# Responses of adult *Hirschmanniella oryzae* towards different plant roots

Anwar L. BILGRAMI, Irfan AHMAD and M. Shamim JAIRAJPURI

*Section of Nematology, Department of Zoology,*
*Aligarh Muslim University, Aligarh-202001, India.*

SUMMARY

Experiments were performed to study the host preference behaviour of *Hirschmanniella oryzae* and to observe the effects of plant root homogenate concentrations on the activity of *H. oryzae*. Attraction was tested in 0.5 % water-agar in Petri-dishes towards plant roots of cabbage, carrot, radish and onion either alone or in different combinations. The effect of 20, 40, 60, 80 and 100 % concentrations of the above plant root homogenates was observed on the activity (head movements/minute) of nematodes. Cabbage and carrot attracted most *H. oryzae* while onion the least. Similarly, homogenate concentrations of cabbage and carrot roots increased activity of nematodes but those of onion and radish suppressed it markedly. The results suggest that *H. oryzae* shows some degree of preference and attraction depends upon the host root, attractants and activity of nematodes.

RÉSUMÉ

*Réactions des adultes de* Hirschmanniella oryzae *envers différentes plantes hôtes*

Une série d'expériences a été réalisée pour étudier le comportement de *Hirschmanniella oryzae* envers différentes plantes hôtes et pour observer les effets d'homogénats de racines sur l'activité du nématode. L'attraction par les racines de chou, de carotte, de radis et d'oignon a été testée sur agar à 0,5 % dans l'eau, en boîte de Petri. Les effets de concentrations à 20, 40, 60, 80 et 100 % d'homogénats de racines des plantes précitées sur l'activité du nématode (nombre de mouvements de la partie antérieure par minute) ont été également observés. Le chou et la carotte attirent le plus *H. oryzae* et l'oignon le moins. De même, les homogénats de racines de chou et de carotte accroissent l'activité du nématode tandis que ceux d'oignon et de radis la suppriment de façon nette. Ces résultats suggèrent que *H. oryzae* montre un certain degré de préférence envers les plantes hôtes et que l'attraction dépend des racines de l'hôte, des substances attractives et de l'activité du nématode.

There is ample evidence to suggest that plant-parasitic nematodes accumulate around roots of host plants (Lownsbery & Viglierchio, 1960; 1961; Azmi & Jairajpuri, 1977; Prot & Van Gundy, 1981a; 1981b). Viglierchio (1961) found a correlation between plant attractiveness and its efficiency as a host in case of *Heterodera schachtii*. He *(l. c.)* also observed a strong attraction of *Meloidogyne hapla* juveniles towards a non-host (Kanota oat) and strong repulsion or weak attraction towards Merced Rye grass. There was no significant difference in the attraction of *Meloidogyne hapla* towards resistant and susceptible cultivars of alfalfa when tested separately but when compared simultaneously susceptible cultivars attracted more nematodes (Griffin, 1969). Lee and Evans (1973) found a strong correlation between the degree of attraction of rice seedling extract and its susceptibility to *Aphelenchoides besseyi*. Mathur and Prasad (1973), and Mohandas, Pattanik and Prasad (1979) observed the host range of rice root nematode, *Hirschmanniella oryzae*, on some commonly cultivated crops and weeds while Park, Han and Lee (1970) studied its behaviour towards different varieties of rice. The attraction and factors influencing the migration of *H. oryzae* towards cabbage roots was studied by Bilgrami (1983) and Bilgrami, Ahmad and Jairajpuri (1985).

In the present work, behaviour of adult *Hirschmanniella oryzae* (van Breda de Haan) was observed towards roots of cabbage *(Brassica oleracea* L. *var capitata);* carrot *(Daucus carota* L. *var sativus);* radish *(Raphanus sativus* L.) and onion *(Allium sepa* L.*)* singly and in combinations of two plants. The effects of different root homogenate concentrations of the above mentioned plants on the activity of *H. oryzae* have also been observed.

## Materials and methods

### HOST SELECTION BEHAVIOUR

The responses of adult *H. oryzae* were observed towards roots of cabbage, carrot, radish and onion singly and towards different combinations of two hosts. All experiments were carried out in 0.5 cm thick layer of 0.5 % water-agar in the presence of 1 cm long excised

roots of 4-6 day old seedlings (Bilgrami, Ahmad & Jairajpuri, 1985). The roots before being excised were surface sterilized with 0.1 % mercuric chloride and the nematodes with 0.01 % mercuric chloride solution. All experiments were carried out at 25 ± 1° and replicated five times unless mentioned otherwise. Controls were run without roots.

