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Short Comminucation

Effect of environmental factors on development of fruit rot of chilli

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Chilli (*Capsicum annum* L.) an important member of solanaceae family is an indispensable spice cum condiment in Indian cuisine. It is grown in tropical and subtropical regions of the world for its pungent fruits which are used both green and ripe. The chilli fruit is subjected to various diseases caused by bacteria, fungi, viruses, nematodes, weather parameters and physiological disorders at different stages of development. However, in recent years the production has declined mainly due to the biotic factors, attributed to diseases such as fruit rot, leaf spot, wilt, damping off, etc. Among these, the fruit rot is a destructive disease causing substantial yield loss in all the chilli growing areas. The disease causes severe damage to mature fruits in the field as well as during transit and storage under favourable conditions. The disease initiates at vegetative growth in the field and may continue even after the red fruits have been picked and drying and even during storage processes. The disease has been reported to cause 8-27 per cent losses in Maharashtra, 20-60 per cent in Punjab and Haryana and 30-76 per cent in Tamil Nadu (Bansal and Grover, 1969; Sujathabai, 1992 and Datar, 1995). However, biological control of this disease has been reported using *Saccharomyces cerevisae* and *Bacillus subtilis* (Jeyalakshmi *et al*. 1998). But due to high cost of chemicals, environment hazards, and variable weather conditions during crop growth and development, these approaches are not feasible. Srivastava *et al*. (2002) recorded the highest disease intensity on chilli fruit due to favourable weather. Environmental factors play an important role in the development of the disease. The relationship between disease progression and weather variables should be well known for better management of the disease. Keeping in view the importance of disease, the present study was conducted to study the weather parameters affecting disease development on fruit rot of chilli.

The study was conducted at the Research Farm of Department of Plant Pathology, CCS Haryana Agricultural University Hisar, which is situated in Arid Zone at an elevation of 215.2 m above mean sea level with latitude of 29°10'N and the longitude of 75°46'E. The weather variables viz., temperature maximum, temperature minimum, relative humidity morning, relative humidity evening were taken and the data was collected from automatic weather station installed in the field. The susceptible cultivar Pusa Jawala of chilli was sown during *kharif* season of the year 2007-08. The progress of disease was recorded at 3 days intervals. The weather data was collected and average of three days was computed for analysis of disease progression with the weather variables. Spore concentration of *Colletotrichum capsici* in the open environment was studied by placing Burkard (Burkard Manufacturing Co. Ltd., Woodcock Hill Industrial Estate, U.K.) 7 days volumetric spore trap in the centre of chilli experiment field. Orifice of spore trap was adjusted near the crop level. The adhesive was applied on the glass slide using a flat nylon brush in the form of thin film. The glass slide was divided into four parts with the help of marker having each width of 12 mm. The spores were counted under microscope by 40 x 10 magnifications. This spore trap has been constructed on a simple turbine principle. The air is suck through an orifice (2x14 mm^2) @ 10 lt. per minute or 0.6 m^3 per hour. The adhesive used in Burkard 7 days volumetric spore trap to record the spore population was Mowiol 35 g (grade 40-20), Distilled water 100 ml, Glycerol 50 ml and Phenol 2 g. The adhesive is applied over glass slide (3x1) and assembly is installed in the trap. The spore count was made at four hours interval with following formula:

$$\text{Average flow of air 10 lt./minute} = \frac{10 \times 60 \text{ min}}{1000} = 0.6 \text{ m}^3/\text{hr}$$

$$\text{Total volume of air sampled/day} = (10 \times 60) \text{ min} \times 24 \text{ hr}$$

$$= 14400 + 1000 = 14.4 \text{ m}^3/\text{day}$$

$$\text{Area of slide exposed in 24 hrs.} = 2 \times 48 = 96 \text{ mm}^2 = 9.6 \text{ cm}^2$$

$$\text{Therefore spores/m3 of air} = \frac{\text{No. of spores}}{\text{Area taken}} \times 0.6 \text{ m}^3$$

