

EFFECT OF AGE OF HOST AND CULTURE OF *ALTERNARIA ALTERNATA* ON *ALTERNARIA* BLIGHT OF FENNEL

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ABSTRACT

Fennel (*Foeniculum vulgare* Mill.) is a seed spice which belongs to the family *Apiaceae*. Alternaria blight is an important disease of fennel caused by *Alternaria alternata*. The present investigations were carried out during *Rabi* 2013-14 and 2014-15 at the Agronomy Farm, S.K.N. College of Agriculture, Jobner to find out the effect of age of host and culture of *Alternaria alternata* on Alternaria blight of fennel. The maximum disease intensity (82.49 %) was recorded when plants inoculated at the age of 50 days followed by 70 days (81.11 %) while 10-day-old culture of the pathogen was found more aggressive in causing higher disease severity (83.81%) as compared to young culture i.e. 6-day-old culture (63.60 %).

KEYWORDS: Important Disease of Fennel Caused by *Alternaria Alternata*

INTRODUCTION

India is rightly known as the land of spices. It is the largest producer, consumer and exporter of spices in the world. Seed spices include all those annuals whose dried seeds are used as spices like fennel, fenugreek, coriander and cumin. Spices have been considered indispensable in seasoning of food, flavouring of beverages, perfumery, cosmetics and medicines. These spices are very important in human health and have a crucial role in Indian cuisine. Fennel (*Foeniculum vulgare* Mill.) belongs to the family *Apiaceae* is an annual, stout, aromatic herb of 100-180 cm height having slender, branched, smooth stem and alternate and decompound leaves. The fennel seeds are used in curing diseases like cholera, bile disturbances, nervous disorders, constipation, dysentery and diarrhoea and also used for control of diseases attacking chest, lungs, spleen, kidney and in colic pain. The major fennel growing belt spreads from arid to semi-arid regions covering large area in Rajasthan and Gujarat. Total area under the crop in India is about 54,000 hectares with production of 70,000 million tonnes (Anonymous, 2014a). In Rajasthan, it occupies an area of 15,160 hectares with an annual production of 14,280 million tonnes (Anonymous, 2014b). Fennel is attacked by a number of diseases viz., Ramularia blight (*Ramularia foeniculi*), powdery mildew (*Leveillula taurica*), seedling damping off (*Alternaria petroselini*), root rot (*Fusarium solani*), Alternaria blight (*Alternaria alternata* and *Alternaria petroselini*). Among these disease Alternaria blight causes the loss of different magnitudes. More than 50% of the inspected fields of fennel showed Alternaria blight symptoms with an incidence ranging from 30 to 100% (Infantino *et al.*, 2009). The present study aimed to study the host age and culture age of *Alternaria* blight on disease development; such information will be useful in developing resistant cultivars of fennel to this disease.

MATERIAL AND METHODS

Collection and Isolation of Pathogen

The diseased samples were collected from farmer's field and brought to the laboratory for further studies. Isolations were made from the infected plants showing typical symptoms of *Alternaria* blight. Small pieces of the leaves and stems of fennel plant were cut from the diseased portion along with some healthy tissues; surface sterilized for 1-2 minutes in 0.1 per cent mercuric chloride solution followed by three washings with sterilized distilled water. These bits were transferred aseptically on to 2 per cent Potato Dextrose Agar in Petri-dishes separately. Incubation was done at $25 \pm 1^\circ \text{C}$ for 7 days. Sub-cultures from un-contaminated peripheral growth were made on PDA slants. The culture purified through single spore technique and used for further studies.

Effect of Host Age on Disease Development

To know the response of host plant age on infection by *Alternaria alternata*, the crop was shown on different dates in such a way that all the ages of the crop are made available on the date of inoculation. The crop was sown in field on 28 October, 8 November, 27 November and 17 December to get the desired host age i.e. 110, 90, 70 and 50 days old and inoculation was made on 5th February on all age groups. The per cent disease intensity was recorded after 15 days of artificial inoculation. The per cent disease intensity (PDI) was calculated by using following formula (Wheeler, 1969).

