EFFECT OF TEMPERATURE, HUMIDITY AND DATE OF SOWING ON DEVELOPMENT OF ALTERNARIA BLIGHT OF RAPESEED MUSTARD

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ABSTRACT

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Two experiments were conducted during 2011-12 and 2012-13 to study the influence of temperature, relative humidity and date of sowing on growth and development of *Alternaria* blight of rapeseed mustard. In 2011-12 first experiment was undertaken at experimental field of Oilseed Research Centre, Bangladesh Agricultural Research Institute (BARI), Gazipur under natural epiphytotic condition. Another experiment was conducted during winter of 2012-13 under controlled condition at Regional Agricultural Research station, BARI, Jamalpur. Under natural condition the highest per day radial growth of *Alternaria* leaf blight disease occurred during 01 – 15 December, when the average temperature and relative humidity in the field were 21.1°C and 77.9%, respectively. But growth rate of leaf blight was decreased with the decrease of temperature and relative humidity. In controlled condition maximum growth rate (0.59 mm/ day) was recorded at 32.7°C temperature and 89.5% relative humidity followed by (0.42 mm/ day) at 31.3°C temperature and 99.0% relative humidity, respectively. It was also observed that temperature played the major role on development of *Alternaria* blight of rapeseed mustard.

Key words: temperature, humidity date of sowing and Alternaria blight

INTRODUCTION

Rapeseed mustard is an important source of cooking oil in Bangladesh (Razzaque *et al*. 2002 Khatun *et al.* 2010). It meets about one third of edible oil requirement of the country (Anon. 2016, Khatun *et al*. 2010). The average yield of rapeseed mustard is very low in Bangladesh in compare to many mustard growing countries of the world (Khatun *et al*. 2010). Several biotic and abiotic factors are responsible for low yield of rapeseed mustard in Bangladesh.Among the biotic factors incidence of diseases and pests are important (Rajendra *et al*. 2003, Bakr *et.al*. 2009, Khatun *et al*. 2010).

It suffers from at least 14 diseases in Bangladesh and *Alternaria* blight of mustard caused by *Alternaria brassicae* is one of the major diseases in Bangladesh (Bakr *et al.* 2009). It occurs every year in Bangladesh and causes an average yield loss of 40-70% in India (Vishwanath and kolte 1997) and 30-60%in Bangladesh (Meah *et al*. 1988, Fakir 1980).The disease cause blight of leaf, pod and stem (Meah *et al*.1988). Severe pod blight cause force maturity. It is endemic in Bangladesh and all cultivar of mustard variety are susceptible to *Alternaria* blight (Hossain *et al.* 2014). This disease is seed borne, soil borne and also air borne. In addition to direct losses of yield the disease adversely affects the seed quality reducing seed size, seed discoloration and reduction in oil contents (Howlider *et al*. 1991, Kaushik *et al.* 1984).Severity of the disease increase with plant age and its development becomes faster during flowering and pod formation stages (Hossain *et al*. 2014). The disease is reported to be influenced by different weather factors like temperature, humidity, rainfall etc. (Coakley 1988, Coakley *et al*. 1999).

Although the weather factors has direct influence on disease incidence and development but in Bangladesh the relationship of weather factors on the severity of *Alternaria* blight is yet to be investigated. Hence, the present study was designed to find out the effect of temperature, humidity on *Alternara* blight of rapeseed mustard.

METERIALS AND METHODS

Study under natural condition

The study was conducted at the oilseed research field of BARI, Gazipur during 2011-12 to determine the influence of temperature, humidity and on the development of *Alternaria* leaf blight of rapeseed mustard at natural epiphytotic condition. BARI Sarisa 14 was used as planting material because it is a short duration crop and complete its life cycle within 75 to 80 days. BARI Sarisha-14 starts flowering at 30 ± 1 days (Hossain *et al.* 2014) after sowing and flowering

and pod formation completed within 60 days after sowing (Hossain *et al.* 2014). The crop was sown on 21 October, 1 November, and 11 November to get the similar aged crop (flowering and pod formation stages) in three different date of sowing. Seeds were sown in line at 30 cm spaced in 5 m x 3 m plots replicated three times. Recommended rate of manures and fertilizers were applied before sowing. Irrigation and weeding was done as and when necessary. Ten plants were randomly selected from each plotsown on different dates and tagged for data recording. Single spot on leaves of selected plant (tagged plant) were marked for measuring the spot diameter starting from 40 days after sowing at three days interval for two weeks. The rate of increase of the spot diameter was calculated and the weather factors (temperature and relative humidity) at that period were also recorded.

Study under polythene house

Another study was conducted at RARS Jamalpur during 2012-13 to determine the influence of temperature and relative humidity on the development of *Alternaria* leaf spot of mustard under controlled condition. BARI Sarisa-14 was sown on 21 November 2012 and two dome shaped polyethylene house were made (Picture 10) and placed on 31 December 2012 in the mustard field at flowering stage when the disease initiation started (40 days after sowing). The polythene houses were made airtight by putting the edge of polyethylene sheet inside soil around the house. In one polythene house water was sprayed inside twice a day and some bowls with water was also placed inside to maintain maximum humidity during the study period (2 weeks). Another polythene house was not sprayed with water and no water bowl was placed inside the house. Similar plot without poly-house was maintained as control (natural condition). Data on temperature and relative humidity inside each polythene house and natural field were recorded regularly. Ten leaves of similar aged plants under each polythene house and control plot (field) having initial leaf spot symptom were randomly selected, marked and tagged for data recording. The diameter of marked spots of tagged leaves were measured at three days interval for two weeks. The data on weather factors (temperature and relative humidity) were also recorded.

