

Xiphinema israeliae n. sp. (Nematoda : Dorylaimoidea)

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SUMMARY

Xiphinema israeliae n.sp., is described from Israel. It is a bisexual species belonging to the group of didelphic, peg-tailed species with two complete female genital branches of the same length and structure, devoid of uterine Z differentiation. Populations were previously identified as *X. diversicaudatum* and were frequently found in association with citrus and avocado, and sometimes grapevines.

RÉSUMÉ

Xiphinema israeliae n.sp. (Nematoda : Dorylaimoidea)

Les auteurs décrivent *Xiphinema israeliae* n.sp., appartenant au groupe des espèces avec deux branches génitales femelles complètes de mêmes longueur et structure, sans différenciation Z et ayant une queue arrondie pourvue d'un mucron terminal. Cette espèce, signalée antérieurement en Israël sous le nom de *X. diversicaudatum*, est fréquemment rencontrée en association avec divers citrus et l'avocatier, plus rarement avec la vigne.

A survey of the genus *Xiphinema* occurring in Israel, carried out in 1964-65 (Cohn, 1969), revealed the presence of ten species, among them *X. diversicaudatum* (Micoletzky, 1923 & 1927) Thorne, 1939. This species differed from *X. index* Thorne & Allen, 1950 and *X. vuittenezi* Luc *et al.*, 1964, two other well-described peg-tailed *Xiphinema* species known at that time, primarily on account of its greater body length and its bisexual status. The biometrical characters of the Israeli population fell within the relatively broad range of the various populations of *X. diversicaudatum*, as redescribed by Goodey, Peacock and Pitcher (1960). However, additional species with pegged tails were described subsequently and detailed morphological descriptions of the female reproductive system were given. Elec-

«Z-organ». Later, in redescribing the species, Pitcher, Siddiqi and Brown (1974) confirmed the presence of a «Z-organ» in the females of other European populations of *X. diversicaudatum*.

Recently, reexamination of the Israeli specimens confirmed the lack of a pseudo-Z-organ or other Z-differentiation in all populations studied. Upon closer examination, additional differences between them and specimens of *X. diversicaudatum* from Europe were observed, and it became evident that we were dealing with a separate species. This paper describes these populations as *X. israeliae* n.sp., and discusses the relationship between this and other closely related species in the genus.

Table 1
Xiphinema israeliae n.s. Morphometrics of females and males of three populations

	<i>Pop. Citrus Nes Ziona</i>		<i>Pop. Golf green</i>		<i>Pop. Citrus, Tel Mond</i>	
	♀♀	♂♂	♀♀	♂♂	♀♀	♂♂
n =	20	20	12	13	10	5
L (mm)	3.93 (3.52-4.16)	3.80 (3.38-4.27)	3.94 (3.42-4.29)	3.75 (3.52-4.09)	3.78 (3.40-3.90)	3.54 (3.28-3.90)
a	91.0 (85.2-97.3)	94.8 (85.1-109.5)	92.6 (85-97.5)	96.2 (86.7-107.6)	90 (81-92)	92 (83-99)
b	8.7 (6.9-9.6)	8.3 (6.6-9.7)	8.4 (7.1-9.3)	8.0 (7.2-8.7)	8.6 (8.1-9.1)	8.2 (7.0-9.5)
tail (µm)	41 (36-48)	45 (39-50)	41 (35-46)	47 (38-53)	37 (34-41)	36 (34-38)
c	96.3 (76.7-106.7)	85.4 (70.4-99.3)	97.4 (85.2-107.5)	81.3 (71.5-98.9)	103 (97-109)	99 (91-109)
c'	1.3 (1.2-1.5)	1.3 (1.2-1.5)	1.4 (1.2-1.5)	1.4 (1.1-1.6)	1.2 (1.1-1.3)	1.1 (1.1-1.2)
V	49.0 (46.4-51.5)	—	48.5 (46.5-51.4)	—	49 (46-54)	—
od. style (µm)	123 (118-129)	126 (121-130)	125 (120-128)	126 (120-133)	116 (113-121)	117 (115-119)
od. phore (µm)	72 (69-76)	72 (68-75)	73 (70-77)	71 (68-75)	68 (65-70)	65 (63-67)
stylelet (µm)	195 (189-202)	198 (191-204)	198 (190-204)	197 (192-205)	184 (178-191)	180 (170-186)
spicula (µm)	—	60 (54-68)	—	57 (53-60)	—	51 (46-54)
acc. pieces	—	12.5 (10-15)	—	12.5 (11-15)	—	—

nematodes. Specimens were mounted in dehydrated glycerine using Seinhorst's (1962) rapid technique.

