

## *Xiphinema gersoni* sp. n. (Nematoda : Longidoridae) from Portugal

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**Summary** – The authors give a description of *Xiphinema gersoni* sp. n. It was found in the rhizosphere of *Lolium* sp. at Herdade da Daroeira, Odemira, Portugal. *X. gersoni* sp. n. is characterized by two equally developed female genital branches, vulva slightly anterior to mid-body, a well developed pseudo-Z-organ, small spine-like structures in the uterus, tail short conical with digitate terminus and presence of male. The new species is similar to *X. aequum* Roca & Lamberti, 1988, *X. belmontense* Roca & Pereira, 1991, *X. coxi europaeum* Sturhan, 1985, *X. dissimile* Roca, Pereira & Lamberti, 1988, *X. diversum* Roca, Lamberti, Santos & Abrantes, 1989, *X. lusitanicum* Sturhan, 1983 and *X. pseudocoxi* Sturhan, 1985.

**Résumé** – *Xiphinema gersoni* sp. n. (Nematoda : Longidoridae) provenant du Portugal. – Les auteurs donnent la description de *Xiphinema gersoni* sp. n. provenant de la rhizosphère de *Lolium* sp., à Herdade da Daroeira, Odemira, Portugal. *X. gersoni* sp. n. est caractérisé par une vulve quelque peu antérieurement située, des branches génitales également développées, un utérus pourvu d'un pseudo-organe Z bien différencié et de petites épines, une queue conoïde, dorsalement convexe avec digitation terminale, la présence de mâles. *X. gersoni* sp. n. est proche de *X. aequum* Roca & Lamberti, 1988, *X. belmontense* Roca & Pereira, 1991, *X. coxi europaeum* Sturhan, 1985, *X. dissimile* Roca, Pereira & Lamberti, 1988, *X. diversum* Roca, Lamberti, Santos & Abrantes, 1989, *X. lusitanicum* Sturhan, 1983 et *X. pseudocoxi* Sturhan, 1985.

**Key-words** : *Xiphinema*, Nématodes, *Lolium*.

During a survey carried out in Portugal populations of *Xiphinema* were collected from several localities and hosts. The specimens were sent to the Istituto di Nematologia Agraria di Bari for a collaborative taxonomic study. Detailed observations revealed the presence of an undescribed species recovered from soil around the roots of *Lolium* sp. at Herdade da Daroeira, Odemira, Portugal. Morphometric data, description and illustration of the new species named *Xiphinema gersoni* sp. n. are given.

Nematodes were extracted from soil samples by the Cobb wet sieve technique, killed and fixed in 5 % hot formalin and mounted in glycerin by the slow method.

### *Xiphinema gersoni* sp. n.

(Fig. 1)

#### MEASUREMENTS

*Holotype, allotype, females, males and juveniles* : see Table 1.

#### DESCRIPTION

*Female* : Habitus in specimens killed by gentle heat usually open C-shaped, almost straight anteriorly and more curved behind the vulva, occasionally J-shaped; body cylindrical, tapering very gradually towards the anterior extremity. Cuticle apparently smooth, 3.5-4  $\mu\text{m}$  thick along the body, more thickened in the neck region, where it measures 4.5-5  $\mu\text{m}$  at the base of

lip region, and in the caudal region where it is 6.5-7  $\mu\text{m}$  ventrally and 7.5-8  $\mu\text{m}$  dorsally thick in the tail. Lateral hypodermal chords not well visible throughout the length of the body, 15-16  $\mu\text{m}$  wide at mid-body or 28-28.5 % of the corresponding body diameter; six lateral body pores in the range of the odontostyle, arranged in a single row in the neck region and in a double row in the rest of the body from the level of the anterior end of the mid-intestine; six dorsal and six ventral body pores in the range of the odontostyle. Labial region broadly rounded frontally and less so laterally, offset from the rest of the body by a shallow depression; amphids stirrup-shaped, with aperture a straight, transverse slit, occupying slightly more than three fifths of the lip region width, situated on the lip region at just three fourths of the lip region height. Odontostyle 2-2.5  $\mu\text{m}$  in diameter; odontophore well developed with conspicuous basal flanges and guiding sheath variable in length, with guiding ring 4-4.5  $\mu\text{m}$  wide. Oesophagus typical of the genus : dorsal gland nucleus located at the beginning of the oesophageal bulb, the two subventral ones almost at the middle; oesophageal-intestinal valve long pear-shaped, well evident within the intestinal tissue. Reproductive system amphidelphic, with both genital branches equally developed; ovary very small, occupying about 7 % of the entire genital branch; oviduct with a slender part consisting of discoid cells, and a *pars dilatata* composed of globular cells, not containing sperm and separated

