

Table 1. Nematicidal activity of different concentrations of serpentine against *Meloidogyne incognita* after 48 h.

Concentration	Mortality %	
	Mean	SEM
0 (control)	Nil	
0.2 %	10	2.8
0.35 %	25	4.2
0.5 %	40	4.8
1.0 %	100	

Table 2. Effect of different concentrations of serpentine on larval emergence of *Meloidogyne incognita*.

Concentration	Number of emerged larvae		Extent of inhibition of hatching in 5 days	Mortality of larvae in 5 days
	Mean	SEM		
0 (control)	821	73.7	Nil	Nil
0.2 %	690	76.2	15.9 %	77 %
0.5 %	517	78.4	37.0 %	84 %

0.5 % of serpentine solution respectively were dead due to apparent nematicidal effect of serpentine. Hence it is concluded that serpentine has very low ovicidal or ovistatic activity but a more pronounced nematicidal activity *in vitro*. It is interesting to recall that serpentine at 0.2 %

concentration showed only 10 % nematicidal activity in 48 h (Table 2) as against 77 % after 5 days in the present hatching experiment. This suggests that even low concentrations of serpentine may exert significant nematicidal effect against *M. incognita* subject to prolonged exposure of the larvae to serpentine.

Studies carried out by Patel *et al.* (1987a) had indicated that *C. roseus* can be used as a trap crop for the management of nematode infestation in field crops, but the basic information on the active nematicidal principle was lacking. One of the active principles has been identified in the present study.

Acknowledgements

We thank Dr. R. M. Pandey, Director, IIHR for providing the facilities and Dr. P. P. Reddy for his keen interest in this study. We are highly grateful to Dr. R. Krishnan for providing the plant material and we thank Mr. C. S. Bujji Babu and Mrs. H. Shanthamma for their technical assistance.

References

- KOGISO, S., WADA, K. & MUNAKATA, K. (1976). Odaracin, a nematicidal constituent from *Daphne odara*. *Agric. Biol. Chem.*, 40 : 2119-2120.
- PATEL, H. R., THAKAR, N. A. & MURALIDHARAN, C. M. (1987a). Periwinkle in management of root knot nematodes disease. *Madras agric. J.*, 74 : 230-231.
- PATEL, H. R., THAKAR, N. A. & PATEL, C. C. (1987b). Larval emergence and infestation of *M. incognita* as influenced by periwinkle (*C. roseus*). *Ind. J. agric. Sci.*, 57 : 863-866.
- SHIMIZU, M. & UCHIMARA, F. (1958). Isolation of alkaloids from *Vinca rosea* L. *Chem. Pharm. Bull.*, 6 : 324-329.

THE CHEMICAL NATURE OF THE AMPHIDIAL AND "EXCRETORY" SYSTEM SECRETIONS OF *HETERODERA SCHACHTII* (NEMATODA: HETERODERIDAE) MALES

Jens AUMANN

Institute of Phytopathology, University of Kiel, Hermann-Rodewald-Strasse 9, 24118 Kiel, Germany.

Accepted for publication 11 September 1993.

Key-words : Chemoreceptors, chemosensilla, O-glycans, mucins, mucus, subunits. Nematode.

The amphids are supposed to be the main chemosensilla of the nematode head. The dendritic nerve extensions of the amphidial neurons are surrounded by secretions of the amphidial gland cells (Wright, 1983). The secretions may protect the nerve dendrites against microbial attack (Aumann & Wyss, 1989). In spite of a recent proposal (Bird *et al.*, 1988) the function of the so-called "excretory" system and of its gland cell secretions is yet unknown. The chemical characterization of the secretions may aid in the determination of their functions.

Previous studies showed that the amphidial secretions of the plant-parasitic nematode *Heterodera schachtii* are composed of glycoproteins with terminal galactose units (Aumann, 1989). Several lectins with different carbohydrate specificities bind to the amphidial and "excretory" system secretions of this (Aumann & Wyss, 1989) and other nematode species (Jansson, 1987). The carbohydrates may be bound to the protein backbone either N-glycosidically via N-acetylglucosamine and asparagine or O-glycosidically via N-acetylgalactosamine and serine or threonine. Fetuin, a blood glycoprotein, con-

Table 1. The effects of glycoprotein-modifying reagents on lectin binding to the amphidial and "excretory" system secretions of *Heterodera schachtii* males.

Treatment	n	No. (%) of males with lectin binding sites			
		Amphids		"Excretory" system	
		Con A	WGA	Con A	WGA
N-Glycosidase F	35	35 (100)	–	21 (60.0)	–
Sodium phosphate, pH 7.2	35	35 (100)	–	27 (77.1)	–
Trifluoromethanesulphonic acid	30	4 (13.3)	6 (20.0)	0	0
Water	30	30 (100)	30 (100)	14 (46.7)	2 (6.7)
Guanidine-HCl plus dithiothreitol	40	40 (100)	–	35 (87.5)	–
Tris-HCl, pH 8.0	40	40 (100)	–	16 (40.0)	–

glucosamine residues should have remained unaffected. The experiments with N-glycosidase F and trifluoromethanesulphonic acid thus indicate that the amphidial and "excretory" system secretions of *H. schachtii* males are composed exclusively of O-glycans.