ATTRACTION TOWARDS SINGLE HOST ROOT

Two experiments were performed to test host preference behaviour of *H. oryzae*. In the first 7 cm diameter Petri-dishes were marked at the bottom into seven equal zones of 1 cm width. These zones were numbered as 1, 2... and 7 (Fig. 1). The roots were placed in zone 1 of the Petri-dishes and left for 12 h after which twenty-five

ATTRACTION TOWARDS DIFFERENT HOST ROOT COMBINATIONS

As above, attraction towards different root combinations was studied in Petri-dishes marked at the bottom into seven zones (Fig. 1). An excised root of one host was placed in zone 1 and that of the other in zone 7 and left for 12 h before fifty adult nematodes were introduced in zone 4. The distribution of nematodes was recorded after 4 h. The following combinations of host roots were used : cabbage and carrot; cabbage and radish; cabbage and onion; carrot and radish; carrot and onion and onion and radish.

ACTIVITY IN ROOT HOMOGENATE CONCENTRATIONS

Twenty grams of roots of 4-6 day old seedlings

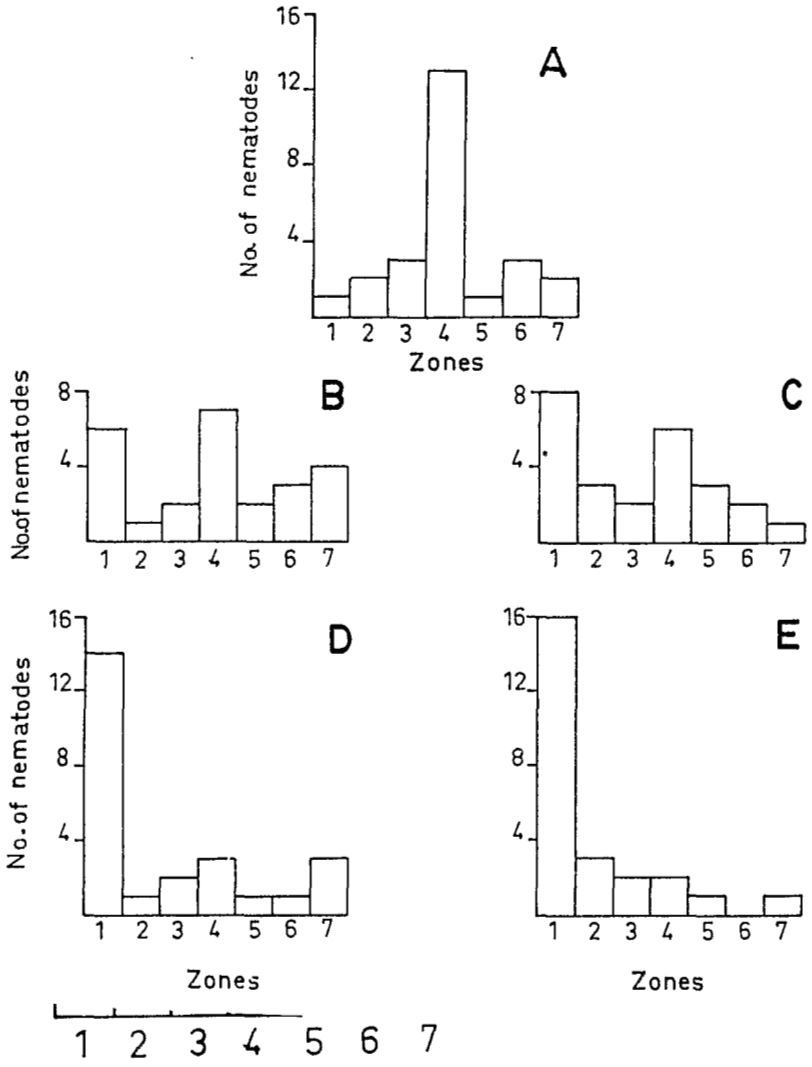


Fig. 2. Attraction of adult *H. oryzae* towards different plant roots. A : without roots; B : onion; C : radish; D : carrot; E : cabbage.

