



Original Article

Environmental and Chemical Control of Phomopsis Blight and Fruit Rot of Eggplant Caused By *Phomopsis vexans*

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Abstract

The experiment was conducted at laboratory and field of Plant Pathology Division at Bangladesh Agricultural Research Institute, Gazipur during the three consecutive cropping seasons 2016-17, 2017-18 and 2018-19 to identify the effective fungicide for controlling phomopsis blight and fruit rot disease of eggplant or brinjal causing *Phomopsis vexans*. There were same 7 treatments viz, T₁= Biomyl plus(0.2%), T₂= Top man (0.2%), T₃= Hayprogim (0.2%), T₄= Arba gold (0.2%), T₅= Defence (0.2%), T₆= Autostin (0.2%) and T₇= Control with three replications both in the laboratory bioassay and field experiment. Bioassay of six different fungicide was done on mycelial growth of *Phomopsis vexans* causing phomopsis blight and fruit of eggplant. Six same fungicide were tested on the incidence of phomopsis blight and fruit, and yield of eggplant or brinjal in the field. All the fungicide had significant effect on mycelia growth of fungus and reduction of disease incidence of the crop compared to control. Fungicide of carbendazim group viz. Autostin, Arba gold, Hayprozim and Defence were found better than others for controlling phomopsis blight and fruit rot of eggplant or brinjal both in the laboratory and field. The maximum yield compared to other group of fungicide and control was observed in carbendazim group of fungicide viz. autostin, arba gold, hayprozim and defence. [*Journal of Science Foundation, July 2020;18(2):81-87*]

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Introduction

Eggplant or brinjal (*Solanum melonena* L.) is a popular fruit vegetable widely grown in Asia, Africa, and the subtropics, including the Southern USA and the Mediterranean region with world production of 50.6 million tons for the year 2015 (FAO, 2016). Asia has the largest eggplant production which comprises more than 90% of the world production area and 87.0% of the world production (Choudhury and Gaur, 2009). It is the second

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most important vegetable crop after potato of Bangladesh in relation to area and production. Bangladesh produces only 51,6007 tons of eggplant from an area of 51,165 hectares with an average yield of 10.09 tons per hectare (Anon., 2019). Eggplant is an important crop of sub-tropics and tropics. Eggplant is a good source of nutrients, vitamins and minerals. It supplies 25 calories per serving and has virtually no fat. Its “meaty” texture makes eggplant a staple in vegetarian diets. Eggplant is also called as the ‘King of Vegetables’ because it is found used by most of the people around the world. Due to its low calorie it is one of the best foods for weight watcher. It is grown round the year in any space available for crop cultivation. Therefore, it is available in the country throughout the year especially during the lean period when the seasonal vegetables are in a scarcity in the market. Eggplant, thus regarded as a cash crop to the farmers which provides them continuous harvesting and financial assistance. Bangladesh represents a wide range of genetic diversity in eggplant with different colour, shape, size and taste. This premier vegetable crop is known to suffer from 12 diseases in Bangladesh (Meah, 2007). Among them phomopsis blight and fruit rot caused by *Phomopsis vexans* (Sacc. and Syd.) Harter (Perfect stage: *Diaporthe vexans*) is very devastating and widespread (Chen et al., 2002). Phomopsis blight ranks second only to bacterial wilt in yield loss and varies in severity depending on area, soil type and weather (Meah, 2007). Studies showed that about 21% of fruit rot and 7% of seed rot in eggplant is caused by *Phomopsis vexans* and gives final yield losses of 15-50% (Das, 1998).