**Table 1.** Morphometrics of *Xiphinema gersoni* sp. n. (All measurements in  $\mu\text{m}$ , except L).

Stages	Means $\pm$ Standard deviation/(Range)						
	Holotype	Allotype	Paratype females	Males	J 1	J 3	J 4
n	1	1	21	8	5	10	8
L	6.6	6.4	6.5 $\pm$ 0.49 (5.4-7.3)	6.4 $\pm$ 0.39 (5.7-6.9)	3.0 $\pm$ 0.05 (2.9-3.1)	4.0 $\pm$ 0.19 (3.6-4.3)	4.5 $\pm$ 0.24 (4.3-4.9)
a	121.7	131.2	123.0 $\pm$ 7.62 (101.5-136.5)	127.5 $\pm$ 6.09 (122.0-137.5)	76.4 $\pm$ 6.98 (69.5-87.0)	95.5 $\pm$ 8.22 (78.0-106.0)	102.0 $\pm$ 2.39 (97.5-105.0)
b	13.0	11.5	11.7 $\pm$ 0.98 (9.5-13.0)	11.7 $\pm$ 1.08 (9.6-13.0)	6.9 $\pm$ 0.53 (6.5-7.8)	8.0 $\pm$ 0.45 (7.0-8.5)	8.5 $\pm$ 0.61 (7.5-9.0)
c	97.4	113.3	108.8 $\pm$ 10.8 (89.7-127.7)	101.8 $\pm$ 12.81 (79.0-121.0)	40.2 $\pm$ 7.29 (35.5-53.0)	59.0 $\pm$ 6.27 (53.0-74.5)	64.5 $\pm$ 4.74 (57.5-71.0)
c'	1.8	1.5	1.7 $\pm$ 0.14 (1.4-2.0)	1.7 $\pm$ 0.17 (1.5-2.0)	2.6 $\pm$ 0.42 (2.0-3.0)	2.1 $\pm$ 0.15 (1.8-2.3)	2.1 $\pm$ 0.13 (1.9-2.3)
V	45.5	–	45.5 $\pm$ 1.93 (42.6-50.2)	–	–	–	–
Lip reg. diam.	13.5	14.5	14.0 $\pm$ 0.52 (13.5-14.5)	14.5 $\pm$ 0.66 (13.5-15.5)	11.0 $\pm$ 0.32 (10.5-11.0)	12.5 $\pm$ 0.55 (11.0-13.0)	13.0 $\pm$ 1.19 (11.5-14.5)
Lip reg. height	6.5	7.0	6.0 $\pm$ 0.68 (4.5-7.0)	6.0 $\pm$ 0.52 (5.5-7.0)	4.5 $\pm$ 0.32 (4.0-4.5)	4.5 $\pm$ 0.19 (4.5-5.5)	5.0 $\pm$ 0.44 (4.5-6.0)
Odontostyle	157.5	159.5	155.0 $\pm$ 4.81 (146.0-164.5)	155.5 $\pm$ 3.90 (151.0-163.0)	108.0 $\pm$ 5.80 (98.0-113.0)	130.5 $\pm$ 1.70 (127.5-131.5)	135.5 $\pm$ 3.72 (131.5-141.0)
Odontophore	78.5	82.5	80.0 $\pm$ 3.66 (75.5-88.5)	85.5 $\pm$ 11.59 (75.5-113.5)	59.5 $\pm$ 8.70 (45.5-67.5)	70.5 $\pm$ 3.19 (64.0-76.0)	71.5 $\pm$ 2.59 (67.0-74.0)
Styler	236.0	242.0	235.0 $\pm$ 7.17 (224.5-247.0)	241.5 $\pm$ 13.84 (229.5-273.5)	167.5 $\pm$ 9.94 (157.0-178.5)	200.5 $\pm$ 3.03 (196.0-203.5)	207.0 $\pm$ 3.77 (200.5-211.5)
Repl. odontostyle	–	–	–	–	132.5 $\pm$ 3.26 (127.0-135.5)	154.5 $\pm$ 5.0 (146.0-157.0)	162.5 $\pm$ 3.30 (157.0-166.5)
Flanges width	12.5	12.5	12.0 $\pm$ 0.66 (10.5-13.5)	11.5 $\pm$ 0.77 (10.5-13.0)	9.5 $\pm$ 0.67 (9.0-10.5)	11.5 $\pm$ 0.68 (10.5-13.0)	10.5 $\pm$ 0.69 (10.0-11.5)
Guide ring	135.5	137.0	134.5 $\pm$ 5.92 (119.5-143.0)	134.5 $\pm$ 5.34 (130.0-145.5)	87.5 $\pm$ 5.10 (82.5-94.0)	108.0 $\pm$ 8.61 (86.0-114.5)	111.5 $\pm$ 5.22 (103.5-119.0)
Guide sheath	17.5	14.5	15.0 $\pm$ 4.10 (5.5-20.5)	14.5 $\pm$ 1.94 (12.5-18.0)	11.0 $\pm$ 2.26 (8.5-13.5)	11.0 $\pm$ 4.06 (3.5-16.0)	10.5 $\pm$ 2.46 (6.5-14.0)
Phar. bulb length	98.5	104.0	114.5 $\pm$ 7.08 (104.0-130.5)	106.5 $\pm$ 7.18 (96.0-117.0)	84.0 $\pm$ 6.56 (76.0-94.0)	98.0 $\pm$ 6.97 (86.0-110.0)	103.0 $\pm$ 5.57 (96.5-112.5)
Phar. bulb diam.	23.5	23.0	22.5 $\pm$ 1.86 (20.0-26.5)	21.5 $\pm$ 1.35 (20.0-24.0)	19.5 $\pm$ 2.18 (17.5-23.0)	20.0 $\pm$ 1.30 (17.5-21.5)	20.5 $\pm$ 1.22 (19.0-22.5)
Ant. gen. br.	764.5	–	686.0 $\pm$ 91.95 (470.5-794.0)	–	–	–	–
Post. gen. br.	800.0	–	711.5 $\pm$ 84.57 (535.5-853.0)	–	–	–	–
Ant. gen. br. (%)	11.6	–	10.5 $\pm$ 1.33 (6.5-12.0)	–	–	–	–
Post. gen. br. (%)	12.0	–	11.0 $\pm$ 1.14 (8.5-12.5)	–	–	–	–
Body diam. (mid-body)	54.0	48.5	53.0 $\pm$ 2.78 (47.0-58.0)	50.0 $\pm$ 3.86 (43.5-56.5)	39.5 $\pm$ 3.89 (34.0-43.5)	43.0 $\pm$ 5.22 (38.5-54.5)	44.5 $\pm$ 2.63 (40.5-48.0)
Body diam. (anus level)	37.0	39.0	36.5 $\pm$ 1.93	38.0 $\pm$ 1.21	29.0 $\pm$ 1.74	32.5 $\pm$ 2.64	33.0 $\pm$ 1.76

