FEEDING OF LONGIDORUS CAESPITICOLA ON RYE-GRASS, LOLIUM PERENNE

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The way Longidorus caespiticola fed on rye-grass roots was studied, using cinemicrography. Despite disturbing one another the nematodes often fed gregariously and mating was thereby facilitated. Root tips attacked previously were the preferred feeding sites and before penetrating them nematodes explored them only briefly. Full protraction of the stylet always preceded ingestion. Salivation was inferred from host responses, and characteristic contractions of the oesophageal bulb may assist saliva flow. The 'salivation phase' was interspersed with short bouts of pumping by which the nematodes apparently tested the suitability of food cells. They then either withdrew or proceeded to ingest by prolonged pumping with the oesophageal bulb. The mechanism of pumping is described and discussed. Feeds lasted up to about 6 hr.

Species of Longidorus seriously damage crop plants, both directly and as virus vectors (Hooper, 1973), but feeding mechanisms and behaviour in this genus are not well known, partly because most species are difficult to maintain under conditions favouring observation. In contrast, the feeding of several Xiphinema spp. has been studied in agar cultures, e.g. X. bakeri (Sutherland, 1969); X. brevicolle (Cohn, 1970); X. diversicaudatum (Fisher & Raski, 1967; Trudgill, 1976) and X. index (Fisher & Raski, 1967; Cohn, 1970; Cotten, 1973; Weischer & Wyss, 1976; Wyss, in litt.). Observations on feeding by L. africanus (Cohn, 1970) and L. elongatus (Wyss, 1970a) lack detail.

We watched L. caespiticola feeding on rye-grass seedlings growing on agar plates and examined phases of the feeding cycle. Feeding on wheat and barley seedlings was also seen. L. macrosoma and L. leptocephalus were difficult to maintain under similar conditions. We never saw L. leptocephalus feed and the few feeds of L. macrosoma on spring barley closely resembled those of L. caespiticola.

MATERIALS AND METHODS

Specimens of L. caespiticola Hooper, extracted by decanting and sieving (after Flegg, 1967) from soil of cereal fields at Shinfield, Berkshire, England, fed on roots of perennial rye-grass, Lolium perenne L., wheat, Triticum vulgare Host. and barley, Hordeum sativum Pers. growing in water agar in Petri-dishes. Nematodes could be watched through the base of the inverted Petri-dish at magnifications up to 200 × but, for more detailed observations and photography, higher magnifications and optically better chambers were needed. Our chambers were like those of Wyss (1973) except that we used rectangular coverslips (No. 1 or No. 2, 36 ×
70 mm) on the base of a 9 cm Petri-dish. A little washed, sieved sand (grains <0.5 mm) and 12 ml of 0.75% water agar delivered from a syringe, were spread over the coverslip and Petri-dish base. Two or three rye-grass seedlings, germinated 3-5 days earlier, were put in the agar above the coverslip to grow for one more day, at 18-22°, then about 50 fourth-stage juvenile and adult *L. caespiticola* were placed on the agar. After two or three more days a second 36 × 70 mm coverslip was laid on the agar above the seedlings and the first coverslip. Then the "sandwich" was separated from the surrounding agar with a knife, lifted out using a strip of photographic flat-film (emulsion removed) and placed in a brass holder with a rebated 33 × 67 mm aperture, to support the chamber 0.5 mm above the microscope stage. The nematodes were often disturbed by this procedure but most soon resumed feeding, and observation and recording could then begin. Between observation periods the chambers were stored on moist filter-paper wads in Petri-dishes but the nematodes usually stopped feeding after about a day. To analyse feeding, 300 m of 16 mm film were shot at 24 pictures per sec with a Beaulieu R-16 cine camera and a Zeiss W. L. microscope with Nomarski differential interference contrast illumination and × 16, × 40 and oil immersion × 100 objectives. The film was projected through an LW motion analysis projector and temporal and spatial measurements were made from tracings or from photographic copies of selected film frames.

RESULTS

Usually more than one day elapsed before *L. caespiticola* began to feed on rye-grass in culture and sometimes up to a week, on wheat or barley. On the cereals, especially wheat, feeding was usually delayed until lateral roots developed, which were preferred to the main root. Few nematodes fed at first, then more later, especially on root tips already attacked.

Figs. 1A, C show typical postures and feeding sites of *L. caespiticola* on root meristems. Nematodes rarely penetrated root caps or fully-differentiated regions and ingestion at such sites was never seen. The tips of main and lateral roots, and lateral root buds of rye-grass were attacked readily (Fig. 1C). Roots damaged by feeding up to 2 days previously and even those no longer growing were heavily attacked.

Nematodes adopted various postures while they fed. Sometimes they lay perpendicular to the root surface but, more commonly, the body was curved with the odontostyle sometimes sharply bent (Fig. 1B). Two or three nematodes could feed undisturbed at the same root tip but, with larger numbers, those feeding were liable to be disturbed or pushed away by newcomers. Often as many as five nematodes aggregated about lateral root tips and twenty about main ones. It was then difficult to see how many were able to ingest and for how long, but feeds seemed to be brief. Undisturbed *L. caespiticola* could feed at one site for about 6 hr. Most that were filmed at high magnification, for more than a few seconds at a time, were disturbed by the bright light needed (or its heat), whereas *Ditylenchus*