

Effect of Fungicides in Controlling Alternaria Blight of Cumin

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ABSTRACT

The experiment was conducted at Spices Research Centre, BARI, Shibganj, Bogra, Bangladesh during 2014-15 to find out the effective fungicides in controlling Alternaria blight of cumin. Four fungicides viz. Rovral 50 WP @ 0.2%, Companion @ 0.2%, Secure 600 W @ 0.15%, Sunvit 50 WP @ 0.5% and one control were used as treatment. Cumin line CN 026 was used in this experiment. Three fungicides reduced disease significantly over control. Alternaria blight ranged from 14.40 - 90.81%, while the lowest severity was recorded in Rovral 50 WP (0.2%) sprayed plots and the highest severity was recorded in control treatment. Rovral 50 WP (0.2%) gave the highest number of umbels/plant, number of umbel lets/plant, number of seeds/umbel, number of seeds/plant, weight of seeds/plant and seed yield (675.0 kg/ha) which was followed by Companion and Secure 600 W. Sunvit and control treatment did not produce any seeds.

Key Words: Alternaria blight, Alternaria bumsii, control, cumin, fungicides

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INTRODUCTION

Cumin or Jeera (*Cuminum cyminum* L.) is an important seed spice crop belongs to the family Umbellifereae and is believed to be a native of the Mediterranean and Near Eastern regions. It is mainly cultivated in India, Egypt, Libya, Iran, Pakistan and Mexico. In India, cumin is mainly cultivated in the states of Rajasthan, Gujarat, Madhya Pradesh, Haryana, Punjab, Uttar Pradesh and Bihar. Cumin is the dried yellowish to grayish brown seeds of a small slender annual herb. Cumin seeds have an aromatic odour and a spicy and somewhat bitter taste. These are largely used as condiment and form an essential ingredient in all mixed spices and curry powders for flavoring soups, pickles, curries, and for seasoning breads, cakes and so on. Aqueous extract of cumin seed is frequently used for removing intestinal worms. The seeds have been considered as stimulant, carminative, stomachic, astringent and useful in diarrhoea and dyspepsia. The essential oil is similarly used for flavoring various food items and as a basic perfume. The oil cake is a good cattle fodder.

But cumin cultivation is not being adapted in Bangladesh. The principal constraints to achieve high productivity are high yielding varieties, improper nutrient management, climatic factors and susceptibility of cumin to devastating diseases viz., Fusarium wilt, Alternaria blight and powdery mildew etc., which are the major yield reducing factors. Among the major diseases of cumin, *Alternaria* blight caused by *Alternaria burnsii* is most devastating disease in major cumin growing areas in Rajasthan and Gujarat (Lodha and Mawar, 2007). The disease was first reported to be occurring sporadically in Maharashtra (Uppal *et al.*, 1938). It has since been observed to be widespread in Rajasthan (Mathur, 1949). The crop suffers from blight due to *Alternaria burnsii* Uppal, Patel and Kamat (Solanki *et al.*, 1973). *A. burnsii* affects cumin plant only after flowering stage and causes complete failure of the crop in some years depending on climatic conditions (Divakara Sastry and Anandaraj, 2013). *A. burnsii*, *A. raphani*, and *Fusarium* spp. were found to be associated with cumin plants in Turkey (Kocaturk, 1988). Blights appear very minute brownish necrotic spots on leaves and stems, which later turn to blackish, whereby the stem tips bend downwards. Mostly diseased plants fail to produce seeds. If seeds are produced they remain shriveled, light in weight and dark in colour. Cloudy weather and warm-wet conditions after flowering increase the incidence of disease and spread in the whole field within a short period causing complete failure of the crop (Jadeja and Pipliya, 2008). The disease severity varied from 16-65% causing serious damage to the crop (Kalpana, 1993). The pathogenic fungi attacks leaves and stems, foliar spraying with fungicides may be beneficial in controlling the disease. The application of fungicide and botanical resulted in significantly greater Alternaria blight disease control (Shekhawat *et al.*, 2013). Few fungicides were reported earlier for the management of the disease (Solanki *et al.*, 1973; Akbari *et al.*, 1996), but the disease is still causing severe yield losses under favourable environmental conditions. Propiconazole was at par with carbendazim + iprodione and recorded significantly least PDI than all other treatments (Sharma *et al.*, 2013). Cumin is a new crop of Bangladesh which is being tried to adapt, but Alternaria blight is main limiting factor due to climate of Bangladesh to cultivate cumin. Considering the above facts, these types of research work are not available in Bangladesh. So, the present study was undertaken to find out the effective fungicides in controlling Alternaria blight of cumin.

