

Inoculum levels of *Fusarium oxysporum* f. sp. *ciceri* isolates for wilt disease in chickpea

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ABSTRACT

Fusarium oxysporum f.sp. *ciceri* 1 (Kanpur) isolate with 86.6% seedling mortality at 5% inoculum level was found virulent as compared to *F. oxysporum* f.sp. *ciceri* 2 (Sehore) and *F. oxysporum* f.sp. *ciceri* 3 (Junagadh) isolates with 66.6 and 53.3% seedling mortality, respectively. Maximum wilt incidence at 5% inoculum level was observed with Foc 1 at 40 days after germination while with Foc 2 and Foc 3 it was observed at 43 and 45 days after germination. The increase in inoculum levels increased the wilt incidence. However, it was not proportionate with the increase in inoculum level. Maximum wilt incidence was observed with Foc 1 (86.6%), Foc 2 (93.3%) and Foc 3 (86.6%) at 25% inoculum level. In case of Foc 1 (Highly virulent), 15 and 20% inoculum levels did not cause increase in wilt incidence, while in Foc 2, 20% inoculum level and in Foc 3, 10 and 20% inoculum levels did not cause any increase in wilt incidence. These observations clearly indicated that for *Fusarium oxysporum* f.sp. *ciceri* isolates with different virulence levels, the amount of inoculum required may differ to obtain maximum wilting in chickpea.

Key words: *Fusarium oxysporum* f. sp. *ciceri*, Pathogenicity, Virulence

Wilt caused by *Fusarium oxysporum* f. sp. *ciceri* is a serious disease in chickpea (*Cicer arietinum* L.). Existence of races in chickpea wilt pathogen (Haware and Nene 1982) warrants for identification of chickpea varieties possessing race specific resistance. Genotypes found resistant in wilt sick plot need to be screened in pots filled with soil infested with the desired race of the pathogen. However, no information is available on the level of inoculum of the pathogen to be used for effective screening of genotypes in pots. Most of the workers have used different levels of inoculum for screening of genotypes without considering virulence of the isolates (Gupta *et al.* 1986, Sugha *et al.* 1994, Zote *et al.* 1996, Krishnappa 1997, Gurha *et al.* 2000). In the present investigation, pathogenic variation and effect of different inoculum levels on wilt incidence caused by three isolates of *Fusarium oxysporum* f. sp. *ciceri* in chickpea were studied.

MATERIALS AND METHODS

Wilt infected chickpea plants were collected from wilt sick plot of Indian Institute of Pulses Research, Kanpur, R.A.K College of Agriculture, Sehore and GAU, Junagadh. Isolation was made on potato dextrose agar medium to obtain cultures of *Fusarium oxysporum* f. sp. *ciceri* from these plants. These cultures were purified by preparing single hyphal bit cultures

and were subjected to pathogenicity test on chickpea genotype JG 62 (wilt susceptible). The inoculum of these isolates was multiplied on sand-maize meal medium (Miller 1946) for 25 days at 25±1°C. For pathogenicity test, the inoculum of each isolate was mixed with sterilized soil @ 5% (w/w) which was filled in plastic pots of 20 cm diameter. For each isolate, three replications were maintained and in each pot, five surface sterilized seeds were sown. Observations on days to disease initiation after germination, days to maximum disease development and maximum wilt incidence were recorded in respect of each isolate.

In order to see response of different inoculum levels on wilt disease in chickpea, the inoculum of *Fusarium oxysporum* f. sp. *ciceri* isolates was mixed @ 5, 10, 15, 20 and 25% (w/w). Three replications for each inoculum level along with uninoculated control were maintained. In each pot, 5 surface sterilized seeds of JG 62 were sown. Observations on wilt incidence were recorded. Finally, increase in wilt incidence for every 5% increase in inoculum level was also worked out.

RESULTS AND DISCUSSION

Perusal of data from Table 1 indicated that Foc 1 (Kanpur) isolate was highly virulent as compared to Foc 2

Table 1. Pathogenic variation in *Fusarium oxysporum* f. sp. *ciceri* isolates at 5% (w/w) inoculum level

Isolate	Time taken for (days)		Maximum wilt incidence (%)
	Disease initiation	Maximum wilting	
Foc 1 (Kanpur)	25	40	86.6
Foc 2 (Sehore)	27	43	66.6
Foc 3 (Junagadh)	31	45	53.3

(Sehore) and Foc 3 (Junagadh). Foc 1 caused 86.6% wilt, while Foc 2 and Foc 3 caused 66.6 and 53.3% wilt, respectively. With Foc 1, disease initiation was observed 25 days after germination, while with Foc 2 and Foc 3, disease initiation occurred at 27 and 31 days. The maximum wilt incidence occurred at 43 and 45 days after germination with Foc 2 and 3, respectively. With Foc 1, maximum wilt incidence was observed at 40 days after germination. These observations clearly indicated that Foc 1 is highly virulent as compared to Foc 2 and 3 and for obtaining maximum wilt incidence, different isolates may need different inoculum levels.

Table 2 showed that the maximum wilt incidence was noticed at 25% inoculum level irrespective of the isolates. However, the extent of incidence varied with the isolate. While there was 100% wilt incidence at 25% inoculum level with Foc 1, it was only 93.3 and 86.6% with Foc 2 and Foc 3. It was observed that with Foc 1 at 10% inoculum level, only 7.7%

Table 2. Wilt incidence and per cent wilt increase in chickpea at different inoculum levels of *F. oxysporum* f.sp. *ciceri* isolates

Inoculum level (w/w) (%)	Foc 1		Foc 2		Foc 3	
	% wilt	% increase	% wilt	% increase	% wilt	% increase
0	0.0	-	0.0	-	0.0	-
5	86.6	86.6	66.6	66.6	53.3	53.3
10	93.3	7.7	73.3	10.0	53.3	0.0
15	93.3	0.0	86.6	18.1	60.0	12.5
20	93.3	0.0	86.6	0.0	60.0	0.0
25	100.0	7.1	93.3	7.7	86.6	44.3

increase in wilt incidence occurred while at 15 and 20% inoculum levels, no further increase in wilt incidence was observed. There was 100% wilt at 25% inoculum level of Foc 1. The reason for this situation is that at 5% inoculum level itself, 86.6% wilt incidence occurred and further increase in inoculum level, commensurate increase in wilt could not be observed as only few surviving plants remained for the fungus to react with.

In case of Foc 2, 5% increase in inoculum level *i.e.*, at 10% inoculum level, 10% increase in wilt incidence was observed, while further 5% increase in inoculum level *i.e.*, at 15% inoculum level, 18.1% increase in wilt incidence was observed. With further increase in inoculum level *i.e.*, 20%, there was no increase in disease level. The maximum wilt incidence of 93.3% was observed at 25% inoculum level of Foc 2.

In case of Foc 3, maximum wilt incidence (86.6%) was observed at 25% inoculum level. At 10% inoculum, there was no increase in wilt incidence while further increase of 5% in inoculum level *i.e.*, at 15%, only 12.5% increase in wilt incidence was noticed as compared to 5 and 10% inoculum levels. At 20% inoculum level, no increase in wilt incidence occurred while further increase in inoculum *i.e.*, at 25% inoculum level, 44.3% increase in wilt incidence was observed (Table 2).

The present findings inferred that for screening genotypes of chickpea against different isolates of *Fusarium oxysporum* f. sp. *ciceri*, different inoculum levels would be required depending on the virulence of the isolates to obtain maximum wilt incidence.

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