

## Taxonomic status of *Paratrichodorus faisalabadensis* Nasira & Maqbool, 1994 and *P. psidii* Nasira & Maqbool, 1994 (Nematoda: Triplonchida)

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**Summary** – The Pakistan species *P. faisalabadensis* and *P. psidii* described by Nasira and Maqbool (1994) are synonymized with *P. mirzai* (Siddiqi, 1960) Siddiqi, 1974 based on a detailed study of type specimens. The presence of a second pair of post-cloacal papillae in *P. mirzai* is questioned.

**Résumé** – *Position taxinomique de Paratrichodorus faisalabadensis Nasira & Maqbool, 1994 et P. psidii Nasira & Maqbool, 1994 (Nematoda: Triplonchida)* – Les espèces pakistanaïses *P. faisalabadensis* et *P. psidii* décrites par Nasira et Maqbool (1994) sont proposées comme synonymes mineurs de *P. mirzai* (Siddiqi, 1960) Siddiqi, 1974 à la suite d'une étude de spécimens types. La présence d'une deuxième paire de papilles post-cloacales chez *P. mirzai* est mise en question.

**Key-words:** nematodes, *Paratrichodorus faisalabadensis*, *P. psidii*, *P. mirzai*.

A polytomous key has been compiled (Decraemer & Baujard, 1998) to aid with species identification in the family Trichodoridae. The most important diagnostic characters were coded based on Decraemer (1995). Additional information was gathered for those character states unknown for a number of species; other characters such as the shape of the vagina were re-assessed based on a larger number of specimens. Still, some species, such as *Paratrichodorus faisalabadensis* Nasira & Maqbool, 1994, *P. psidii* Nasira & Maqbool, 1994, and *P. mirzai* (Siddiqi, 1960) Siddiqi, 1974, remained difficult to differentiate. A study of type specimens and additional material was needed to clarify their status. Dr. M.A. Maqbool kindly provided us with specimens of *P. faisalabadensis* and *P. psidii*, two species recently described from Pakistan, together with additional information on *P. mirzai* specimens from Pakistan (Nasira & Maqbool, 1994).

The Pakistan species were said to be close to *P. mirzai* and *P. porosus* (Allen, 1957) Siddiqi, 1974. They were differentiated by the characters listed in Table 1. Since we consider *P. porosus* to be a clearly different species, because of the presence of medio-ventral pores in vulvar region in females and the numbers of ventro-median cervical papillae and of pre-cloacal supplements in males, this species is not included in the Table nor in the discussion below.

### Observations

#### MALES

##### *Cervical papillae*

In the article of Nasira and Maqbool (1994), *P. mirzai* was mentioned with three ventro-median cervical papillae as in the original description. However, Siddiqi (1962) argued that the number of ventro-median cervical papillae in *P. mirzai* males was two instead of three, the third posterior papilla being in fact the excretory pore. This assumption was later confirmed by Decraemer (1989).

##### *Pre-cloacal supplements*

The second pre-cloacal supplement was said to be located at the level of the spicule head in *P. faisalabadensis* and *P. psidii* vs shortly anterior to the retracted spicule in *P. mirzai*. However, in *P. psidii* paratypes (Fig. 1 I), this supplement was observed just anterior to the retracted spicules, as in *P. mirzai*. In trichodorids in general, the position of pre-cloacal supplements in relation to retracted spicules often shows some minor variability. Therefore, this character is not considered here to be a differentiating character between the three species.

##### *Post-cloacal papillae*

The number of post-cloacal supplementary papillae was not considered to be a differentiating character

**Table 1.** Characters used by Nasira and Maqbool (1994) for differentiating *Paratrichodorus faisalabadensis*, *P. psidii* and *P. mirzai* (measurements in  $\mu\text{m}$ ).

