

# A study of the intestinal contents of some mononchs

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## SUMMARY

The intestinal contents of over one thousand specimens of thirty three species belonging to nine genera of the order Mononchida were analysed to determine their range and preference for prey. The study showed that mononchs feed upon tylenchs, dorylaims, mononchs and free-living saprophagous nematodes besides rotifers. Cuticular remains of all types including trophi of rotifers and other unidentifiable objects of prey were of frequent occurrence. Forty five percent of the predators had prey in their intestine. Feeding of different mononchs is polyvalent and predation aleatory. However, more predators (75 %) had free-living saprophagous nematodes within the intestine rather than tylenchs (45 %) or dorylaims (42 %). *Pratylenchus*, *Hoplolaimus*, *Tylenchorhynchus*, *Tylencholaimus*, *Aporcelaimus*, *Thornenema*, *Iotonchus*, *Mylonchulus*, *Rhabditis*, *Acrobeloides* and *Chiloplacus* were found most frequently in the intestine of different species of mononchs. *Parahadronchus shakili* appeared to be most active predator as 68 % of its specimens had prey in their intestine while *Coomansus indicus* was least active with only 21 % having prey. Twenty percent predators were cannibals while 27 % devoured mononchs belonging to other species/genera. *Mylonchulus* spp., and *Iotonchus bagrii* did not contain any prey or its remains in their intestine. None to eight prey could be present in the intestine of a single predator.

## RÉSUMÉ

### Étude du contenu intestinal de quelques Mononchides

Le contenu intestinal de plus de mille spécimens appartenant à 33 espèces et neuf genres de l'ordre des Mononchides a été analysé en vue de connaître l'éventail des proies et les préférences dans la prédation. La présente étude a montré qu'en sus des rotifères, les proies des Mononchides appartiennent aux Tylenchides, Dorylaimides, Mononchides et aux nématodes libres saprophages. Il a été fréquemment observé des restes cuticulaires de nature variée, y compris des trophi de rotifères et d'autres portions de proie non identifiables. L'intestin de 45 % des nématodes prédateurs contenait une ou des proies. La nourriture des Mononchides est polyvalente et la prédation aléatoire. Cependant, un plus grand nombre de prédateurs (75 %) contenait des nématodes libres saprophages plutôt que des Tylenchides (45 %) ou des Dorylaimides (42 %). Les représentants des genres *Pratylenchus*, *Hoplolaimus*, *Tylenchorhynchus*, *Tylencholaimus*, *Aporcelaimus*, *Thornenema*, *Iotonchus*, *Mylonchulus*, *Rhabditis*, *Acrobeloides* et *Chiloplacus* sont les proies les plus fréquemment observées. *Parahadronchus shakili* paraît être le prédateur le plus actif car 68 % de ses spécimens ont une proie dans leur intestin, tandis que ce pourcentage n'est que de 21 % chez *Coomansus indicus*, espèce la moins active. Vingt pour cent des prédateurs sont « cannibales », tandis que 27 % dévorent des Mononchides appartenant à une espèce ou à un genre différents. *Mylonchulus* spp. et *Iotonchus bagrii* ne contiennent aucune proie ni aucun reste de celles-ci. Les proies peuvent être au nombre de zéro à huit dans l'intestin du même prédateur.

Observations on the predatory behaviour of nematodes of the order Mononchida Jairajpuri, 1969 have been made (Cobb, 1917; Steiner & Heinly, 1922; Thorne, 1927; Nelmes, 1974; Jairajpuri & Azmi, 1978; Bilgrami, Ahmad & Jairajpuri, 1984) and the possibility of using them in controlling population levels of some species of plant-parasitic nematodes has been assessed (Cohn & Mordechai, 1974; Small, 1979). Mohandas and Prabhoo (1980) found *Rotylenchulus reniformis* Linford & Oliveira, *Meloidogyne incognita* (Kofoid & White), *Rhabditis* sp. and *Monohysterella* sp. to be most common in the gut of mononchs. Arpin and Kilbertus (1981) made observations on the intestinal contents and epithelium of these nematodes. While observing the predatory abilities of nematodes belonging to different orders on a range of prey species, Small and Grootaert (1983) found *Panagrellus redivivus* (L.) to be most

susceptible to attack than other free-living or plant-parasitic species. In the present work the intestinal contents of mononchs belonging to 33 species of nine different genera were studied. This study was carried out to determine and enumerate different kinds of ingested prey and to find out whether these mononchs have any choice for a particular type of prey.

