tk. 395/100 g, Secure 600 WG @ Tk. 260/100 g, Nativo 75 @ Tk.500/100 g, Folicur EW 250 @ Tk. 240/100 ml, Indofil @ 100gm/90 TK, Companion 100gm @ 130Tk and Lentil @ Tk. 100/kg. Labour wage for spraying of fungicides @ Tk. 400/day/labourer (8 hours day). Marginal Benefit Cost Return (MBCR) was calculated as gross revenue (Seed yield in kg/ha\* cost per kg) divided by variable cost (CIMMYT 1987).

The percent disease control (PDC) and percent yield gain were calculated by using the following formulae:

$$\text{Percent Disease Control (PDC)} = \frac{(\text{PDS in Control plot} - \text{PDS in treated plot})}{\text{PDS in Control plot}} \times 100,$$

where, PDS represented percent disease severity.

$$\text{Percent Yield Grain (PYG)} = \frac{(\text{Treated plot yield} - \text{Control plot Yield})}{\text{Control Plot yield}} \times 100.$$

The severity of stemphylium blight disease of lentil was also related to seed yield of the crop by correlation analysis (Steel *et al.* 1997).

## RESULTS AND DISCUSSION

The prophylactic fungicide application played a significant role on disease severity, seed yield, and the marginal benefit cost ratio (MBCR) against the stemphylium blight disease in lentil. The Control (T<sub>7</sub>) plot had the highest disease severity of 80%, 73.3%, and 46.7% and the lowest seed yield of 543 kg/ha, 613 kg/ha, and 837 kg/ha during the years 2015–16, 2016–17, and 2017–18, respectively and this suggested that the later years were less conducive to the development of SB disease (Table 1). Moreover, the results showed that, every fungicidal treatment decreased the severity of the disease and enhanced seed output compared to the control plot except the fungicides Indofil and Companion. Besides, Nativo and Folicur were more effective against the disease than other fungicides. During three consecutive cropping seasons, Rovral exceeded Secure in terms of lowering disease and enhancing yield; nevertheless, there was no statistically significant difference between the two fungicides. After three seasons of study, Companion and Indofil were proven to be relatively less effective fungicides against the disease. Nativo produced the highest seed yields of 940, 1056, and 1315 kg/ha and the lowest disease severity of 6.7, 6.0, and 5.3% in the cropping seasons of 2015–16, 2016–17, and 2017–18, respectively. The second option in terms of decreased disease severity and enhanced seed production was Folicur.

Table 1. Effect of fungicides on disease severity, grain yield and MBCR in lentil during three consecutive years

Treatments	Cropping year								
	2015-2016			2016-2017			2017-2018		
	Disease Severity (%)	Yield (kg/ha)	MBCR*	Disease Severity (%)	Yield (kg/ha)	MBCR*	Disease Severity (%)	Yield (kg/ha)	MBCR*
T <sub>1</sub> = Rovral	15.0	826	3.7	11.7	1007	5.2	8.3	1258	5.6
T <sub>2</sub> = Secure	16.7	704	3.2	13.3	946	6.7	13.3	1248	8.2
T <sub>3</sub> = Folicur	8.3	900	6.8	6.7	1048	8.2	6.7	1305	8.9
T <sub>4</sub> = Nativo	6.7	940	7.4	6.0	1056	8.3	5.3	1315	8.9
T <sub>5</sub> = Companion	16.7	644	3.2	20.0	820	6.6	15.0	1066	7.3
T <sub>6</sub> = Indofil	15.0	672	4.2	18.3	778	5.4	16.7	1071	7.7
T <sub>7</sub> = Control	80.0	543	-	73.3	613	-	46.7	837	-
LSD Values	1.1	293.8		0.94	164.9		0.76	237.1	

MBCR\* = Marginal Benefit Cost Ratio

The most cost-effective fungicide spray was determined by calculating benefit-to-cost ratio (Kumar et. al, 2016). Examining the economics of remarkable treatments showed that the Nativo-treated plot yielded the higher MBCR, followed by Folicur throughout three testing seasons. In the 2015–16 cropping season, the recommended fungicide Rovral decreased profit margin and MBCR compared to other fungicides, except the Companion. The plots treated with Rovral showed very high levels of rust infection, which might be due to revival of a secondary pathogen that allowed for ongoing application of the same fungicide and a reduction in lentil yield.

#### Relationship between Disease Severity and Seed Yield

There was a strong negative correlation between *Stemphylium* blight (SB) disease severity and seed yield of lentil. The predicted linear regression line was a downward slope i.e.  $y = - 6.5952x + 1067.4$  (Fig. 1) with regression coefficient of  $R^2 = 0.7368$ , where ‘y’ denoted predicted seed yield of the lentil an ‘x’ stood for disease severity of SB. The estimated line indicated that with the unit rise in disease severity, there existed possibilities of seed yield reduction by 6.5 kg/ha. The stemphylium blight disease was comparatively low during the experimental season of 2017-18 and thus produced higher seed yield (Fig. 2). The weather condition during 2017-18 cropping seasons was favourable for lentil production when the disease was sporadically occurred at the end of season.