Three populations were studied :

— pop. 1 (type population) : rhizosphere of *Citrus* sp., Nes-Ziona, Israel,

— pop. 2 : golf green, Caesarea, Israel,

— pop. 3 : rhizosphere of *Citrus* sp. (lemon), Tel-Mond, Israel.

***Xiphinema israeliae* n.sp.**
 = *X. diversicaudatum* apud Cohn, 1969 ;
 Cohn & Mordechai, 1969.

MEASUREMENTS

Morphometrics of females and males of the three populations studied are given in Table 1 and morphometrics of the four larval stages on Table 2.

Holotype: female : L = 3.52 mm ; a = 88 ; b = 6.9 ; tail length = 40 µm ; c = 88 ; c' = 1.3 ; V = 47.7 ; odontostyle = 124 µm ; odontophore = 69 µm.

DESCRIPTION

Female: When heat-relaxed, body habitus from slightly ventrally curved to open shape. Cuticle apparently composed of two layers, 2.5-3 µm thick at mid-body and slightly reinforced in the neck region (3-4 µm). Lateral chord 14 µm (10-17) wide at mid-body, or 30% (23-38) of the corresponding diameter. Cervical pores in four rows, few in number and spaced : 2-4 dorsal, 2-4 ventral and 3-5 lateral ; lateral cervical pore line prolonged as a subdorsal line of pores, rare and irregularly spaced on the anterior three quarters of the body, more numerous and regularly disposed on the posterior part of