RESULTS AND DISCUSSION

Study under natural field condition

Maximum per day radial growth (0.67 mm/day) of the *Alternara* leaf spot occurred during December 1 to 15 of 2011 when the average temperature and relative humidity prevailing in the field were 21.1ºC and 77.9%, respectively (Table 1). Growth rate of leaf spots decrease with the decrease of temperature and relative humidity. Minimum growth rate (0.40 mm/day) of disease was recorded during January 11 to 25, when temperature and relative humidity were 17.3ºC and 75.9%, respectively (Table 1). Percentage of relative humidity during 01 to 15 December and 21 December 2011 to 4 January 2012 was more or less similar (78.1% and 77.9%), but average temperature during that period was lower (18.5ºC). From this result it may be mentioned that temperature had the major role in disease development (Fig. 1a, 1b and 1c). Deepti *et al.* (2014) studied the influence of temperature and relative humidity on charcoal rot development in sesame and reported that both the factors influence the disease development in field condition. They opined that maximum temperature (31.6ºC), minimum temperature (24.0ºC) and relative humidity (88%) favoured high disease development. They also noticed the positive and no significant correlation between disease and temperature while significant and negative correlation was noticed between disease development and relative humidity. Vihol *et al.* (2012) worked with blight of cumin caused by *Alternaria burnsi*i and reported that maximum (25.00 -37.30ºC) and minimum (7.4 – 17.6ºC) temperature had positive correlation,whereas relative humidity at morning (60% - 96.1%) and evening (11% - 33.4%) had negative correlation with disease intensity.

Table 1. Effect of temperature, moisture and date of sowing on development of leaf spot under field condition.

Sl No	Sowing Date	Observation period	Increase of spot diameter (mm)	Growth rate/day (mm)	Temperature (º C) during the observation period		RH (%) during the observation period	
					Max./ Min.	Av.	Max./ Min	Av.
1.	21/10/ 2011	01/12/2011 to 15/12/2011	1.3 - 10.7	0.67	27.3/14.9	**21.1**	91.3/64.9	**78.1**
2.	01/11/2011	21/12/2011 to 05/01/2012	1.1 - 8.6	0.53	24.1/12.8	**18.5**	89.2/66.7	**77.9**
3.	11/11/ 2011	11/01/2012 to 25/01/2012	1.3 – 6.9	0.40	23.2/11.4	**17.3**	89.3/62.4	**75.9**

Study under polythene house

Among the three treatments, the highest per day radial growth of *Alternaria* leaf spot (0.59 mm/day) was recorded in house without water spray where average temperature and relative humidity were 30.9ºC and 89.5%, respectively (Table 2). Comparatively lower growth rate (0.42 mm/day) was recorded in water sprayed polythene house where temperature and relative humidity were 31.3ºC and 99.0%, respectively which was higher than that of unsprayed polythene house. The lowest rate of disease development (0.17 mm/day) was recorded in control treatment (in the field), where the average temperature and relative humidity were 20.0º C and 45.9%, respectively. From these results it is noticeable that relative humidity had little influence on development of *Alternaria* blight of rapeseed mustard (Table 2 and Fig. 2). These findings are in accord with the results of Patel and Patel (990) who studied the relationship of meteorological factor with the incidence of charcoal rot of sesame (*Macrophomina phaseolina*) and mentioned that high temperature (35ºC) and low relative humidity to be favourable for maximum disease incidence. Sabalpara *et al*. (2007) worked with blight of green gram caused by *Macrophomina phaseolina* and reported that maximum disease incidence was found in the month of October when maximum temperature (35ºC), minimum temperature (25ºC) and relative humidity (88%) prevailed in the field. Hossain *et al*. (2014) reported that the higher temperature and relative humidity were favourable for the development of *Alternaria* leaf spot of mustard. They also mentioned that the highest per day radial growth (0.67 mm/day) of *Alternara* leaf spot occurred during the first fortnight of December when the maximum/minimum temperature and highest/lowest relative humidity were 27.3ºC /14.9ºC and 91.3% / 64.99%, respectively.

Table 2. Effect of temperature, moisture and date of sowing on development of leaf spot polythene house and field conditions

Treatment	Spot diameter (mm)	Growth rate/day (mm)	Temp. (º C) during the observation period		RH (%) during the observation period	
			Max/ Min	Av.	Max/ Min	Av.
Water sprayed	2.2 – 6.4	0.42	34.1/28.5	**31.3**	99.0/99.0	**99.0**
Without water spray	2.2 – 8.1	0.59	36.4/28.9	**32.7**	90.0/89.0	**89.5**
Natural condition	2.9 – 4.6	0.17	23.0/17.0	**20.0**	89.3/62.4	**75.9**

Fig. 1a. At 21º C & 77.9% r.h.

Fig. 1b. At 18.5º C & 77.9 r.h.%

Fig. 1c. At 17.2º C & 75.9 r.h%

Fig. 1. Development of *Alternaria* blight of mustard under field condition

Fig. 2 Polythene house for study of the development of *Alternaria* blight of mustard

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