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RESEARCH NOTE - NOTA INVESTIGATIVA

PRATYLENCHUS JORDANENSIS A JUNIOR SYNONYM OF *P. ZEAE*

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ABSTRACT

Inserra, R. N., L. W. Duncan, D. Dunn, Z. A. Handoo, A. Troccoli, and J. Rowe. 2005. *Pratylenchus jordanensis* a junior synonym of *P. zeae*. Nematropica 35:161-170.

Pratylenchus jordanensis paratypes from the Rothamsted Nematode Collection in England and three populations from Oman deposited at the USDA Nematode Collection, Beltsville, U.S.A. were used for morphological analyses by light (LM) and scanning electron microcopy (SEM). Morphometrics and tail shape of *P. jordanensis* paratypes and populations from Oman were determined and compared with those reported in the literature for *P. zeae*. Head patterns of *P. jordanensis* and *P. zeae* were examined by SEM using a 20 year-old *P. jordanensis* paratype removed from the original slide, specimens of an Oman population from grapevine, and a Florida population of *P. zeae* from St. Augustine grass. Head patterns of the *P. jordanensis* specimens showed a smooth face with oral disc and lip sectors fused together and three lip annuli like those of *P. zeae*. The margin of the third lip annulus was interrupted by a diagonal incisure in both the *P. jordanensis* paratype and *P. zeae*. The morphological similarities between *P. jordanensis* and *P. zeae* suggest that *P. jordanensis* is a junior synonym of *P. zeae*.

Key words: Head patterns, lesion nematodes, morphological analysis, SEM, taxonomy.

RESUMEN

Inserra, R. N., L. W. Duncan, D. Dunn, Z. A. Handoo, A. Troccoli, and J. Rowe. 2005. *Pratylenchus jordanensis* es un sinónimo menor de *P. zeae*. Nematropica 35:161-170.

Se realizaron análisis morfológicos, utilizando microscopía de luz y microscopía electrónica de barrido, de paratipos de *Pratylenchus jordanensis* provenientes de Rothamsted Nematode Collection en Inglaterra y tres poblaciones de Omán depositadas en USDA Nematode Collection, Beltsville, E.E.U.U. Se determinaron la morfometría y forma de la cola de los paratipos de *P. jordanensis* y las poblaciones de Omán, y se compararon con aquéllas registradas en la literatura para *P. zeae*. Se examinaron los patrones de la región cefálica de *P. jordanensis* y *P. zeae* por microscopía electrónica de barrido, utilizando un paratipo de 20 años de antigüedad removido de su placa original, especímenes de una población hallada en viñedos en Omán, y una población de *P. zeae* de pasto San Agustín de Florida. Los patrones de la región cefálica de los especímenes de *P. jordanensis* mostraron una cara lisa con disco oral y sectores labiales fusionados entre sí, y tres ánulos labiales, como los presentes en *P. zeae*. La margen del tercer ánulo labial se interrumpe por una incisión tanto en el paratipo de *P. jordanensis* como en *P. zeae*. Las similitudes morfológicas entre *P. jordanensis* y *P. zeae* sugieren que *P. jordanensis* es un sinónimo menor de *P. zeae*.

Palabras clave: análisis morfológico, nematodo lesionador, microscopía electrónica de barrido, patrones cefálicos, taxonomía.

Pratylenchus jordanensis is a lesion nematode described by Hashim (1983) from specimens collected from the rhizosphere of grapevine (*Vitis* sp.), in Jordan. This species was characterized as having two lip annuli, relatively anterior position of the vulva [77.8 (75.1-79.1)], lateral field with four incisures and a conoid tail with a smooth terminus slightly indented in some specimens. Males were not detected. The morphological and biological characters of this species are similar to those of *P. agilis* Thorne, 1968, *P. hexincisus* Taylor & Jenkins, 1957 and *P. scribneri* Steiner in Sherbakoff & Stanley, 1943, which have also two lip annuli, a relatively anterior vulval position, a smooth tail terminus, and no males. Ryss (2002a) considers *P. jordanensis* a junior synonym of *P. scribneri* based on morphological and morphometric characters of these two species as viewed with a compound microscope. However, Ryss listed *P. jordanensis* as a valid taxon in a following paper (Ryss, 2002b).

