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Effect of Temperature, Light and Relative Humidity on Chilli Fruit Rot Infection

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ABSTRACT

Chilli fruit rot infection was the highest when the inoculated chilli fruits with *Colletotrichum capsici* were incubated at temperature of 25^{0}C. Temperature beyond and below 25^{0}C caused significant reduction in both lesion size and per cent disease index (PDI). A light cycle of 18 h light followed by 6 h dark period found was optimum for chilli fruit rot development. The inoculated chilli fruits incubated at relative humidity of 95 per cent recorded the highest infection.

Key words : Bio-control agents, *Colletotrichum capsici* and Chilli.

Chilli (*Capsicum annum* L.), one of the spice crops belonging to the family, Solanaceae, is a well-known commercial crop used both as condiment or culinary supplement and vegetable. Chillies are excellent source of Vitamin, A, B, C and E with minerals like molybdenum, manganese, folate, potassium, thiamin, and copper. Chillies produce alkaloids, capsaicinoids and carotenoids which make chilli hot and pungent. Many of the diseases have been reported to affect chilli crop. Among these diseases, dieback and fruit rot caused by *Colletotrichum capsici* (Syd) Butler and Bisby is prevalent in all chilli growing states of the country and causes losses ranging from 10 to 60 %. Although only ripe fruits turning red are most frequently affected. In Assam, 12-32% fruits are found to be affected by this disease (Chowdhury, 1957).

Environmental factors like temperature, relative humidity and light must be favourable for the infection to takes place. The optimal requirements of these factors vary with different species of plant pathogens.

MATERIAL AND METHODS

Effect of temperature on chilli fruit rot infection:

Surface sterilized chilli fruits were inoculated with spore suspension (concentration of 10^6 conidia ml^{-1}) of *C. capsici* by hypodermic injection method and incubated in moist chamber at different temperatures *viz*., 15^{0}C, 20^{0}C, 25^{0}C, 30^{0}C, 35^{0}C and 40^{0}C for five days in BOD incubators. Three replications were maintained for each temperature and ten inoculated fruits constituted one replication. At the end of incubation, the lesion size on inoculated fruits was measured and per cent disease severity was calculated, severity ratings assigneed and expressed as per cent disease index (PDI). PDI was computed using the 0-9 scale (Wheeler, 1969).

Effect of light on chilli fruit rot infection

Chilli fruits were inoculated with spore suspension (10^6 spores per ml) of *C. capsici* by hypodermic injection method. The inoculated chilli fruits were kept 25 cm below a pair of 40 watts cool day light fluorescent lamps for exposure to light. Different cycles of light and dark periods for five days. Fruits were completely wrapped with black paper and at the end of incubation, the lesion size on inoculated fruits was measured, severity rating assigned and per cent disease severity was calculated and expressed as per cent disease index (PDI).

Effect of relative humidity on chilli fruit rot infection:

Chilli fruits were inoculated with the spore suspension (10^6 spores ml^{-1}) of the *C. capsici* and incubated for five days at different relative humidity levels ranging from 75 to 100 at 25 ± 1^{0}C.

RESULTS AND DISCUSSION

Effect of temperature on chilli fruit rot infection

The results of the present study indicated that, the temperature of 25^{0}C was found optimum for the development of fruit rot infection caused by *C.*

Table 1. Lesion size and PDI of chilli fruit rot at different inoculation temperature

Temperature (oc)	Lesion size (mm)	PDI
15^0 C	4.5	31.1(33.9)
20^0 C	12.4	34.1(35.7)
25^0 C	15.1	38.5(38.4)
30^0 C	13.9	37.8(37.9)
35^0 C	13.0	35.6(36.6)
40^0 C	5.7	33.3(35.2)
CD at 5 % level	0.6	0.58

Values in parenthesis are angular transformed values

Table 2. Lesion size and PDI of chilli fruit rot in different light and dark periods.

Treatment	Lesion Size (mm)	PDI
Continuous light	3.6	34.8(36.2)
Continuous darkness	4.9	42.5(40.7)
18 h darkness followed by 6 h light period	7.4	55.2 (48.0)
18 h light followed by 6 h darkness period	9.0	61.1 (51.4)
CD at 5% level	0.34	0.91

Values in parenthesis are angular transformed values

Table 3. Lesion size and PDI of chilli fruit rot in different levels of relative humidity.

Relative Humidity (%)	Lesion Size (mm)	PDI
75	14.9	28.3(32.1)
80	16.9	30.2(33.3)
85	17.7	37.5(37.8)
90	18.8	47.3(43.5)
95	21.0	59.5(50.5)
100	18.4	44.5(41.8)
CD at 5% level	0.53	0.93

Values in parenthesis are angular transformed values

capsici. Largest lesions (15.10 mm) and highest PDI (38.50) were recorded at 25^{0}C. The lowest lesion size and PDI were recorded at 15^{0}C (4.5 mm & 31.1) and 40^{0}C (5.7 mm & 33.3) (Table 1).

Temperature beyond and below 25^{0}C caused significant reduction in chilli fruit infection. An optimum temperature of 28^{0}C was reported for the development of chilli fruit rot by Chowdhury (1957). In mungbean, temperature of 25^{0}C favoured increase in lesion size on bean leaves inoculated with *C. dematium* (Mishra and Gupta, 1994). Kaushal *et al*. (1998) observed the appearance of acervuli of *C. truncatum* on inoculated pods of soybean at 25^{0}C.

Effect of light on chilli fruit rot infection:

Exposure of inoculated fruits to either continuous light or continuous darkness did not favour the development of disease much (Table 2). The cycle of 18 h light followed by 6 h period of darkness was found to be the most conducive for the development of infection as evidenced by largest mean size of the lesions (9.0 mm) and PDI (61.1). Lowest lesion size and per cent disease index (PDI) were recorded in the treatment of continuous light (3.6 mm & 34.8).

Alternate light and dark periods of 12 h each was required by *C. dematium* for infection in soybean (Wong, 1983) and increase in lesion size in mungbean (Mishra and Gupta, 1994). Similar light period requirement by *C. truncatum* for causing increased lesion size in mungbean (Thakur and Khare, 1991) along with results of the present investigation point that *Colletotrichum* spp. in general have matching light requirement.

Effect of relative humidity on chilli fruit rot infection:

Largest lesion size (21 mm) and highest PDI (59.9) occurred at 95% RH. It is interesting to know that disease development (18.38 mm & 44.50) at 100% relative humidity was as a par with that 90% relative humidity (18.80 mm & 47.27). When the relative humidity was decreased to 75%, the lesion size (14.88 mm) and per cent disease index (28.30) showed a sharp decrease.

In the case of mungbean infection by *C. truncatum* highest increase in the lesion size was observed at relative humidity of 100% and no lesions were observed when relative humidity was reduced to 50 and 25% (Thakur and Khare, 1991). A positive correlation was observed between PDI and average maximum relative humidity in the case of mango infection by *C. gloeosporioides.* The decrease in the lesion development and per cent disease index with decreasing relative humidity recorded in the present investigation is in agreement with the reports of above workers.

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