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Host range, cross inoculation and interaction of *Colletotrichum capsici* with other Fruit Rot pathogens in Chilli

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Colletotrichum capsici, cause of chilli fruit rot, which was also found host of Solanaceous vegetables and tested legume crops cowpea, green gram, black gram, moth bean, soybean, chickpea and pea by host range study. *C. capsici* can cause seed rot, die-back of twigs, pedicel discoloration and fruit rot from all tested above ground parts of chilli plant by cross inoculation. Combinations of *C. capsici* with *C. gloeosporioides, C. acutatum, Alternaria alternata, Fusarium oxysporum* and *F. sporotrichioides* causes high fruit rot severity and fast disease development was confirmed by pathogen interaction study.

Key words: *Colletotrichum capsici,* host range, cross inoculation, interaction, chilli

INTRODUCTION

Chilli fruit rot disease is one of the most economically important disease was reported for the first time in India from Coimbatore of Madras Presidency in 1913. *Colletotrichum capsici* is the major pathogen of fruit rot but it causes in severe form in association with other *Colletotrichum* spp. (*C. gloeosporioides* and *C. acutatum*), also *Alternaria alternata* and *Fusarium oxysporum*, *F. sporotrichioides* (Santoshreddy *et al,*2014 a). *Colletotrichum* is pathogen of solanaceous vegetables and legumes hence to know the host range of commonly cultivating annual crop hosts are studied. *C. capsici* causes seed, seedling rot, dieback and fruit rot so cross inoculation study was done to know the same pathogen from seed produces all symptoms and vice versa. The interaction of *C. capsici* with other fruit rot causing pathogens is studied and presented in this paper.

MATERIALS AND METHODS

Host range

Host range studies were made in order to find out the capacity of the *C. capsici* to infect any host other than chilli, solanaceous vegetables like brinjal, tomato and legume crops *viz.,* moth bean, black gram, green gram, cowpea, soybean, chickpea and pea. Five seeds of these plants were sown in earthen pots of 30 cm diameter (2 kg soil), one month old plants were inoculated with spore suspension of *C. capsici,* by spray inoculation technique. Plants were kept in moist chamber for 24 h

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before and after inoculation. Chilli plants inoculated with spore suspension (10 x10^6/ml served as control. Symptoms were recorded at every 24 h after inoculation up to 10 days.

Cross inoculation

To know the cross inoculation nature of *C. capsici* which causes seed rot, seedling rot, die-back and fruit rot, different disease affected parts (seed, twigs, pedicel, fruits) were collected and subjected for isolation on PDA using standard tissue isolation and incubated at 25±1^{O}C for seven days. Pathogen from infected seed, twig and pedicel were inoculated to fruits and vice-versa. Development of symptoms were recorded after ten days of incubation in glasshouse condition.

Interaction of Colletotrichum capsici with F. oxysporum and A. alternata

Interaction of the *Colletotrichum* spp. alone also with *F. oxysporum* and *A. alternata* in combination were studied. Byadgi Dabbi chilli fruits were collected and surface sterilized by sodium hypochlorite solution (1%). Further pin prick method was used for injury and inoculation of spore suspension (1x10^6/ml) of pathogens. These fruits were incubated in moist chamber for 5 days, development of symptoms were recorded. All experiments were carried out during 2013 at Department of Plant Pathology, College of Agriculture, Dharwad, Karnataka.

RESULTS AND DISCUSSION

To know the host range of *C. capsici* two solanaceous vegetables and seven legume hosts were tested. The results revealed that *C. capsici* can infect all the nine hosts. On solanaceous vegetables tomato and brinjal, chlorotic lesions were produced on 4th day after inoculation. These lesions turned to brown colour leading to necrosis after seven days of inoculation. In legume crops like cowpea, green gram and black gram brown colour horse shoe type lesions were observed after 8 days after inoculation. An earliest visible chlorotic symptom was observed in pea after 2 days of inoculation, while maximum duration (6 days) taken to produce the initial symptom in moth bean. Details are furnished in Table 1. *C. capsici* can overwinter on alternative hosts such as solanaceous vegetables and legume crops, plant debris and rotten fruits in the field (Pring *et al,* 1995). *C. capsici* which causes fruit rot of chilli also infects soybean, tomato, potato, and brinjal (Hegde, 1998). Pandey (2006) showed on the basis of morphological, pathological and molecular characterization that *C. capsici* from chilli causes fruit rot, seed and seedling mortality in tomato.

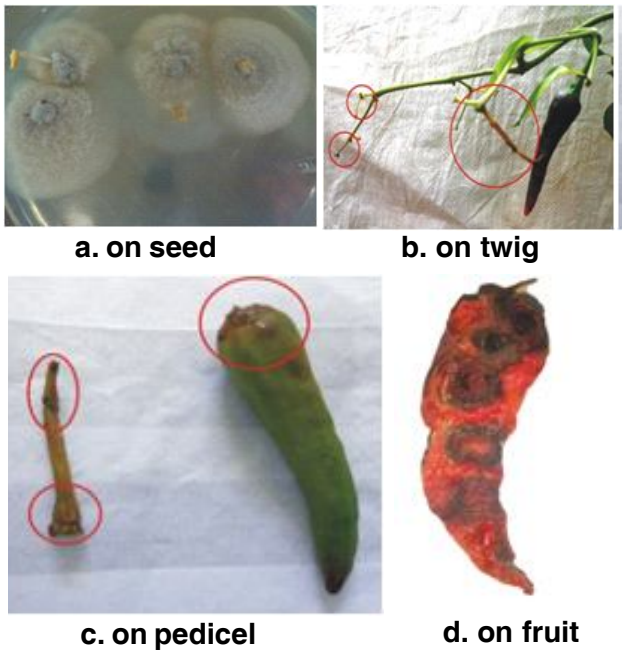

Fig. 1: Symptoms on different parts of chilli plant produced by cross inoculation of *Colletochtrium capsici*