## Materials and methods

Observations were made on the intestinal contents of mononchs that were collected during past several years from all parts of India. Over one thousand specimens of mononchs belonging to nine genera viz., *Parahadronchus* (one species), *Mononchus* (two species), *Miconchus* (three species), *Clarkus* (two species),

*Prionchulus* (one species), *Sporonchulus* (one species), *Coomansus* (one species), *Iotonchus* (thirteen species) and *Mylonchulus* (nine species) were studied.

**Results**

All species had variable number of prey in their intestine. The nematodes identified as prey are given in Table 1. In *Iotonchus*, *I. trichuris* and *I. monohystera* were most active predators while *I. basidontus* was least active. Other species are of intermediate grouping

except *I. baqrii* which contained no prey or its remains in the intestine. *I. trichuris* preyed upon three genera each of Tylenchida and Rhabditida and two each of Dorylaimida and Mononchida. Three genera each of Tylenchida and Mononchida, one of Dorylaimida and three of Rhabditida were identified as prey in the nematode genera were most commonly found in had preyed only upon one genus of Tylenchida and two of Rhabditida. In *Miconchus*, more specimens of *M. aquaticus* contained prey in their intestine than *M. dalhousiensis*. *M. aquaticus* preyed upon two genera each of Tylenchida, Mononchida and Rhabditida and

Table 1  
Predator-prey list

Predators	Prey			
	Tylenchs	Dorylaims	Mononchs	Free-Living
<i>Parahadronchus shakili</i>	1, 2, 3, 4, 5, 6, 7, 8	10, 12, 17, 18, 19, 21	22, 23, 24, 27, 29	31, 32, 33, 36, 37
<i>Mononchus aquaticus</i>	2, 3, 8	10, 13, 14, 19	23, 24	32, 33, 34
<i>M. tunbridgensis</i>	2, 3, 7	10, 17	24	31, 34
<i>Miconchus aquaticus</i>	4, 6	10, 15, 18	22, 28	31, 32
<i>M. citri</i>	1, 3	11	23, 28	33
<i>M. dalhousiensis</i>	9	10, 20	23	34
<i>Clarkus papillatus</i>	7, 9	11, 13	25, 27	31, 32
<i>C. sheri</i>	3, 8	11	25, 28	34
<i>Prionchulus muscorum</i>	2, 3, 7, 8	11, 12, 15	22, 23, 28	31, 34
<i>Sporonchulus vagabundus</i>	1, 6, 9	11, 12, 19	28, 30	33, 34
<i>Coomansus indicus</i>	1, 3, 7	18	28	31, 33
<i>Iotonchus antedontus</i>	3	14	23	34, 35
<i>I. baqrii</i>	—	—	—	—
<i>I. basidontus</i>	3	—	—	31, 32
<i>I. indicus</i>	3, 4	10, 12	22, 23	33, 34
<i>I. jairi</i>	2	16	25	33
<i>I. longicaudatus</i>	2, 5	12	24, 26	33, 34
<i>I. monohystera</i>	1, 2, 5	10	22, 24, 27	31, 34, 35
<i>I. parabasidontus</i>	5	16	22, 23	32, 33
<i>I. prabhooi</i>	—	11	—	32, 35
<i>I. risoceiae</i>	1	11	22, 23	32
<i>I. shafii</i>	2	12	—	31, 32
<i>I. trichuris</i>	1, 2, 3	12, 18	22, 26	31, 34, 35
<i>Iotonchulus</i> sp.	5	—	—	—
<i>Mylonchulus</i> spp.	—	—	—	—

KEY :

