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Effect of different temperatures and pH on growth and sporulation of Colletotrichum lindemuthianum causing anthracnose of Mungbean

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ABSTRACT

Colletotrichum lindemuthianum, causal agent of anthracnose of Mungbean was tested at six various temperatures (10, 15, 20, 25, 30, 35°C) and 5 different pH of (5,6,7,8,9) to observe the growth and sporulation of test pathogen. Best temperature for maximum growth and sporulation was found at 25°C with maximum colony diameter of 78 mm at 168 hrs incubation, with mean diametric growth 11.1mm/ day. At 25°C temperature sporulation was observed moderate to abundant, whereas maximum growth and sporulation was found at pH 6 with77.6 mm radial growth.

***Key words**: Temperature, pH, colony diameter.*

INTRODUCTION

Mungbean [*Vigna radiata* (L.) Wilczek], is an important leguminous crop of India. It is commonly called as greengram, which is a well known and ancient pulse crop of Asia. It is a multipurpose crop grown for seed production, green manuring and forage. Because of its high nutritional value, suitability for increasing soil fertility, addition of nitrogen to the soil it may be considere as "Golden Bean". Pulse crop adds upto 30 kg nitrogen content per hectare area per year.It is a short duration crop which makes it to fit proper in different cropping systems.

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Mungbean is rich in protein (23-24%), carbohydrate (54-56%), vitamins and minerals. It has high digestibility due to which it is used as babies food, teenagers and elders. Unlike other pulse crops, it is free from flatulent problems in stomach. It can be consumed in many ways such as boiled dhal, sprouts, bean cakes, noodles and pudding. Currently, in India the per capita contribution of pulse crops in providing nutrition with respect to protein, energy and fat is 117.4 K cal, 6.9 g and 1 g/day respectively. An adult aged male and female needs 80 and 70 g per capita per day, respectively for the balanced diet **(Anonymous, 2004).** Greengram crop covers a total world area of 5 m ha with a total production of 3 mt **(John, 1991).** It is widely grown throughout the world *i.e.* South Asia including India, Pakistan, Sri Lanka, Bangladesh, Thailand, Indonesia, Cambodia, Vietnam, Malaysia and South China. India is considered as an important pulse growing country contributing 28 % to the global pulse basket with an area of about 37% **(Masood Ali and Shivkumar , 2000).** Mungbean (*vigna radiata* (L.) Wilczek) is grown principally for its protein rich edible grains, in India. It is also cultivated for green manuring. It is also known by other name viz. mung, moog, golden gram, sona, greengram. Mungbean is native of India, Mayanmar and area of Southeast Asia. In India mungbean is cultivated in 3.77 million ha with production of 1.52 mt and productivity of 406 kg/ha in 2008 and in 2009 production of mungbean 1.04 m tones **(Anonymous, 2010).** Mungbean is a crop of tropical and subtropical region. It can tolerate temperature as 400c. It is grown in India, Indonesia, Bangladesh, Mayanmar, China, Philippines and Thailand. It is also grown in parts of East and Central Africa, Australia, United state of America and West India **(Westphal, 1974).** The area under mungbean in Uttarakhand is very small and limited to the plains. In 2008, 23metric tones of mungbean were produced in state from 52 ha area with 443 kg/ha productivity, which is higher than national average. Greengram crop can be affected by vious pathogens for example fungi, bacteria,

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viruses, and nematodes. Major diseases of Soybean include powdery mildew, anthracnose, *Cercospora* leaf spot, dry root rot and web blight. In last few years, greengram anthracnose caused by *Colletotrichum capsici* has become a major disease which is well known to occur in many countries *viz.* India, Thailand ,Nigeria, Philippines, Upper volta, Zambia, Columbia and Palmira, *etc*. **(Agarwal, 1991).**

MATERIALS AND METHODS

In vitro evaluation of growth and sporulation of test pathogen at different temperatures

PDA media was used to know the influence of various temperaturee on growth and sporulation of *C. lindemuthianum.* Media was poured in the petriplates. Three replication of Petri plates were incubated at temperature of 10, 15, 20, 25, 30, 35^0C for 7 days. Radial growth and sporulation was noted on 24hrs, 72hrs and 168hrs.

In vitro evaluation of growth and sporulation of test pathogen at different pH

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The *Colletotrichum lindemuthianum* was grown on PDA and incubated at different pH to observe the effect of pH ranges from5 to 9. The colony diameter recorded after 24 hrs, 72 hrs and 168 hrs of incubation periods.

