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Effect of different physical factors on growth of *Alternaria* isolates from *Capsicum annum* L.

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Abstract
Genus Alternaria belong to deuteromycetes having different species, which are destructive plant pathogen to the families such as Solanceae, cucurbitaceae, brasicaceae. Capsicum crop is from solanaceae family grown in rabbi and kharip season having nutritional and economical value. *Alternaria* cause early blight, fruit rot diseases of Capsicum, which lose the quality and quantity of crop. The growth of pathogen is greatly influenced by various physical factors like temperature, light, pH etc. The results indicated that five isolates of the *Alternaria* were identified and all test isolates showed increase in growth at 25^{O}C temperature and at alternate cycle of 12 hr light and 12 hr. dark.

Keywords: early blight of capsicum, *Alternaria* sp, physical factors

Introduction
Capsicum (*Capsicum annum L.)* is susceptible to many fungal diseases and the total losses reported in India is up to 80 percent of the crop due to severe defoliation and reduction in photosynthesis and reducing the size, quantity and number of the fruits per plant (Shivaprakasam *et al*., 1976) [1]. Among those diseases, early blight is of foliar diseases of capsicum caused by *Alternaria solani* is the most destructive and widespread in temperate, tropical and subtropical regions of the world, which causes a highest reduction in the quality and quantity of fruit yield (Hijmans *et al*., 2000) [4]. *Alternaria* sp. infect the various crops belonging to the several families and reduce yield both qualitatively and quantitatively. The genus *Alternaria* was first recognised by Nees in 1817. *Alternaria* belongs family Dematiaceae. Species of the genus are cosmopolitan, surviving both as saprophytes as well as weak parasites. In several cases, small dark coloured spots are also formed on pods and tender twigs (Valkonen and Koponen, 1990). A comprehensive, comparative account of morphological differentiation of different Alternaria species occurring on cucurbitaceous, brassicaceous and solanaceous crops are described by Khalid et.al. (2004) [6] and Deshwal (2004) [1].

The temperature requirement for *A. solani* was found to be in the range of 5-35°C (Gemawat and Ghosh, 1980). Kaul and Saxena (1988) [5] reported that the maximum growth of five isolates of *A. solani* was at 25°C followed by 20, 15, 10 and 5°C with least growth at 35°C. *A. solani* germinated most rapidly in darkness when ambient temperature was near 25°C (Stevenson and Packer, 1988) [12].

According to Lukens (1963) [7] the conidia of *A. solani* normally formed after incubation for 6 hours in the dark. Prasad and Dutt (1971) [10] found maximum sporulation in six days old culture with 24 hours of exposure to sunlight, than culture exposed to incandescent electric light or infrared light. Growth and sporulation of *A. solani* was low in Czapek's dox synthetic medium but the same was high in case of semi-synthetic and natural carrot leaf media when exposed to light (Fencelli and Kimati, 1990) [2].

Understanding the effect of temperature and light on growth of pathogen will help in developing the effective management strategies, therefore present study were attempted to explore influence of different temperatures and light on five isolates of *Alternaria* sp. isolated from infected Capsicum samples from Nashik district.

Material and methods
Collection of Samples: Samples of fungal infected parts of capsicum were collected from the different area and tehsils of Nashik district of Maharashtra, India during 2014. Fungal infected part samples are collected randomly and fresh infected plant materials were used for the isolation of fungus.

Isolation and culture preparation
Capsicum leaves showing typical early blight symptoms were collected in the early 2014 from growing capsicum plants in different capsicum growing fields of Nashik district. The infected leaves were brought to laboratory and diseased leaves would cut into small bits measuring about 5mm and surface sterilized in mercuric chloride solution for 1 min, rinsed twice with sterile distilled water. Pieces were then placed on Potato Dextrose Agar (PDA) medium and incubated under alternative 12 h light and 12 h dark at 28±2°C according to Naik *et al*., (2010) [8]. Pure culture of the fungus was obtained by hyphal Tip Isolation Method. Fungi are identified from microscopic characters with the help of identification key by The Illustration of Fungi by D.S. Mukadam *et al*. Amongst the several geographical isolates collected from various fields, a representative isolate was picked up for detailed studies. These fungal isolates were grown on PDA slants, stored at 5°C in refrigerator and sub culturing was done subsequently at intervals of 30 days for further research studies.

