THE BEHAVIOUR OF LARVAE OF HETERODERA SCHACHTII ON NITROCELLULOSE MEMBRANES

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Although there has been considerable study of the behaviour of fungal pathogens on host cell wall imitations, no record has been found of such a study with any nematode. To achieve passage by force through a cell wall, it has been shown that a pathogen must first be firmly anchored. In fungi, anchorage is obtained by adhesion between the wall of the pathogen and that of the host cell, and passage through the latter follows with or without the softening of the wall by enzyme action.

LINFORD (1942), describing the entry into roots of the root-knot nematode, wrote “a larva thrusts its stylet chiefly when its body is so braced that it may hold its head firmly against a resistant surface”. He made no mention of how such bracing was achieved. In entry of Schistosoma mansoni (Cestoda), into mammalian skin described by GORDON & GRIFFITHS (1951) and GRIFFITHS (1953), the adhesion of the cercariae was obtained by the anterior suckers. GRIFFITHS (1953) wrote “the cercaria with tail attached, makes its attack upon the stratum corneum at right-angles to the skin surface, and by mechanical body and tail movement, assisted by material ejected from the anterior cephalic glands, creates a minute puncture in the stratum corneum”. It would appear that suction was the means for the essential adhesion (or anchorage) in S. mansoni, and that penetration was achieved by a combination of enzyme action and body movement. The latter was rapid and from side to side. There was also a considerable elongation of the body.

In H. schachtii, the means of adhesion are unknown, but the back thrust to mechanical penetration (i.e. LINFORD’s “body is so braced”) might be taken up either by the surface tension of the water film, or by the inertia of the soil particles around the roots. No reference has been found in the literature to suction between the fused lips and the root surface. The object of the present study was to find out how an eelworm larva penetrates the outer cell wall of the root apex.
METHODS

The type of nitrocellulose used was Messrs. I.C.I. H.L. 30/40. The stock solution was 0.4% in 9/91 : alcohol/ether. Paraffin wax/m.pt. 52°C was dissolved at the rate of 0.5% in ether. The parent solution for making membranes contained 2 ml of nitrocellulose, 3 ml of 9/91 : alcohol/ether and 0.7 ml of ether, with or without wax. The two types of membranes were made on a perfectly clean level glass plate by dropping three drops of this mixture from a pipette held vertically one inch above it. Such a volume of solution spread to cover a circle of about 3 cm in diameter. After evaporation of the solvents, this had a rim of about 1 mm in width, and within it an even film, coloured blue by reflected light. The thickness and therefore the colour of the membrane could be varied by altering the amount of nitrocellulose. After evaporation the glass plate was momentarily immersed in water. Any drops of water present were shaken from the surface of the membrane which was then gently floated off on to water. At this stage selection of membranes was rigorous. Only those truly circular with a diameter of 3 cm and coloured blue were kept. Van Tieghem cells (DICKINSON, 1949), were modified for testing the behaviour of larvae on such membranes. They had the membrane as a horizontal partition, thus dividing them into two compartments. Distilled water only was used in the lower compartment. The rings comprising the cells were fastened together with vaseline.

The larvae used were freshly hatched. After repeated centrifuging and decanting, they were suspended in distilled water. The angle of contact between the drop of larval suspension and a wax-free membrane was low, i.e. below 70°, therefore the membrane surface was hydrophilic. The angle of contact between the suspension and a membrane containing wax was high, i.e. about 120°, therefore this membrane surface was hydrophobic.

EXPERIMENTAL EVIDENCE

In Van Tieghem cells, the larvae wriggled along the membrane surface, and only left it under the conditions described below. Larvae moving freely in a film of water less than their own diameter have not been observed attempting to fasten themselves to the membrane. Recently WALLACE (1958) has shown that a maximum speed was attained in a film of 2-5 μ in thickness. On a hydrophilic surface larvae at the edge of a liquid drop have been seen to make unsuccessful attempts both