FEEDING BEHAVIOUR AND PATHOGENICITY OF XIPHINEMA INDEX ON GRAPEVINE ROOTS

BY

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The feeding behaviour of Xiphinema index on grapevine roots in agar was studied with different observation chambers. The nematodes fed on excised roots preferring the zone of elongation of growing rootlets, then just emerging rootlets, callus tissue developing from cuts, wounds, and, last, slightly lignified tissue. The cell wall is perforated by a twisting action of the nematode’s odontostyle. Soon after perforation, rhythmic contractions of the basal oesophageal bulb occur at a rate of about 70 contractions per 30 sec. On each contraction the bulb is stretched and the oesophageal lumen is dilated. Upon muscular relaxation the bulb shortens again and the lumen narrows from front to back thus forcing food into the intestine. Pumping is usually intermittent. The length of the period nematodes stay at one feeding site can vary from several minutes to several days. Root areas already fed on strongly attract the nematodes so that crowding often results at single sites. Attacked roots turn brown and swell at the tips. Epidermal and outer cortical cells collapse at feeding sites and show necrosis. In growing roots multinucleate cells, which are considerably enlarged and contain dense cytoplasm, are formed beneath the layer of necrotic cells. The development and significance of these modified cells is not yet clear.

Since Hewitt et al. (1958) showed that Xiphinema index transmitted the grapevine fanleaf virus, this nematode species has attracted much attention. The account given in the literature of the feeding habits of Longidoridae has recently been revised by Wyss (1975a) and that of the host-parasite relations by Cohn (1975). In spite of the observations published so far, detailed information on feeding and pathogenicity is still lacking. The present study was undertaken to fill some of these gaps.

MATERIALS AND METHODS

Feeding behaviour. Excised roots from grapevines (Vitis vinifera var. Müller-Thurgau) were kept in observation chambers (Wyss, 1971) in 0.5% water agar. To reduce the growth of microorganisms no nutrients were added. No attempts were made to work under aseptic conditions. When new rootlets formed, after 8-10 days, one and ten individuals respectively of X. index were placed on the agar near roots. Nematodes and roots were rinsed several times in deionised water before placing in the agar. After inoculation the chambers were sealed with parafilm and kept in an incubator at 24°. The cultures were checked daily, in some series twice or three times a day, under the microscope, and the behaviour of the nematodes and the visible reaction of root tissue recorded. The nematodes,
originating from a vineyard near Boppard/Rhine and from the Scottish Horticultural Research Institute, Dundee, were reared in the greenhouse on virus-free grapes and on fig, and handpicked for each experiment. Usually the nematodes were observed for 4-6 weeks before parts of the roots began to decay; exceptionally they were kept for several months.

Pathogenicity. In order to determine the actual feeding sites of *X. index* on growing roots of grapevines (var. Müller-Thurgau) for later histological examination, the method illustrated in Fig. 1 was applied. A cutting (1) with a well developed root system was at first held above a plastic beaker (2) of 95 mm diam. and a single rapidly extending white root was carefully led through a small hole burnt near the base of the beaker. The beaker was then filled with sterile sandy soil and covered with aluminium foil (3). Afterwards a glass tube (4) of 7 mm diam. was slid over the root and carefully inserted through the hole into the soil of the beaker. The tip of the root, jutting out, was washed several times with sterile water. Then the other end of the glass tube was introduced into a plastic Petri dish (5) through a hole that was first burnt with the heated end of the same tube. The two holes through which the glass tube was inserted were sealed with vaseline (6). Distilled water-agar (0.6%), cooled to about 35 °, was later poured over the root that led into the Petri dish. Immediately afterwards sterile sand particles, not exceeding 1 mm diam., were finely scattered over the agar and allowed to settle to the bottom of the Petri dish. Sand was added as

![Fig. 1. Method used for observations of the feeding sites of *X. index* on extending *Vitis vinifera* roots (see text). 1: Young plant; 2: Plastic beaker; 3: Aluminium foil; 4: Glass tube; 5: Petri dish; 6: Vaseline; 7: Extending root, growing in aqua dest.-agar; 8: Piece of cardboard; 9: Wooden block to support the observation chamber.](image-url)