

Effect of temperature, relative humidity and light on lesion length due to *Alternaria porri* in onion

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SUMMARY: Infection due to *Alternaria porri* on onion was observed to occur over a temperature range of 15°C to 35°C, with maximum infection at 25°C. However, there was no infection at 40°C. The infection of onion plants was maximum when inoculated leaves were incubated under continuous light (24 h) followed by alternate darkness and light. Least infection was obtained when it was incubated under continuous darkness (24 h). The optimum relative humidity for the infection of onion by *Alternaria porri* was found to be 95 per cent, though disease development occurred over a range of 75 to 100 per cent relative humidity.

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Key Words :

Infection of onion,
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Onion (*Allium cepa* L.) is an important bulb crop of India belonging to the family Alliaceae. In India, the onion crop occupies an area of 0.4546 million hectares with a total production of 6034.25 million tonnes (Anonymous, 2005-06). In Andhra Pradesh, it is grown over an area of about 0.022 million hectares with an annual production of 197 million tonnes (Anonymous, 2005-06). In Guntur district, of Andhra Pradesh it is cultivated in an area of 0.001239 million hectares with an annual production of 0.019680 million tonnes (Anonymous, 2006). Several factors contribute to the low productivity of onion. Diseases like purple blotch, downy mildew, Stemphylium blight, basal rot and storage rot are known to be more significant in reducing the production of the crop. Of these, purple blotch is the most destructive disease, prevalent in almost all onion growing areas of the world causing heavy losses under field conditions. In Guntur district, the disease has become prevalent causing heavy losses to onion farmers in recent times. Present investigation was carried out to find the effect of temperature, relative humidity and duration of

length of purple blotch severity on onion.

EXPERIMENTAL METHODOLOGY

To study the effect of temperature on the infection of onion by *Alternaria porri*, experiment was conducted by using detached onion leaves. Onion leaves of 8 to 9 cms length were allowed to float on 5 per cent sucrose solution (20 ml) in a bottom half of a Petri dish. These leaves were inoculated by spraying them with the conidial suspension (2.8×10^2 spores/ml) and then incubated for about 7 days in BOD incubators set at different temperatures viz., 15°C, 20°C, 25°C, 30°C, 35°C and 40°C. Three replications were maintained for each temperature and three leaves constituted one replication. After incubation, the length of the lesion was recorded for each temperature level.

In order to study the infection of onion by *Alternaria porri* under different regimes of light and darkness, detached onion leaves techniques as described earlier was followed with different regimes of light at room temperature ($28 \pm 1^\circ\text{C}$) as given below:

– Continuous light 24 h.

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- Continuous darkness 24 h.
- Alternate light 12 h and darkness 12 h.

The Petri dishes containing inoculated leaves were kept at 25 cm below a pair of 40 watts cool day light fluorescent lamps for exposure to continuous light 24 h (Treatment 1). The plates were wrapped with black paper and maintained to ensure continuous darkness 24 h (Treatment 2). For the third treatment, the plates were exposed to continuous light 12 h and continuous darkness 12 h alternately. Each treatment was replicated seven times and each replication consisted of three leaves. All the treatments were maintained for 7 days after which the length of the lesion was recorded in centimeters.

To know the effect of relative humidity on the infection of onion by *Alternaria porri*, onion leaves inoculated with the conidial suspension (2.8×10^2 spores/ml) of the fungus were incubated at different relative humidity levels in desiccators ranging from 75 to 100 per cent at room temperature ($28 \pm 1^\circ\text{C}$). Saturated salt solutions with excess of salt were used to maintain different relative humidity levels. The saturated solutions of different Analar grade salts were prepared as described by Dhingra and Sinclair (1993) and transferred into separate desiccators which were kept for 24 h at 20°C to maintain desired levels of relative humidity.

The inoculated leaves floated on 5 per cent sucrose solution (20 ml) in the bottom half of a Petri dish were incubated and kept in desiccators for 7 days. For each level of relative humidity four replications were maintained and each replication consisted of three leaves. The length of the lesion was recorded as explained earlier.

EXPERIMENTAL FINDINGS AND DISCUSSION

The results in Table 1 revealed that the purple blotch disease lesion development occurred over temperatures ranging from 15°C to 35°C . With maximum lesion length (7.36 cm) recorded at 25°C . Temperature beyond and below 25°C caused significant reduction in the length of the lesion. No

Table 1 : Effect of temperature on the infection of onion by *Alternaria porri*

Sr. No.	Temperature ($^\circ\text{C}$)	Length of lesion (cm)
1.	15	2.04 (8.13)
2.	20	4.94 (12.79)
3.	25	7.36 (15.79)
4.	30	3.28 (10.47)
5.	35	1.66 (7.49)
6.	40	00.00 (00.00)
S.Em \pm		0.04
C.D. at 1% level		0.15

Values in Arc sine are transformed values

lesion development was recorded at 40°C . The results of the present study indicated 25°C as the optimum for the development of onion purple blotch disease.

The results presented in Table 2 revealed that the maximum lesion length of 7.80 cm was recorded with continuous light (24 h). However, exposure to alternate darkness and light could result in a lesion of 5.90 cm, while the lesion was 2.13 cm long when it was exposed to continuous darkness (24 h), indicating the continuous light favoured the optimum development of purple blotch disease lesion.

Table 2: Effect of light on the infection of onion by *Alternaria porri*

Sr. No.	Treatments	Length of lesion (cm)
1.	Continuous light (24 h)	7.80 (16.22)
2.	Continuous darkness (24 h)	2.13 (8.33)
3.	Alternate light (12 h) and darkness (12 h)	5.90 (14.06)
S.Em \pm		0.03
CD at 1% level		0.12

Values in Arc sine are transformed values

The results presented in Table 3 revealed that with the increase in the levels of relative humidity from 75 per cent to 95 per cent, there was a significant increase in the length of purple blotch disease lesion on the inoculated detached onion leaves. The maximum length of purple blotch disease lesion of 7.90 cm was observed at 95 per cent relative humidity followed by 7.04 cm and 6.73 cm at 90 per cent and 100 per cent relative humidity, respectively. The purple blotch disease lesion measured 1.53 cm, 2.56 cm and 3.24 cm at 75, 80 and 85 per cent relative humidity, respectively.

Table 3 : Effect of relative humidity on the infection of onion by *Alternaria porri*

Sr. No.	Relative humidity (%)	Length of lesion (cm)
1.	75	1.53 (7.03)
2.	80	2.56 (9.28)
3.	85	3.24 (10.30)
4.	90	7.04 (15.34)
5.	95	7.90 (16.32)
6.	100	6.73 (15.00)
S.Em \pm		0.02
CD at 1% level		0.08

Values in Arc sine are transformed values

The findings of the present study are corroborated by Khare and Nema (1984) who reported maximum disease development at 25°C temperature, continuous light (24 h) followed by alternate darkness and light. The disease

development was least when it was exposed to continuous darkness and 95 per cent relative humidity followed by 100 per cent.

However, Gupta and Pathak (1986) observed maximum disease development (75%) when the plants were kept under 100 per cent relative humidity for 120 h.

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