According to Aumann and Wyss (1989), Con A (glucose/mannose specificity group) and WGA (N-acetylglucosamine specificity group) and the lectins from *Helix pomatia* and *Arachis hypogaea* (galactose/N-acetylgalactosamine specificity group) specifically bind to the amphidial secretions of *H. schachtii* males. The lectin from *A. hypogaea* also specifically bound to the "excretory" system secretions. Table 1 shows that, in contrast to previous observations (Aumann & Wyss, 1989), Con A bound to the "excretory" products, which may have been caused by an increased accessibility of internal Con A binding sites after the pre-incubation of nematodes with ultrapure water (Aumann, 1989). The variability of Con A binding to the "excretory" system secretions (Table 1) may be explained by the relatively small size of the "excretory" pore and by its variable position in specimens that had been fixed on microscopic slides. In summary, these data suggest that mannose or glucose, N-acetylglucosamine, and galactose and/or N-acetylgalactosamine are components of the amphidial secretion oligosaccharide chains, whereas the oligosaccharides of the "excretory" system secretions may contain galactose and/or N-acetylgalactosamine residues. Furthermore, as N-glycans do not seem to occur in the amphidial and "excretory" system secretions (Table 1), these monosaccharide residues may be components of O-glycans. This points to an unusual composition of *H. schachtii* O-glycans, since, in contrast to N-glycans (Kornfeld & Kornfeld, 1985), O-glycans usually do not contain mannose residues (Schachter & Brockhausen, 1989).

Human gastric mucus glycoproteins appear to be composed of four subunits linked together via disulphide bridges (Slomiany *et al.*, 1989). Using the guani-

dine hydrochloride plus dithiothreitol method, subunits were obtained from several mucous glycoproteins (Carlstedt *et al.*, 1982; Meyer, 1983; Carlstedt & Sheehan, 1984). This method did not affect the amphidial and "excretory" system secretions of *H. schachtii* males (Table 1), indicating that they are not composed of disulphide-linked subunits.

Acknowledgments

I thank Dr. Karin Petersen for providing the nematodes and the Deutsche Forschungsgemeinschaft for financial support (Au 100/1-1).

References

- AUMANN, J. (1989). Enzymatic effects on lectin binding to *Heterodera schachtii* (Nematoda: Heteroderidae) males. *Nematologica*, 35: 461-468.
- AUMANN, J. & WYSS, U. (1989). Histochemical studies on exudates of *Heterodera schachtii* (Nematoda: Heteroderidae) males. *Revue Nématol.*, 12: 309-315.
- BIRD, A. F., BONIG, I. & BACIC, A. (1988). A role for the "excretory" system in secretory nematodes. *J. Nematol.*, 20: 493-496.
- CARLSTEDT, I., KARLSSON, H., SUNDLER, F. & FRANSSON, L.-A. (1982). An insoluble mucin complex from rat small intestine. *Adv. expl. Med. & Biol.*, 144: 155-157.
- CARLSTEDT, I. & SHEEHAN, J. K. (1984). Is the macromolecular architecture of cervical, respiratory and gastric mucins the same? *Biochem. Soc. Trans.*, 12: 615-617.
- CUMMINGS, R. D., MERKLE, R. K. & STULTS, N. L. (1989). Separation and analysis of glycoprotein oligosaccharides. *Methods Cell Biol.*, 32: 141-183.
- EDGE, A. S. B., FALTYNEK, C. A., HOF, L., REICHERT, L. E. JR. & WEBER, P. (1981). Deglycosylation of glycoproteins by trifluoromethanesulfonic acid. *Analyt. Biochem.*, 118: 131-137.
- HILKENS, J., LIGTENBERG, M. J. L., VOS, H. L. & LITVINOV, S. V. (1992). Cell membrane-associated mucins and their

