THE EFFECT OF TEMPERATURE ON DEVELOPMENT AND GENERATION PERIODS OF *APHELENCHOIDES BESSEYI* 1)

BY

C. S. HUANG, S. P. HUANG & L. H. LIN

Plant Nematology Laboratory, Institute of Botany, Academia Sinica, Nankang, Taipei, Taiwan

Body length of *Aphelenchoides besseyi* Christie in second, third and fourth molts reared on *Fusarium solani* was found to fall into three consecutive but discrete ranges. The body length of the nematodes in the second molt remained within 225-375 µ under the temperatures tested (16-30°C), while that of the third and fourth molts respectively spread over broader ranges and varied slightly with temperature. When initial inocula consisted exclusively of adults, the percentage of juveniles in a particular age bracket in the population fluctuated with the age of culture. Body length of the second molt was employed to identify the juveniles in an age bracket which should be of second or third developmental stages. Based on the fluctuation curves, generation periods of the nematode reared on *F. solani* under 16°, 20°, 23°, 25°, 30° and 35° were estimated respectively to be 24 ± 4, 15 ± 2, 9 ± 2, 11 ± 2, 10 ± 2 and 8 ± 2 days. The optimum temperature for oviposition and hatching appeared to be 30°. At 35° the nematode failed to build-up its population, though oviposition, hatching and molting took place.

Studies on laboratory culturing, crop damage, control, bionomics and various other aspects of *Aphelenchoides besseyi*, the incitant of rice white-tip disease, have been reviewed by Ichinohe (1964). There appear to have been no studies on the development and multiplication of this nematode under controlled environment. Christie (1959) stated that under “favorable conditions”, the nematode “develops from egg to egg-laying female in about two weeks”. The so-called “favorable conditions”, however, were not clarified and neither was it indicated what experimental data the statement was based on. While preparing this manuscript, we learned, through an abstract, of Sudakova’s (1968) work in pot experiments on the effect of temperature on the life cycle of the nematode. Unfortunately, details of her work are not accessible to us.

This paper reports the results of our studies on the development and generation periods of rice white-tip nematodes *in vitro*.

MATERIALS AND METHODS

The experimental nematodes were the progenies of those initially isolated from infected rice kernels (Tai-ta No. 1) which were kindly donated by Lo-tung Agricultural Improvement Station, Taiwan.

The nematodes were surface sterilized with 0.1% HgCl₂ for 10 minutes followed by four thorough washings with sterilized water before being transferred

---

to cultural medium. To prepare the medium, *Fusarium solani* was grown on potato-dextrose-agar slants under room temperature seven days before being inoculated with the nematodes. The slants were almost completely covered with the mycelia by the time the nematodes were inoculated. To minimize variations in cultural medium between treatments, care was exercised to distribute an equal amount (12 ml) of the agar medium to each test tube and slants of uniform size were then made.

The nematode cultures were incubated under different temperatures in the dark. To harvest the nematodes, the entire contents of a test tube were removed and placed on a Baermann funnel. The nematodes thus obtained were killed with gentle heat (60°) and preserved in 2.5% formaldehyde for studies.

**RESULTS**

*Body length and developmental stages of the nematodes*

If an initial nematode inoculum consists of one developmental stage, the percentage of any age bracket in the population built up from such inoculum should theoretically fluctuate with time in a manner characteristic of the culture. The percentage of second-stage larvae in such a culture, for instance, if plotted against the age of culture, should reach a peak whenever the larvae hatch from eggs, since all the nematodes lay eggs more or less simultaneously. A percentage curve prepared according to such a system then permits one to estimate the generation period of a population from the distance between the two consecutive peaks.

To apply the aforementioned system, a convenient method of identifying developmental stages of the nematode is obviously essential, but characters to distinguish larval stages of *A. besseyi* are not yet known. Inasmuch as larval stages are designated with reference to molting processes, nematodes in the process of molting might show morphological characters useful in identification. Such nematodes were therefore hand-picked from various populations and their body lengths measured with a micrometer under a compound microscope. As shown in Fig. 1 the body lengths of nematodes in various molts in a population fell into three consecutive but discrete ranges, each with a distinct peak. This type of distribution is similar for populations reared under all temperatures tested, except 35°, at which only a few molting nematodes were found. The population kept at 35° failed to reproduce. The patterns in Fig. 1 were confirmed in a separate but identical experiment.

The three body-length ranges for the molting nematodes in each population (Fig. 1, except 35°) are interpreted, in increasing order, as measurements for the nematodes in second, third and fourth molts respectively.

Of 18,968 nematodes studied during this investigation, the vulva was visible in females above 550 μ and spicules in males longer than 525 μ. The measurements for these apparent adults correspond approximately to the body-length range of