The authors of this note are studying lesion nematode populations similar to *P. scribneri* that occur on flowering ornamentals such as amaryllis (*Hippeastrum* sp.) in Florida. The morphological characterization of these lesion nematodes requires comparison with *P. scribneri* from the type locality in Tennessee and with closely related species such as *P. jordanensis*. Due to the lack of live *P. jordanensis* cultures, we examined fixed *P. jordanensis* paratypes and specimens from nematode repositories. According to the original description of *P. jordanensis*, only 14 paratypes were deposited in nematode collections. We were able to obtain five *P. jordanensis* paratypes, which were provided by the last author from the nematode collection at Rothamsted Research in Harpenden, England. In addition, three populations of putative *P. jordanensis* from Oman deposited at the USDA Nematode Collection in Beltsville, Maryland, U.S.A. were provided by the fourth author.

The objectives of this study were to examine the morphological characters and morphometrics of *P. jordanensis* in order to identify features of diagnostic value which were not reported in the original description. We were interested in observing the arrangement of the lip sectors, which allow the separation of this species from *P. scribneri* and other closely related species. Observations of the head patterns of *P. zeae* were included during the progress of this study because *P. jordanensis* and *P. zeae* were found to share similar morphological features. The results of these observations are reported herein.

The five *P. jordanensis* paratypes were collected from grapevine (*Vitis* sp.) in Jordan, in 1981 and mounted on slide (# 57/2/72 RES). The *P. jordanensis* populations from Oman were collected by A. Mani. They were fixed in formalin and enclosed in vials. The collection numbers and host plants of these populations were G-4699f (entry 1332) from grapevine, 8248 G-4937f (entry 8248) from eggplant (*Solanum melongena* L.) and G-5115f (entry 19161) from alfalfa (*Medicago sativa* L.).

The paratype specimens were measured and photographed on the original slide. The preserved specimens from Oman were transferred to water agar (Esser, 1986) for measurements. Morphological parameters of diagnostic value for the genus *Pratylenchus* (Loof, 1991) were determined for all specimens.

Following the observations with the light microscope, the paratypes were transferred from the museum slide into anhydrous glycerin. One paratype was rehydrated by the method of Eisenback (1985) and processed for scanning electron microscope (SEM) examination. The remaining paratypes were left in glycerin to be used if necessary. The rehydrated

Table 1. Morphometrics of *Pratylenchus jordanensis* paratypes from Jordan, three populations from Oman, the original description and *P. zeae*.