Eggplant or brinjal is an important vegetable in Bangladesh. In Bangladesh, the district of Jamalpur, Sherpur, Mymensingh, Rangpur, Faridpur, Rajshahi, Pabna, Comilla and Joshore are the major growing areas of brinjal. There are a number of diseases that can cause yield reduction of eggplant or brinjal. Among the diseases, phomopsis blight and fruit rot caused by *Phomopsis vexans* is found to be major disease of eggplant or brinjal. Phomopsis blight and fruit rot reduced the yield and quality of eggplant or brinjal. Therefore, protection of the crop from the disease by effective control measure is needed. Use of host resistance is usually the most feasible and economical disease control strategy. However, information available at present does not provide any concrete suggestion in selecting any cultivar resistant to phomopsis blight and fruit rot disease of eggplant. In addition, still there is no effective bio-rational control measure has been developed to control the phomopsis blight and fruit rot disease of eggplant. The chemical control is the only suitable approach to control the phomopsis blight and fruit rot disease of eggplant (Meah et al., 1998, Islam et al., 1989, Anon. 2017, Anon. 2019, Anon. 2019). So, the present research work was done to find out the effective fungicide against phomopsis blight and fruit rot of eggplant or brinjal.

Methodology

First of all, an experiment of bioassay on six fungicide was conducted at the laboratory of Plant Pathology Division, Bangladesh Agricultural Research Institute, Gazipur during the cropping season 2016-17 to identify the effective fungicide for controlling *Phomopsis vexans* causing phomopsis blight and fruit rot disease of eggplant or brinjal. Then a field experiment was conducted at the field of Plant Pathology Division, Bangladesh Agricultural Research Institute, Gazipur during three consecutive cropping seasons i.e 2016-17, 2017-18 and 2018-19 to identify the effective fungicide for controlling phomopsis blight and fruit rot disease of eggplant or brinjal causing *Phomopsis vexans*. There were six same fungicide for bioassay as well as for the field experiment viz, T₁= Biomyl plus(0.2%), T₂= Top man (0.2%), T₃= Hayprogim (0.2%), T₄= Arba gold (0.2%), T₅= Defence (0.2%), T₆= Autostin (0.2%) and T₇= Control were used. Bioassay of fungicide was done against *Phomopsis vexans* by growth inhibition technique. One 5 mm block of 7 days old fungal culture(pathogen) was placed at the centre of the plate. The linear growth (cm) of mycelium of *P. vexans* was recorded at 24 hr. interval until the control plates were filled.

For the field experiment, the seeds of eggplant variety BARI begun-4 (Kazla) was collected from Horticulture Research Center (HRC), BARI during August of 2016, 2017 and 2018, respectively. Seedlings were raised in plastic trays in the net house with proper care and management for consecutive three years. Trays were prepared by mixing soil, sand and well decomposed cow dung in the proportion of 2:1:1. The prepared soil was heaped like a square block. Formalin solution (4%) @ 200 ml/cft soil were mixed with the soil heap and the soil was covered by a polythene sheet for 48 hours. After 7 days, surface sterilized trays were filled up with the sterilized soil (Dhasgupta, 1988).

Seeds were sown in a diametric line and labeled by a permanent marker. Watering was done to maintain the soil moisture. Shade was provided to save the young and delicate seedlings from heavy showering and scorching sunlight. A piece of medium high land with well drainage system was selected and prepared by ploughing, followed by laddering. The soil was well pulverized for tilth condition. Weeds and stubbles were removed. During field preparation, fertilizers and manures were applied at recommended doses (Anon.2012). Seedlings of age 25 days were transplanted in the field followed by watering. Fifteen seedlings were planted in each subplot maintaining plant-to-plant distance 75 cm and line-to-line 1 m. Inoculation of 5 plants in each plot of each cultivar/entry was done at flowering stage and 5 plants at fruiting stage. Seventy millilitre spore suspension (5×10^6 spore/ml) sprayed for each plant (Khan, 1999). Another 5 plants were kept uninoculated (control). For ensuring better infection, the spraying was done at afternoon and inoculated plants were covered with moist transparent polythene sheet for 24 hours. Data were recorded on percent disease incidence and yield(t/ha) by eye estimation. After inoculation, records on expression of symptom on leaf, flower and fruit were taken at an interval of seven days. Infection was expressed in percentage. The test entries were placed in various categories of resistance and susceptibility utilizing the standard area diagram of Islam *et al.* (1990) with slight modification. The design of the experiment was RCBD. Data was recorded on disease incidence of phomopsis blight and yield of eggplant or brinjal. Data was analyzed statistically following DMRT.

