Indian J.L.Sci. 5 (2) : 65-67, 2016

ISSN : 2277-1743 (Print)
ISSN : 2278-7879 (Online)

CLIMATIC CONDITION LIKE TEMPERATURE AFFECTED THE MYCILIAL GROWTH OF *Alternaria solani* CAUSING EARLY BLIGHT OF POTATO

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ABSTRACT

The early blight of potato is caused by *Alternaria solani* Sorauer is one of the world's most atrophic diseases. *Alternaria solani* spores are universally present in fields where host plants have been grown. Free water is required for Alternaria spores to germinate; spores are unable to infect a perfectly dry leaf. Alternaria spores germinate within 2 hours over a wide range of temperatures but at 26.6-29.4°C (80-85°F) may only take 1/2 hour. Another 3 to 12 hours are required for the fungus to penetrate the plant depending on temperature. After penetration, lesions may form within 23 days or the infection can remain dormant awaiting proper conditions [15.5°C (60°F)] and extended periods of wetness. Alternaria sporulates best at about 26.6°C (80°F) when abundant moisture (as provided by rain, mist, fog, dew, irrigation) is present. The suitability of temperature for appropriate growth of the pathogen was analysed at different temperature viz. 20˚C, 25˚C, 30˚C and 35˚C for observation of radial growth of *Alternaria solani*. The maximum radial growth (9 cm) was recorded at 25˚C within 8 days followed by 30˚C in 10 days, 20˚C in 12 days and 35˚C was found least suitable for the growth of *A. solani* which took 13 days for full plate growth.

KEYWORDS : Fungus *Alternaria solani*, Temperature, Mycelial Growth

Early blight is widespread in most areas where potatoes and tomatoes are grown, but is especially prevalent in the tropics and temperate zones. The disease is the potential threat where potatoes are grown under irrigation or during times of heavy dew. Early blight is prevalent in all provinces in South Africa and is a limiting factor in production in late summer. Early blight tuber may occur if tubers wounded during harvest are inoculated by *A. solani* spores found on or near the soil surface. Early blight is one of the three diseases taken into account when selecting new potato varieties in South Africa. Next to the widespread potato disease, late blight caused by *Phytophthora infestans*, early blight has become a noticeable problem for German potato production during the year 2008. A rapid increase in diseases severity has been observed for German potato growing areas. Early blight is caused by *A. solani* and *A. alternata*, which is also the causal agent for brown spot. Early mainly affects potato foliage and leads to leaf necrosis and premature defoliation (Leiminger and Hausladen, 2011). The primary damage of early blight is due to premature defoliation of the plant. Photosynthesis rates increase and respiration rates increase in apparently healthy tissues. Physiological changes are difficult to measure and evaluation of crop loss is based on the level of disease. Early literature cites yield losses of 5 50%. There is often a discrepancy between damage to foliage and yield loss, which is due to the increase in disease spread at the end of the season, when most of the yield has been produced. When tomato fruit and potato tubers become infected, control of early blight has been shown to increase yield (Van der waals, 2002).

Bashi and Rotem (1974) noted that spores could germinate at 20 °C after only a two-hour wetting period. Elongation of the germ-tube requires a longer wetting period. Germ-tubes form appressoria, and penetrate the epidermis directly or through wounds or stomata. Spore germination is facilitated by free moisture, but can be induced by relative humidity close to saturation. Reports on the germination of spores give varying values for minimum, optimum and maximum temperatures. Deshwal (2004) described a comprehensive, comparative account of morphological differentiation of different *Alternaria* species occurring on cucurbitaceous, brassicaceous and solanaceous crops. It is observed that disease severity increases with increase in leaf wetness duration at all temperatures. The maximum observed mean disease severity occurred after 24 hrs duration of wetness at 18°C.

The climatic condition like temperature humidity light and rain can affect the myclial growth and sporulation of pathogen and finally disease severity may be affected. The Management of environmental conditions is very difficult but unfavorable temperature can created under

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poly house cultivation. Therefore present investigation was carried out to see the effect of different temperature on mycelial growth of *A. solani* causing early blight disease in potato.

MATERIALS AND METHODS

Preparation of Culture Media

Yeast Extract Potato Dextrose Agar medium was used for effect the temperatures on mycelial growth of *Alternaria solani* .

Yeast Extract Potato Dextrose Agar Medium (YEPDA) Composition

Yeast extract	2 g
Potato	250 g
Dextrose	20 g
Agar agar	20 g
Distilled water	1000ml

Sliced potato was boiled in 500 ml. distilled water for 30 minutes in a pan. Potato extract was filtered through muslin cloth and added 20 g dextrose, 20g agar powder and 2 g yeast extract were mixed with filtered potato extract in a pan and heated for 5 minutes. Extract was continuously heated and stirred for avoiding the clot formation of agar. Distilled water was added for made 1 L volume and placed in conical flask (1/3 of the flask volume). Conical flask contained medium was plugged with non-absorbent cotton and then sterilized in autoclave at 121°C temperature for 1 hour.

Effect of Temperature on the Growth of *Alternaria solani*

Twenty ml medium was poured in sterilized Petriplate. These plates were inoculated with a 5mm mycelial bit of 7 days old culture (*Alternaria solani*) separately. These inoculated Petriplate were incubated at different temperature, viz. 20°C, 25°C, 30°C and 35°C in BOD incubators. The observations on radial growth were recorded with the help of metric scale and the data were analyzed statistically using completely randomized design (CRD). Three replications of each treatment were maintained.

Table 1 : Effect of Temperature on the Radial Growth of *A. solani*

No. of days	Radial Growth (cm) at Different Temperature			
	20˚C	**25˚C**	**30˚C**	**35˚C**
2	1.20	1.50	1.40	1.10
3	2.20	3.30	3.00	2.90
4	3.30	4.50	4.20	3.60
5	3.60	5.80	5.40	4.40
6	4.20	7.00	6.60	4.80
7	5.50	8.30	7.20	5.20
8	6.20	Full plate	8.10	6.00
9	7.00		8.60	6.60
10	7.80		Full plate	7.40
11	8.30			8.00
12	Full plate			8.50
13				Full plate
C.D. (P0.001)		0.03		
S.E.D.		0.01		

RESULTS AND DISCUSSION

Mycelia Growth at Different Temperature

After selecting Yeast Extract Potato Dextrose Agar medium as best suited medium for fast growth of *Alternaria solani*; the suitability of temperature for appropriate growth of the pathogen was analysed at different temperature. *Alternaria solani* was allowed to grow at four different temperature viz. 20˚C, 25˚C, 30˚C and 35˚C for observation of radial growth.

The effect of different temperature viz. 20˚C, 25˚C, 30˚C and 35˚C are shown in Table 1. The maximum radial growth (9 cm) was recorded at 25˚C within 8 days followed by 30˚C in 10 days, 20˚C in 12 days and 35˚C was found least suitable for the growth of *A. solani* which took 13 days for full plate growth.

These results are confirmative with findings of Chohan et al. (2015). He observed that growth of Alternaria solani was most significant at 25˚C. This investigation will help to farmer for avoid the temperature favourable by altering the sowing time for disease occurrence.

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