Effect of temperature on growth of *Alternaria* species

All the isolates of *Alternaria* were separately grown in 150 ml conical flasks containing 25ml glucose nitrate broth. The dry mycelium weight was recorded with respect to different temperature. Eight temperatures from 15-45°C (5°C intervals) were used to incubate cultures of the selected *Alternaria* isolates to find out the optimum temperature as well as the lowest and the highest temperatures at which fungal growth occurred. All incubation was carried out under 12 h light and 12 h dark for 10 days at different temperatures. Four replicates were used for each of the selected isolate at each temperature. The dry weight was determined after 7 days.

Effect of light on growth of *Alternaria* species:

Isolates of *Alternaria* on glucose nitrate broth were exposed to continuous darkness (Flask wrapped with black paper), light and alternative 12 h dark and 12 h light in an aseptic chamber maintained at 28±2°C. Mycelial discs of 5 mm from each isolate were used to inoculate flasks. Four plates were maintained for each treatment. For Inoculated plates, light intensity was adjusted to required level. The dry weight was determined after 7 days.

Results and Discussion

Physical conditions like temperature and light influences the growth of fungi. It was determined by measuring dry weight of mycelium. The Alternaria sp. isolates under study grow best at temperature 25oc where as optimum range is between 20oC to 30oC. As compared to other isolates A. tenuissima (AtMc) and A. tenuissima (AtRc) showed maximum growth at temperature 25oC (Table 1).

Light also effect on growth of fungi. The preliminarily study carried out on effect of light on growth of Alternaria species indicated maximum growth when exposed to alternate cycles of 12 hours light and 12 hours darkness resulted maximum growth. Continuous light or dark show reduction in growth (Table 2).

Table 1: Effect of different temperature on growth of *Alternaria* species

Temp. °C	Mycelium dry weight (mg)				
	AtVc	AcLc	AsJc	AtMc	AtRc
15ºc	0	0	0	0	0
20ºc	180	170	175	210	176
25ºC	280	295	240	322	308
30ºc	245	220	210	215	235
35ºC	200	195	182	160	160
40ºC	70	30	50	45	54
45ºC	20	25	40	40	26

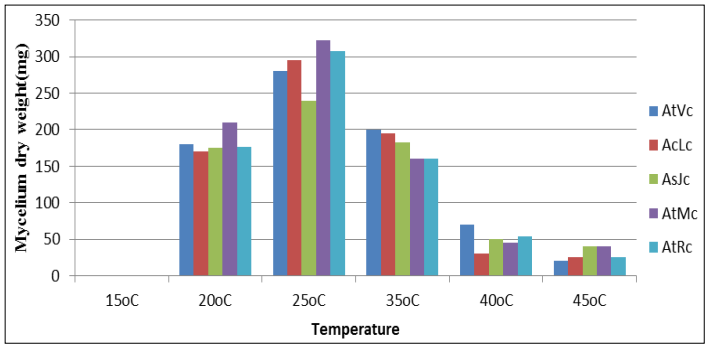

Fig 1: Effect of diffrent temperatures on growth of Alternaria isolates

Table 2: Effect of light on growth of *Alternaria* sp.

Light condition	Mycelium dry weight (mg)				
	AtVc	AcLc	AsJc	AtMc	AtRc
Continuous light	40	30	35	44	38
Continuous dark	42	60	55	58	62
Alternate 12 hr light and 12 hr dark	80	95	80	85	130

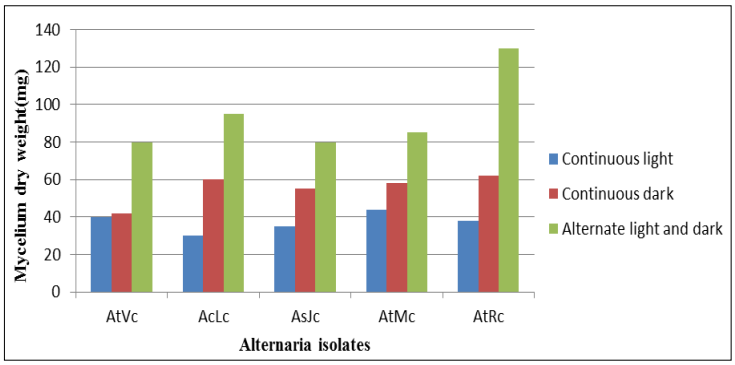

Fig 2: Effect of light on growth of Alternaria sp.

Conclusion

Alternaria is a very destructive fungus for capsicum crop. The present findings clearly indicate that at 25^{O}C temperature and alternate cycle of 12 hr light and 12 hr dark conditions are favorable for growth of all five test isolates of Alternaria sp. so management of pathogen is important at those conditions.

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