Acta Phytopathologica et Entomologica Hungarica 37 (4), pp. 347–351 (2002)

Effect of *Fusarium* Seed-Borne Infection Levels on Watermelon Wilt Incidence

S. H. MICHAIL, M. A. ABDEL REHIM,
A. M. TARABEIH and M. A. ALY

Faculty of Agriculture, University of Alexandria, Alexandria, Egypt

Seed-bone infection level of watermelon with *F. oxysporum* f. sp. *niveum* has a significant effect on wilt incidence. When high (23–31.5%) or moderate (8.5–9.5%) seed-borne infection occurred, wilt incidence reached up to 47.5–57.5% and 45–55%, respectively. However, when low (1.5–2.5%) seed borne levels occurred wilt incidence did not increase more than 5–10%. It is recommended to use seeds of free or low infection levels of *Fusarium* to minimize watermelon wilt incidence.

Keywords: watermelon wilt, *Fusarium oxysporum* f. sp. *niveum.*

Watermelon (*Citrullus lanatus* L.) is the most important summer cucurbit in Egypt. Watermelon seeds were reported to bear important phytopathogenic mycoflora. *Fusarium oxyporum* Schl. f. sp. *niveum* (E. F. Smith) Snyder and Hansen is a seed-borne pathogen of watermelon, and the seeds play an important role in spreading wilt disease (Tymchenko, 1967; Sun and Huang, 1979; Martyn, 1985; Michail et al., 1989). *F. oxysporum* f. sp. *niveum* the watermelon wilt pathogen might induce seed decay and damping off to its host (Walker, 1952; Hine, 1962; Naik et al., 1993; Larkin et al., 1996).

The present work was carried out to know more about the role of seed infection levels on watermelon wilt incidence.

Materials and Methods

Two hundred watermelon seeds each of the five tested cultivars, i.e. Giza 1, Giza 21, Gorma, Aswan and Congo were tested by the standard agar method at 28 ºC under alternating cycles of NUV light and darkness for seven days (Anon, 1976). The percentage of infection was recorded for *F. oxysporum,* and pure cultures were maintained on PDA slants and kept at 5 ºC.

Location of fungi in different seed parts

One hundred seeds each of the five cultivars (sample nos 5, 10, 16, 21 and 26) were used. The seeds were first soaked in tap water for 60 minutes in order to facilitate separation of the different seed parts, i.e. testa, cotyledons and embryo axis. Parts of each

0238–1249/2002/$ 5.00 © 2002 Akadémiai Kiadó, Budapest

seed were surface sterilized, plated on PDA Petri dishes and incubated as mentioned before. The developing *F. oxysporum* colonies were recorded.

Isolation from plant debris mixed with seed samples

One hundred plant debris of watermelon were taken from each of the aforementioned watermelon samples surface sterilized for three minutes in 1% sodium hypochlorite solution and plated at the rate of 5 pieces/dish. The dishes were incubated under the same conditions indicated earlier.

Table 1

Seed health testing of 30 watermelon samples tested on PDA, incubated at 20 ºC under 12 hours alternating cycles of NUV light and darkness for seven days (200 seeds/samples)

Tested cultivars	Sample No.	Level of *Fusarium oxysporum* in percentage of infection
Giza1	1	1.5
	2	6.5
	3	16.0
	4	8.5
	5	29.0
	6	2.0
	7	0.0
	8	0.0
Giza 21	9	6.5
	10	18.5
	11	2.5
	12	9.5
	13	0.0
Gorma	14	12.0
	15	0.0
	16	31.5
	17	9.5
	18	16.5
	19	7.5
	20	1.5
Aswan	21	23
	22	15.5
	23	9.5
	24	0.0
	25	2.5
Congo	26	23.5
	27	0.0
	28	6.5
	29	9.5
	30	0.0

Role of seed infection level on watermelon wilt incidence

The relationship between the seed infection level with *F. oxyporum* and wilt symptoms of three melon cultivars namely; Giza, Gorma and Aswan was studied. Four seed samples of each cultivar differing in infection levels (high, moderate, low and healthy) were used. Four pots (4 replicates)/seed sample were filled with autoclaved and aerated sandy clay soil and each was sown with ten seeds. The pots were daily irrigated and kept under observation for 60 days to determine the number of wilted plants.

Results

Seed health testing of 30 watermelon seed samples *(Table 1)* show the presence of *F. oxysporum* in 23 samples. The highest infection percentage reached up to 31.5 and 29 in sample No. 16 and sample No. 5 of Gorma and Giza 1, respectively. On the other hand, Giza 1, Gorma and Aswan show the lowest infection percentage (1.5 and 2.5 in samples no. 1 and 6 for Giza 1; sample No. 2 for Gorma and sample No. 25 for Aswan cultivars). However, moderate infection level (8.5–9.5%) occurred in sample No. 4,17 and 23 for Giza 1, Gorma and Aswan cultivars, respectively. Sample Nos 7, 8, 15 and 24 were free from infection.