Results and Discussion

Results of the three consecutive years are presented in this chapter chronologically.

Year 2016-2017

Six different fungicide were assayed against *Phomopsis vexans* in the Lab. Among the fungicide, Autostin, Hayprozim 50wp, Arba gold 50 wp and Defence 35 SC were found promising in reducing the mycelial growth of the fungus (Table 1). Among the six fungicidal treatments viz. Autostin, Top man, Arba gold and Defence 35 Sc gave good results followed by Biomyl plus and Top man (Table 2) also in the field. In case of field experiment, the lowest disease incidence was found from Autostin (9%) followed by Hayprozim 50wp (10%), Arba gold 50 wp (10.1%) and Defence 35 SC (10.3%). The highest disease incidence (60 %) was found from control plot (Table 2). In fact, all the chemical treatments had significant effect on reduction of disease incidence of Phomopsis blight of eggplant or brinjal compared to control. In terms of disease reduction of phomopsis blight, 85.00% in Autostin, 83.33% in Hayprozim 50wp, 83.17% in Arba gold 50 wp and 82.83% in Defence 35 SC were found (Table 2) over control treatment. The maximum yield 50 t/ha was recorded in Autostin followed by 48.50 t/ha in Hayprozim 50wp, 48.00 t/ha in Arba gold 50 wp and 47.80 t/ha in Defence 35 SC. The minimum yield 25 t/ha was observed in control treatment (Table 2).

Year 2017-18

In the year 2017-2018, effect of six different fungicidal treatment on disease incidence of Phomopsis blight and fruit of eggplant or brinjal was studied. Among the six fungicides - Autostin, Top man, Arba gold and Defence 35 Sc was showed good results followed by Biomyl plus and Top man (Table 3). The lowest disease incidence was found from Autostin (9.5%) followed by Arba gold 50 wp (10%), Hayprozim 50wp (10.1%) and Defence 35 S (10.2%). The highest disease incidence (59 %) was found from control plot (Table 3).

Table 1: Effect of six different fungicide on inhibition of mycelial growth of *Phomopsis vexans*

Sl. No.	Treatment	Radial mycelia growth (cm)	Growth decreased over control (%)
1	T ₁ = Biomil Plus 72 wp (mancozeb + cymoxanil)	4.50b	50.00
2	T ₂ = Top Man 80 wp (mancozeb)	4.50b	50.00
3	T ₃ = Hayprozim 50wp (carbendazim + iprodione)	2.50c	72.22

4	T ₄ = Arba gold 50 wp (carbendazim)	2.60c	71.11
5	T ₅ = Defence 35 SC (carbendazim + hexaconazole)	2.60c	71.11
6	T ₆ = Autostin (carbendazim)	2.50 c	72.22
7	T ₇ = Control	9.00a	-
% CV		5.12	-

Table 2: Effect of six different fungicide against homopsis blight and fruit rot of eggplant and yield in field condition in 2016-17

Sl. No.	Treatment	Disease incidence (%)	Disease decreased over control (%)	Yield (t/ha)
1	T ₁ = Biomil Plus 72 wp (mancozeb + cymoxanil)	40.00 b	33.33	30.50b
2	T ₂ = Top Man 80 wp (mancozeb)	41.00b	31.66	29.00b
3	T ₃ = Hayprozim 50wp (carbendazim + iprodione)	10.00c	83.33	48.50a
4	T ₄ = Arba gold 50 wp (carbendazim)	10.10c	83.17	48.00a
5	T ₅ = Defence 35 SC (carbendazim + hexaconazole)	10.30c	82.83	47.80a
6	T ₆ = Autostin (carbendazim)	9.00 c	85.00	50.00a
7	T ₇ = Control	60.00a	-	25.00c
% CV		9.45	-	14.20

In fact, all the chemical treatment had significant effect on reduction of disease incidence of *Phomopsis* blight of eggplant or brinjal compared to control. In terms of disease reduction of *phomopsis* blight, Autostin (84.23%), Arba gold 50 wp (83.05%), Hayprozim 50wp (82.88%) and Defence 35 SC (82.71%) were found over control treatment. In case of yield, the highest yield 50.78 t/ha was found in Autostin followed by 49.50 t/ha in Hayprozim 50wp, 48.70 t/ha in Arbagold 50wp, and 48.60 t/ha in Defence 35SC. The lowest yield 27.00 t/ha was found in control treatment (Table 3).