	P. jordanensis paratypes (n = 5)			*P. jordanensis* (Oman, G4937f) (n = 16)			*P. jordanensis* (Oman, G4699f) (n = 6)			*P. jordanensis* (Oman, G5115f) (n = 2)			Original description (n = 14)		*P. zeae* (from Loof, 1991)	
Character	Range	Mean	SD	Range	Mean	SD	Range	Mean	SD	Range	Mean	SD	Range	Mean	Range	Mean
Body length	475.3-544.8	504.2	22.8	381-508.6	463.4	35.6	337.1-406.7	361.6	25.6	370- 455.7	412.9	60.5	380-590	490	340-640	
Body width	15.6-17.1	16.2	0.6	14.7-19.8	17	1.5	12.2-14.7	13.9	0.9	14.7-15.6	15.2	0.6				
Width at vulva	15.1-16.1	15.4	0.4	12.7-17.6	16.3	1.4	11.7-13.7	13.4	0.8	14.2-15.6	14.9	1				
Width at anus	10.7-11.7	11.1	0.4	9.3-11.2	10.2	0.8	7.8-9.8	8.7	0.7	8.3-10.2	9.3	1.3				
Width at tail terminus	3.4-5.3	4.1	0.6	4.4-5.0	4.9	0.4	3-4.4	3.8	0.5	4.4-4.4	4.4	0				
Pharyngeal overlap	42.1-54.8	47.2	4.2	34-63.7	49.1	7.9	33.3-58.8	40.5	9.4	34.3-39.2	36.8	3.5	29.0-52.5	39	18-40	31
V	77-78.5	77.7	0.5	72.8-78	75.1	1.3	73.1-73.8	73.5	0.3	73.5-77.3	75.4	2.7	75.1-79.1	77.8	65-76	
Stylet	14.7-14.8	14.7	0.05	14.2-15.1	14.8	0.3	14-14.2	14	0.08	14.7-14.7	14.7	0	14.5-15	14.6	15-18	
Stylet knob width	4-4.7	4.4	0.3	4.3-5.0	4.6	0.2	4-4.5	4.2	0.3	4.5-4.5	4.5	0				
Stylet knob height	1.8-2.1	1.9	0.1	2.0-2.7	2.1	0.2	2-2.3	2.2	0.2	2.1-2.2	2.2	0.02				
DGO	2.1-2.9	2.6	0.3	2.1-3.5	2.6	0.4	2.2-3.2	2.7	0.4	2.5-2.6	2.6	0.07	3.0-3.5	3.4		
Excretory pore	78.4-89.2	82.1	3.7	70.5-92.1	80.3	5.1	68.1-73.5	70.3	2.3	73.5-83.3	78.4	6.9				
Esophagus	90.1-94	92	1.4	73.5-90.1	82	4.7	69-73.5	71.3	1.8	76.4-86.2	81.3	6.9				
Vulva-anus distance	75.4-88.6	82.3	4.6	71.5-103.8	91	9.1	63.7-85.2	71.8	7.5	60.7-94	77.4	23.5				
Head-vulva distance	369.4-425.3	392.3	18.4	328-385.1	348	25.2	248.9-298.9	266.1	18.4	286.1-335.1	310.6	34.6				
Postuterine branch	19.6-24.5	22.1	1.6	14.7-24.5	20.9	2.3	11.7-20.5	17.2	3	18.6-19.6	19.1	0.7	13-20.5	16.2		

Table 1. (Continued) Morphometrics of *Pratylenchus jordanensis* paratypes from Jordan, three populations from Oman, the original description and *P. zeae*.

	P. jordanensis paratypes (n = 5)			*P. jordanensis* (Oman, G4937f) (n = 16)			*P. jordanensis* (Oman, G4699f) (n = 6)			*P. jordanensis* (Oman, G5115f) (n = 2)			Original description (n = 14)		*P. zeae* (from Loof, 1991)	
Character	Range	Mean	SD	Range	Mean	SD	Range	Mean	SD	Range	Mean	SD	Range	Mean	Range	Mean
Tail	26.4-30.3	28.3	1.6	19.6-24.5	22	1.3	19.6-23.4	21.3	1.3	18.6-19.6	19.1	0.7				
a	29.8-31.9	31	0.9	24.4-29.9	27.4	1.7	24.3-27.7	26.1	1.4	23.7-31	27.4	5.5	26-32	29	17-32	
b	5.1-5.9	5.4	0.3	5.2-6.3	5.6	0.3	5-5.6	5.1	0.3	4.8-5.3	5.1	0.3	4.5-5.9	5.3	4.9-9.6	
c	16.5-19.2	17.9	1.2	17.7-22.6	21	1.5	15.7-17.6	17	0.9	17.9-19.9	18.9	1.4	16.1-25	18.3	11-24	
c'	2.4-2.7	2.5	0.2	1.8-2.6	2.2	0.2	2.3-2.8	2.5	0.2	2.2-2.5	2.4	0.2	2.1-3.0	2.6	2.3-3.7	
Tail annuli	22-31	28	3	24-29	26	1.5	21-29	25	2.9	27-28	27	0.7	19-24	21	20-35	
Tail shape	Bluntly pointed with a smooth or indented terminus			Bluntly pointed with a smooth terminus			Bluntly pointed with a smooth terminus			Bluntly pointed			Conoid with a smooth or indented terminus		Tapered tail with narrowly rounded or subacute terminus	

