GLASS-HOUSE AND LABORATORY STUDIES ON THE BIOLOGY OF THE NEEDLE NEMATODE, *LONGIDORUS ELONGATUS* 1)

BY

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Thirty-one plant species belonging to eleven botanical families were tested as possible hosts of *L. elongatus*. They included plants suspected as favourable for reproduction of the nematode, those which are known to be mainly infected with tomato black ring or raspberry ringspot viruses, or those immune to infection, and those used as virus assay plants or 'bait' plants to detect the presence of virus in the soil. There was, however, little connection between ability to support *L. elongatus* and susceptibility to the viruses it transmits. Strawberry, *Fragaria vesca*, was among the best hosts. *F. vesca* was subsequently used to study the life cycle of the nematode.

The hatching time of *L. elongatus* eggs reported here (9-12 days) agrees closely with that in most other plant parasitic nematodes reported by various investigators. On the other hand, the rate of multiplication of *L. elongatus* found in this investigation was low compared with that in the closely related species, *Xiphinema index*, studied by other investigators. Thus, while *L. elongatus* on *F. vesca* increased about 20-fold over 4-6 months, *X. index* on fig (*Ficus carica*) increased more than 1,000 times over a comparable period. This low rate of multiplication of *L. elongatus* is the product of both a low rate of reproduction (about 1 egg/week) and a slow life cycle (about 19 weeks from female to female), as also found here. Although *L. elongatus* reproduced relatively slowly, reproduction was found to be continuous and females were still reproducing at the end of the experiments (16-23 weeks), so that the total reproduction appears comparable to that in other plant parasitic nematodes. This is because *L. elongatus* persists for a long time in the soil.

There was little interest in the biology of *L. elongatus* until it was shown to be a vector of two plant viruses of economic importance to raspberry and strawberry crops in Scotland, namely tomato black ring (TBRV) and raspberry ringspot (RRV) (Harrison, Mowat & Taylor, 1961; Taylor, 1962).

Certain aspects of the biology of *L. elongatus* in relation to virus transmission have been studied but little is as yet known of its biology. The present investigation extends work done by Taylor (1967) on the host range of the nematode and also comprises some detailed investigation into its life cycle.

HOST RANGE

There is much circumstantial evidence to show that *L. elongatus* feeds, at least occasionally, on a very wide range of plant species and some evidence that a minority are favoured hosts for reproduction. For example, one or both of the viruses transmitted by *L. elongatus* have been found naturally infecting some 15

1) This work was done at the Scottish Horticultural Research Institute, Invergowrie, Dundee, Scotland.
different species. Observations by Taylor, Chambers & Pattullo (1965) and Taylor (1967) indicated that chickweed (Stellaria media (L.) Vill.), rye-grass (Lolium perenne L.) and strawberry (Fragaria ananassa Duch. and F. vesca L.) are species on which the nematode reproduces relatively freely. On the other hand, some of the raspberry varieties, even those susceptible to the viruses transmitted by L. elongatus, seemed to act as poor or non-hosts for the nematode. To gain more precise information on the host range of L. elongatus, a series of experiments was done in the glass-house using L. elongatus from Glendevon soil and a range of plant species.

Procedure and results

Glendevon soil from which the nematodes were to be used was kept stored either in polythene bags outdoors or in the glass-house in pots kept regularly watered and allowed to grow a crop of weeds. The mode of storage did not seem to affect the subsequent behaviour of the nematodes. Glass-house temperatures fluctuated around 20°C during the course of the experiments.

Experiment 1: An initial experiment was designed to compare the performance of L. elongatus on 15 different kinds of plant grown in each of four different potting media. Of the species used, Capsella bursa-pastoris (L.) Medic (shepherd’s purse) and chickweed are commonly virus-infected in the field; Spargula arvensis L. (spurrey) rarely so; Chenopodium amaranticolor Coste and Reyn., C. quinoa Willd., Lycopersicon esculentum Mill. (Kondine Red) and Nicotiana tabacum L. are commonly used as test plants for RRV and TBRV; Brassica rapa L. (Early Milan), Cucumis sativus L. (Lockie’s perfection) and Petunia hybrida Vilm. have often been used as ‘bait’ plants to detect the presence of RRV and TBRV in soils. Rye-grass and F. vesca, according to Taylor (1967), are species preferred by L. elongatus. Two varieties of raspberry were included, Malling Exploit which is susceptible to both RRV and TBRV and Lloyd George which is immune to the commonly occurring strains of these two viruses. The potting media compared were field loam (from a source free from L. elongatus), 1:1 mixtures of sand and field loam, sand and John Innes Compost (J.I.P.), or pure sand. Preliminary tests showed that more L. elongatus were recovered from small than from large containers over a given sampling time, possibly because smaller containers allowed quicker access of the nematodes to roots than larger ones. Therefore, 75 mm pots were subsequently used in preference to larger ones. Samples from smaller pots were also easier to handle. Seedlings were transplanted, one/pot, to batches of the pots filled with each of the potting media and grown on in the glass-house. Pots containing sand were watered with a mineral nutrient. Two weeks later samples of 50 L. elongatus, extracted from Glendevon soil by a simple hand sieving/Baermann funnel technique (Yassin, 1967), were added to each pot and to each of a set of 12 pots (four lots of three filled with each of the potting media) containing no plants. After a lapse of 12-14 weeks the pots were emptied, L. elongatus