

Research Article

## Effect of host age and inoculum concentration on disease severity of purple blotch of onion caused by *Alternaria porri*

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### ABSTRACT

In the present study onion plants at different ages viz., 15, 30, 45, 60 and 75 days were inoculated separately with conidial suspension of *Alternaria porri*. With the increase in the host age there was a significant increase in disease development. Highest per cent disease index (54.43) was recorded on plants inoculated at 60 days followed by plants inoculated at 75 days (51.75). Plants inoculated at 45 days (36.25) and 30 days (28.83) showed less per cent disease index relative to 60 days and 75 days old plants. Plants inoculated at 15 days showed the least per cent disease index (21.08). With the increase in the inoculum concentration, there was a significant increase in disease development of *A. porri*. Highest per cent disease index (57.03) was recorded on plants inoculated with inoculum of  $10^8$  spores/ml concentration followed by plants inoculated with inoculum of  $10^6$  spores/ml concentration (52.00) and  $10^4$  spores/ml concentration (43.75). Plants inoculated with  $10^2$  spores/ml concentration (29.50) showed less per cent disease index.

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## INTRODUCTION

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. In Andhra Pradesh, it is grown over an area of about 0.022 million hectares with an annual production of 197 million tonnes (Anonymous, 2005-2006). 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 caused by *Alternaria porri* 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. Therefore, the present investigation was carried out in order to assess the effect of host-age and

inoculum concentration on purple blotch severity.

## MATERIALS AND METHODS

Onion plants were raised by staggered planting in earthen pots containing potting media at 15 days interval. The plants at 15, 30, 45, 60 and 75 days were inoculated by spraying them with conidial suspension ( $2.8 \times 10^2$  spores/ml) of *Alternaria porri*. Each age was replicated four times and each replication consisted of three plants. The inoculated plants were kept in the glass house for symptoms expression. The observations on appearance and severity of the disease on the plants were recorded and per cent disease index (PDI) was calculated by

Scale	Disease intensity (Per cent)
0	Nil
1	1-15
2	16-25
3	26-50
4	51-75
5	Above 76

using the 0-5 scale (Utikar and Padule, 1977).

The per cent disease index (PDI) was computed by using the following formula:

$$\text{PDI} = \frac{\sum(\text{Disease class} \times \text{No. of plants in each class})}{\text{Maximum disease grade} \times \text{Total no. of plants selected}} \times 100$$

Sixty days old onion plants were inoculated separately by spraying them with the conidial suspension of *Alternaria porri* at different concentration viz.,  $10^8$ ,  $10^6$ ,  $10^4$  and  $10^2$  spores/ml. Each inoculum concentration was replicated five times and each replication consisted of three seedlings. The inoculated plants were kept in the glass house for symptoms expression. The observation on appearance and severity of the disease on the plants were recorded and per cent disease index (PDI) was calculated by using the above scale.

## RESULTS AND DISCUSSION

In order to find the effect of plant age on the infection of onion by *Alternaria porri*, onion plants at different ages viz., 15, 30, 45, 60 and 75 days were inoculated separately with conidial suspension of *Alternaria porri*. Observations on the disease severity were made on the inoculated plants ten days after inoculation and expressed as per cent disease index (PDI).

All the inoculated plants at different ages showed infection and significant differences in the per cent disease index were found among the plants inoculated at different ages. Highest per cent disease index (54.43) was recorded on plants inoculated at 60 days followed by plants inoculated at 75 days (51.75). Plants inoculated at 45 days (36.25) and 30 days (28.83) showed less per cent disease index relative to 60 days and 75 days old plants. Plants inoculated at 15 days showed the least per cent disease index (21.08). From the above data it is evident that with the increase in the host age, there was a significant increase in disease development (Table 1).

Sr. No.	Age of plants at inoculation (days)	Per cent disease index
1.	15	21.08 (27.83)
2.	30	28.83 (32.46)
3.	45	36.25 (37.05)
4.	60	54.43 (47.52)
5.	75	51.75 (46.03)
	S.E. $\pm$	0.23
	C.D. (P=0.01)	0.98

Values in Arc sine are transformed values

The findings of the present study are corroborated by Gupta and Pathak (1986) who reported that 60 days old onion

plants were the most susceptible, exhibiting the lowest incubation period and highest disease incidence and severity. In 30 and 40 days old plants poor development of the disease was seen. Khare and Nema (1984) reported that onion plants of 25 and 33 days old did not develop any symptom. Only white specks were observed on 41 and 49 days old plants, which were completely dark on 58 days old plants. The disease symptoms first appeared on older leaves. The appearance of the severe disease symptoms formed on old leaves was attributed to the low sugar content in older leaves by Horsefall and Dimond (1957).

In order to study the effect of inoculum concentration on the infection of onion by *Alternaria porri*, sixty days old onion plants were inoculated with conidial suspension of *Alternaria porri* at different concentrations viz.,  $10^2$ ,  $10^4$ ,  $10^6$  and  $10^8$  spores per ml and the per cent disease index was estimated for each inoculum concentration ten days after inoculation.

The results revealed that all the plants inoculated with inoculum at different concentrations showed infection. Significant differences in the amount of infection were found among the plants inoculated with inoculum at different concentrations (Table 2). Highest per cent disease index (57.03) was recorded on plants inoculated with inoculum of  $10^8$  spores/ml concentration followed by plants inoculated with inoculum of  $10^6$  spores/ml concentration (52.00) and  $10^4$  spores/ml concentration (43.75). Plants inoculated with  $10^2$  spores/ml concentration (29.50) showed less per cent disease index. From the above data it is clear that with the increase in the inoculum concentration from  $10^2$  to  $10^8$  spores/ml there was a significant increase in disease development of *A. porri*.

Sr. No.	Inoculum concentration (No. of spores/ml)	Per cent disease index
1.	$10^2$	29.50 (32.90)
2.	$10^4$	43.75 (41.38)
3.	$10^6$	52.00 (46.15)
4.	$10^8$	57.03 (49.20)
5.	Check (sterile water)	00.00 (00.00)
	S.E. $\pm$	0.75
	CD (P=0.01)	2.43

Values in Arc sine are transformed values

In the present study it was found that, with increase in the inoculum concentration from  $10^2$  to  $10^8$  there was a significant increase in disease development of *A. porri*.

The findings of the present study are corroborated by Gupta and Pathak (1986) who observed the maximum disease incidence (100%) and severity (68.8%) and short incubation period at an inoculum concentration of  $3.28 \times 10^5$  mycelial

propagules/cm<sup>3</sup>. Late appearance and poor development of purple blotch were observed as the density of inoculum decreased.

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