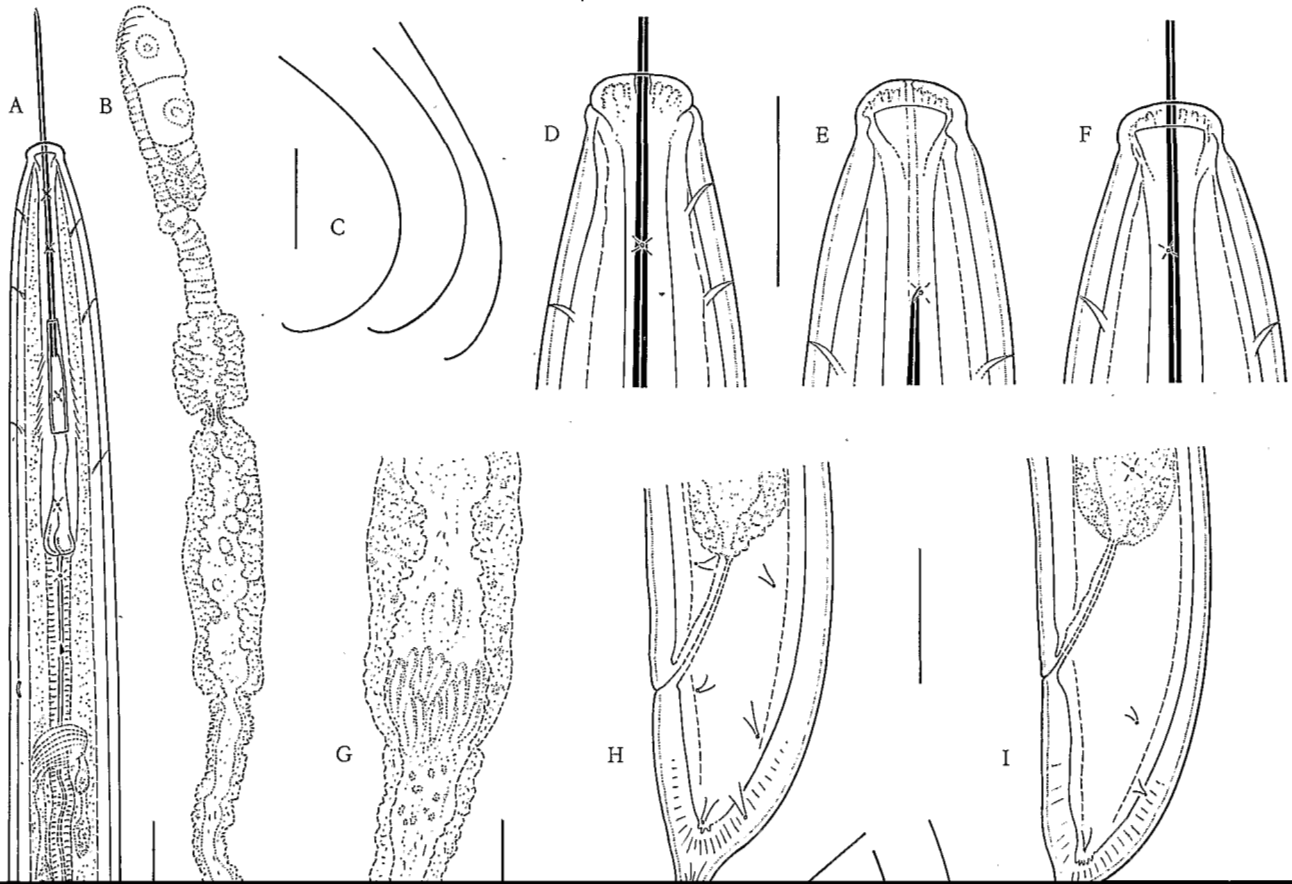


Table 2
Xiphinema israeliae p.sp. Morphometrics of juveniles
 (Pop. Citrus, Nes-Ziona and Golf Green)

	J 1	J 2	J 3	J 4
n	4	7	13	20
L (mm)	1.10 (1.02-1.30)	1.42 (1.28-1.67)	2.01 (1.65-2.35)	2.87 (2.55-3.05)
a	47.0 (43.3-54.2)	51.7 (43.4-59.6)	64.1 (53.2-72.4)	73.9 (69.8-83.3)
b	4.1 (3.5-4.8)	4.4 (3.9-5.3)	5.3 (4.7-6.5)	6.8 (5.8-8.5)
Tail (μm)	58 (54-64)	59 (55-63)	52.5 (47-58)	47 (36-56)
c	19.5 (18.9-20.3)	25.6 (22.1-28.2)	38.2 (34.4-42)	61.2 (52.1-77.8)
c'	3.7 (3.4-4.0)	3.4 (3.2-3.5)	2.2 (1.9-2.4)	1.6 (1.3-1.9)
Od. style (μm)	57 (53-61)	70.5 (68-78)	88 (83-92)	104 (99-111)
Od. phore (μm)	42 (39-44)	48 (45-50)	58 (54-65)	65 (61-68)
Stylet (μm)	99 (96-104)	118.5 (113-127)	146 (139-153)	169 (160-178)
Repl od.	69 (66-72)	86 (82-90)	106.5 (102-113)	125.5 (118-134)

body; no latero-subventral pores; ventral pores regularly disposed along the body. Lip region rounded in front, 14-16 μm wide, separated from the rest of the body by a weak, smooth constriction. Amphid stirrup-shaped; amphidial aperture a large, straight, transverse slit (65-72% of the corresponding diameter) situated in front of the constriction. Hemizonid flat, 5-8 μm wide, situated at 210 μm (190-225) from anterior end; hemizonion lenticular, 2-4 μm wide, situated at 272 μm (251-304) from anterior end. Nerve ring 11-18 μm wide, at variable distance from base of stylet (10-85 μm); no second posterior nerve ring. Stylet conforms to genus; flanges of odontophore 11-14 μm wide, reinforced at their margins. Stylet guiding apparatus appearing tubular; basal annule at 111 μm (96-122) from anterior end; length of the « tube » very variable, depending on whether the stylet is retracted or protracted (3-43 μm). Oesophagus conforms to genus; « mucro » situated in oesophageal wall, very variable in length (2-7 μm) and in position (10-82 μm from base of stylet). Oesophageal bulb clearly set off at anterior end, measuring 124 \times 22 μm (114-135 \times 20-25); position and size of the dorsal oesophageal gland nucleus and of the subventral oesophageal gland nuclei conform to genus. Vaginal