ATTRACTION TOWARDS DIFFERENT HOST ROOT COMBINATIONS (Fig. 5)

In combinations of cabbage and onion and cabbage and radish, *H. oryzae* was attracted more towards cabbage than other plant roots ($p < 0.05$) (Fig. 5, C & D) but in the combination of cabbage and carrot there was no significant difference in the attraction ($p > 0.05$) (Fig. 5, B). The roots of carrot when placed in the combination of radish (Fig. 5, E) and onion (Fig. 5, F) attracted significantly more *H. oryzae* than the latter two plants ($p < 0.05$). The differences in the attraction of nematodes in combination of radish and onion were insignificant ($p > 0.05$) (Fig. 5, G). In the absence of

ACTIVITY IN ROOT HOMOGENATE CONCENTRATIONS (Fig. 6)

All concentrations of cabbage root homogenate appeared favourable for *H. oryzae*. The homogenate of 60 and 80 % stimulated activity most and the increase in activity from 2 to 12 h was significant ($p < 0.05$) (Fig. 6, A). 20, 40 and 60 % concentrations of carrot appeared to be more suitable for nematodes ($p < 0.05$). The 80 and 100 % concentrations seemed unfavourable (Fig. 6, B). All concentrations of radish and onion suppressed the activity of nematodes (Fig. 6, C & D). No activity was observed in 100 % solution of radish and onion root homogenate. The nematodes became immobile after 6 h

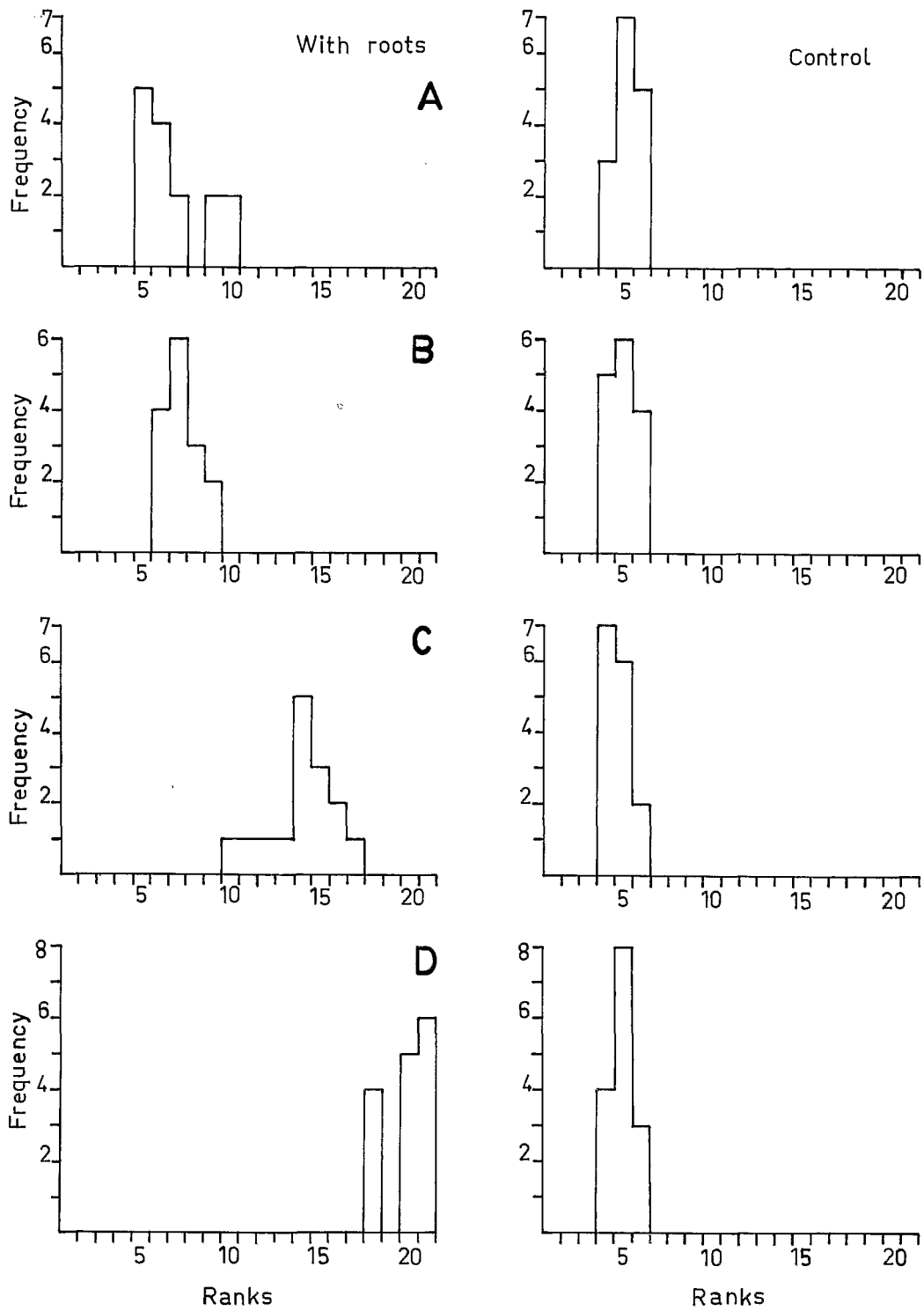


Fig. 3. Distribution of adult *H. oryzae* in presence and absence of different plant roots. A : onion; B : radish; C : carrot; D : cabbage.


