MECHANISM OF LOCOMOTION IN *HOPLOLAIMUS INDICUS* AND *HELICOTYLENCHUS INDICUS*

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The locomotory behaviour of adults and juveniles of *Hoplolaimus indicus* and *Helicotylenchus indicus* was studied in the presence of the host (directional stimulus). The movement of the two species of nematodes accelerates as they approached the host. The behavioural mechanism responses by which they increase their velocity differed. The response of attraction was also variable in both the species and also between the adults and the juveniles of the same species.

The mechanism of attraction of phytoparasitic nematodes to their hosts is a complex phenomenon manifested by a series of changes in their posture during locomotion. The mechanical significance of the basic structure of nematodes in locomotion was first recognized by Harris & Crofton (1957). Gray (1953) and Gray & Lissmann (1950 and 1964) have clearly explained the biophysical mechanisms involved in the undulatory propulsion of animals. The mechanism of movement in some species of nematodes was studied by Wallace (1968 and 1969). The attraction of plant parasitic nematodes towards their hosts under the influence of root diffusates was observed by Bird (1962), Sandstedt et al. (1961), Viglierchio (1961), Wallace (1958 and 1969) and Croll (1967). Nematodes, when placed in water-agar, inscribe tracks on the surface of this medium. The tracks are characteristic for a particular species and may even differ in different stages of the life cycle of a single nematode species (Croll, 1973).

In the present paper, locomotion in two species of nematodes, *Hoplolaimus indicus* Sher and *Helicotylenchus indicus* Siddiqi were studied. The characteristics of the waves formed along the path of movement were studied in adults and juveniles of the two species under the influence of the host (tomato, *Lycopersicon esculentum* L.) which acts as source of attraction.

**MATERIALS AND METHODS**

The nematodes were extracted by a modified Baermann funnel technique. Water-agar 2% was poured into four petri-dishes of 3.5 cm diameter and were kept in an incubator maintained at 20° for 4 hours. Three circles of 3, 2 and 1 cm radius from the centre of the petri-dish were drawn on the bottom of the petri-dishes giving the regions *a, b* and *c* respectively. Surface sterilized tomato seeds were grown in water-agar. Afterwards, 4-5 day old actively growing tomato seedlings were placed in the centre of each of the petri-dishes. Adults and
juveniles of *Hop. indicus* and *Hel. indicus* were placed in separate petri-dishes near the periphery. Before taking observations, the dishes were again kept at 20° for 24 hours. The tracks formed by the nematodes of the two species on the agar during locomotion under the influence of the host were drawn separately in each of the three regions (a, b and c).

The rate of movement of the nematodes was recorded during steady motion with a stop-watch. The two velocities, i.e., the velocity along the axis (Va), and the velocity along the track (Vt) were estimated for the two species separately and their mean value was calculated. The mean values of wave frequencies N (wave/minute), wave per body length η, wave length λ, amplitude α, of the waves were also measured (Fig. 1). The mean value of radius of the circles formed by the waves (R), and the angle (A’) formed by the waves at the centre were measured. The number of crossings along the path of movement during locomotion in each region of the petri-dishes were noted.

**DIRECTION AND CROSSINGS OF THE TRACKS**

Some of the tracks in a and b regions show deviation from a straight path, but in the region b and c the direction of the tracks is towards the centre. In the region a the tracks show that the nematodes start from the periphery where they were initially introduced and may re-enter this zone once they begin to move. The tracks formed by nematodes show many turns in the region c approximately 2-4 mm around the roots.

The number of crossings along the tracks in the region a is greater than those in region b and c (Fig. 2). These observations suggest that the nematodes change their wave pattern as they approach the root.

*Angular deviation:* The deviation from a straight line is called angular deviation. Most of the tracks consist of arcs, formed by muscular contraction of one side of body. The radius R of the arcs of the circles and its subtending angle A’ at the centre were measured and their mean values were calculated. In general, the value A’ increases with the increase in distance from the roots (Fig. 2).