- |                             |                           |                           |                           |
|-----------------------------|---------------------------|---------------------------|---------------------------|
| 1. <i>Pratylenchus</i>      | 10. <i>Tylencholaimus</i> | 19. <i>Trichodorus</i>    | 28. <i>Miconchus</i>      |
| 2. <i>Hoplolaimus</i>       | 11. <i>Aporcelaimus</i>   | 20. <i>Diphtherophora</i> | 29. <i>Parahadronchus</i> |
| 3. <i>Tylenchorhynchus</i>  | 12. <i>Thornenema</i>     | 21. <i>Campydora</i>      | 30. <i>Sporonchulus</i>   |
| 4. <i>Helicotylenchus</i>   | 13. <i>Discolaimus</i>    | 22. <i>Iotonchus</i>      | 31. <i>Rhabditis</i>      |
| 5. <i>Hirschmanniella</i>   | 14. <i>Belondira</i>      | 23. <i>Mylonchulus</i>    | 32. <i>Acrobeles</i>      |
| 6. <i>Hemicycliophora</i>   | 15. <i>Axonchium</i>      | 24. <i>Mononchus</i>      | 33. <i>Acrobeloides</i>   |
| 7. <i>Hemicriconemoides</i> | 16. <i>Dorylaimellus</i>  | 25. <i>Clarkus</i>        | 34. <i>Chiloplacus</i>    |
| 8. <i>Aphelenchus</i>       | 17. <i>Nygolaimus</i>     | 26. <i>Coomansus</i>      | 35. <i>Mesorhabditis</i>  |
| 9. <i>Aphelenchoides</i>    | 18. <i>Xiphinema</i>      | 27. <i>Prionchulus</i>    | 36. <i>diplogasterid</i>  |
|                             |                           |                           | 37. <i>monohysterid</i>   |

Table 2  
Analysis of intestinal contents of mononchs

	Number of specimens observed	Number of specimens containing prey	Number of specimens containing different preys						
			Dorylaims	Tylenchs	Free* living	Unidentified prey	Cuticular parts	Mononchs of other genera	Mononchs of same genus
<i>Parahadronchus</i>	164	112 (68 %)	42	48	68	48	21	38	14
<i>Mononchus</i>	198	87 (44 %)	22	24	55	33	19	10	23
<i>Miconchus</i>	34	15 (44 %)	10	8	15	6	3	4	3
<i>Clarkus</i>	62	26 (42 %)	4	6	17	8	4	8	8
<i>Prionchulus</i>	105	32 (30 %)	18	20	22	24	16	12	0
<i>Sporonchulus</i>	59	16 (27 %)	4	6	16	8	7	3	6
<i>Coomansus</i>	24	5 (21 %)	4	5	4	4	2	1	0
<i>Iotonchus</i>	173	75 (43 %)	50	49	70	52	24	24	20
<i>Mylonchulus</i>	190**	0	0	0	0	0	0	0	0
Total	816	368 (45 %)	154	166	277	184	96	100	74

\* Including monohysterid, diplogasterid and rhabditid nematodes.

\*\* Not included in total as no specimen of this genus had prey or its remains in the intestine.

three of Dorylaimida while *M. dalhousiensis* on one genus each of Tylenchida, Mononchida and Rhabditida and two of Dorylaimida. *Mononchus aquaticus* preyed upon more varied type of nematodes (three genera each of Tylenchida and Rhabditida, four of Dorylaimida and two of Mononchida) than *M. tunbridgensis* (three genera of Tylenchida, two each of Dorylaimida and Rhabditida and one of Mononchida). Similarly, *Clarkus papillatus* preyed upon two genera each of Tylenchida, Dorylaimida, Mononchida and Rhabditida while *C. sheri* predated only upon two genera each of Tylenchida and Mononchida and one each of Dorylaimida and Rhabditida.

Table 2 shows the distribution of prey in the intestine of different species of mononchs. The following nematode genera were most commonly found in the gut of mononchs: *Pratylenchus*, *Hoplolaimus*, *Tylenchorhynchus*, *Tylencholaimus*, *Aporcelaimus*, *Thornenema*, *Iotonchus*, *Mylonchulus*, *Rhabditis*, *Acrobeloides* and *Chiloplacus*. Other prey not too frequently encountered belonged to the genera *Helicotylenchus*, *Hirschmanniella*, *Hemicyclophora*, *Hemicriconemoides*, *Aphelenchus*, *Aphelenchoides*, *Discolaimus*, *Belondira*, *Axonchium*, *Dorylaimellus*, *Nygolaimus*, *Trichodorus*, *Xiphinema*, *Diphtherophora*, *Campydora*, *Mononchus*, *Clarkus*, *Coomansus*, *Prionchulus*, *Miconchus*, *Acrobeles* and *Mesorhabditis* besides some diplogasterids and monohysterids. *Tylenchorhynchus*, *Tylencholaimus*, *Mylonchulus* and *Chiloplacus* were found within the intestine of maximum number of species of mononchs. *Tylenchorhynchus* was observed in the gut of eleven species, *Tylencholaimus* in seven, *Mylonchulus* in nine and *Chiloplacus* in eleven species belonging to different genera (Tab. 1).