Tab. 1. (cont.)

Stages	Means ± Standard deviation/(Range)						
	Holotype	Allotype	Paratype females	Males	J 1	J 3	J 4
Rectum	34.0	42.5	(32.5-40.5) 37.5 ± 3.91 (31.0-47.0)	(35.5-39.5) 41.0 ± 1.59 (39.0-44.0)	(26.5-31.0) 28.5 ± 3.61 (22.5-31.0)	(29.5-38.5) 32.0 ± 3.30 (26.5-36.0)	(30.5-35.5) 32.5 ± 2.22 (29.5-36.5)
Tail	67.5	56.0	60.5 ± 4.93 (51.5-69.0)	63.0 ± 4.80 (57.0-72.5)	76.0 ± 10.71 (57.5-83.0)	69.5 ± 6.36 (54.0-76.5)	71.0 ± 5.88 (64.0-83.0)
Hyaline tail tip	21.5	23.0	22.0 ± 2.76 (17.0-26.5)	22.5 ± 2.77 (17.5-27.0)	21.0 ± 2.79 (17.5-24.5)	21.5 ± 6.53 (10.0-30.0)	23.0 ± 2.63 (20.0-27.0)
Prerectum	659.0	835.0	692.5 ± 150.38 (488.0-1188.0)	788.0 ± 149.77 (611.5-1011.5)	493.0 ± 56.79 (447.0-588.0)	526.0 ± 102.38 (400.0-741.0)	559.5 ± 71.80 (400.0-647.0)
Spicules	-	73.0	-	76.0 ± 3.19 (69.5-79.5)	-	-	-
Lat. guid. piece	-	16.0	-	15.5 ± 1.83 (11.5-17.5)	-	-	-