occur in *H. oryzae* adults. The maximum attraction towards cabbage and least towards onion roots as well as enhanced activity in different concentrations of cab-

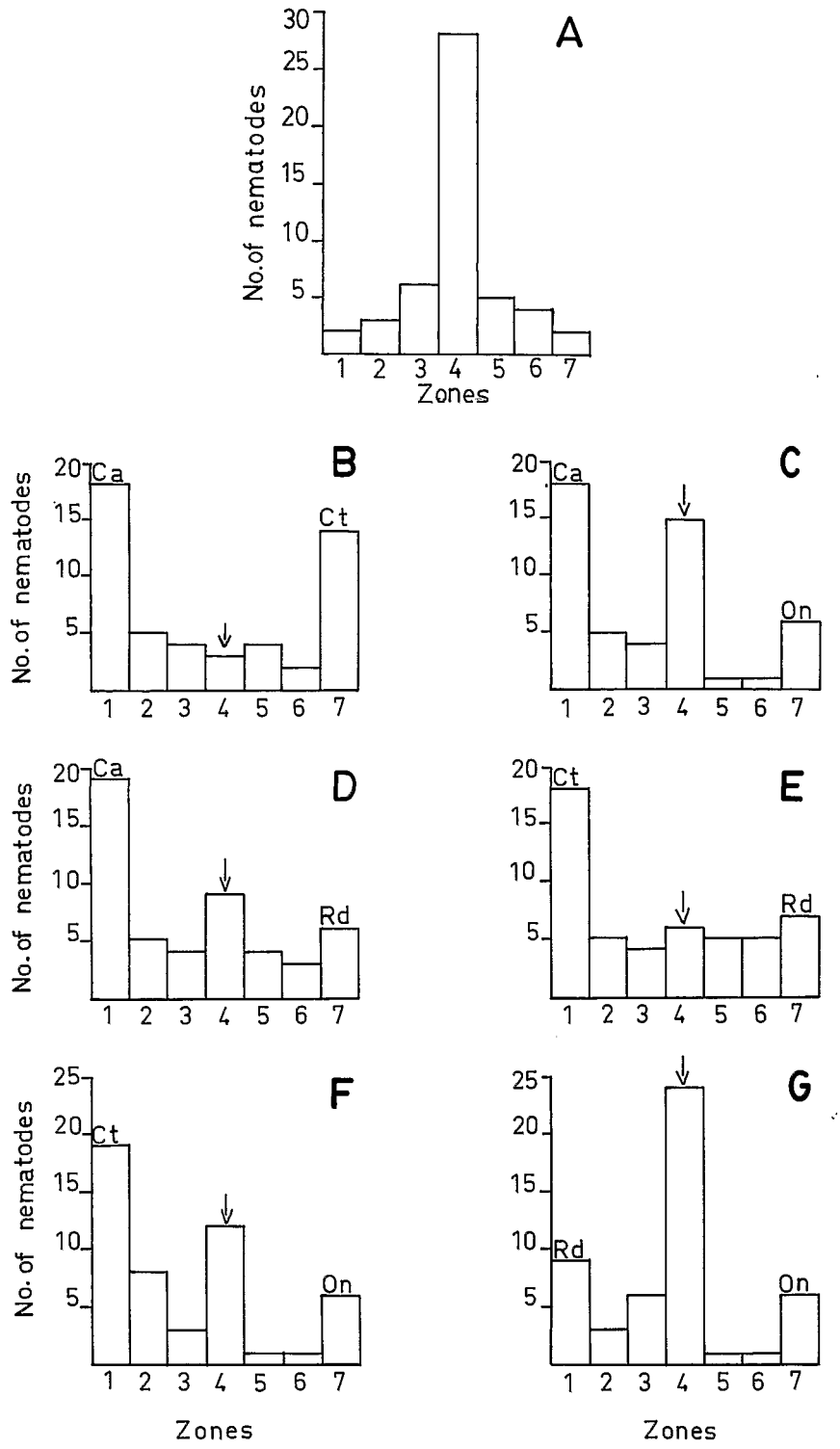


Fig. 5. Attraction of adult *H. oryzae* towards plant roots in combinations. A : without roots; Ca : cabbage; Ct : carrot; Rd : radish; On : onion *(Arrows indicate point of introduction of nematodes).*