None of the species of *Mylonchulus* (*M. brachyuris*, *M. contractus*, *M. dentatus*, *M. lacustris*, *M. hawaiiensis*, *M. amurus*, *M. muradi*, *M. sigmaturus*, *M. nainitalensis*) contained prey or its remains in the intestine. Forty five percent of the remaining predators had prey in their intestine (Tab. 2). The preys were observed either whole or in semi-digested conditions or their cuticular remains were found in the intestine of the predators. An analysis of intestinal contents showed that mononchs feed upon tylenchs, dorylaims, mononchs and free-living nematodes. Some specimens of *Iotonchus trichuris*, *I. longicaudatus*, *I. indicus*, *Clarkus papillatus*, *Coomansus indicus*, *Sporonchulus vagabundus* and *Parahadronchus shakili* also preyed upon rotifers besides soil and plant-parasitic nematodes. Various types of cuticular remains such as spear, spicules, buccal cavity, cuticle, trophi of rotifers and other unidentifiable structures of prey were found frequently in the intestine of the predators.

## Discussion

Under natural conditions mononchs probably feed upon all types of nematodes besides rotifers and some soil microorganisms. Arpin (1979) and Mahapatra and Rao (1981) found significant correlation between the populations of mononchs and free-living nematodes but Nelmes and Mc Culloch (1975) did not find such a correlation. Since the present observations were made only on mounted specimens and not on actual populations, the relation of mononchs with other nematodes present along with them in the soil could not be determined. It cannot, therefore, be suggested with certainty that the widespread presence of free-living nematodes in the intestine of different mononchs is due

to any preference for them as prey or it has resulted as a consequence of a correlation between the populations of prey and predators or due to their widespread occurrence in the soil besides their susceptibility to predation. A few species of tylenchs and dorylaims are reported to be resistant to some extent to predation perhaps because of having thick cuticles (Esser, 1963; Small & Grootaert, 1983). The heterogeneity of prey within the intestine of mononchs suggests that these predators have no choice of prey, their feeding being polyvalent and predation aleatory. A similar conclusion was also drawn by Mohandas and Prabhoo (1980) and Small and Grootaert (1983). However, we have found that more predators (75 %) had free-living saprophagous nematodes in their intestine rather than tylenchs (45 %) or dorylaims (42 %) (Tab. 2).

Cannibalism appears to be more of a natural phenomenon than occurring only under conditions of prey non-availability (Azmi & Jairajpuri, 1979; Bilgrami & Jairajpuri, 1985) as in most instances the mononchs (prey) occurred together with other types of prey in the intestine of mononchs (predator). All species except *Prionchulus muscorum*, *Coomansus indicus*, *Iotonchus antedontus*, *I. baqrii*, *I. basidontus*, *I. jairi*, *I. longicaudatus*, *I. prabhooi*, *I. shafii* and all species of *Mylonchulus* showed cannibalistic tendencies. Twenty percent predators having prey in their intestine were cannibals while 27 % devoured mononchs belonging to other species/genera also (Tab. 2). Most predators devoured a greater number of mononchs of other genera than their own except species of *Mononchus* and *Sporonchulus* which showed a reverse trend.

Of all the mononchs studied *Parahadronchus shakili* was the most active predator as 68 % of its specimens had prey in their intestine while *Coomansus indicus* was least active with only 21 % having prey. Eight genera of Tylenchida, six of Dorylaimida, five of Mononchida, three of Rhabditida and one each of Diplogasterida and Monohysterida were identified as prey of *Parahadronchus shakili*, while *Coomansus indicus* fed upon three genera of Tylenchida, one Dorylaimida and two each of Mononchida and Rhabditida (Tab. 1). Mohandas and Prabhoo (1980) did not find any prey within the intestine of predators belonging to the genus *Mylonchulus*. The same holds true in the present work also. The number of prey present in the intestine of a single predator varied from none to eight.

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