Table 3. Effect of six different fungicide against homopsis blight and fruit rot of eggplant and yield in field condition in 2017-18

Sl. No.	Treatment	Disease incidence (%)	Disease decreased over control (%)	Yield (t/ha)
1	T ₁ = Biomil Plus 72 wp (mancozeb + cymoxanil)	38.00 b	35.59	32.50b
2	T ₂ = Top Man 80 wp (mancozeb)	39.00b	33.90	31.50b
3	T ₃ = Hayprozim 50wp (carbendazim + iprodione)	10.10c	82.88	49.50a
4	T ₄ = Arba gold 50 wp (carbendazim)	10.00 c	83.05	48.70a
5	T ₅ = Defence 35 SC (carbendazim + hexaconazole)	10.20c	82.71	48.60a
6	T ₆ = Autostin (carbendazim)	9.50 c	84.23	50.78a

7	T ₇ =Control	59.00a	-	27.00c
% CV		10.46	-	11.35

Year 2018-19

In 2018-2019, effect of six different fungicide on disease incidence of Phomopsis blight of brinjal was studied. Among the six fungicide - Autostin, Top man, Arba gold and Defence 35 Sc was showed good results followed by Biomyl plus and Top man (Table 4). The lowest disease incidence was found from Autostin (9.5%) followed by Arba gold 50 wp (10%), Hayprozim 50wp (10.1%) and Defence 35 SC (10.2%). The highest disease incidence (59 %) was found from control plot (Table 4). In fact, all the chemical treatment had significant effect on reduction of disease incidence of Phomopsis blight of eggplant or brinjal compared to control. In terms of disease reduction of phomopsis blight, Autostin (84.23%), Arba gold 50 wp (83.12%), Hayprozim 50wp (82.50%) and Defence 35 SC (82.81%) were found over control treatment. The maximum yield 49.50 t/ha was recorded in Autostin followed by 48.10 t/ha in Hayprozim 50wp, 47.70 t/ha in Arba gold 50 wp and 47.25 t/ha in Defence 35 SC Table). The minimum yield 25 t/ha was observed in control treatment (Table 4).

Table 4: Effect of six different fungicide against phomopsis blight and fruit rot of eggplant and yield in field condition in 2018-19.

Sl. No.	Treatment	Disease incidence (%)	Disease decreased over control (%)	Yield (t/ha)
1	T ₁ = Biomil Plus 72 wp (mancozeb + cymoxanil)	43.00 b	32.82	27.50b
2	T ₂ = Top Man 80 wp (mancozeb)	44.00 b	31.25	27.75b
3	T ₃ = Hayprozim 50wp (carbendazim + iprodione)	11.20c	82.50	48.10a
4	T ₄ = Arba gold 50 wp (carbendazim)	10.80 c	83.12	47.70a
5	T ₅ = Defence 35 SC (carbendazim + hexaconazole)	11.00c	82.81	47.25a
6	T ₆ = Autostin (carbendazim)	10.00 c	84.38	49.50a
7	T ₇ =Control	64.00a	-	23.00c
% CV		11.78	-	15.15