Colletotrichum species were generally able to survive in or on seeds and one of the ways that anthracnose was introduced to the chilli field is through infected transplants. *C. capsici* infection of chilli was shown to have two pathways: invasion through the seed coat and invasion through the openings of the testa (Jewsakun, 1978). *C. capsici* caused seed rot and root rot of seedlings (Hemannavar, 2008; Santoshreddy *et al,* 2014b) and also it causes die-back of chilli (Akhtar *et al,* 2008; Rajput, 2011). Hence, to know whether the same pathogen will cause all these symptoms, in the present investigation cross inoculation of *C. capsici* between seed, twig, fruit pedicel and fruit was carried out, the results (Table 2 and Figure1**)** revealed that *C. capsici* can cause seed rot, die-back of twigs, pedicel discoloration and fruit rot from all tested parts of chilli plant.

Fruit rot of chilli is caused by more than one pathogen i.e., different species of *Colletotrichum*, (*C. capsici*, *C. gloeosporioides, C. acutatum*), *A. alternata* and *Fusarium* spp. (Santoshreddy *et al,*

Table 1: Host reaction to *Colletotrichum capsici* inoculation

Host	Reaction	Days after inoculation	Symptoms observed
Tomato	+	4	Initiation of Chlorotic lesion
		6	Chlorotic lesion
		8	Chlorotic lesion turning to brown color necrotic lesion
Brinjal	+	4	Chlorotic lesion from margin of leaf
		6	Lesion turning to brown color
		8	Necrosis of leaf
Chick pea	+	4	Chlorotic lesions from margin of leaves
		6	Chlorotic lesions to brown color with drying from margin
		8	Necrosis of leaves
Moth bean	+	6	Chlorotic lesions from tip of leaves
		8	Chlorotic lesions turning to brown color
		10	Necrosis of leaf from tip of leaf
Green gram	+	4	Chlorotic lesions on lower surface of leaf
		6	Chlorotic lesions on upper surface of leaf
		8	Chlorotic lesions turning to reddish brown color horse shoe type symptoms on upper surface
Cowpea	+	4	Chlorotic lesions on lower surface of leaf
		6	Chlorotic lesions on upper surface of leaf
		8	Chlorotic lesions turning to reddish brown color horse shoe type symptoms on upper surface
Black gram	+	4	Chlorotic lesions on lower surface of leaf
		6	Chlorotic lesions on upper surface of leaf
		8	Chlorotic lesions turning to reddish brown color horse shoe type symptoms on upper surface
Soybean	+	3	Chlorotic lesions on leaves
		5	Reddish brown color lesion
		7	Necrotic lesion
Pea	+	2	Chlorotic lesions on leaves
		4	Chlorotic lesions to brown color with necrosis
		6	Necrotic lesion

Table 2: Reaction on different parts of chilli by cross inoculation of *Colletotrichum capsici*

Isolated from	Inoculation to Twig	Fruit	Pedicel
Seed	+	+	+
Twig	+	+	+
Fruit	+	+	+
Pedicel	+	+	+

2012; Parey *et al,* 2013). Hence to know about the symptoms caused by interaction of these pathogens in combination, an experiment was conducted the results are presented in following paragraph and Table 3.

C. capsici + A. alternata

Symptoms appear on two days after inoculation as water soaked lesion of 1.0-1.5cm diameter. After five days of inoculation concentric rings with black color mold growth was observed on 2-3 cm diameter lesion, eight days after inoculation black color spore mass wer produced on these lesions.

C. capsici + F. oxysporum

Symptoms appear on two days after inoculation as water soaked lesion of 0.5-1.0 cm diameter, after four days of inoculation pinkish white color mycelial growth was observed on 1.5 – 2.0 cm diameter lesion. Eight days after inoculation pink color spore mass were produced on these lesions.

C. capsici + C. gloeosporioides + C. acutatum

Symptoms appear on one day after inoculation as water soaked lesion of 0.5 -1.0 cm diameter. After

Table 3: Interaction effect of chilli fruit rot pathogens

Pathogen	First appearance of symptoms (DAI)	Symptom observed (DAI)	Symptom
C. capsici + A. alternata	2	2	Water soaked lesion of 1.0-1.5 cm diameter
		5	Concentric rings with black color mold growth was observed on 2.0-3.0 cm diameter lesion
		8	Black color spore mass produced on these lesions
C. capsici + F. oxysporum	2	2	Water soaked lesion of 0.5-1.0 cm diameter
		4	Pinkish white color mycelial growth was observed on 1.5 - 2 .0 cm diameter lesion
		8	Pink color spore mass produced on these lesions.
C. capsici + C. gloeosporioides + C. acutatum.	1	1	Water soaked lesion of 0.5 -1.0 cm diameter.
		7	Sunken lesion with salmon color spore mass produced on 1.5 - 2 .0 cm diameter lesion
C. capsici + A.alternata + F.oxysporum	1	1	Water soaked lesion of 0.5 – 1.0 cm diameter
		4	Greyish mycelial growth observed on 2.0 – 2.5 cm diameter
		6	Concentric rings with grayish salmon colored spore mass were produced on lesion

DAI = Days after inoculation

seven days of inoculation sunken lesion with salmon color spore mass produced on 1.5 – 2.0 cm diameter lesion .

C. capsici + A.alternata + F.oxysporum

Symptoms appear on one day after inoculation as water soaked lesion of 0.5 – 1.0 cm diameter, after four days of inoculation grayish mycelial growth observed on 2.0 – 2.5 cm diameter, six days after inoculation concentric rings with grayish salmon color spore mass were produced on these lesions.

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