

Istituto di Nematologia Agraria, C.N.R. - Bari, Italy¹
and
International Center for Agricultural Research in the Dry Areas (I.C.A.R.D.A.) - Aleppo, Syria²

REACTION OF WILD *CICER* SPP. LINES TO *HETERODERA CICERI*

by
K.B. SINGH², M. DI VITO¹, N. GRECO¹ and M.C. SAXENA²

Summary. Twenty three lines of *Cicer bijugum*, five of *C. chorassanicum*, three of *C. cuneatum*, four of *C. echinospermum*, forty seven of *C. judaicum*, thirty of *C. pinnatifidum*, twenty three of *C. reticulatum*, and two of *C. yamashitae*, were screened for their reaction to *Heterodera ciceri*. None of the tested lines was free of nematode attack but 91% of the *C. bijugum* lines were rated < 2 on a 0-5 point scale and therefore considered resistant to *H. ciceri*. All lines of other *Cicer* spp. were rated susceptible to highly susceptible to *H. ciceri*.

Heterodera ciceri Vovlas, Greco et Di Vito has been reported to cause severe yield losses of chickpea (*Cicer arietinum* L.) in northern Syria (Greco et al., 1984; 1988; Vovlas et al., 1985). This nematode also reproduces well on lentil, pea and grass pea (Greco et al., 1986) but its reproduction on other legumes is limited.

Adoption of suitable crop rotations would reduce the nematode population in soil and thus limit damage, but the use of resistant cultivars remains the most easily adoptable method of control. Resistance to *H. ciceri* was not found in 2001 lines of *C. arietinum* (Di Vito et al., 1988); nor was it found in an additional 2000 germplasm lines of cultivated species that were tested. Therefore, in 1987-88 the reaction of some lines of wild *Cicer* spp. to *H. ciceri* was evaluated and the results of this investigation are reported here.

Materials and methods

The nematode population had been reared on chickpea grown in microplots. Cysts were extracted from the soil of these plots with a can similar to but larger than that described by Caswell et al. (1985) and mixed with about 40 kg of sand and used as inoculum. The cysts were extracted from six 10 g samples by pouring them on a 710 µm sieve mounted on a 250 µm sieve. Cysts were then counted and their egg content estimated. Proper amounts of this inoculum were thoroughly mixed with steam sterilized soil (20% sand, 33% silt, 46% clay, and 1% o.m.) to give a population density of 20 eggs/cm³.

Plastic pots of 3.5 dm³ were then filled with this inoculated soil.

The wild *Cicer* spp. material tested included 23 accessions of *C. bijugum* Rech., 5 of *C. chorassanicum* (Bge) M. Pop, 3 of *C. cuneatum* Hochst, 4 of *C. echinospermum* P.H.

Davis, 47 of *C. judaicum* Bois, 30 of *C. pinnatifidum* Jaub et Sp., 23 of *C. reticulatum* Ladiz, and 2 of *C. yamashitae* Kitamura. The line ILC 1929 of *C. arietinum* served as a susceptible check.

Five seeds of each line were sown per pot, with 2 replicates each line, in early November 1987. The pots were arranged in a randomized block design on benches in a plastic-house (temperature 16-25°C) at Tel Hadya, main station of ICARDA, Syria.

All plants were uprooted 50 days after their emergence and the roots gently washed in water and the presence of females and cysts on them rated according to a 0-5 scale, where 0 = absence of females, 1 = 1-2 females, 2 = 3-5 females, 3 = 6-20 females, 4 = 21-50 females, and 5 = > 50 females.

Nematodes at varying life stages were extracted from roots of some lines of *C. bijugum* (averaging 1.8 g each) and from the line ILC 1929 by Coolen's method (1979) and counted. Lines found resistant were tested again from January to March 1988 to confirm their reaction to the nematode.

Results and discussion

Root observations showed that all chickpea lines were attacked by the nematode. Nevertheless, significantly lower infestation compared with the control were found in the 23 lines of *C. bijugum* of which 21 (91%) were rated ≤ 2 and thus considered resistant to *H. ciceri* (Tables I, II). The remaining two lines were rated 2.4 and 3.7 and considered to be susceptible. Lines of other *Cicer* spp. were rated highly susceptible to the nematode as many females developed in their roots with mean infestation rates of 5 for *C. chorassanicum*, 4.7 for *C. cuneatum*, 4.8 for *C. echinospermum*, 4.5 for *C. judaicum*, 4.7 for *C. pinnatifidum*,

4.1 for *C. reticulatum*, and 4.7 for *C. yamashitae*. The rate of infestation in control plants (ILC 1929) was 5.

Experiments by several investigators have indicated that chickpea germplasm lines may differ greatly in their reaction to root-knot nematodes, *Meloidogyne* spp. (Sharma and Mathur, 1985; Handa *et al.*, 1985), and to *H. ciceri* infestations (Di Vito *et al.*, 1988). In our experiment these findings were confirmed with respect to the reaction of lines of different *Cicer* spp. to *H. ciceri*. It is noteworthy that all but two lines of *C. bijugum* showed resistance to the nematode and it may be possible that lines of this species could profitably be used in a breeding programme to obtain chickpea cultivars resistant to *H. ciceri*, if problems of compatibility with *C. arietinum* can be overcome (Ladizinsky and Adler, 1976).

TABLE I - Evaluation of some accessions of 8 wild *Cicer* spp. for resistance to *Heterodera ciceri* in plastic-house at Tel Hadya, Syria, 1987-88.

<i>Cicer</i> species	No. of lines tested	No. of lines found resistant	% of lines found resistant
<i>C. bijugum</i>	23	21	91
<i>C. chorassanicum</i>	5	0	0
<i>C. cuneatum</i>	3	0	0
<i>C. echinospermum</i>	4	0	0
<i>C. judaicum</i>	47	0	0
<i>C. pinnatifidum</i>	30	0	0
<i>C. reticulatum</i>	23	0	0
<i>C. yamashitae</i>	2	0	0
<i>C. arietinum</i> (check)	1	0	0

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TABLE II - Response of *Cicer bijugum* lines to *Heterodera ciceri*.

Line	Nematode life stages/ root	Rating of infestation	Type of reaction*
ILWC 7-1	160	0.9	R
» 7-2	158	1.1	R
» 7-4	176	1.1	R
» 7/S-1	127	0.9	R
» 7/S-3	91	1.1	R
» 7/S-4	155	1	R
» 7/S-5	—	1	R
» 7/S-11	150	1	R
» 7/S-12	—	1	R
» 7/S-13	—	1.6	R
» 7/S-14	—	1.3	R
» 7/S-15	57	1.3	R
» 7/S-17	—	1.4	R
» 7/S-18	—	1.5	R
» 8-3	122	1.9	R
» 8-4	—	1.7	R
» 8/S-1	—	1.5	R
» 8/S-3	26	1.6	R
» 32-2	—	2.4	S
» 34/S-1	147	3.7	S
» 34/S-2	72	1.9	R
» 42/1	—	2.0	R
» 42/2	—	1.7	R
ILC 1929 (Check)	2,151	5.0	S
L.S.D. $P \leq 0.05$	221	0.5	
$P \leq 0.01$	391	0.67	

* R = resistant; S = susceptible.

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