Average result of the years 2016-17, 2017-18 and 2018-19

Three years average effect of six different fungicide on disease incidence of phomopsis blight and fruit rot of eggplant or brinjal are presented in table 5. Among the six fungicide - Autostin, Top man, Arba gold and Defence 35 Sc was showed good results followed by Biomyl plus and Top man (Table 5). The lowest disease incidence was found from Autostin (9.50%) followed by Arba gold 50 wp (10.30%), Hayprozim 50wp (10.43%) and Defence 35 SC (10.50 %). The highest disease incidence (61 %) was found from control plot (Table 5). In fact, all the chemical fungicide had significant effect on reduction of disease incidence of phomopsis blight and fruit rot of eggplant or brinjal compared to control. In terms of disease reduction of phomopsis blight, Autostin (84.54%), Arba gold 50 wp (83.05%), Hayprozim 50wp (82.90%) and Defence 35 SC (82.78%) were found over control treatment Table 5). In the yield parameter, the maximum yield 50.10 t/ha was recorded in Autostin followed by 48.70 t/ha in Hayprozim 50wp, 48.42 t/ha in Arba gold 50 wp and 47.88 t/ha in Defence 35 SC. The minimum yield 25 t/ha was recorded in control treatment (Table 5).

Table 5: Average effect of six fungicide in consecutive three years (2016-17, 2017-18 and 2018-19) on phomopsis blight and fruit rot and yield of eggplant in field condition

Sl. No.	Treatment	Disease incidence (%)	Disease decreased over control (%)	Yield (t/ha)
1	T ₁ = Biomil Plus 72 wp (mancozeb + cymoxanil)	40.33 b	33.35	29.83b
2	T ₂ = Top Man 80 wp (mancozeb)	41.34b	32.27	29.42b
3	T ₃ = Hayprozim 50wp (carbendazim + iprodione)	10.43c	82.90	48.70a
4	T ₄ = Arba gold 50 wp (carbendazim)	10.30 c	83.11	48.13a
5	T ₅ = Defence 35 SC (carbendazim + hexaconazole)	10.50c	82.78	47.88a
6	T ₆ = Autostin (carbendazim)	9.50 c	84.54	50.10a
7	T ₇ = Control	61.00a	-	25.00c
% CV		10.58	-	13.57

Carbendazim group of fungicide viz. Autostin, Arba gold, Hayprozim and Defence were found promising against *Phomopsis vexans* both in the laboratory and in the field. Among the fungicide Autostin, Arba gold, Hayprozim and Defence completely arrested the mycelial growth and produced largest inhibition zone (6.5 cm dia) in culture medium. In controlling field disease, the performance of carbendazim better than mancozeb. The present findings are in agreement with the findings of Meah *et al.* (2003), Khan (1999), Meah *et al.* (1998), Panda *et al.* (1996), Kaushal and Sugha (1995), Mohanty *et al.* (1994), Islam and Sintansu (1992) and Islam *et al.* (1989) who reported carbendazim group of fungicide against phomopsis blight and fruit rot disease of eggplant or brinjal causing *Phomopsis vexans*. Meah (2003), Islam *et al.* (1989) and Mohanty *et al.* (1994) suggested 0.1% concentration of Carbendazim as the effective dose against the disease. Pre-inoculation spray was suggested in controlling phomopsis blight and fruit rot disease of eggplant or brinjal by Meah *et al.* (1998). These findings are also corroborate with the findings of Anon. 2018, Anon. 2019 and Anon. 2020. Carbendazim group of fungicides completely inhibited the mycelial growth of *Phomopsis vexans* even at 0.2% concentration in the laboratory. In the field, spraying of carbendazim group of fungicide (0.2%) reduced upto 84.10% disease. Islam (2005) reported that Bavistin (50% carbendazim) even at 50 ppm concentration completely inhibited mycelial growth of *Phomopsis vexans* in the laboratory and effectively controlled phomopsis blight and fruit rot of eggplant in the net house and in the field at 0.1% concentration. Anon. (2018) and Anon. (2019) reported that chemical fungicide had significant effect on mycelial growth of fungus and reduction of disease incidence of the crop compared to control. Fungicide of carbendazim group were found better than others for controlling phomopsis blight and fruit rot of brinjal both in the laboratory and in the field. All of these findings are accord with the present findings.

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