	<i>P. faisalabadensis</i>	<i>P. psidii</i>	<i>P. mirzai</i>
Female			
Shape of vulva	pore	pore	longitudinal slit
Shape of vaginal sclerotizations	short rods	dot-like	dot-like
Shape of vagina	rounded triangular*	rounded	–
L	540-650	400-520	–
Anterior end to excretory pore	56-76	49.6-60	–
Male			
Onchiostyle length	–	30-32	33-36
Spicule length	–	30-31	32-34
Length of gubernaculum	7-8.8	7-8	11-13
Spicule shape	curved	almost straight, with striae	–
Ventromedian cervical papillae	2	2	3

\* confusion with shape of vaginal sclerotizations (see text)

between *P. faisalabadensis* and *P. psidii* in the original description (Nasira & Maqbool, 1994): *P. faisalabadensis* and *P. psidii* were described with one pair *vs* two pairs in *P. mirzai*. Nasira and Maqbool (1994) considered the Pakistan specimens of *P. mirzai* to be in close agreement with the description of Siddiqi (1962), but their illustration of a male specimen does not show the presence of a second pair of post-cloacal papillae.

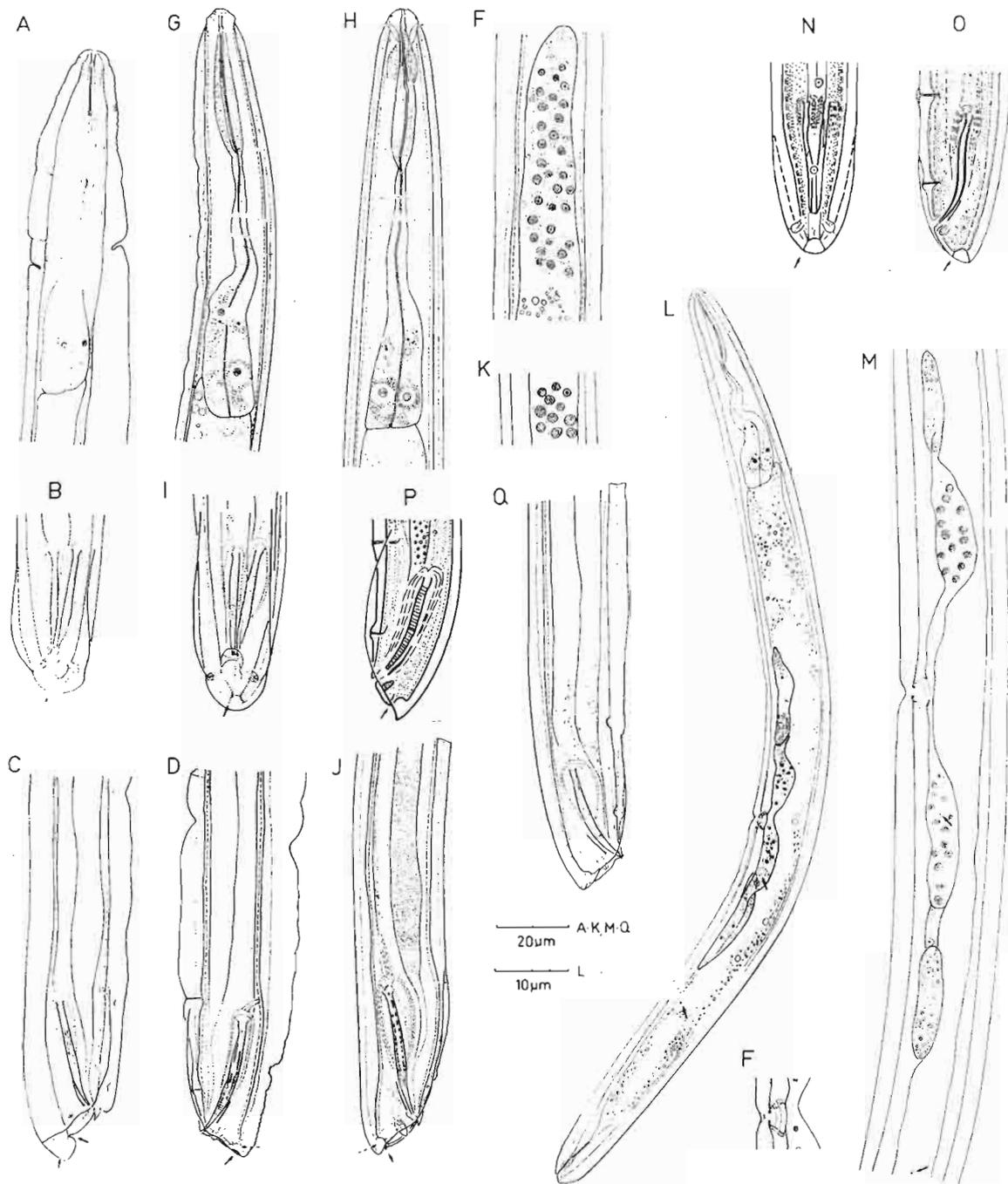
*P. mirzai* males were originally described with a pair of large pedunculated ventro-submedian papillae just posterior to the "anal" opening and another pair of post-anal papillae located at about the mid-distance from the first pair to the paired terminal caudal pores; the illustration of the tail in lateral view shows the latter to be a minute, pore-like "papilla", and a ventral view of the tail does not show any caudal pores. Siddiqi (1962) gave another illustration of the male tail in lateral view where caudal pores were not represented, but in the brief accompanying description these pores were said to be terminal in position. The illustrations and description of *T. musambi* Edward & Misra, 1970 (considered, without comments, to be a junior synonym of *P. mirzai* by Siddiqi, 1974) do not mention or show the presence of a second pair of post-cloacal papillae.