MATERIALS AND METHODS

The experiment was conducted at Spices Research Centre, BARI, Shibganj, Bogra, Bangladesh during Rabi season of 2014-15 to find out the effective fungicides in controlling Alternaria blight of cumin. The experimental plot was prepared with five ploughings and cross ploughings followed by laddering to break the clods as well as level the soil. The weeds and stubbles of previous crops were collected and removed from the soil. Cowdung 5 t/ha, N @ 70 kg/ha, P @ 25 kg/ha and K @ 50 kg/ha were applied. The entire quantity of cowdung, P and K were applied during final land preparation. Nitrogen was applied in two equal splits one at 20 days after germination and the other half at flowering stage followed by irrigation. The experiment was carried out following Randomized Complete Block Design with three replications. Size of the plots was 3.0 m × 1.2 m and plant spacing was 30 cm × continuous sowing. Cumin line CN 026 was used in the experiment. Four fungicides and one control were used as treatment. The treatments were T₁=Rovral 50 WP (Iprodion) @0.2%, T₂=Companion (Carbendazim + Mancozeb) @0.2%, T₃=Secure 600 WG (Fenamidone + Mancozeb) @0.15%, T₄=Sunvit 50 WP (Copper Oxichloride) @0.5%, and T₅=Control (untreated). The fungicides were sprayed 7 times at an interval of 7 days from disease initiation (flowering stage).

Seeds were sown on November 18, 2014. Five weedings were done at 15, 30, 45, 60 and 75 days after emergence and five irrigations were also applied just after five days of each weeding. Other intercultural operations were done to maintain the normal hygienic condition of crop in the field. Bavistin DF (0.2%) was sprayed at plant base at soil level five times at an interval of 10 days from seedling stage to control wilt of cumin. The plots were inspected regularly to take observations on blight disease from seedling to maturity stage of the crop. Disease plant parts were collected in laboratory for identifying blight causal pathogens (Plate 1). The crop was harvested from March 26-31, 2015. Data were recorded on blight, number of primary branches/plant, plant height at harvest, number of umbels/plant, number of umbel lets/plant, number of seeds/umbel, number of seeds/plant, weight of seeds/plant and seed yield (kg/ha). Percentage data were converted into angular or arcsign transformation. The recorded all data were analyzed statistically to find out the level of significance and the variations among the respective data were compared following Duncan's New Multiple Range Test (Gomez and Gomez, 1984).



Plate 1: Isolate of *Alternaria burnsii* of Cumin

RESULTS AND DISCUSSION

Effect of fungicides in controlling *Alternaria* blight of cumin

Results on effect of fungicides in controlling *Alternaria* blight of cumin are presented in Table 1. *Alternaria* blight severity was significantly influenced by the treatments. *Alternaria* blight severity ranged from 14.40 - 90.81%, while the lowest severity was recorded in Rovral (0.2%) sprayed plots (Plate 2) which was statically similar to Companion (0.2%) by 19.95% (Plate 3), and the highest severity was recorded in control treatment (Plate 4) which was not statistically similar to any other treatments but followed by Sunvit sprayed plots (Plate 5). The highest disease reduction over control (84.14%) was obtained from Rovral 50 WP (0.2%) sprayed plot which was followed by Companion (0.2%) and Secure 600 W (0.15%), and the lowest (20.17%) was obtained from Sunvit sprayed plots.

Table 1: Effect of fungicides in controlling *Alternaria* blight of cumin

Fungicides	<i>Alternaria</i> Blight (%)	% Disease reduction over control
Rovral 50 WP (0.2%)	14.40 d (22.27)	84.14
Companion (0.2%)	19.95 cd (26.48)	78.03
Secure 600 WG (0.15%)	25.04 c (30.00)	72.42
Sunvit 50 WP (0.5%)	72.49 b (58.41)	20.17
Control	90.81 a (72.38)	-
Level of significance	*	-
CV (%)	4.52	-

In a column, similar letter(s) do not differ significantly at 5% (*) level of provability. Data represent in parentheses of Angular or Arcsign transformation.