from the uterus by a conspicuous sphincter muscle; uterus consisting of a very long *pars dilatata uteri*, with sperm inside in some specimens, a pseudo-Z-organ, a tube with small spine-like structures in the lumen and an ovejector. Pseudo-Z-organ consisting of a variable number (generally ten to fifteen) of granular structures, each one consisting of a large eccentric portion, spherical and not refractive, surrounded by irregular and wrinkled refractive pieces. Small spine-like and crystalloid structures are present in the uterus irregularly distributed and likely attached to the internal wall of the uterus. Prerectum variable in length; rectum 1.3-1.5 anal body widths long. Tail conoid, slightly rounded dorsally and almost straight ventrally, with digitate or subdigitate terminus, generally directed ventrally with respect to the body axis and with an inconspicuous blind canal, more visible in the tail shorter and with digitate terminus. Three, exceptionally four caudal pores are visible on each side of the tail.

**Male:** General appearance similar to female with posterior part of the body more curved. Morphology and anatomy similar to female except for the genital apparatus and the somatic structures associated with it; testes well developed; spicules curved, not cephalated; lateral guiding pieces well sclerotized, almost straight, slightly rounded proximally and bifid at distal end. Pre-cloacal pair of papillae preceded by three or four, exceptionally five, medioventral supplements. Distances of preanal supplements are given in Table 2. Tail similar to that of female, with terminal peg ventrally located in relation to the body axis and a very vague blind terminal canal; three caudal pores are visible on each side of the tail.

**Juveniles:** Morphologically similar to adult female but smaller; tail of first stage elongate-conoid, bearing three caudal pores on each side.

Table 2. *X. gersoni* n. sp., distances of the preanal supplements in nine paratype males (in µm).

	Cloacal opening-Double pap.	Double pap.-S1	S1-S2	S2-S3	S3-S4	S4-S5
1*	28.5	83.5	34.0	29.5	35.5	-
2	28.5	82.5	23.5	26.0	24.5	-
3	24.5	83.5	34.5	39.0	-	-
4	27.0	92.5	40.0	31.0	-	-
5	30.5	94.0	42.0	30.5	27.5	-
6	27.5	69.0	26.0	33.5	36.5	23.5
7	29.5	97.0	34.5	39.5	24.0	-
8	27.5	86.5	31.0	32.5	24.5	-
9	27.0	97.0	38.5	36.0	-	-

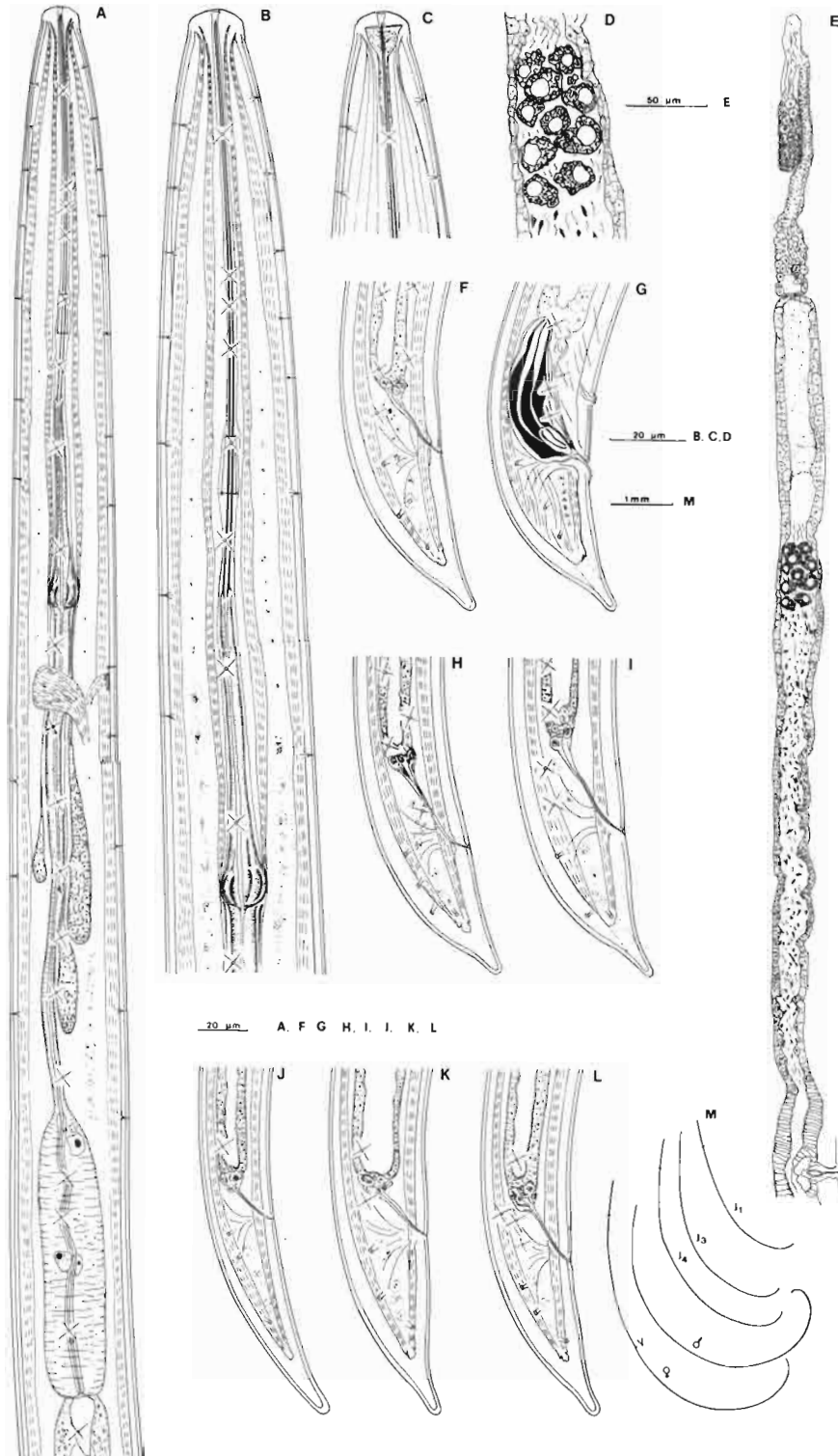
\* Allotype.