Our observations of specimens of *P. mirzai* from CAB Nematode Collection (courtesy Dr. P. De Ley) revealed the presence on each side of the body of an obvious post-cloacal papilla shortly posterior to the cloacal opening and of a subterminal pore (= outlet of an inner canal). At the tail tip, a vertical differentiation was visible in the cuticle, apparently induced by the thickened terminal body cuticle. Similar observa-

tions were made in type specimens of *P. faisalabadensis* and *P. psidii*. The tails of some specimens of both species were ventrally flattened (as the result of the contraction of anal muscles upon fixation) from the level of the cloacal opening to almost the tail end. A pore was observed in the indentation just in front of the tail tip. In some specimens of *P. psidii* (Fig. 1 B, C), this pore was associated with small accumulations of secretion. Ventral views of males of *P. faisalabadensis* and *P. psidii* showed a pair of large post-cloacal papillae and two subterminal pores. No differences were observed in the tail region between *P. faisalabadensis*, *P. mirzai*, and *P. psidii*. Therefore, we assume that the males of all three species possess only one pair of post-cloacal papillae and a subterminal pair of caudal pores at the same level as the "second pair of post-cloacal papillae" formerly described in *P. mirzai*. The caudal pore and inner canal in previous descriptions seem to be just a differentiation of the cuticular layers.

#### Other characters

Several of the differentiating characters mentioned in Table 1 between *P. faisalabadensis* and *P. mirzai* (length of gubernaculum, number of ventro-median cervical papillae) and between *P. psidii* and *P. mirzai* (length of onchiostyle, spicule, and gubernaculum, and number of ventro-median cervical papillae) are in fact not different: the differences between *P. faisalabadensis* and *P. psidii* in body length (520-660 *vs* 430-510  $\mu\text{m}$ ) lie within the intraspecific body length range of *Paratrichodorus* species (e.g., *P. mirzai* with L= 450-630  $\mu\text{m}$ ), while the differences mentioned in spicule shape (curved *vs* almost straight and with striae) were not observed; male paratype specimens



**Fig. 1.** *Paratrichodorus mirzai* (= *P. faisalabadensis*, = *P. psidii*). – Pharyngeal region. A: *P. psidii*, male paratype; G-H: *P. faisalabadensis*, male paratypes (H in oblique ventral view). – Tail region and copulatory apparatus. B-D: *P. psidii*, male paratypes; I-J: *P. faisalabadensis*, male paratypes; N, O-Q: *P. mirzai*, males. – Sperm in vesicula seminalis. F: *P. psidii*, male paratype; K: *P. faisalabadensis*, male paratype. – Total view. L: *P. psidii*, female paratype. – Detail of vagina region. F: *P. psidii*, female paratype. – Reproductive system. M: *P. faisalabadensis*, female paratype. (N after Siddiqi, 1960; O-P: after Siddiqi, 1962).

studied of both species possess almost straight spicules with striated corpus.

#### FEMALE

##### *Vulva and vagina*

The Pakistan species were described with a pore-like vulva but the vulva we observed in paratype specimens was a short longitudinal slit.