Plate 2. Rovral sprayed plot



Plate 3. Companion sprayed plot



Plate 4. Control plot



Plate 5. Sunvit sprayed plot

Effect of fungicides on growth characters of cumin

Results on effect of fungicides on growth characters of cumin are presented in Table 2. Fungicides did not show any statistical effect on number of primary branches/plant. Primary branches of cumin were more or less same (4.2-4.5) among the treatments. Significantly the tallest plants (39.10 cm) at harvest were recorded in Secure (0.15%) sprayed plots which was statistically at par with Rovral 50 WP (38.60 cm) and Companion (36.10 cm), and the smallest (30.42 cm) plants were recorded in control plots which was followed by Sunvit 50 WP (33.07 cm) and Companion (36.10 cm).

Table 2: Effect of fungicides on growth characters of cumin

Fungicides	No. of primary branch/plant	Plant height at harvest (cm)
Rovral 50 WP (0.2%)	4.50	38.60 ab
Companion (0.2%)	4.40	36.10 abc
Secure 600 WG (0.15%)	4.30	39.10 a
Sunvit 50 WP (0.5%)	4.30	33.07 bc
Control	4.20	30.42 c
Level of significance	NS	*
CV (%)	5.49	8.18

In a column, similar letter(s) do not differ significantly at 5% (*) level of provability.

NS=Not Significant

Effect of fungicides on yield contributing characters of cumin

Number of umbels/plant, number of umbel lets/plant, number of seeds/umbel, number of seeds/plant and weight of seeds/plant were significantly affected by the fungicides (Table 3). The highest number of umbels/plant (64.61) was obtained from Rovral (0.2%) sprayed plot which was statistically at par with Companion (59.12) and Secure (55.52) sprayed plots, and the lowest number (22.08) was obtained from control treatment which was not statistically similar to all other treatments. Rovral (0.2%) sprayed plots resulted the highest number of umbel lets/plant (177.33) which was followed by Companion (138.33) and Secure (106.77), and control plots resulted the lowest number of umbel lets/plant (49.38). Number of seeds/umbel varied from 28.37 - 40.16, where the highest was recorded in Rovral (0.2%) and the lowest (28.37) was recorded in Secure (0.15%) sprayed plots, but Sunvit and control treatment did not produce any seeds/umbel. Rovral sprayed plots showed the highest number of seeds/plant (395.15) and weight of seeds/plant (1.96 g) which was followed by Companion (0.2%) and Secure (0.15%), but Sunvit (0.5%) and control treatment did not produce any seeds/plant.

Table 3: Effect of fungicides on yield contributing characters of cumin

Fungicides	No. of umbels/plant	No. of umbel lets/plant	No. of seeds/umbel	No. of seeds/plant	Wt. of seeds/plant (g)
Rovral 50 WP (0.2%)	64.61 a	177.33 a	40.16 a	395.15 a	1.96 a
Companion (0.2%)	59.12 a	138.33 b	32.54 b	331.44 b	1.80 ab
Secure 600 WG (0.15%)	55.52 a	106.77 c	28.37 b	300.68 c	1.65 b
Sunvit 50 WP (0.5%)	32.17 b	88.37 d	0.00 c	0.00 d	0.00 c
Control	22.08 c	49.38 e	0.00 c	0.00 d	0.00 c
Level of significance	*	*	*	*	*
CV (%)	6.87	5.25	8.13	4.96	7.02

In a column, similar letter(s) do not differ significantly at 5% (*) level of provability.

Effect of fungicides on seed yield of cumin

Results on effect of fungicides on seed yield of cumin are presented in Fig. 1. Significantly the highest seed yield (675.0 kg/ha) was recorded in Rovral 50 WP sprayed plots which was followed by Companion (638.9 kg/ha) and Secure (557.4 kg/ha). Sunvit and control treatment did not produce any seeds.

