Research Paper :

Effect of certain factors favouring the mycelial growth and conidial germination of *Colletotrichum gloeosporioides* (Penz.) Penz. and Sacc

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SUMMARY

Anthracnose caused by *Colletotrichum gloeosporioides* (Penz.) Penz. and Sacc. is one of the most damaging diseases causing losses in pre and post harvest conditions in mango. Studies were conducted to find out the favourable temperature, relative humidity and light period for the growth and conidial germination of *C. gloeosporioides* under *in vitro* condition. The study indicated that the temperature of 25^{0}C was found to be good for the mycelial growth (89.6mm) and conidial germination (69%). At 100% relative humidity, the mycelial growth (90mm) and conidial germination (87%) were higher. In this context, different light periods were tested, continuous light favoured the both mycelial growth and conidial germination

Key words : *Colletotrichum gloeosporioides*, Temperature, Relative humidity, Light period

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The mango (*Mangifera indica* L.) is native to India and Southeast Asia. It is grown throughout the tropics and sub-tropics of the world. India is the world's largest producer of mango (FAO, 1999). Even though it has the largest area, the productivity is very low due to various biotic and abiotic stresses. Of them, anthracnose incited by *Colletotrichum gloeosporioides* (Penz.) Penz. and Sacc. is a destructive pathogen that cause yield loss upto 60% or more during heavy rainy season (Arauz, 2000). Post harvest diseases can reduce fruit quality and causes severe losses, sometimes because they yield completely unmarketable fruit, and in many cases because blemished fruit does not meet the cosmetic standards for first quality fruit in the major import markets (Cappellini *et al.*, 1998). To know the outbreaks of the disease, the favourable environmental condition prevalent in a particular region should be known. Hence, the present work was conducted for temperature, light periods and relative humidity requirement for its growth.

MATERIALS AND METHODS

Isolation of the pathogen:

The pathogen was isolated from infected fruits of mango which were collected from orchard of Annamalai University, Annamalainagar. The isolation was done as per the method described by Sundravadana *et al.* (2007). After obtaining pure culture, the identification was done based on the conidial character and acervuli production. Then it was confirmed as *C. gloeosporioides.*

Factors favoring the pathogen :

Temperature :

A quantity of fifteen ml of the sterilized Potato dextrose agar medium was poured into 90 mm sterile Petri plates. The plates were inoculated with 9 mm mycelial disc of the pathogen obtained from 7 days old culture grown on PDA and incubated in BOD at different temperature *viz.*, 15, 20, 25, 30 and 35^{0}C for 7 days in a BOD incubator. The linear growth of the pathogen was measured in mm at the end of incubation period. The mycelial growth was recorded on 7 days after inoculation. Each treatment was replicate thrice.

The cavity slides containing 0.1 ml of conidial suspension (10^6 conidia/ml) were placed in Petri plates containing moist filter papers at the bottom. The Petri plates were incubated at different temperature as mentioned above. The conidial germination was recorded after 24 h of incubation. Three replications were maintained and in each replication, 100 conidia were observed for germination (Prabakar *et al.*, 2003).

Relative humidity :

The pathogen was inoculated in Petri plates containing PDA medium as described earlier.

The inoculated Petri plates were placed in desiccators over different conc. of H_2SO_4 to give appropriate relative humidities *viz.*, 36.8, 46.8, 56.9, 66.8, 82.9, 92.9 and 100 per cent (Johnson and Booth, 1983; Prabakar *et al.*, 2003). Each treatment was replicated thrice. The radial growth was measured on 10 days after incubation.

The cavity slides containing 0.1 ml of conidial suspension (10^6 conidia/ml) were placed in Petri plates containing moist filter papers at the bottom were incubated for 24h at different relative humidities as mentioned earlier. Each treatment was replicated thrice and in each replication, 100 conidia were counted for the germination.

Light period :

The PDA medium in the Petri plates were inoculated with the pathogen as described earlier. The inoculated Petri plates were incubated at different light periods like 8 days light, 8 days dark, 4 + 4 light and dark, 2+6 light and dark and 6+2 light and dark. Each treatment was replicated thrice (Akhtar *et al.*, 1999).

The cavity slides containing 0.1 ml of conidial suspension (10 conidia/ml) were placed in Petri plates containing moist filter papers at the bottom and were incubated for 24 h at different light periods such as 24h light, 24h dark, 12+12 light and dark, 16+8 light and dark and 8+6 light and dark. Each treatment was replicated thrice and in each replication, 100 conidia were counted for the germination.