paratype for SEM was cold fixed in 3% glutaraldehyde, buffered with 0.1 M phosphate buffer (pH 7.2), post-fixed for 1 h in 2% osmium tetroxide, dehydrated in a graded series of ethanol, critical point dried with CO_2, and sputter coated with gold palladium (Eisenback, 1985). Specimens were observed with a Hitachi S530 microscope at 15-20 kV accelerating voltage. Specimens of the Oman population from grapevine (vial 4699f) were also processed for SEM observations. These specimens were not rehydrated because they were in an aqueous solution of formalin. After the completion of the SEM observations, the unused paratypes were mounted on permanent slides. One paratype was lost during this procedure.

Specimens of *P. zeae* collected from St. Augustine grass [*Stenotaphrum secundatum* (Walt.) O. Kuntze] in Tampa, Florida were processed for SEM by the procedures described above. Drawings of the face of *P. jordanensis* paratype and Oman population and *P. zeae* were reproduced from the SEM photos of these nematodes.

Light Microscope (LM) Observations

Morphometrics of the *P. jordanensis* paratypes, the Oman populations and those reported in the original description are listed in Table 1. The ranges of the parameters of diagnostic importance for these populations overlapped and the tail was also similar in the *P. jordanensis* populations and paratypes that were examined (Fig. 1).

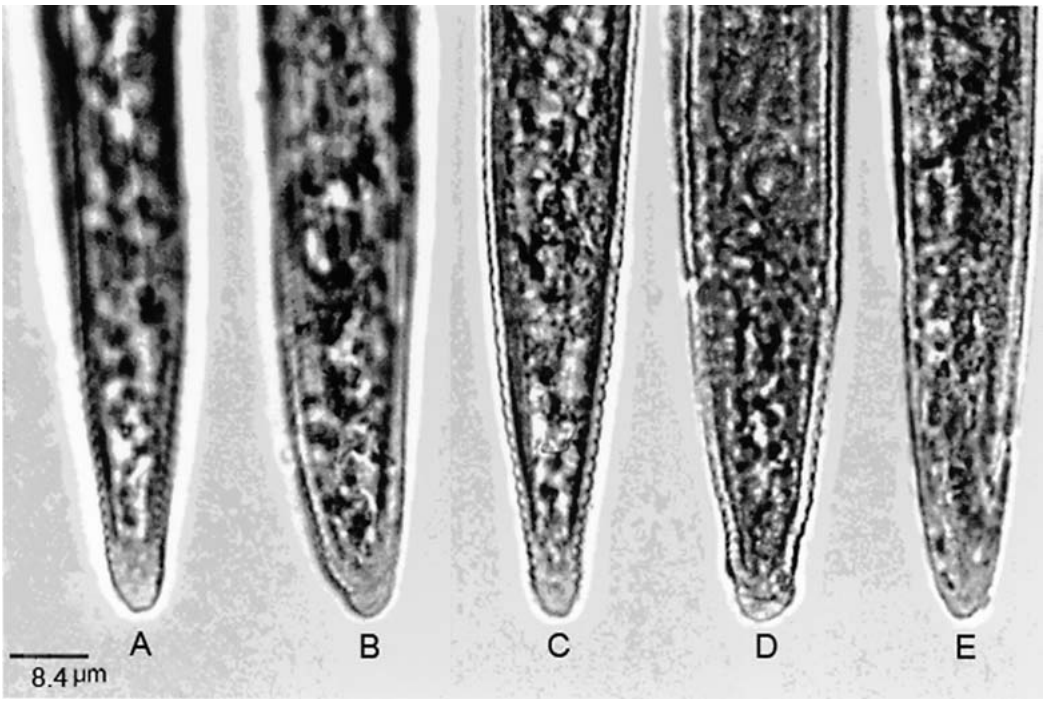

Fig. 1. Tail shapes of *Pratylenchus jordanensis* paratypes deposited at the nematode collection, Rothamsted Research, in Harpenden, England. Note the bluntly pointed (A-D) tail shape with smooth (B, D, E) or slightly indented (A, C) terminus like that reported for *P. zeae* (Loof, 1991).