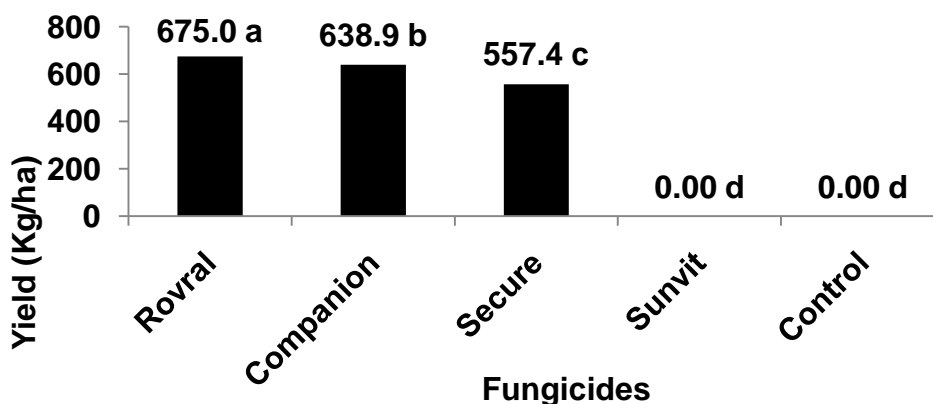


Fig. 1: Effect of fungicides on seed yield of cumin

It has been observed that the lowest Alternaria leaf blight severity was recorded in Rovral (0.2%) sprayed plots which was statically similar to Companion (0.2%), and the highest Alternaria leaf blight severity was recorded in control treatment which was not statistically similar to any other treatments. The highest Alternaria leaf blight disease reduction over control was obtained from Rovral 50 WP (0.2%) sprayed plot which was followed by Companion (0.2%) and Secure 600 W (0.15%), and the lowest reduction was obtained from Sunvit sprayed plots. Davis and Shoemaker (1999) registered Rovral (iprodione) for controlling Alternaria leaf blight on ginseng in North Carolina and is available in 3 formulations (50W, WG and 4F). One and half to two lb of the 50W or WG products or 1.5-2.0 pt of the 4F product per 100 gallons of water was sprayed at first appearance of the disease and repeat at 7 to 14 day intervals as long as conditions favor disease development. Few fungicides were reported earlier for the management of the disease (Solanki *et al.*, 1973; Akbari *et al.*, 1996), but the disease is still causing severe yield losses under favourable environmental conditions. Islam (2007) stated that Rovral 50 WP and Dithane M-45 were most effective in reducing the seed borne infection of *Alternaria* spp. and increasing seed germination of Radish. Sharma *et al.* (2013) found that Propiconazole was at par with carbendazim + iprodione and recorded significantly least PDI than all other treatments. Arifuzzaman (2007) tested fungicides against Alternaria blight of radish, among the fungicides, Iprodione (0.2%) was found the most effective. Two sprays of Iprodione significantly reduced the leaf area diseased by 76.01% and pod area diseased by 81.87% over control. Shekhawat *et al.* (2013) applied fungicides and botanicals for disease control and found in significantly greater Alternaria blight disease control.

Significantly the tallest plants at harvest were recorded in Secure (0.15%) sprayed plots which was statistically at par with Rovral 50 WP and Companion, and the smallest plants were recorded in control plots which was followed by Sunvit 50 WP and Companion. The highest number of umbels/plant was obtained from Rovral (0.2%) sprayed plot which was statistically at par with Companion and Secure sprayed plots, and the lowest number was obtained from control treatment which was not statistically similar to all other treatments. Rovral (0.2%) sprayed plots resulted the highest number of umbel lets/plant which was followed by Companion and Secure, and control plots resulted the lowest number of umbel lets/plant. The highest number of seeds/umbel was recorded in Rovral (0.2%) and the lowest was recorded in Secure (0.15%) sprayed plots, but Sunvit and control treatment did not produce any seeds/umbel. Rovral sprayed plots showed the highest number of seeds per plant and weight of seeds/plant which was followed by Companion (0.2%) and Secure (0.15%), but Sunvit (0.5%), and Sunvit and control treatment did not produce any seeds per plant. Gemawat and Prasad (1972) found that under wet conditions infection readily spreads to the stem and blossom. The succulent leaves and blossoms are more affected and may be killed. In cases of very severe infection, there may not be any seed production. Even if seeds are produced, they are shrivelled, dark-coloured, light and usually nonviable. Significantly the highest seed yield was recorded in Rovral 50 WP sprayed plots which was followed by Companion and Secure. Sunvit and control treatment did not produce any seeds.

CONCLUSION

It may be concluded that foliar spraying with Rovral 50 WP (0.2%) or Companion (0.2%) seven times at an interval of seven days from disease initiation (flowering stage) decreased Alternaria blight and increased seed yield of Cumin of cumin.

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