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Short note

Identification and distribution of *Heterodera filipjevi* in the Esfahan area of Iran

Mahmoud Damadzadeh and Behrouz Ansaripour

Agricultural Research Center P.O. Box 81785-199, Esfahan, Iran, e-mail: agresor@cc.iut.ac.ir

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Heterodera avenae group nematodes were first recorded in Iran by Talatchian *et al.* (1976) in samples collected from sugar beet fields in Esfahan, Fars, Kerman, Central Iran, Tehran, West Azarbayejan, Semnan, Hamadan, and Kermanshahan provinces. Subsequently, damage to wheat growing in the Marwast of Yazd province, Iran was identified as being caused by cereal cyst nematode (CCN) (M. Shakeri, unpublished results), and Barooti & Loof (1990) identified the nematodes as *H. avenae*. Also, Hojat-Jalali (1991) reported *H. avenae* on wheat growing in Kerman shahan, and Damadzadeh *et al.* (1993) reported that the pathotype of CCN collected from the Marwast of Yazd province differed from European pathotypes. Sturhan (1996) reported CCN associated with wheat in Iran as *H. filipjevi* (Madzhidov, 1981) Stelter, 1984, and from other hosts as *H. latipons* Franklin, 1969.

In this paper we report on the identification and distribution of *H. filipjevi* collected from samples in wheat, barley and wild oat in Esfahan province.

A compound soil sample was obtained for each 500 ha area of wheat and barley growing in Esfahan province. Nematode cysts were extracted by the Fenwick can method (Fenwick, 1940), counted, and species identification made from vulval cones of cysts. In addition, individual cysts were placed in watch-glasses and the emerging juveniles were collected, fixed, and used for morphological examination. Species identification was made based on the identification keys of Mulvey & Golden (1983) and of Wouts *et al.* (1995). Root samples were collected during the following growing season from fields identified as having CCN cysts present and in each instance cysts were observed attached to the roots of the plants.

A total of 113 out of 231 (49%) soil and root samples collected from wheat and barley fields from different parts of Esfahan province contained *Heterodera* cysts. The cysts from 46 of the 113 samples (41%) were identified as representing *H. filipjevi* (Table 1). The number of cysts present in the samples ranged from 1 to 153, with an average of 16 cysts per 200 g of soil.

Morphometrics of cysts (n=31): L (excluding neck)=754±59 (600-816) µm; width=587±48 (480-688) µm; L/W=1.3; fenestral length=47±3.8 (41-56) µm; vulval slit length=9.4±0.5 (8.0-10.4) µm; vulval bridge width=12±2.5 (8.8-16) µm.

Morphometrics of freshly hatched J2s (n=14): L=483±52 (430-580) µm; a=24±2.9 (19-30); b= 4.8±1.1 (3.3-6.6); b'=3.5±0.9 (2.4-4.7); c=8.6±1.3 (6.7-10.6); c'=3.5±0.3 (2.9-4.2); stylet length (S)= 24±1.0 (22-26) µm; tail length=59±5.5 (53-74) µm; hyaline part of tail length (H)=34±2.4 (30-44) µm; body width at mid-body level=21±1.4 (18-23) µm; body width at anus level=16±1.7 (13-18) µm; H/S=1.3±0.3 (0.5-1.6).

Data obtained from *H. avenae* group nematodes reported from England (Williams & Siddiqi, 1972), and Germany and Tadzhikistan (Subbotin *et al.*, 1996) are provided for comparison. As the cysts have an underbridge in the vulval cone (obscure in some specimens) and a mean vulval slit length of 9.4 µm; the J2s having a mean stylet length of 24-25 µm, the stylet knobs being concave, and a tail length of 53-74 µm, the species is identified here as *H. filipjevi*. Sturhan (1996) reported that the protein pattern obtained with CCN from different regions of Iran confirmed the nematodes as representing *H. filipjevi*. Also, the results reported by Sturhan (1996) were confirmed with data obtained by Subbotin *et al.* (1999).

The distribution of *H. filipjevi* in different parts of Esfahan province is shown in Table 1. The maximum percentage of infestation was from

Table 1. Distribution and population density of *Heterodera filipjevi* in Esfahan province.

Area	No. of samples			No. of samples with *H. filipjevi*			Percentage of infestation			Maximum-population cyst/200g. soil
	Total	Wheat	Barley	Total	Wheat	Barley	Mean	Wheat	Barley	
Golpayegan	42	28	14	7	6	1	17	21	7	7
Esfahah	47	24	23	13	12	1	28	50	4	120
Fereydan	41	31	10	0	0	0	0	0	0	0
Khonsar	4	3	1	0	0	0	0	0	0	0
Kashan	47	17	30	14	5	9	30	29	30	153
Nain	11	5	6	5	3	2	46	60	33	12
Ardestan	23	16	7	6	3	3	26	19	43	24
Natanz	11	7	4	0	0	0	0	0	0	0
Semirom	3	3	0	1	1	0	33	33	0	18
Shahreze	2	1	1	0	0	0	0	0	0	0
Total	231	135	96	46	28	18	20	21	19	

Nain, Kashan and Esfahan regions that have more sand-loam soil and hot summer temperatures. There were no significant differences between percentage of infection in wheat (21%) and barley (19%). During the study white females were observed on the roots of wild oat (*Avena ludoviciana*) and these nematodes were also identified as *H. filipjevi*.

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