

Environmental parameters affecting seedling blight development of jute caused by *Macrophomina phaseolina*

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In the present study the effect of temperature and moisture content of soil on the development of seedling blight of jute caused by *Macrophomina phaseolina* was studied. It was found that under moisture stress the disease development was maximum and the disease development decreased along with the increase of moisture level. The development of disease was more at higher temperature than that of lower temperature.

Key words : Seedling blight of jute, *Macrophomina phaseolina*, moisture level of soil, temperature

INTRODUCTION

Macrophomina phaseolina, a soil borne plant pathogen, causes economic loss of many crops in the warmer belt of the world. This pathogen causes seedling blight of jute in West Bengal extensively. There are many reports on the factors affecting disease development viz. temperature and moisture. The pathogen favours high temperature and low moisture for disease development, in many crops like strawberry (Teich and Ernstein, 1961), cotton (Gaffar and Erwin, 1969), jute and cotton (Gaffar and Malik, 1969).

The present investigation has studied the effect of two factors-temperature and moisture on seedling blight of jute caused by *Macrophomina phaseolina*.

MATERIALS AND METHODS

The pathogen, *M. phaseolina*, was isolated from infected jute and maintained on potato dextrose agar medium. Soil used in this experiment had pH of 6.1 and water holding capacity of 47.5%.

Preparation of pathogen

Macrophomina phaseolina was grown in sand maize medium for ten days and used as inoculum.

Preparation of sick soil

Soil inoculated with 10 days old *M. phaseolina* in a wooden trays and jute seeds were sown in it. Infected seedlings again mixed with soil and again seeds were sown in soil. When the jute seedlings showed more than 60% infection (seedling blight), it was taken as sick soil.

Effect of moisture

Sick soils were taken in polythene beakers. Jute seeds (var JRC 412) were sown in soil and moisture was adjusted according to moisture holding capacity. The following moisture regimes were used — 10, 20, 30, 40, 50 and 60% water holding capacity. All the beakers were weighed on a physical balance and water added every day whenever necessary, to adjust the actual moisture in soil. After 21 days disease were recorded. The pathogen population was assayed by plating the soil in chloronebmercuric chloride-rose bengal agar (CMRA) medium, (Meyer *et al.*, 1973).

Effect of temperature

To determine the effect of temperature on seedling blight of jute, an experiment was set up in a walk in incubator. Jute seedlings (var-JRC 412) were

sown in wooden trays containing soil and at the age of 4-5 days, seedlings were inoculated with *M. phaseolina* growing in sand maize meal medium. After inoculation, the trays were incubated at different temperatures of 27°, 30°, 33°, 36°, and 39°C. Seedling blight of jute was recorded after 21 days.

RESULTS

Effect of moisture

In acute moisture stress the jute seedlings became weak and shrivelled and almost all the seedlings (94%) died. As moisture percentage increased in soil the intensity of disease decreased progressively. Population of pathogen was assayed in CMRA medium, which showed that when the moisture percentage was increased gradually, the population of pathogen became gradually less (Table 1).

Table 1 : Seedling blight of jute caused by *Macrophomina phaseolina* at different moisture levels

Moisture (% WHC)	Per cent blight of seedlings	Population of <i>M. phaseolina</i> (per g of soil)
10	96.0 (78.46) ^a	356.7
20	86.7 (68.61)	343.3
30	62.7 (52.36)	288.3
40	32.4 (34.70)	203.3
50	23.3 (28.80)	128.3
60	17.3 (24.58)	63.0
C.D. at 5%	6.29	

^a Figures in the parentheses are angular transformed values.

Table 2 : Seedling blight of jute caused by *Macrophomina phaseolina* at different temperature levels

Temperature (% C)	Per cent blight of seedlings	Population of <i>M. phaseolina</i> (per g of soil)
27	60.6 (51.12) ^a	301.7
30	80.5 (63.79)	310.0
33	79.7 (63.22)	313.3
36	84.8 (67.05)	326.7
39	84.4 (66.74)	326.7
C.D. at 5%	10.6	

^a Figures in the parentheses are angular transformed values.

Effect of temperature

Very high seedling blight was recorded over the

entire range of temperature but it was further aggravated because of high temperature. It appeared that seedling blight was very high above 30% and tapered off as the temperature was lowered. At the end of the experiment population of pathogen was determined. No significant deviation in population was observed (370/g of soil) though it was less than the initial population (Table 2). Lower temperatures were not tested because jute seed did not germinate at low temperature.

DISCUSSION

Moisture stress situation in soil affect the disease development. However, as moisture level in the soil increased the population level of *M. phaseolina* decreased. Hence, the effect of moisture probably affect on inoculum density—disease intensity relationship (ID). High moisture may also improve the vigour of the host and cause reduction in ID through increased level of antagonism. Finstein and Alexander (1962) arrived at similar conclusion.

The pathogen *M. phaseolina* is a basically a warm temperature organism that has a high temperature optima in culture, as well as in disease development (Ghosh and Sen, 1973). Even when the short range of temperature, over which the studies were undertaken, seedling blight appeared to be significantly high at and above 30°C. Over such short range of temperature the population of pathogen was not altered. It has been shown repeatedly that the disease caused by the pathogen are favoured at high temperature as in potato tubers (Dutta and Raj, 1970), cotton (Vasudeva and Ashraf, 1939), bean (Miller *et al.*, 1947) soyabean (Agarwal *et al.*, 1973). Here temperature may have indirect effect on level of antagonism and thus greater disease would result.

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