#### TYPE HOST AND LOCALITY

Rhizosphere of *Lolium* sp. at Herdade da Daroeira, Odemira, Portugal.

#### TYPE SPECIMENS

Holotype, allotype, ten paratype females, three paratype males and juveniles in the Collection of the Istituto di Nematologia Agraria del Consiglio Nazionale delle Ricerche, Bari, Italy; five paratype females and two paratype males in the Collection of Estação Agronómica Nacional, Instituto Nacional de Investigação Agrária, Oeiras, Portugal; two paratype females and one paratype male in each of the following collections: Muséum National d'Histoire Naturelle, Paris, France; Entomology and Nematology Department, Rothamsted Experimental Station, Harpenden, Herts, England; Plant Nematology Laboratory Collection, United States Department of Agriculture, Beltsville, Maryland, USA.



**Fig. 1.** *Xiphinema gersoni* sp. n. A, B : Female, anterior region; C : Head end (surface view); D : Pseudo-Z-organ; E : Anterior branch of the genital tract; F, H, I : Female posterior regions (F : holotype); G : Male posterior region (allotype); J-L : Posterior region of juveniles, J1, J3, J4 respectively; M : Posture of adult stages and juveniles.

## DIAGNOSIS AND RELATIONSHIPS

*Xiphinema gersoni* sp. n. is characterized by vulva slightly anterior to mid-body, well developed pseudo-Z-organ and small spine-like and crystalloid structures in the uterus, tail short conical with subdigitate terminus and presence of the male.

The code in the polytomous key (Loof & Luc, 1990) is the following :

