THE EFFECT OF *PRATYLENCHUS FALLAX* ON WHEAT, BARLEY AND SUGAR BEET ROOTS

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*Pratylenchus fallax* Seinhorst penetrated root tips, the region of root hair development and the junction of main and lateral roots of wheat, barley and sugar beet. Many tended to penetrate together at one site. In microbiologically sterile cultures, roots of sugar beet rapidly became necrotic: barley and wheat roots were damaged less and more slowly. Transverse sections of wheat roots showed that cells were severely damaged and collapsed before symptoms showed externally. The endodermis became thickened and discoloured in response to heavy attack. *P. fallax* reproduced better on roots of wheat and barley than on those of sugar beet.

*Pratylenchus fallax* occurs in barley fields in England (Corbett, 1970) and in orchards and meadows in the Netherlands (Seinhorst, 1968) but nothing is known of its biology. As it was associated with patchy growth of barley in sandy soils in England its effects on roots of wheat, barley and sugar beet in the absence of other microorganisms were studied.

MATERIALS AND METHODS

Roots of two varieties of barley (*Hordeum vulgare* L.) and one of sugar beet (*Beta vulgaris* L.) were grown on Carew & Schwarting’s (1958) basal medium, and two varieties of wheat (*Triticum aestivum* L.) on White’s medium (Mountain, 1955). Nematode behaviour was the same on one variety of wheat as on the other, and on one variety of barley as the other. To provide the roots, seeds were sterilised in 0.1 % mercuric chloride, washed in sterile water and placed on the agar. Roots more than 1 cm long were excised and placed individually on the appropriate agar medium in Petri dishes. Two cultures of *P. fallax* derived from single females were grown on lucerne callus on Krusberg & Blickenstaff’s medium (1964). From these, batches of 130 to 140 sterile, live adults and larvae were extracted (Webb, 1971) and pipetted in a little sterile water into separate Petri dishes near an excised root. The Petri dishes were incubated at 20-25 °C. In the tests, three roots of each host were inoculated with each nematode isolate and three not. Two wheat-root cultures became contaminated with microorganisms and were discarded: all other inoculated dishes remained uncontaminated. All three hosts were observed periodically, and transverse sections of infected wheat cv. Jufy were cut 10μ thick at weekly intervals for four weeks.
after inoculation. Sections were fixed first in FAA, then in osmic acid and stained of the slides with toluidine blue.

At the end of the experiment *P. fallax* were extracted from the roots and agar on the wheat, barley, and sugar beet respectively using Stemerding’s (1963) method.

**OBSERVATIONS ON ROOT CULTURES**

*Nematode behaviour.* The day after inoculation, more *P. fallax* were attracted to barley and wheat roots than to sugar beet roots. On all three hosts, nematodes clustered about root tips, the region of root-hair development and the junction of laterals with the main root. Many penetrated together at these points. Four days after inoculation most of the nematodes were at these sites, and within a week many were inside the roots near them. Twelve days after inoculation nematodes were still feeding on and through the root cap, at the junction of lateral and main roots, at the tips of emerging lateral roots and within the root hair zone. Most of the nematodes fed inside the roots, but a few were only partially embedded. In sugar-beet roots, nematodes fed for relatively long periods apparently without moving; one fed at the same site for a day and another for 2 days. Many nematodes and eggs were in barley and sugar-beet roots and on the agar alongside; many eggs but few nematodes were in the agar alongside wheat roots. There were many tracks in the agar along roots and at root tips. Seven weeks after inoculation many nematodes and eggs were in barley and wheat roots but few in the older parts of sugar-beet roots. Nematodes began to leave the older heavily infested parts of barley and wheat roots especially at main and lateral root junctions, and re-invaded healthy parts of roots towards the tip. In sugar-beet nematodes continued to leave parts of the root system where the brown discolouration was severe and to re-invade healthy roots towards the tip. This migration persisted in all three hosts until the experiment ended 10 weeks after inoculation.

*Root damage on barley and wheat*

**First week.** Five days after inoculation a brown diffuse patch was seen on the stele of a barley root where a lateral root emerged, but there was no visible reaction in wheat roots. Inoculated and uninoculated wheat had about 8 lateral roots; lateral root development in barley was very sparse. Transverse sections of inoculated wheat roots showed epidermal and cortical cells with broken walls (Fig. 1) and sometimes neighbouring cells had collapsed. The many nematodes that invaded the roots created cavities containing the remnants of cell walls in the cortex (Fig. 3). Nematodes were found in the large cells of the main root surrounding the base of lateral roots that they were penetrating.

**Second week.** Some roots of barley and wheat were discoloured slightly; one barley root tip had a microscopic lesion and some were irregularly swollen for about 5 mm behind the tip. The “collar” of epidermal cells of main roots sur-