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been presented under following heads:

Temperature :

Among the six different temperature levels tested, the pathogen exhibited the maximum growth at temperature 25^{0}C, which was conducive for the mycelial growth of *C. gloeosporioides* (89.6 mm). This was followed by 30^{0}C while little growth was observed at 10^0 C (7.2 mm). Best conidial germination was observed 24 h after incubation at 25^0 (69.00%) but the minimum number of conidia was germinated in 10^{0}C (Table 1).

Similarly, Ahmed (1985) and Quimio and Quimio (1975) reported the good growth of *C. gloeosporioides* at a temperature range of 25-30^{0}C. whereas Saxena (2002) indicated that good growth of *C. gloeosporioides* was observed at 28^{0}C. Quimio (1975) reported that growth, sporulation, conidial germination and disease development on fruits occurred at the temperature range between 25-30^0 C. Similar results were also reported by Prabakar *et al.* (2003) and Sangeetha and Rawal (2009).

Table 1 : Effect of different temperatures on the mycelial growth and conidial germination of *C. gloeosporioides*

Temperature (°C)	Mycelial growth (mm)	Per cent decrease over control	Conidial germination after 24 h (%)	Per cent decrease over control
10	7.2	91.21	8.60 (17.05)	87.40
15	33.3	59.39	19.56 (26.24)	71.34
20	78.7	4.02	47.47(43.54)	30.45
25	89.6	-9.26	69.00(56.16)	-1.09
30	79.3	3.29	53.85(47.05)	21.10
35	74.2	9.75	28.43(32.22)	58.34
Control	82.0	0.00	68.25(55.07)	0.00
S.E. ±	0.3152		0.3023	
C.D.(P=0.05)	0.6481		0.6215	

Mean of three replications
Figures in the parenthesis are arcsine transformed value

Relative humidity :

The maximum mycelial growth of pathogen was recorded at 100% relative humidity (90 mm), while minimum mycelial growth (7.30 mm) was observed at 36.8 % relative humidity. The conidial germination was maximum (87.00%) in 100% RH and there was no conidial germination in 36.8% RH. Relative humidity is one of the major factors determining growth and conidial germination (Table 2). Similar findings were observed by Baker *et al.* (1940); Dodd *et al.* (1991); Estrada (1990) and Prabakar *et al.* (2003). The fungus showed variation in its growth and conidial germination at different relative humidity levels. The above results lend support to the present findings.

Table 2 : Effect of relative humidity on the mycelial growth and conidial germination of *C. gloeosporioides*

Relative humidity (%)	Mycelial growth (mm)	Per cent decrease over control	Conidial germination after 24 h (%)	Per cent decrease over control
36.8	7.3	89.40	0.00(0)	100
46.8	18.3	73.44	4.33(12.01)	89.64
56.8	48.0	30.34	16.80(24.19)	59.80
66.8	65.1	5.51	34.15(35.75)	18.30
82.9	76.6	-11.17	48.40(44.08)	-15.79
92.9	86.4	-25.40	71.65(57.82)	-71.41
100.0	90.0	-30.62	87.0(68.86)	-108.13
Control	68.9	0.00	41.8(40.28)	0.00
S.E. ±	0.4246		0.2887	
C.D.(P=0.05)	0.8731		0.5935	

Mean of three replications

Table 3 : Effect of light periods on the mycelial growth and conidial germination of *C. gloeosporioides*

Light periods (days)	Mycelial growth (mm)	Light periods (h)	Conidial germination (%)
8 L	78.6	24 L	44.3(41.72)
8 D	65.1	24 D	36.1(36.92)
4+4 LD	69.9	12+12 LD	39.8(39.11)
6+2 LD	73.4	16+8 LD	42.6(40.74)
2+6 LD	67.3	8+10 LD	38.3(38.23)
S.E. ±	0.7177		0.3651
C.D.(P=0.05)	1.4756		0.7507

Mean of three replications; L – Light; D – Dark
Figures in the parenthesis are arcsine transformed value

Light period :

Continuous light was found to be the most suitable for the maximum mycelial growth (78.6 mm at 8 days light periods) and conidial germination (44.3% at 24h light period) of *C. gloeosporioides*. Continuous darkness resulted in the least mycelial growth (65.1 mm at 8 days continuous dark) and conidial germination (36.1% at 24 h dark) of pathogen (Table 3). Similarly, Akhtar *et al.* (1999) also reported that maximum mycelial growth and acervuli production at *C. gloeosporioides* which was observed at continuous light periods.

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