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OCCURRENCE OF TOMATO FUSARIUM WILT DISEASE IN KAZAKHSTAN

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ABSTRACT: Nine Fusarium isolates identified as A, B, C, D, E, F, G, H, and I were isolated from tomato wilted plants grown under glasshouse conditions at different locations of Almaty, Kazakhstan. All isolates formed colonies, conidia and mycelia with morphological characteristics typical of *F. oxysporum*. These isolates were used for inoculation seedlings of the Carolina Gold cultivar grown in plastic pots under glasshouse conditions. Wilt symptoms particularly brown vascular discoloration in stem were observed after two months from inoculation. This was the first record about presence of tomato wilt caused by *Fusarium oxysporum* f. sp. *lycopersici* in Kazakhstan.

INTRODUCTION

Fusarium oxysporum has received considerable attention because of its ability to cause vascular wilt or root rot diseases on a wide range of plants. *F. oxysporum* f. sp. *lycopersici* (FOL) causes Fusarium wilt disease only of plants belonging to the genus *Lycopersicon* **(Rowe, 1980)**. Since then, it has become a major limiting factor in the production of greenhouse tomato in many countries **(Rowe *et al.*, 1977; Nuter *et al.*, 1978)**. At the first, the causal fungus was identified as a new race (J3) of *F. oxysporum* Schlecht. f. sp. *lycopersici* Snyd. & Hans. which causes Fusarium wilt of tomato **(Sato and Araki, 1974)**. The sever FOL symptoms appears at soil temperatures of about 27ºC. **(Rowe, 1980; Menzies *et al.*, 1990** and **Hibar *et al.*, 2007)**. This study aimed to confirm the pathogenic potentialities of the collected *F. oxysporum* f. sp. *lycopersici* isolates on inciting the wilt symptoms of tomato (cv. Carolina Gold) plants.

MATERIALS AND METHODS

Isolation, identification, preparation of inocula and pathogenicity test of the wilt pathogen:

Tomato (*Solanum lycopersicum*) plants showing typical symptoms of the Fusarium wilt disease were collected from different tomato glasshouses in Almaty province of Kazakhstan during May 2008 season. Cuttings (3 cm length) revealed different degrees of vascular discoloration were used for isolation of the wilt fungus (**Katan *et al.*, 1991 and Amini, 2009**). The growing fungi were purified using the hyphal tip followed by single spore techniques. In addition to the vascular discoloration, identification of the *Fusarium oxysporium* f. sp. *lycopersici* isolates was made according to **Nelson *et al.*, 1983** and **Leslie** and **Sumerell, 2006.** Spore suspensions of the obtained isolates were prepared and adjusted to be containing about "10^{6}" spores/ml (**Beshir, 1991 and Amini, 2009**). Spore suspension of each known Fusarium isolate was used to inoculate seedlings of tomato cultivar Carolina Gold which is resistant to *Fusarium oxysporum* f. sp. *lycopersici* race 1 and 2 (**Bost, 2005**).

Tomato 4-weeks-old seedlings were transplanted into plastic pots (30 cm. in diameter) each containing 11 Kg of natural soil mixture consisted of clay and sand at rate of 2:1 (by weight) at rate of 3 seedlings per pot then spore suspension was poured over stem base at rate of 20 ml/seedling. In control (non-inoculated), plain water was used instead spore suspension. Pots were irrigated and maintained in a glasshouse at 25-30ºC and 70% relative humidity. The inoculated tomato plants were kept under observation of wilt symptoms at 2 months after inoculation.

Disease assessment:

Two months after inoculation, the wilt disease incidence was carried out using a visual 0 - 4 scale according to **Vakalounakis** and **Fragkiadakis, 1999** and the disease incidence was determined according to **Song *et al.*, 2004.**

Statistical analysis:

Three pots (replicates) were used for each particular treatment. The inoculation treatments were arranged in a completely randomized block design in the glasshouse. The data were subjected to analysis of variance according to **Snedecor and Cochran (1982)**. The least significant difference at 0.05 was calculated.

