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Short notes

PERMEABILITY OF CHEMOSENSILLUM-ASSOCIATED EXUDATES FOR LECTINS IN A PLANT-PARASITIC AND IN A FREE-LIVING NEMATODE

Jens AUMANN

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

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Nematode chemosensilla are thought to be in direct contact with the environment. Their dendritic nerve extensions are located in body pores. The pores are filled with glycoprotein exudates that are produced in gland cells. The paired amphids and the six inner labial sensilla in the head region and the paired phasmids and male spicule receptors in the tail region are thought to possess chemosensitive functions (Wright, 1980). An inhibition of chemoreception after nematode treatment with lectins has been reported for the animal-parasitic *Trichostrongylus colubriformis* (Bone & Bottjer, 1985) and for the free-living *Panagrellus redivivus* (Jansson & Nordbring-Hertz, 1984) and *Caenorhabditis elegans* (Jeyaprakash *et al.*, 1985). In these species, lectins are thought to inhibit chemoreception by binding to receptor molecules on the surface of dendritic nerve extensions of chemosensilla after they have diffused through the chemosensillum-associated exudates (Jansson, 1987). Lectins, however, had no effect on reception by males of the plant-parasitic *Heterodera schachtii* of the female sex pheromone (Aumann *et al.*, 1990).

The present investigation was performed to test possible differences in lectin permeabilities for chemosensillum-associated exudates of plant-parasitic and free-living nematodes. For this purpose, the diffusion through the exudates of the lectins from *Triticum vulgare* (WGA), *Helix pomatia* (HPA), and *Arachis hypogaea* (PNA) was examined for females of *P. redivivus* and males of *H. schachtii*.

Materials and methods

P. redivivus was reared under axenic conditions in a liquid medium containing 2 % (w/v) liver extract (Difco) and 4 % soya peptone (Oxoid). *H. schachtii* was reared as described by Aumann and Hashem (1993). The TRITC (tetramethylrhodamine isothiocyanate) – labelled lectins WGA, HPA and PNA were purchased from Sigma. After the nematodes had been washed three times with phosphate buffered saline, pH 6.8, they were incubated for 24-25.5 h with the different lectins (100 µg/ml) at room temperature in the dark. Shorter incubation times made the observation of lectin binding to *P. redivivus* exudates in amphidial and phasmidial canals and in the corresponding receptor cavities more difficult or even impossible. The specificity of lectin binding has not been tested because it was not of interest in these experiments. The experiments were performed three times with a total of at least 51 and up to 60 nematodes tested for each species/lectin combination. Lectin binding sites were observed fluorescence-microscopically after the incubation as described by Aumann and Wyss (1989).

Results

There appeared to be structural differences between *H. schachtii* and *P. redivivus* (Table 1); phasmids were observed in *P. redivivus* but not in *H. schachtii*. Also, the amphidial and phasmidial canals in *P. redivivus* extended into receptor cavities which were absent from *H. schachtii*.

The lectin binding studies (Table 1) showed that WGA, HPA and PNA bound to the surface of the amphidial exudates in *H. schachtii*, but only PNA bound to that of *P. redivivus*. In contrast to *H. schachtii*, all three lectins bound strongly to the exudates in amphidial canals in *P. redivivus*, but only WGA and HPA bound to the exudates in the cavities. The results for the phasmids of *P. redivivus* were similar to that for their amphids. A shedding was not observed during the lectin incubation.

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Table 1. Lectin binding sites on chemosensillum-associated exudates of *Panagrellus redivivus* females and *Heterodera schachtii* males.

Lectin	Nematode	No. of nematodes tested	Percentage of nematodes with lectin binding sites					
			Amphids			Phasmids		
			Apertures	Canals	Cavities	Apertures	Canals	Cavities
WGA	*P. redivivus*	57		93.0	86.0		94.7	98.2
	H. schachtii	60	100	0	0	–	–	–
HPA	*P. redivivus*	51		88.2	17.6	21.6	58.8	27.5
	H. schachtii	60	96.7	0	0	–	–	–
PNA	*P. redivivus*	58	10.3	87.9	0	25.9	69.0	0
	H. schachtii	60	96.7	0	0	–	–	–

Discussion

In both species examined lectins seem to have bound to chemosensillum-associated exudates. In *H. schachtii* males lectin binding to phasmidial exudates was not observed (Table 1). This is supported by Carta and Baldwin (1990) who found no phasmids in males of this species. In contrast, the lectins bound to phasmidial exudates in *P. redivivus* females.

The species differences in permeability of chemosensillum-associated exudates for lectins (Table 1) may give an explanation for opposing experimental data. According to Jansson and Nordbring-Hertz (1984), the chemoreception of *P. redivivus* was inhibited after an incubation with the lectin from *Limulus polyphemus* (LPA). Jeyaprakash *et al.* (1985) found an inhibition of chemoreception after treatment of *C. elegans* with LPA and the lectin from *Canavalia ensiformis* (Con A). The lectin from *Lens culinaris* (LCA) inhibited chemoreception of *T. colubriformis* (Bone & Bottjer, 1985). Conversely, Aumann *et al.* (1990) did not observe an effect of the lectins Con A, WGA, PNA, HPA and of the lectin from *Limax flavus* on *H. schachtii* male reception of the female sex pheromone. The lectin incubation times in the above-mentioned experiments were 25-100 fold shorter than that used in the present study for a reliable fluorescence microscopical visualization of lectin binding sites. Nevertheless it is supposed that in the present study a significant amount of lectins had diffused through the exudates of *P. redivivus* at the beginning of lectin incubation. In summary, the results support the hypothesis of Jansson (1987) that lectins can block chemoreception of *P. redivivus* by binding to membrane receptors of dendritic nerve extensions. Furthermore, the results indicate the occurrence of fundamental differences in the structure of chemosensillum-associated exudates between plant-parasitic and free-living nematodes.

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