Nativo and Folicur were broad spectrum systemic fungicides with protectant and curative properties

containing Strobilurin and triazole compound, respectively. The plants become dark green and delayed maturity compared to control due to the application of these fungicides Ruske *et al.* (2004) and Zhang *et al.* (2010) noted that morphological and physiological changes occur in plants due to Triazole and strobilurin compounds, including inhibition of plant growth, decrease in intermodal elongation, enlarged chloroplast or enhanced chlorophyll content, thicker leaf tissue, increased antioxidant activity enhancement in alkaloid production and higher amount of protein and delayed senescence. Application of strobilurin fungicide group prolonged the period of healthy green leaf area maintenance in the crop and, consequently, might have a positive impact on the yield (Barros *et al.* 2006).

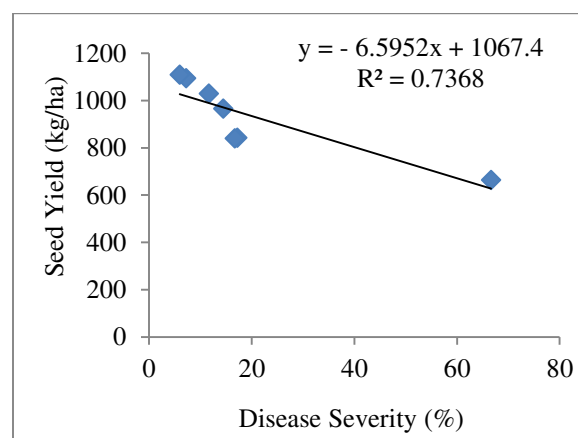


Figure 1. Relationship between seed yield and severity of stemphylium blight disease in lentil

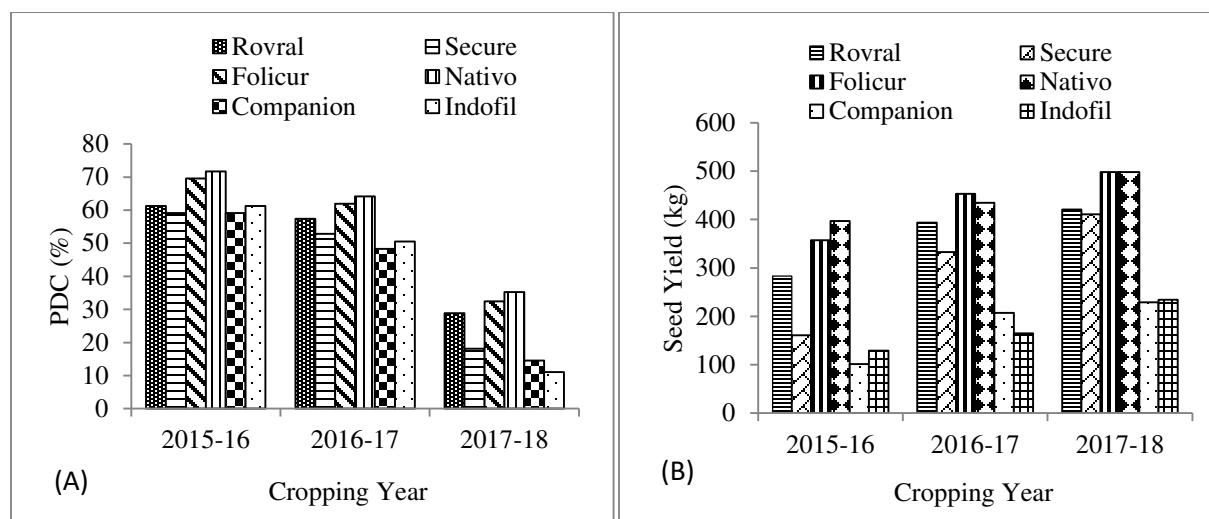


Figure 2. Role of different fungicides in controlling stemphylium blight disease and seed production in lentil (A) = Percent Disease Control over Control (check) and B= Increased Seed Yield over Control (check)

### CONCLUSION

The fungicides Nativo 75, Folicur EW 250, Rovral 50 WP, and Secure 600 WG reduced the stemphylium blight disease of lentil with higher seed yield but the best economic return came from Folicur EW 250 and Nativo 75 sprayed plots. Three times application of Folicur EW 250 @ 1ml/L and 0.5gm/L @ Nativo 75 at 7 days interval could be new recommended for the management of Stemphylium blight disease of lentil in Bangladesh.

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