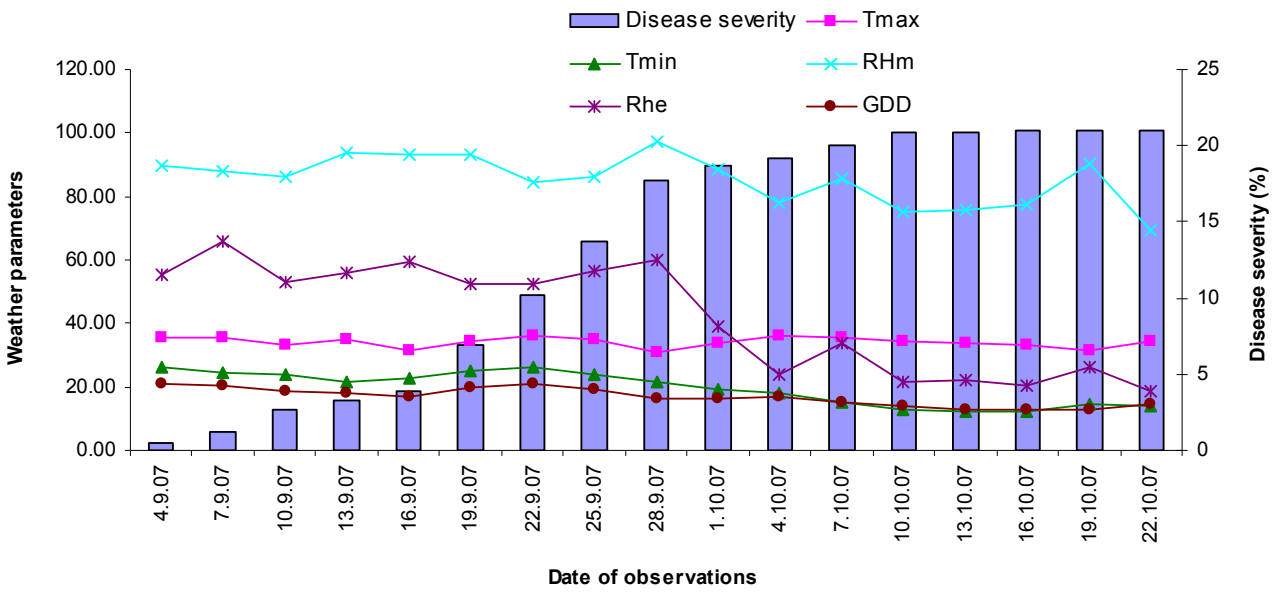

Fig. 1: Relationship of disease progression with weather parameters

Table 1 : Correlation co-efficient of fruit rot disease severity and spore population with weather parameters

Variables	Max temp (X_1)	Min temp (X_2)	RH (Morning) (X_3)	RH (Evening) (X_4)	Spore Population / M^3 (X_6)
Disease	-0.20	-0.84**	-0.56*	-0.82**	0.63
Spore population/M^3		-0.60*	-0.50	0.05	-0.43

*At 5per cent level of significance, ** At 1per cent level of significance

The spores were measured with the help of Burkard 7 days volumetric spores trap. The total number of spore was counted on daily basis and three days spore average were taken. The spores were first trapped on 4th September when disease just appeared in the field. The disease severity and spore population were observed at regular intervals up to 22nd October when the crop was near maturity (Figure 1). It is evident that there was steep increase in the disease severity (6.86-17.71 per cent) during 16th September to 28th September. The maximum number of spores (24spores/ day) was trapped when temperature ranged between 22 to 31°C with higher relative humidity during the period. It has already been reported that maximum trapping of the spores of *Colletotrichum lindemuthianum* and *Colletotrichum dematum* when temperature ranged between 26 to 29°C with higher relative humidity (Thakur and Khare, 1991 and Balmukand 2006).

From the recorded data it has been inferred that maximum temperature (30.6-35.9°C), minimum temperature (21.7-26.5°C), morning relative humidity (84.3-97.0 per cent) and evening relative humidity (54.3-58.3 per cent) were congenial for disease development and spore production in the field. Srivastava *et al.*, 2002 also reported that maximum temperature about 35°C, minimum temperature 28 °C and more than 86 percent relative humidity favoured the disease development. Several workers also reported that the average temperature 25-30°C coupled with high humidity were favourable for the disease development (Parkash, 2011 and Singh 2013).

The correlation co-efficient between diseased seed, spore populations and weather parameters were presented in Table 1. The correlation coefficient of disease severity was negative with maximum and minimum temperature and morning relative humidity was positive with spore population and which was not significant with maximum temperature. Spore population showed negative correlation

with maximum temperature.

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