

Epidemiological studies on *Colletotrichum lindemuthianum* (Sacc. & Magn.) Scribber, the incitant of Cowpea Anthracnose

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The epidemiological factors like temperature, relative humidity and pH were studied under the laboratory conditions for spore germination of *Colletotrichum lindemuthianum*, the causative organism of anthracnose disease in cowpea. Maximum spore germination was marked at optimum temperature 28°C, relative humidity 95-100% and pH 6.5-7.0.

Key words: Cowpea, anthracnose, temperature, pH, RH

INTRODUCTION

Amongst the food legumes, Cowpea (*Vigna unguiculata*) has gathered importance in today's human life. This crop is now cultivated throughout India. Anthracnose is one of the important fungal diseases which cause economic loss incited by *Colletotrichum lindemuthianum*. This disease is predominant in this type of crop causing damages, although the extent of loss is yet to be ascertained in our country. Therefore, the study of epidemiological parameters have been imperative in developing Integrated disease management schedule. The epidemiological studies have been undertaken to find out the role of temperature, relative humidity and pH on the spore germination of *C. lindemuthianum* in cowpea.

MATERIALS AND METHODS

In order to check the effect of different levels of temperature on germination of spores of the test fungus, Petriplates containing spore suspensions in cavity slides were incubated in BOD incubators maintained at different temperatures such as 15, 20, 22, 25, 26, 28, 30, 35 and 40°C for 48 hrs. Four replications for each temperature were maintained. The effect of different levels of relative humidity (RH) on germination of spores of the fungus was also studied. Spore suspensions were taken in cavity slides with four replications. These were incubated in dessicator maintaining 100, 95, 90, 85, 80 and 75

per cent RH. The graded RH was obtained by using concentrated sulphuric acid and water as per the method described by Hokokowa and Kubota, (1957). The dessicators were placed in an incubator maintained at $28 \pm 1^\circ\text{C}$ for 48 hrs. After the incubation period, the spore germination of each treatment was estimated and expressed in percentage. The data were analysed statistically using suitable transformations.

The effect of pH on spore germination was determined at different pH levels viz. 3.0, 3.5, 4.0, 4.5, 5.0, 5.5, 6.0, 6.5, 7.0, 7.5, 8.0, and 8.5 to find out the optimum pH favouring maximum spore germination. The pH levels were adjusted by a standard pH meter using N/10 HCl and N/10 NaOH solution. Spore suspensions were prepared in different pH solutions separately. A drop of spore suspension from each pH level was taken in cavity slide inside the moist chamber and incubated for 48 hrs in an BOD incubator. Three replications were maintained for each pH level. At the end of the incubation period percentage of spore germination was recorded. The data obtained were analysed statistically by using suitable transformations.

RESULTS AND DISCUSSION

As per the data presented in the Table 1, the different incubation temperatures significantly influenced the per cent of spore germination of *C. lindemuthianum*. A remarkably low percentage of spore germination

Table. 1: Effect of temperature on spore germination of *C.lindemuthianum*.

Temp(°C)	Mean
15	8.7 (17.16)*
20	32.62 (34.82)
22	48.4 (44.08)
25	53.3 (46.89)
26	70.75 (57.23)
28	76.5 (61.00)
30	42.32 (40.57)
35	23.55 (29.00)
40	0.0
S.Em±	0.482
CD(0.01)	1.408

* The figures in the parentheses are angular transformed values.

Table. 2 : Effect of RH on spore germination of *C.lindemuthianum*.

Relative Humidity (%)	Mean
75	8.65 (17.10)*
80	24.57 (29.71)
85	50.27 (45.15)
90	68.32 (55.75)
95	78.2 (62.16)
100	83.25 (65.84)
S.Em±	0.235
CD(0.01)	0.708

* The figures in the parentheses are angular transformed values.

occurred at 15°C and this went on increasing till the incubation temperature reached 28°C. Then gradual decrease in germination marked up to 35°C and no germination was found in 40°C.

Table. 3 : Effect of pH on spore germination of *C.lindemuthianum*.

pH	Mean
3.0	0.4 (1.15)*
3.5	2.6 (9.28)
4.0	4.0 (11.54)
4.5	14.4 (22.30)
5.0	28.5 (32.27)
5.5	42.6 (40.74)
6.0	61.5 (51.65)
6.5	91.6 (73.15)
7.0	82.5 (65.27)
7.5	50.4 (45.23)
8.0	31.6 (34.20)
8.5	18.7 (25.62)
S.Em±	0.540
CD(0.01)	1.585

* The figures in the parentheses are angular transformed values.

The data in Table 2 revealed that there was a significant variation in spore germination of *C.lindemuthianum* at different RH levels. Minimum spore germination of 8.65% was recorded at RH 75 per cent while it was maximum (83.25%) at RH 100 per cent. Hence, the optimum range of RH for spore germination was between 95 and 100 per cent.

The data in Table 3 described that there was a significant variation in spore germination of *C.lindemuthianum* at different pH levels. At pH 3.0, the germination percentage was very low (0.4%) and this gradually increased till pH level reached 6.5(91.6%). Afterwards, there was a decline in the spore germination.

The temperature and pH played vital roles during the spore germination and subsequent growth of the pathogen. Investigations on different *Colletotrichum* species regarding the effect of different temperatures indicated that the disease caused by these patho-

gens was more severe at 25-30°C (Prassana, 1985; O'Connell *et al.*, 1993; Zulfiqar *et al.*, 1996; Pring *et al.*, 1995; Latunde-Dada *et al.*, 1996, Rajesha *et al.*, 2010). In the present study, the optimum temperature for spore germination was 28°C and the germination failed at 40°C. Similar reports have already been discussed by Chowdhury (1957), Mishra and Dutta (1963), Palarpawar (1988) and Beura and Acharya (2002). Observations made on the effect of relative humidity on the spore germination of *C.lindemuthianum* showed that maximum spore germination was in the range of 95 to 100 per cent RH which was corroborated by the earlier findings of Raynal (1971) and Beura and Acharya (2002). The pH of 7.0 recorded maximum mycelial growth and conidia formation in *C.capsici* (Durairaj, 1956; Mishra and Dutta, 1963), where as Chowdhury (1957) found maximum growth and sporulation at pH 5-6. Palarpawar (1988) reported that the conidial germination of *Colletotrichum capsici* at pH 5.5 but Agnihotri and Prasad (1973) found good sporulation at pH 5.5 – 6.9. In *Colletotrichum lindemuthianum*, the most suitable pH level was 6.0 followed by 7.0 and 5.0, but at pH 3.0 and 9.0, there was no growth (Rajesha *et al.*, 2010). The studies on the effect of pH on spore germination showed that, pH 6.0 and 7.0 were most favourable for spore germination and optimum being 6.5. However, Rai and Chohan (1966) reported the pH range 6.6 to 8.3 was found favourable for maximum growth and sporulation of the fungus. The spores did not germinate at pH 3.0 and above 9.0 which supported the findings of Mishra and Mahmood (1960).

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