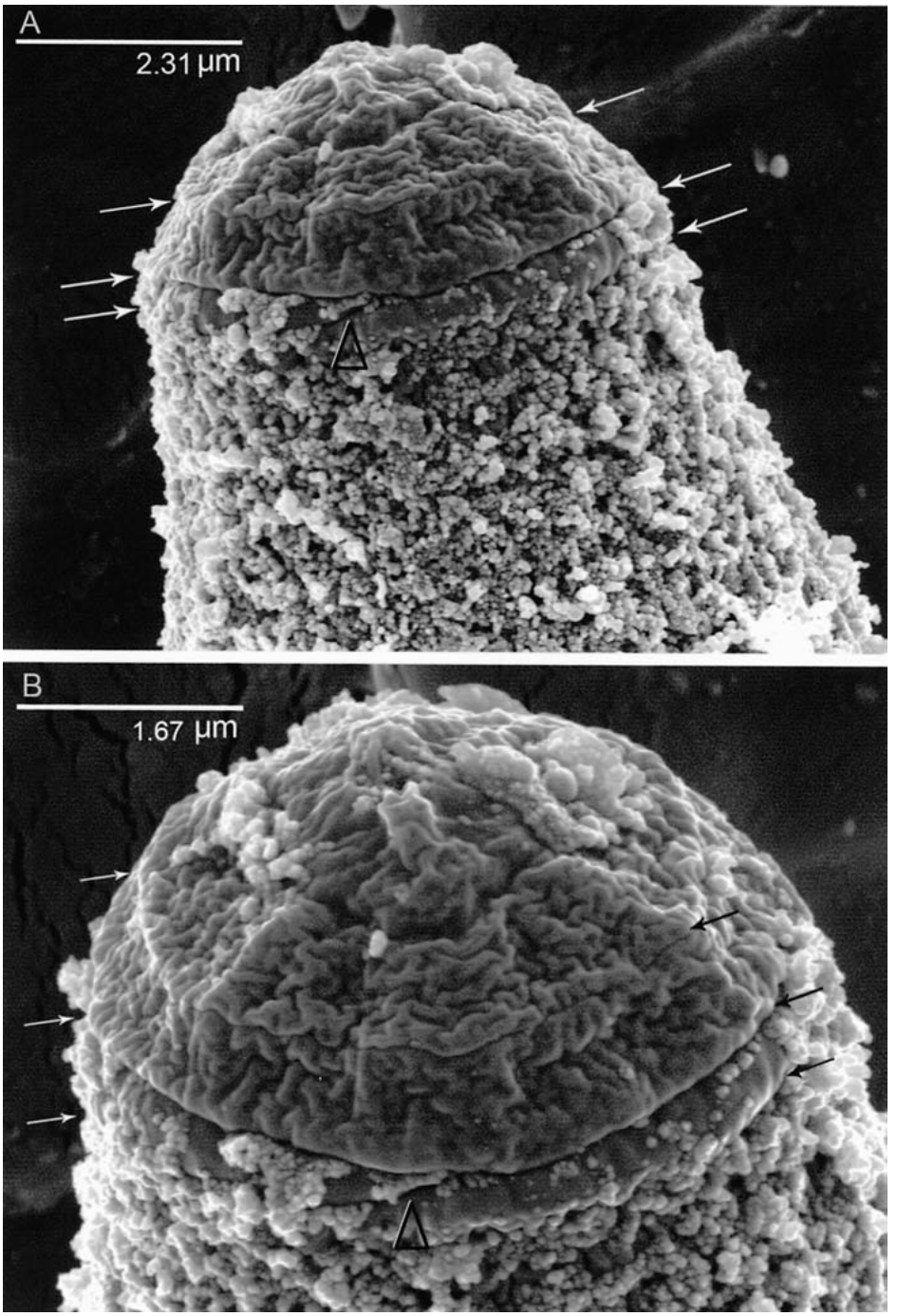

Fig. 2. Scanning electron micrographs of *Pratylenchus jordanensis* paratype female from glycerin mount showing three lip annuli (A) and a smooth face (B). Arrows point to the separation (striation) at the base of each lip annulus. Black triangles denote a diagonal incisure in the third lip annulus.