slit transverse; vagina reaching half the corresponding diameter; vaginal sphincter flat; ovejector muscularized; two genital branches, approximately the same length and of similar structure; uterus in two parts, a tubular portion connected with the ovejector, composed of globular cells, with no muscularized part, no Z-differentiation or spines; wide uterine pouch, composed of large cells with internal wall convoluted; sphincter between uterus and oviduct well developed; oviduct with a large pouch at contact with sphincter and a thin part composed of closely packed small cells; ovary without any particular characteristic⁽¹⁾. Spermatozoa present in some females, aggregated in the lower part of the uterine pouch. Tail short, rounded, with curvature essentially dorsal, and ventral profile

⁽¹⁾ All females examined apparently had recently completed egg-laying; this was assumed from several characters evident in the genital tracts: lumen of the tubular part of the uterus wide with granules and presenting occasional swellings; oviduct pouch often vacuolated; thin part of oviduct with distended cells; ovary reduced in size and with no clearly formed oocytes (Fig. 1B); thus such structures probably are physiological and cannot be reported as specific.

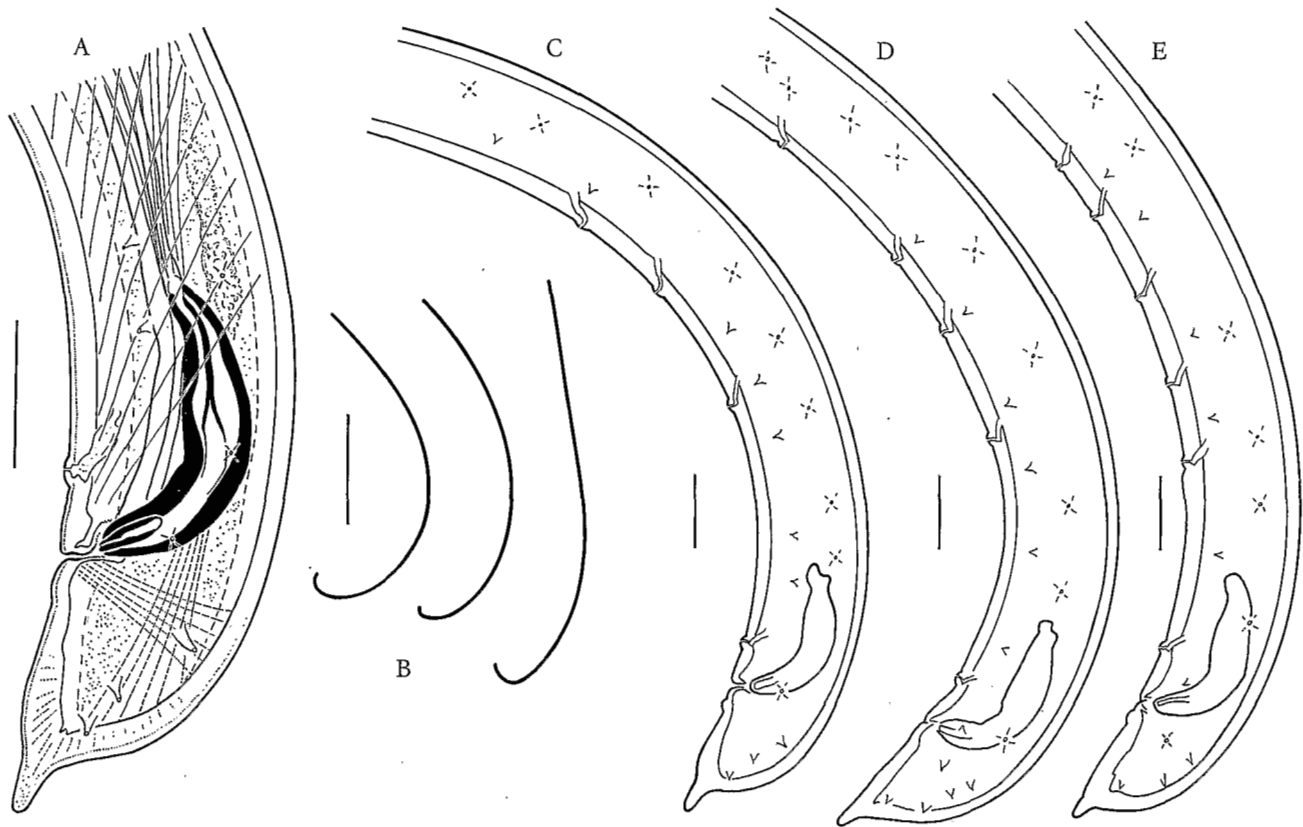


Fig. 2. *Xiphinema israeliae* n.sp. Male. A : tail and spicules. B : habitus. C, D, E : posterior part of males showing distribution of ventral supplements and of pores. (Bars represent : B : 1 mm ; others : 25 μ m).

on the same line as body profile, with a conical smooth terminal peg slightly ventral to the body axis and not clearly separated from the rest of the tail ; cuticle at tail thick and about the same thickness on the ventral and dorsal sides (5.7-7 μ m) ; radial striations clearly visible in internal layer(s) of tail cuticle ; no blind canal at tail extremity :

to five ventral single supplements (exceptionally three or six) ; very rarely (three of 33 males observed) the most anterior supplement is slightly atrophied ; six to nine pairs of ventro-sublateral pores, well developed, in the area of the supplements ; position of the double papilla and of the single supplements are given in Table 3. Tail bearing the same shape

Table 3
