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STUDY ON SEED TO SEEDLING TRANSMISSION OF *FUSARIUM OXYSPORUM F.SP. CICERI* CAUSING CHICKPEA WILT IN SUSCEPTIBLE CULTIVARS OF CHICKPEA

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ABSTRACT Chickpea (*Cicer arietinum* L.) is one of the major legume crop widely grown in the Indian sub continent. The major diseases of the chickpea crop are Ascochyta blight, *Fusarium* wilt and dry root rot. Of these wilt caused by *F. oxysporum* f. sp. *ciceri* has been considered as divesting one to cause up to 10 per cent loss in yield. The transmission of the pathogen from seed to seedling was studied by seedling symptom test followed by serial isolation method on three susceptible varieties ICP-1454, Radhey and ICCP-1854 under laboratory conditions. The pathogen was transmitted from seed to seedlings within 15 days in the ratio 9:1 to 4.5:1 with in variety Radhey. The pathogen was found systemic as it was recovered from the healthy tissues as well diseased tissues from roots to the top of the seedlings in serial isolation method.

KEYWORDS : Chickpea, *Fusarium oxysporum* f. sp. *Cicer.*

INTRODUCTION

Gram (Chana) (*Cicer aritinum* L.) belongs to the sub family Papilionaceae of the family Leguminaceae is an herbaceous annual, having branching close to the ground with semi-erect to semi-spreading habit. India is the largest chickpea producer as well as consumer in the world This disease was reported for the first time in India by Butler (1918). Role of *Fusarium oxysporum* f. sp. *ciceri* in causing vascular wilt has been reported from almost all the chickpea growing countries of the world. Pulse crops play an important role in Indian agriculture, besides being rich in protein; they sustain the productivity of the cropping system. The use of resistant cultivars is one of the most practical and cost-effective strategies for managing *Fusarium* wilt, but deployment of resistant varieties has not been extensive because of undesirable agronomic characteristics. Moreover, the high pathogenic variability in *F. oxysporum* f. sp. *ciceri* may limit the effectiveness of resistance. Pathotypes have been differentiated into two groups based on the distinct yellowing or wilting syndromes (Jimenez-Gasco *et al.,* 2004). Its green leaves produces malice and oxalic acids, which are prescribed for intestinal disorders. Gram possesses a highly economic nutritive value as is evident from its analysis. One hundred-gram chickpea seeds contain about 9.8 per cent moisture, 21.1 g protein, and 5.3 g fat. 61.0 g carbohydrates and 3.9 g fiber in addition to vitamins and other things. The crop is subjected to infection by several fungi, among them *Fusarium* wilt is an important disease and is considered relatively more serious disease in most of chickpea growing countries with yield losses ranging from 10 to 90 % (Singh and Dahiya, 1973). The typical vascular wilt caused by *Fusarium oxysporum f. sp. ciceri* is the outstanding problem in Uttar Pradesh

REVIEW OF LITERATURE

Wilt caused by *Fusarium oxysporum* Schl. emends Snyd. and Hans. f. sp. *ciceri* [Padwick] Snyd. and Hans, is one of the major soil borne diseases which causes considerable loss. Haware *et al*. (1978) reported that the fungus *F. oxysporum* f. sp. *ciceri* is a primarily soil borne pathogen, however, few reports indicated that it can be transmitted through seeds. Attempts were made to estimate loss in yield on a per plant basis. Early wilting caused more loss than late wilting. The pathogen may be seed borne and also survives in plant debris in soil (Brayford, 1998). Haware *et al.* (1982) showed the fungus to be in the hilum of the seed in the form of chlamydospores like structures.

MATERIAL AND METHODS

The chickpea seeds were collected from post padding wilted plants at maturity of susceptible variety ICP-1454, Radhey and ICC-1876 from wilt sick plot of E.B. Legume research farm of C.S.A. University of Agriculture and technology, Kanpur at the last week of March, 2003. The seed to seedling were studies by seedling symptom test (Khare *et al.,* 1977) followed by Serial isolation method (Neergaard, 1979). In seedling symptom test one hundred seeds of each variety were surface sterilized with 1 per cent sodium hypo chlorite solution for 10 minutes and placed aseptically in separate culture tubes containing 2 per cent water agar medium (One seed in one tubes). These tubes were plugged loosely with cotton and placed in an incubation room at 25 ± 1 ^{0}C under 12 hours alternating cycle of artificial fluorescent light 12 hours darkness for 45 days. Observations on the symptoms on seed and seedling were recorded in the tube after 7 days and up to 45 days and calculated in terms of the ratio of seed infection of seed transmission.

Isolations from the diseased tissues and rotted seeds were taken serially on PDA in serial isolation test for confirming the association of the pathogen and the root to apical tip of the stem and placed on potato dextrose agar medium in Petri- plates and incubated for 7 days at 25 ± 1 ^{0}C in serial isolation method.

RESULTS AND DISCUSSION

Seedling symptom test followed by serial isolation indicated that the pathogen was transmitted from seed to seedlings within 15 days. It produced drooping of the seedling from the top with browning of rootlets in seedling symptoms test. The pathogen was found systemic as it was recovered from the healthy tissues as well as diseased tissues from roots to the top of the seedlings in serial isolation and seed transmission was varied from 4.5:1 to 9:1 in different varieties. It was minimum in variety Radhey (4.5:1) and maximum in ICP-1454 (9:1).

CONCLUSION

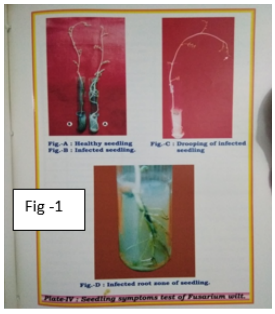
The transmission of the pathogen from infected seed to seedling of varieties ICP-1454, Radhey and ICC-1876 was studied by using seedling symptom test and serial isolation method a described under Materials and Methods. The results are presented in the **Table-1.**

Table-1: Transmission of the pathogen from seed to seedling (seedling symptom test).

Seed sample /varieties	Per cent infection of F. *oxysporum* f. sp. *ciceri*			
	No. of seeds shown	Seeds showing infection	Seedling showing disease symptom	Seed infection seed transmission
ICP-1454	100	18	2	9 : 1
Radhey	100	18	4	4.5 : 1
ICC-1876	100	12	2	6 : 1
Average	100	16	2.67	6 : 1

The results presented in Table-1 revealed that the pathogen was transmitted from seed to seedling within 15 days. The average ratio of seed infection and seed transmission was varied from 4.5: 1 to 9: 1 in different varieties. It was minimum in variety Radhey (4.5: 1) and maximum in ICP-1454 (9: 1).

The disease syndrome as observed in seedling symptom test indicated that the seeds in culture tubes started showing the browning of the lateral roots (Primary roots) within 10 days after sowing. In next two days secondary roots of the affected seedlings become brown Fig-1 (Plate-IV). The whole of the root system of the affected seedlings was covered with the fungus within 15 days of showings and become brown. There after the yellowing of the leaves with drooping of the seedling started in next 2-5 day. The affected seedling then collapsed and dried out.



For confirming the presence of *F. oxysporum* f. sp. *ciceri* in affected seedlings, the roots and stem pieces were placed on potato dextrose agar (PDA) medium in Petri-plates and incubated for 7 days at 25 ± 10C. After 7 days of incubation typical growth of the fungus was a seed that was later identified as *F. oxysporum* f. sp. *ciceri*.

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