Unimpeded PDA medium Petri plates inoculated with *Colletotrichum lindemuthianum* used as check. All the pathogen inoculated plates were kept in incubator at 28±2°C. After 07 days radial growth of the pathogen was measured with the ruler. Per cent inhibition over check was calculated by using formula **given by Vincent, 1947**:

$$I = \frac{C-T}{C} X100$$

I = grotwh inhibition percent

C = radial growth in check (mm)

T = radial growth in treatment (mm)

Result and discussion:

Influence of various temperatures on growth of *C. linemuthianum*

Colletotrichum linemuthianum was grown on PDA and incubated at different temperatures *viz.*, 10, 15, 20, 25, 30, 35°C to observe the effect of temperature ranges on growth and sporulation. The colony diameter and sporulation recorded after 24 , 72 and 168 hrs of incubation periods is presented in **Table1.** Data revealed that maximum growth and sporulation was found at 25°C, at which maximum colony diameter 9.8 mm after 24 hrs, 36 mm after 72 hrs and 78 mm at 168 hrs incubation, with mean diametric growth 11.1mm/ day. At 25°C temperature sporulation was observed moderate to abundant. The next best temperature was found at 20°C with radial growth of 8.5 , 34.1 and 71.6 mm recorded after 24 hrs, 72 hrs, 168 hrs of incubation, respectively, and

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slight to moderate sporulation was occured at this temperature. The other temperature in order to superiority is 15 and 300C. It was also observed that no fungal growth occurred at 10 and 35 ^{0}C even after 168 hrs of incubation. Same repot was observed by **Thangamani *et al*., 2011** in *Colletotrichum musae*.

Influence of pH on growth and sporulation of *Colletotrichum lindemuthianum*

C. lindemuthianum was grown on PDA and incubated at different pH to observe the effect of pH ranges viz, 5, 6, 7, 8 and 9. The colony diameter recorded after 24 hrs, 72 hrs and 168 hrs of incubation periods **(Table 2)**.

Data revealed that the best pH for growth and sporulation was found maximum at 6 pH, at which maximum colony diameter 12.3 mm after 24 hrs, 29.3 mm after 72 hrs and 77.6 mm at 168 hrs incubation, with mean diametric growth 11.0 mm/ day. At 6pH sporulation was observed moderate to abundant. The next best pH was 7 at which radial growth was 11.0, 28.0 and 73.0 mm recorded after at 24 hrs, 72 hrs, 168 hrs of incubation, respectively, and slight to moderate sporulation occurs at this pH. The other pH in order to superiority is 8, 5 and 9 pH. It was also observed that no fungal sporulation occurred at 5 and 9 pH even after 168 hrs of incubation.

In the present investigation, maximum radial growth was found at pH 6 which is in sink with the results of **Nandinidevi (2008).** She has found that at neutral pH growth of *C. gloeosporioides* was maximum which is followed by pH 6. However, same type of report was observed by **Gina (1999)** who found pH 7 as the suitable for mycelial growth.

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Temperature	After 24 hrs	After 72 hrs	After 168 hrs	Average growth

Table1: Influence of various temperatures on growth and sporulation *of C. lindemuthianum*

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(C°)	Radial growth (mm)	Sporulation density	Radial growth (mm)	Sporulation density	Radial growth (mm)	Sporulation density	per day
10°C	0 .0	-	0.0	-	0.0	-	0.0
15°C	6.9	-	22.0	-	61.0	+	8.7
20°C	8.5	-	34.1	++	71.6	++	10.2
25°C	9.8	++	36	+++	78	+++	11.1
30°	6.1	+	28	++	65.5	++	9.3
35°C	0.0	-	0.0	-	0.0	-	0.0

CD 5% **Temperature** = **0.486**

Days = **0.376**

Temperature × Day = **0.842**

CV = 2.205

-= without sporulation; + = slight < 100 spores/ml; ++ =moderate 100-200 spores/ml; +++ = abundant > 200 spores/ml data based on mean of three replications.

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Table 2: Effect of various pH levels on growth of *C. lindemuthianum* at 25 ± 1°C after 7 days

pH	Radial growth (mm)*						Average growth per day
	After 24 hrs	Sporulation	After 72 hrs	Sporulation	After 168 hrs	Sporulation	
5	8.3	-	26.0	-	61.0	-	**8.7**
6	12.3	+	29.3	++	77.6	+++	**11.0**
7	11.0	-	28.0	+	73.0	++	**10.4**
8	9.0	-	27.3	+	64.0	+	**9.1**
9	8.0	-	25.6	-	54.6	-	**7.8**
CD 5%		**pH**	**=**	**1.307**			
		Days	**=**	**1.012**			
		pH× Days	**=**	**2.264**			
CV =		**3.95**					

- = without sporulation; + = slight < 100 spores/ml; ++ =moderate 100-200 spores/ml; +++= abundant > 200 spores/ml data based on mean of three replications.

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