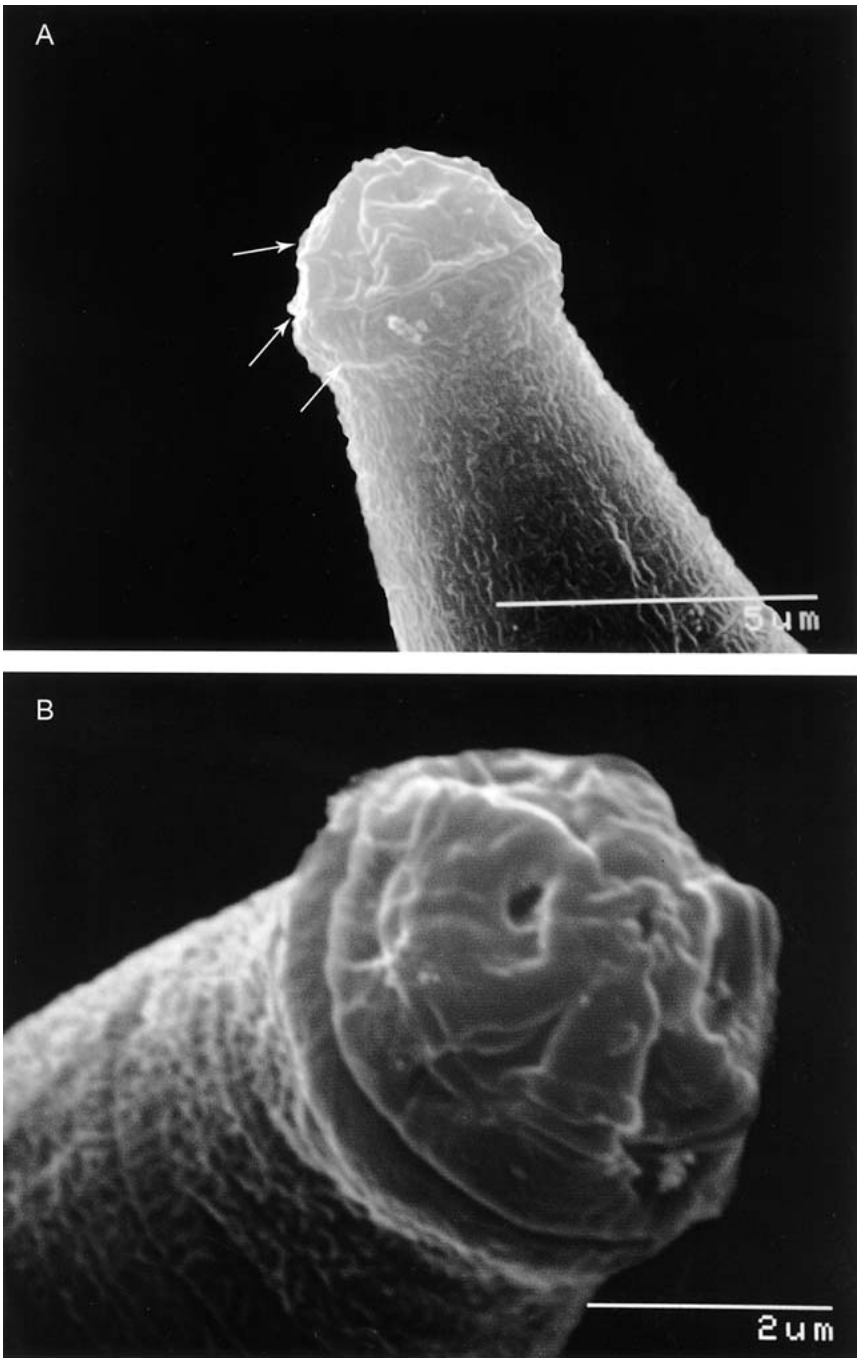

Fig. 3. Scanning electron micrographs of putative *Pratylenchus jordanensis* female from grapevine in Oman and deposited (fixed in formalin) in the USDA Nematode Collection in Beltsville, MD (vial 4699f). The females were characterized by three lip annuli (A) and a smooth face (B). Arrows point to the separation (striation) at the base of each lip annulus.