Table 1

S. No	Description	Grade
1	No incidence/ Healthy	0
2	Symptoms on leaf tip and leaves only	1
3	Symptoms on leaves and petiole	2
4	Symptoms on leaves, petiole and stem	3
5	Symptoms on leaves, petiole stem and inflorescence	4
6	Symptoms on leaves, stem, inflorescence including seed	5

$\text{PDI} = \frac{\text{Sum of numerical disease rating} \times 100}{\text{No. of plants assessed} \times \text{maximum disease rating}}$

Effect of Age of Culture on Disease Development

To know the effect of culture age on disease development, suspension of spores of *A. alternata* was prepared from culture of different age's viz., 6, 8, 10, 12, 14 and 16 days old culture. Fennel plants of same age were inoculated for each treatment and the per cent disease intensity was recorded after one week of inoculation.

RESULTS AND DISCUSSIONS

Effect of Host Age on Disease Development

In order to know the most vulnerable stage of the host, the fennel plants of different ages (50, 70, 90 and 110 days old) were inoculated with *A. alternata*. The results showed (Table 2) that maximum disease intensity (82.49 %) was recorded when plants inoculated at the age of 50 days followed by 70 days (81.11 %). It was found that disease intensity with three early sown dates was comparatively less than at the later sowing dates. Sangwan *et al.* (2002) reported similar results for infection in radish caused by *A. raphani*. Parashar and Lodha (2012) concluded that fennel plant had maximum susceptibility to infection of Ramularia blight at the age of 95-105 days old.

Effect of Age of Culture on Disease Development

Age of culture also plays an important role in onset and development of disease. The plant pathogens are known to be metabolically more active at younger stage and cause maximum infection. Culture of *A. alternata* of different ages was inoculated on fennel plants to determine their aggressiveness in causing the blight disease. Increasing the age of culture up to 10 days also increased the aggressiveness of the pathogen. Maximum disease intensity (83.81%) was recorded with 10-day-old culture (Table 3). Cultures ageing beyond 10 days showed decreased aggressiveness. Young culture was less virulent as evident from the data where minimum mean disease intensity was observed with 6-day-old culture (63.60%). These findings are supported with the results of earlier workers, working with *Alternaria* spp. on radish (Sangwan *et al.*, 2002), adusa (Singh, 2005) and senna (Tetrawal and Rai, 2007).

Table 2: Effect of Age of Fennel against *A. Alternata* under Artificial Inoculation Conditions

Date of Sowing	Host Age (Days)	Per Cent Disease Intensity*		
		2013-14	2014-15	Pooled
28 Oct.	110	76.82 (61.22)	78.12 (62.11)	77.47 (61.67)
08 Nov.	90	77.55 (61.72)	80.25 (63.61)	78.90 (62.67)
27 Nov.	70	80.13 (63.53)	82.08 (64.96)	81.11 (64.24)
17 Dec.	50	81.23 (64.33)	83.74 (66.22)	82.49 (65.27)
SEm+		1.92	1.91	1.98
CD (p = 0.05)		4.85	4.81	4.99

*Average of five replications

Figures in parentheses are angular transformed values

Table 3: Effect of Age of Culture on Development of Alternaria Blight of Fennel

Age of Culture (Days)	Per Cent Disease Intensity *		
	2013-14	2014-15	Pooled
6	62.65 (52.33)	64.54 (53.45)	63.60 (52.89)
8	72.25 (58.21)	74.54 (59.70)	73.40 (58.95)
10	81.33 (64.40)	86.28 (68.26)	83.81 (66.33)
12	76.12 (60.75)	80.17 (63.56)	78.15 (62.15)
14	69.45 (56.45)	71.68 (57.85)	70.57 (57.15)
16	65.62 (54.10)	67.45 (55.21)	66.54 (54.66)
SEm+	1.24	1.26	1.25
CD (p = 0.05)	3.82	3.87	3.84

*Average of four replications

Figures in parentheses are angular transformed values

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