Xiphinema israeliae n. sp.
 Position of ventral male supplements, in μm
 (No. 1-13 : pop. golf green
 No. 14-33 : Pop. Citrus, Nes-Ziona)

No.	Cloaca- double pap.	Double pap.- S_1	S_1 - S_2	S_2 - S_3	S_3 - S_4	S_4 - S_5	S_5 - S_6
1	17	106	30	25			
2	16	62	24	49	(58)		
3	17	94	26	25	34		
4	15	79	24	31	29		
5	15	65	31	35	23		
6	15	74	36	25	23		
7	16	62	26	40	27		

voor Nematologie, Wageningen, Nederland ; USDA Collection, Beltsville, Md, USA ; University of California, Davis, USA ; Scottish Crop Research Institute Invergowrie, Dundee, U.K. ; Rands Afrikaans University, Johannesburg, South Africa. Remaining type material in the Paris Muséum collection.

TYPE LOCALITY

Rhizosphere of *Citrus* sp., Nes-Ziona, Israel.

DIAGNOSIS AND RELATIONSHIPS

Xiphinema israeliae n. sp. may be classified in

from *X. seredouense*. In the latter species the habitus of the female is a loose spiral or more rarely a rather closed C; lip area is continuous with the rest of the body; tail is longer (41-61 μm) and a blind canal is present.

X. israeliae n. sp. shows resemblance to *X. diversicaudatum* (Micoletzky, 1923 & 1927) Thorne, 1939, but in the latter species, the vulva is somewhat more anterior ($V = 39-46$), the tail has a more pronounced dorsal curvature and the peg is shorter and clearly set-off from the rest of the tail. Also the female genital tracts in *X. diversicaudatum* contain the characteristic pseudo Z-organ with numerous globular bodies.

X. paraelongatum Altherr, 1958 was considered by Luc and Tarjan (1963) to be a minor synonym of *X. diversicaudatum*. Syntypes (one female, one male; kindly supplied by Dr. R. Vallotton) were re-examined. Although the specimens, particularly the female, were flattened, the pseudo Z-organ was observed; this finding confirms the synonymy with *X. diversicaudatum* and the distinction from *X. israeliae* n. sp.

BIONOMICS

Some biological data concerning this species are available from earlier studies. During the survey carried out in the mid-sixties *X. israeliae* n. sp.

Field and pot experiments to investigate any possible implication of the nematode in the transmission of several citrus virus diseases and avocado sunblotch were inconclusive.

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