Location of F. oxyporum *in seed parts of water melon seed samples*

Isolation from seed parts of watermelon *(Table 2)* showed the presence of *F. oxysporum* in the testa, cotyledons and embryo axis. The fungus was mostly located in the testa rather than in the cotyledons and least frequently in the embryo axis.

Table 2

Location of *Fusarium oxysporum* in seed parts of five watermelon cultivars

Cultivars	Infection percentage		
	Testa	Cotyledons	Embryo axis
Giza 1	19	5	2
Giza 21	12	3	2
Gorma	19	4	4
Aswan	18	2	1
Congo	16	3	2

Isolation of F. oxysporum *from plant debris mixed with watermelon seed samples*

Isolation of *F. oxysporum* from plant debris mixed with five watermelon seed samples *(Table 3)* revealed the frequent presence of the fungus in all tested samples. The highest infection reached up to 17% in Aswan cultivar.

Table 3

Percentage of *F. oxysporum* in plant debris mixed with watermelon seed samples

Infection percentage in cultivars				
Giza 1	Giza 21	Corma	Aswan	Congo
11	13	7.0	17.0	8.0

Role of seed infection levels on wilt incidence

Data *(Table 4)* show that there is no significant differences in the percentage of wilted plants produced from the moderate and the high seed infection levels, whereas there are significant differences between the percentage of wilted plants produced from the low seed infection level and those produced from moderate and light seed infection levels.

Table 4

Effect of seed infection level of *F. oxysporum* on wilt percentages of watermelon cultivars grown in potted-sterile soil for 60 days

	Wilt infection percentage			
S. I. L.	Giza 1	Giza 0	Aswan	Mean
Highly	52.5	57.5	47.5	52.5
Moderate	50.0	55.0	45.0	50.0
Low	5.0	5.0	10.0	6.8
Healthy (control)	2.5	2.5	0.0	1.7
Mean	27.5	30.0	23.1	

L. S. D. $_{0.05}$:
Cultivars: 4.27 S. I. L.: 4.93

Discussion

Fusarium oxysporum f. sp. *niveum* is known to be seed borne in watermelon. Michail et al. (1989) showed that the fungus was internally and externally seed-borne in watermelon.

The level of natural seed borne infection has a significant effect on wilt incidence. In the case of high (23–31.5%) and moderate (8.5–9.5%) seed-borne infection levels of wilt incidence reached up to 47.5–57.5% and 45–55%, respectively. However, in case of low (1.5–2.5%) seed-borne infection level, wilt incidence did not increase higher than 5–10%. These results suggest to use seeds with low *Fusarium* seed-borne infection (not more than 1.5–2.5%) or *Fusarium*-free seeds in watermelon to minimize wilt incidence in the field.

Literature

Anon (1976): International Seed Testing Association (ISTA). International rules for seed testing. Seed Sci. and Technol. 4, 3–49.

Hine, R. B. (1962): Saprophytic growth of *Fusarium oxysporum* f. sp. *niveum* in soil. Phytopathology. 52, 840–843.

Larkin, R. P., Hopkins, D. L. and Martin, F. N. (1996): Suppression of Fusarium wilt of watermelon by non-pathogenic *Fusarium oxysporum* and other microorganisms recovered from a disease suppressive soil. Phytopathology 86, 812–819.

Martyn, R. D. (1985): An aggressive race of *Fusarium oxysporum* f. sp. *niveum* new to United States. Plant Disease 69, 1007.

Michail, S. H., Sheir, H. M. and Rasmy, M. R. (1989): Cross protection of watermelon and cucumber plants against wilt by prior inoculation with an irrespective forma speciales of *Fusarium oxysporum.* Acta Phytopathologica et Entomologica Hungarica 24, 301–309.

Naik, M. K., Sen, B. and Nagarjan, S. (1993): Relationship of adaphic factors with Fusarium wilt of watermelon. Indian Journal of Plant Protection 21, 95–97 .

Sun, S. K. and Huang, J. W. (1979): Variation in the watermelon wilt pathogen, *Fusarium oxysporum* f. sp. *niveum.* Plant protection Bulletin, Taiwan, 21, 313–322.

Tymchenko, V. I. (1967): Character of pathological changes in *Fusarium* of watermelon and the role of seed in the spread of infection. In: Sokol, P. F. (ed.), pp. 141–164. Izdat, Urozhai Kiv, Ukr.

Walker, J. C. (1952): Fusarium wilt of watermelon. Diseases of Vegetable Crops. McGrow Hilt Book. Company, New York, pp. 190–191.