- adhesion-modulating property. *Trends biochem. Sci.*, 17 : 359-363.
- JANSSON, H.-B. (1987). Receptors and recognition in nematodes. In: Veech, J. A. & Dickson, D. W. (Eds). *Vistas on nematology*. Hyattsville, MD, Society of Nematologists : 153-158.
- KNOP, W. (1865). Quantitative Untersuchungen über den Ernährungsprozess der Pflanze. *Landw. Versuchsstat.*, 7 : 93-107.
- KORNFELD, R. & KORNFELD, S. (1985). Assembly of asparagine-linked oligosaccharides. *A. Rev. Biochem.*, 54 : 631-664.
- MEYER, F. A. (1983). Polymeric structure of a high-molecular-weight glycoprotein from bovine cervical mucus. *Biochem. J.*, 215 : 701-704.
- PLUMMER, T. H., JR., ELDER, J. H., ALEXANDER, S., PHELAN, A. W. & TARENTINO, A. L. (1984). Demonstration of peptide: N-glycosidase F activity in endo- β -N-acetylglucosaminidase F preparations. *J. Biol. Chemistry*, 259 : 10700-10704.
- REUTER, G., KELM, S. & SCHAUER, R. (1988). Chemistry and biology of cell surface glycoconjugates. *Acta histochem., Suppl.-Vol.*, 34 : 51-79.
- SCHACHTER, H. & BROCKHAUSEN, I. (1989). The biosynthesis of branched O-glycans. In: Chantler, E. & Ratcliffe, N. A. (Eds). *Mucus and related topics*. Cambridge, UK, The Company of Biologists : 1-26.
- SLOMIANY, B. L., MURTY, V. L. N., PIOTROWSKI, J. & SLOMIANY, A. (1989). Effect of antiulcer agents on the physicochemical properties of gastric mucus. In: Chantler, E. & Ratcliffe, N. A. (Eds). *Mucus and related topics*. Cambridge, UK, The Company of Biologists : 179-191.
- WRIGHT, K. A. (1983). Nematode chemosensilla: form and function. *J. Nematol.*, 15 : 151-158.

PLESIOROTYLENCHUS TRUNCATUS (SHER, 1964) N. COMB.
(NEMATA : HOPLOLAIMIDAE)

Pierre BAUJARD

*Muséum National d'Histoire Naturelle, Laboratoire de Biologie Parasitaire,
Protistologie, Helminthologie, 61, rue Buffon, 75005 Paris, France.*

Accepted for publication 14 september 1993.

Key-words : Nematode, *Plesiorotylenchus*.

Plesiorotylenchus Vovlas, Castillo & Lamberti, 1993 described in the Hoplolaimidae, is characterized by the continuous lip region with *i*) longitudinal striae radially disposed, *ii*) distinct rectangular labial disc, *iii*) no differentiated lip sectors. The type and only species is *P. striaticeps* Vovlas, Castillo & Lamberti, 1993. However, a second species could be placed in that genus.

Scutellonema truncatum Sher, 1964 was characterized by its "lip region conical, truncate, not offset, without annules; labial disc elevated, basal lip annule with six longitudinal striations" (Germani *et al.*, 1986). SEM photographs of the head (Figs 1 A, B and 2 A in Germani *et al.*, 1986) show a head pattern similar to that of *P. striaticeps*: lip region conical, continuous, labial disc prominent and rectangular, no transverse annulation, lip sectors not differentiated, presence of six faint, longitudinal, striae (one ventral, one dorsal, four submedian). This head pattern does not fit entirely with the emended diagnosis of the genus *Scutellonema* proposed by Germani *et al.* (1986).

S. truncatum head differs from that of *P. striaticeps* only by the absence of numerous longitudinal striations, only six of them being present, corresponding probably to the limits of the lip sectors.

This species therefore appears to represent an interesting transitional form between "true" *Scutellonema* species and *Plesiorotylenchus*. However, it appears closer to the latter genus by the head pattern and, consequent-

ly, it is proposed to transfer *S. truncatum* to the genus *Plesiorotylenchus* as *Plesiorotylenchus truncatus* (Sher, 1964) n. comb. *P. truncatus* differs from *P. striaticeps* by *i*) the shorter female body (0.5-0.8 vs 1.26-1.72 mm), *ii*) the shorter stylet (21-29 vs 45-50 μ m), *iii*) the greater diameter of the phasmid (1.8-3.7* vs 1-1.25** μ m), *iv*) the number of longitudinal striae on the head (6 vs 35-40), *v*) the absence vs presence of males.

References

- GERMANI, G., BALDWIN, J. G., BELL, A. H. & WU, X. Y. (1986). Revision of the genus *Scutellonema* Andrassy, 1958 (Nematoda: Tylenchida). *Revue Nématol.*, 8 (1985) : 289-320.
- SHER, S. A. (1964). Revision of the Hoplolaimidae (Nematoda). III. *Scutellonema* Andrassy, 1958. *Nematologica*, 9 (1963) : 421-443.
- VOVLAS, N., CASTILLO, P. & LAMBERTI, F. (1993). A new genus of Hoplolaiminae: *Plesiorotylenchus striaticeps* n. gen., n. sp. (Nematoda: Tylenchida). *Nematologica*, 39 : 1-11.

* Measured on the female paratype deposited in the Laboratoire de Biologie Parasitaire, Protistologie, Helminthologie, Muséum National d'Histoire Naturelle, Paris.

** Measured on drawing Fig. 2 in Vovlas *et al.* (1993).