A	B	C	D	E	F	G	H	I	J	K	L
4	2+3	4	4+5	5	5	3	2	3	4	3	2

The new species belongs to the *X. coxi*-group (group 5 in Loof & Luc, 1990), among whose species it closely resembles *X. aequum* Roca & Lamberti, 1988, *X. belmontense* Roca & Pereira, 1991 and *X. pseudocoxi* Sturhan, 1985 by the presence of pseudo-Z-organ with inclusion bodies very similar. *X. gersoni* sp. n. differs from *X. aequum* in having longer and more slender body (L = 5.4-7.3 vs 4.1-5.3 mm; "a" value 101.5-136.5 vs 76-109.6 in *X. aequum*), higher "c" and "c'" values (89.7-127.7 vs 82.6-103 and 1.4-2.0 vs 1.2-1.5, respectively), longer odontostyle (146-164.5 vs 139.3-150.6  $\mu$ m) and tail (51.5-69 vs 46.6-52  $\mu$ m) and presence of pseudo-Z-organ; from *X. belmontense* in having longer and more slender body (L = 5.4-7.3 vs 3.1-4.7 mm; "a" value 101.5-136.5 vs 58.4-72.3 in *X. belmontense*), higher "c" and "c'" values (89.7-127.7 vs 63.1-96.7 and 1.4-2.0 vs 1.0-1.4, respectively), more posterior vulva (V = 42.6-50.2 vs 36.3-41.9), longer odontostyle (146-164.5 vs 126-140.6  $\mu$ m) and longer tail (51.5-69 vs 40-56.5  $\mu$ m); from *X. pseudocoxi* in having longer and more slender body (L = 5.4-7.3 vs 3.53-4.26 mm; "a" value 101.5-136.5 vs 74-94 in *X. pseudocoxi*), higher "c" value (89.7-127.7 vs 77-86), longer odontostyle (146-164.5 vs 104-114  $\mu$ m), longer odontophore (75.5-88.5 vs 58-64  $\mu$ m), tail (51.5-69 vs 44-55  $\mu$ m) and larger distance from oral opening to guide ring (119.5-143 vs 100-112  $\mu$ m), presence of spiniform structures in the uterus and male abundant (male is rare in *X. pseudocoxi*).

Among the species belonging to the same group, *X. gersoni* sp. n. also resembles *X. coxi europaeum* Sturhan, 1985, *X. dissimile* Roca, Pereira & Lamberti, 1988, *X. diversum* Roca, Lamberti, Santos & Abrantes, 1989 and

*X. lusitanicum* Sturhan, 1983. It differs from *X. coxi europaeum* in having longer and more slender body (L = 5.4-7.3 vs 3.85-5.08 mm; "a" value 101.5-136.5 vs 66-91 in *X. coxi europaeum*), higher "c" and "c'" values (89.7-127.7 vs 61-92 and 1.4-2.0 vs 1.2-1.5, respectively), slightly more posterior vulva (V = 42.6-50.2 vs 41.1-46.3), longer odontostyle (146-164.5 vs 114-135  $\mu$ m) and larger distance from oral opening to guide ring (119.5-143 vs 95-126  $\mu$ m), differently shaped inclusions of pseudo-Z-organ and presence of spiniform structures in the uterus; from *X. dissimile* in having longer and more slender body (L = 5.4-7.3 vs 4.6-5.8 mm; "a" value 101.5-136.5 vs 89.6-118.2), higher "c'" value (1.4-2.0 vs 1.2-1.5), longer odontostyle (146-164.5 vs 121.3-134.3  $\mu$ m), longer odontophore (75.5-88.5 vs 72-78  $\mu$ m), larger distance of guide ring from oral opening (119.5-143 vs 116-127.3  $\mu$ m) and longer tail (51.5-69 vs 41.3-52.6  $\mu$ m) and absence of spiniform structures in the uterus; from *X. diversum* in having longer and more slender body (L = 5.4-7.3 vs 2.7-3.2 mm; "a" value 101.5-136.5 vs 66.3-80.8 in *X. diversum*), higher "c" value (89.7-127.7 vs 55.3-74.3), longer odontostyle (146.0-164.5 vs 97.7-105.3  $\mu$ m), longer odontophore (75.5-88.5 vs 52.9-64.7  $\mu$ m), larger distance from oral opening to guiding ring (119.5-143.0 vs 90.0-101.2  $\mu$ m), longer tail (51.5-69.0 vs 41.2-50.0  $\mu$ m) and presence of male (not found in *X. diversum*); from *X. lusitanicum* in having longer and more slender body (L = 5.4-7.3 vs 4.4-5.9 mm; "a" value 101.5-136.5 vs 66-78 in *X. lusitanicum*), higher "c" and "c'" values (89.7-127.7 vs 87-94 and 1.4-2.0 vs 0.98-1.1 respectively), more anterior vulva (V = 42.6-50.2 vs 51-53.9), shorter odontostyle (146-164.5 vs 168-175  $\mu$ m), shorter odontophore (75.5-88.5 vs 108-115  $\mu$ m) and smaller distance from oral opening to guide ring (119.5-143 vs 141-159  $\mu$ m), presence of spiniform structures in the uterus and male abundant (males were not observed in *X. lusitanicum*).

## References

- LOOF, P. A. A. & LUC, M. (1990). A revised polytomous key for the identification of species of the genus *Xiphinema* Cobb, 1913 (Nematoda: Longidoridae) with exclusion of the *X. americanum*-group. *Syst. Parasitol.*, 16 : 35-66.