*P. faisalabadensis* was originally differentiated from *P. psidii* by the shape of the vagina and the shape of the vaginal sclerotized pieces (short rod-like *vs* dot-like). However, the shape of the vagina of *P. faisalabadensis* was not clearly described, due to a confusion between shape of vagina and shape of vaginal sclerotizations. The same confusion between these two features also was made in the diagnosis and discussion on relationships of this species (Nasira & Maqbool, 1994). The shape of the vagina is a character that may be variable depending on the physiological condition of the specimens and on fixation. During our observations of type specimens of *P. faisalabadensis* and *P. psidii*, the shape of the vagina was found to be similar (*i.e.*, rounded trapezoid) to that of *P. mirzai*. A similar observation was made for the vaginal sclerotizations (small, dot-like). In the original description, the illustrated specimen of *P. psidii* is rather badly fixed, which makes it difficult to observe the shape of the organs.

##### *Body pores*

We observed two post-vulvar lateral body pores in both *P. faisalabadensis* and *P. psidii* (Fig. 1 L, M). Siddiqi (1960, 1962) did not observe hypodermal pores in *P. mirzai*, neither did Edward and Misra (1970) in *T. musambi*. Decraemer (1995) described the number of lateral body pores in *P. mirzai* as varying between one to three on each side. This feature often shows some variability within the genus. We conclude that there is no difference in the number of lateral body pores between the species.

##### *Pharyngo-intestinal junction*

From the descriptions of the three species and our own observations, the paratypes of *P. faisalabadensis* and *P. psidii* usually have a short antero-dorsal overlap of the pharyngeal bulb by the intestine, whereas the pharyngeal bulb of *P. mirzai* is offset in females and offset or with a minute ventral overlap in males. The type of pharyngo-intestinal junction is intra- and interspecific variable (Decraemer, 1989; 1995).

## Conclusions

Based on the above observations, we consider *P. faisalabadensis* and *P. psidii* to be junior synonyms of *P. mirzai*. The new observations on the post-cloacal papillae may trigger further discussions on the presence of a second pair of post-cloacal papillae. Their presence in *P. pachydermus* has been questioned by Sturhan (1985). He considered the anterior pair of post-cloacal papillae to be simple pores; the large posterior pair of papillae would then represent the real post-cloacal papillae.

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## References

- DECREAEMER, W. (1989). Morphometric variability and value of the characters used for species identification in *Paratrichodorus* Siddiqi, 1974 (Nematoda: Trichodoridae). *Nematologica*, 35: 37-61.
- DECREAEMER, W. (1995). *The family Trichodoridae: stubby root and virus vector nematodes*. Dordrecht, Boston & London, Kluwer Academic Publishers, xvi + 360 p.
- DECREAEMER, W. & BAUJARD, P. (1998). A polytomous key for the identification of species of the family Trichodoridae (Thorne, 1935) Clark, 1961 (Nematoda: Triplonchida). *Fundam. appl. Nematol.*, 21: 37-62.
- EDWARD, J. C. & MISRA, S. L. (1970). Two new species of *Trichodorus* from Uttar Pradesh, India. *Allahabad Fmr*, 44: 167-171.
- NASIRA, K. & MAQBOOL, M. A. (1994). Two new species of *Paratrichodorus* Siddiqi, 1974 (Nematoda: Trichodoridae) with observation on *P. mirzai* (Siddiqi, 1960) Siddiqi, 1974 and *P. renifer* Siddiqi, 1974 from Pakistan. *Fundam. appl. Nematol.*, 17: 323-332.
- SIDDIQI, M. R. (1960). Two new species of the genus *Trichodorus* (Nematoda: Dorylaimoidea) from India. *Proc. helminth. Soc. Wash.*, 27: 22-27.
- SIDDIQI, M. R. (1962). *Trichodorus pakistanensis* n.sp. (Nematoda: Trichodoridae) with observations on *T. porosus* Allen, 1957, *T. mirzai* Siddiqi, 1960, and *T. minor* Colbran, 1956, from India. *Nematologica*, 8: 193-200.
- STURHAN, D. (1985). Ein neuer Phytonematode aus Deutschland: *Paratrichodorus weischeri* spec. nov. (Nematoda, Trichodoridae). *Mitt. biol. BundAnst. Ld- u. Forstw.*, 226: 31-45.