RESULTS AND DISCUSSION

Tomato plants (cv. Carolina Gold) inoculated with isolates of *Fusarium oxysporum* showed different degrees of wilt disease symptoms after 2 months from inoculation. The vascular bundles of infected tomato plant showed dark lines in both sides compared with stems of the healthy plants **(Fig.1)**. This browning of the vascular tissue is characteristic of the disease and can be used for its tentative identification. *F. oxysporum* f. sp. *lycopersici* (FOL) causes severe wilt disease. The browning of the vascular system is characteristic of the disease and generally can be used for identification of the fungal isolates as *Fusarium oxy* f. sp. *lycopersici* (**Armstrong and Armstrong 1968; Jones, 1991** and **Reis, *et al.*, 2005)**.

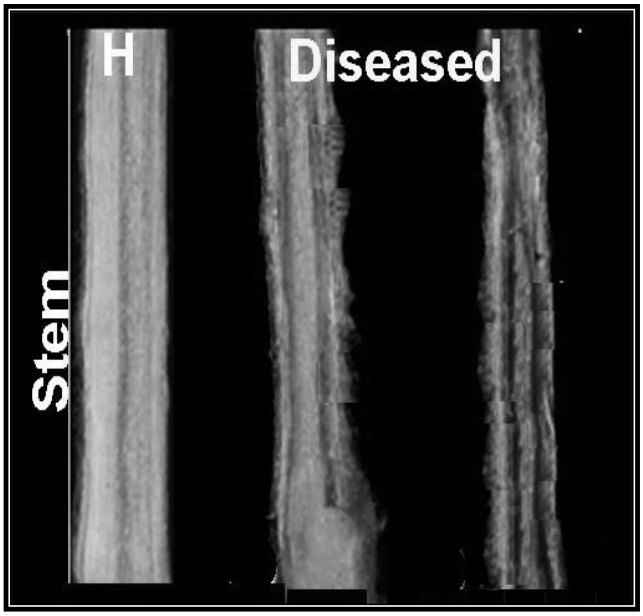

Fig. (1): Healthy (H) and vascular discoloration on stem of diseased tomato plants (cv. Carolina Gold) infested with *Fusarium oxysporum* f. sp. *lycopercici* isolate A.

Data in **Table (1)** reveal that, the (FOL) isolates A and G caused the highest percentage of diseased and dead tomato plants (77.78%) and disease incidence (52.78%). However, isolates H and I seemed to be non-significant when compared with the non-inoculated control which remained disease free. As Carolina Gold tomato cultivar was described as resistant to Fusarium wilt races 1 & 2 **(Bost, 2005)**, the tested Fusarium isolates particularly isolates A and G might considered as new isolates of race 1 or 2 or might be race 3. Such findings agree with **Jones et al. (1982)** observed mature plants with Fusarium wilt symptoms in tomato cultivars possessed resistance to races 1 and 2. Also, **Volin and Jones (1982)** isolated a new race of *Fusarium oxysporum* f. sp. *lycopersici* from commercially produced plants in western Florida. The principal varieties currently produced commercially are reported to have the l2 gene for race 2 resistance. **Cai, *et al.*, (2003)** stated that the collective evidence suggests that race 3 in California originated from the local race 2 population.

Table (1): Percentage diseased and dead plants and disease incidence after inoculation with isolates of *Fusarium oxysporum* f.sp. *lycopersici*

Fusarium isolate FOL	Diseased plants %	Disease incidence %
A	77.78	52.78
B	55.56	33.33
C	33.33	22.22
D	44.44	25.00
E	33.33	22.22
F	66.67	41.67
G	77.78	52.78
H	11.11	11.11
I	11.11	8.33
Control	**0.00**	**0.00**
L.S.D. at 0.05	21.063	9.173

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