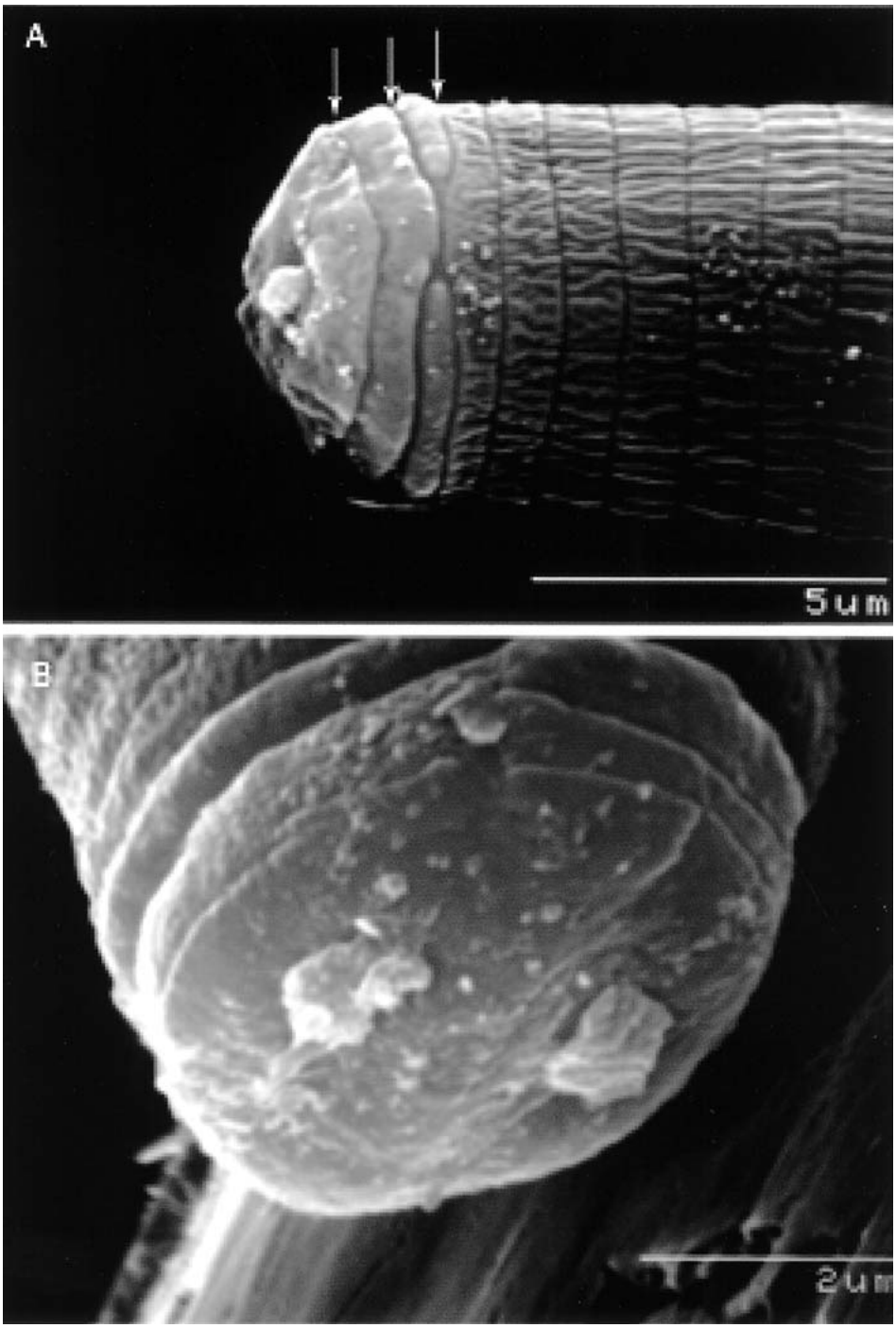

Fig. 4. Scanning electron micrographs of *Pratylenchus zeae* female from St. Augustine grass in Tampa, FL showing three lip annuli (A) and a smooth face (B). Arrows point to the separation (striation) at the base of each lip annulus.

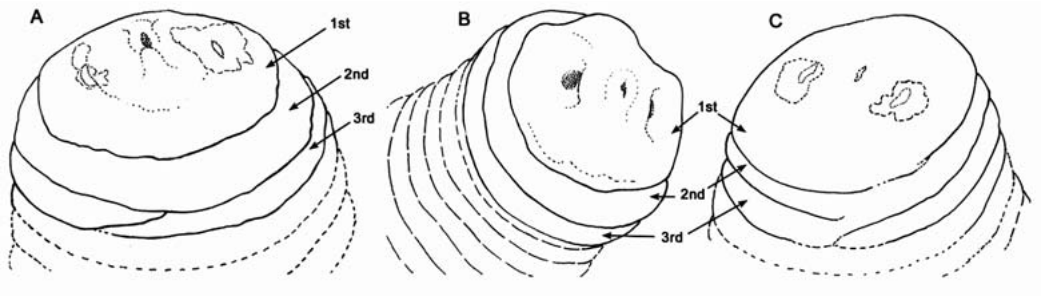

Fig. 5. *En face* drawings of *Pratylenchus jordanensis* paratype (A), putative *P. jordanensis* from Oman (B) and *P. zeae* (C). Both *P. jordanensis* and *P. zeae* share a smooth face and three lip annuli. Arrows point to the annuli.

The lip annuli of the five paratypes were indistinct when viewed with a light microscope, but in the specimens from Oman they were visible and consisted of three annuli in contrast to the original description of *P. jordanensis* which reported only two.

SEM Observations

The face of the *P. jordanensis* paratype revealed three lip annuli (Figs. 2A-B, 5A). The first and second annulus were adhering together and separated from the third annulus that showed the margin interrupted by a diagonal incisure. The oral disc and lip sectors were fused, giving this nematode a smooth face (Figs. 2B, 5A). A smooth face and three lip annuli were also observed in the Oman specimens from grapevine (vial 4699f), confirming the results of the LM observations (Figs. 3A-B, 5B).

The head morphology of the *P. zeae* population collected from St. Augustine grass in Tampa consisted of a flat face and three lip annuli with interrupted margins (Figs. 4A-B, 5C). These morphological features were like those of the *P. jordanensis* paratype and Oman population and matched those reported by Corbett and Clark (1983) for *P. zeae* populations from other geographical areas.

The ranges of *P. zeae* morphometrics reported by Loof (1991) are included in Table 1 for comparison with those of *P. jordanensis*. The ranges of these *P. jordanensis* populations overlap those of *P. zeae* even though the upper range values of the stylet and vulva were higher than those of *P. zeae*. It is worth mentioning that the tail shapes of all populations of both species were bluntly pointed with a smooth or slightly indented terminus, unlike the cylindrical rounded shape reported by Ryss (2000a) for *P. jordanensis*. Since *P. jordanensis* and *P. zeae* share the same head patterns, tail shape, and morphometrics we conclude that *P. jordanensis* is a junior synonym of *P. zeae*.

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