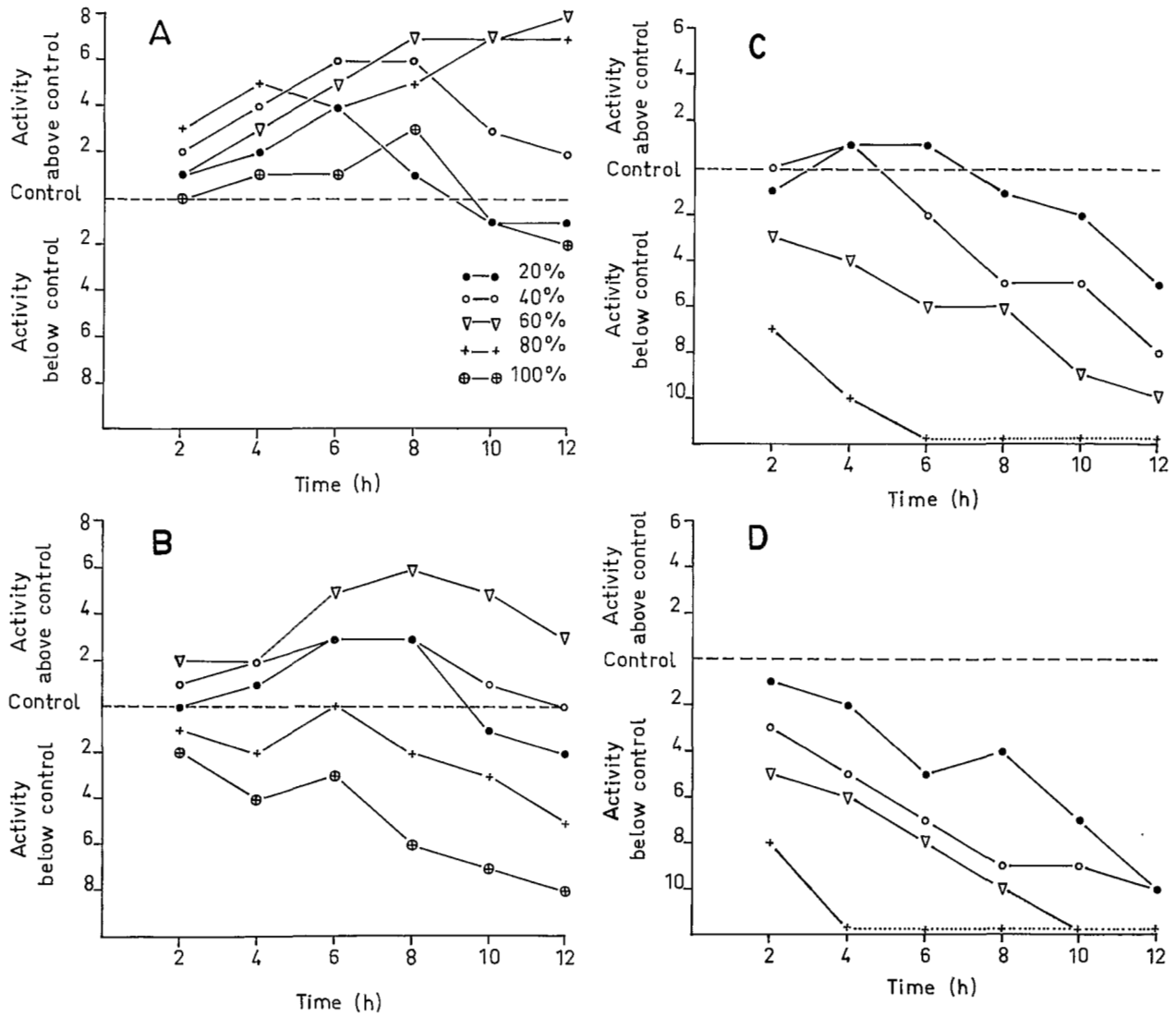


Fig. 6. Activity of adult *H. oryzae* in different concentrations of plant root homogenates. A : cabbage; B : carrot; C : radish; D : onion.


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