Invasion of Sugarbeet Leaf Blades by Larvae of Heterodera schachtii[1]

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Although Polychronopolis and Lownsbery (1) found that *Heterodera schachtii* invaded the radicle, hypocotyl, and cotyledons of seedling sugarbeet, they observed no histological or cytological changes other than cellular death and disorganization. Ross (2) reported development of females and brown cysts accompanied by formation of giant cells and hypertrophy in leaves of white clover inoculated with *H. trifolii*. Steele (3) reported development and reproduction of *H. schachtii* on lateral roots of defoliated sugarbeet and on root slices of sugarbeet, red table beet, icicle and globe radish, turnip, and rutabaga. As part of an ongoing study of penetration and development of *H. schachtii* in its host plants, an experiment was undertaken to determine if the sugarbeet nematode would invade and develop in leaf blades of sugarbeet.

Cysts of *H. schachtii* collected from sugarbeet (*Beta vulgaris* L.) were placed in sugarbeet-root-diffusate for 10 d to induce hatching of second-stage larvae. Hatched larvae were washed in tapwater to remove the diffusate and used to inoculate 30-d-old sugarbeet plants. To prevent desiccation of larvae, a device (Fig. 1) was first attached to leaves. One end of the plastic tube (2 × 1.75 cm) was placed in contact with the adaxial leaf surface and ringed with stop-

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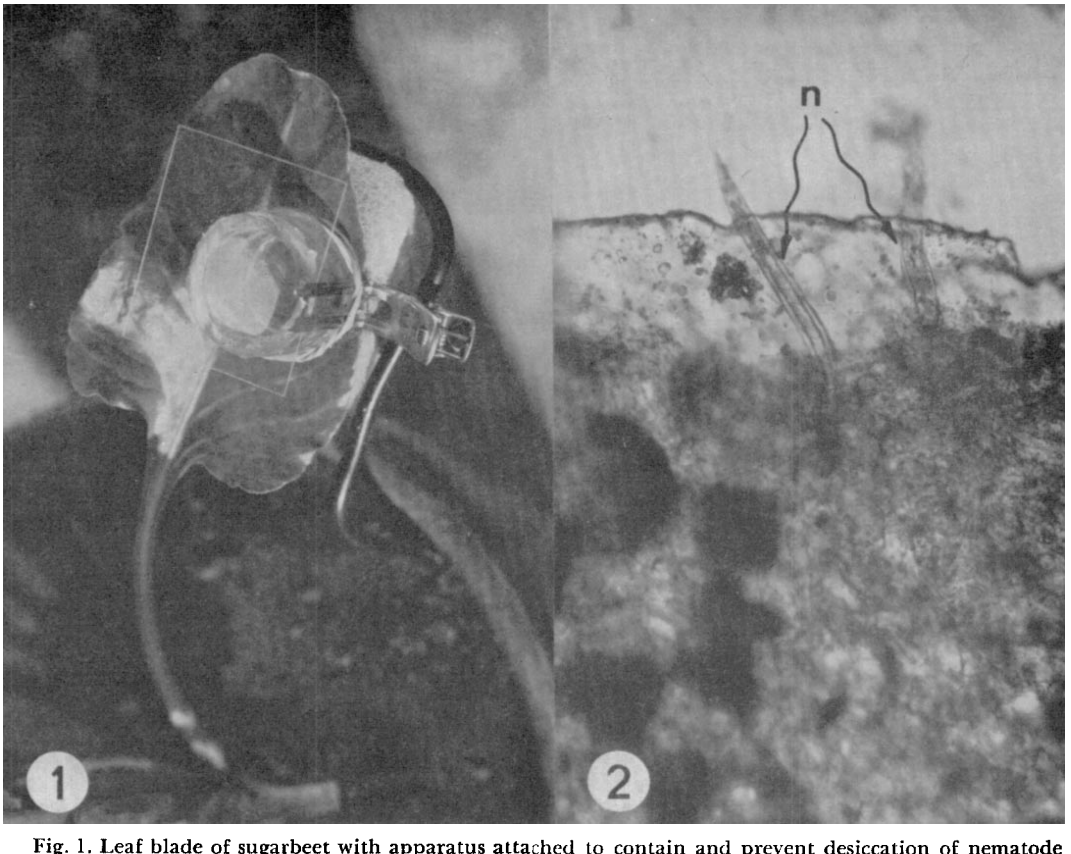

Fig. 1. Leaf blade of sugarbeet with apparatus attached to contain and prevent desiccation of nematode inoculum.

Fig. 2. Fragment of sugarbeet leaf dissected to reveal positions of invaded larvae (n) 8 d after inoculation.

cock grease to provide an air-tight seal. One hundred larvae in 1 ml of water were placed in the device and a cover slip sealed in position with stop-cock grease as shown. One leaf on each of six plants was inoculated and the attached apparatus was shaded from direct sunlight throughout the experiment. Air temperatures near the plant foliage ranged from 68 to 80 C.

Eight and sixteen days after inoculation, leaves of three plants were gently washed to remove larvae which had not penetrated. The inoculated area of the leaves were removed and fragments mounted on slides and examined with a microscope to ascertain if larvae had invaded the leaf tissues.

Two of the six leaf blades inoculated had second-stage larvae situated completely within leaf tissues. One leaf examined 8 d after inoculation contained three larvae and one examined 16 d after inoculation contained two larvae (Fig. 2). Although the larvae were actively moving within the leaf tissue, there was no indication of migration toward vascular tissues or the onset of the second molt or initiation of syncytia. This suggests that the foliage of sugarbeet is unsuitable for parasitism by *H. schachtii.*

The tough periderm which surrounds the storage root of sugarbeet normally restricts larval entry and parasitism to lateral roots (3). It is likely, therefore, that entry of *H. schachtii* larvae into plant tissues is primarily dependent upon the absence of a physical barrier to penetration. This study demonstrates that leaf blades of sugarbeet do not provide a barrier sufficient to completely prevent larval invasion.

LITERATURE CITED

1. Polychronopolis, A. G., and B. F. Lownsbery. 1968. Effect of Heterodera schachtii on sugar beet seedlings under monoxenic conditions. Nematologica 14:526-534.

2. Ross, J. P. 1960. Heterodera trifolii, a foliage pathogen on white clover. Phytopathology 50:866-867.

3. Steele, A. E. 1972. Development of Heterodera schachtii on large rooted crop plants and the significance of root debris as substratum for increasing field infestations. J. Nematol. 4:250-256.