FECUNDITY OF *APHELENCHUS AVENAE* BASTIAN*

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Little is known about the various factors that determine the rate of reproduction of plant parasitic and free-living nematodes. The available data on the life span of females, the number of eggs laid, and the rate of egg-laying are based on total egg counts from single females or rates of egg-laying over short periods. Assessment of egg production in migratory ectoparasitic plant nematodes is also technically difficult because, unlike sedentary endoparasitic nematodes, the eggs are deposited at random in soil. *Aphelenchus avenae* Bastian, 1865, although a parasite of higher plants (Chin and Estey 1966), is easily cultured on many fungi (Townshend 1964) and so offers a ready means of studying fecundity in migratory species.

Fourth-stage larvae of *A. avenae* were picked from a culture of *Rhizoctonia solani* Kuhn (strain 48) (Flentje, Stretton, and Hawn 1963) and placed on young cultures of the fungus. Four larvae were placed in each of five Petri dishes which were incubated at 27°C for 3 days, during which time moulting occurred; the nematodes were then transferred to new cultures of the fungus. Thereafter, each batch of four females was transferred to new fungal cultures at about 2-day intervals. The females were transferred in a small block of agar each time to prevent their being damaged. The Petri dishes, from which the females were removed, were placed in the incubator for 2 days to allow any eggs to hatch and then water was added for 24 hr to extract the larvae; this procedure was repeated for a further 24 hr. This population of *A. avenae* reproduces in the absence of males so that a need for copulation did not affect egg production.

The egg-production curve (Fig. 1) shows a skewed normal distribution. After moulting, 24 hr passed before the first egg was laid. The highest rate of egg production occurred almost immediately after laying commenced, each female producing on average approximately 21 eggs per day. However, the nematodes in different replicates varied in the number of eggs produced each day and in the time at which the highest rate occurred. Thereafter the number of eggs produced in each 2-day interval decreased and the last egg was produced between the twenty-fourth and twenty-sixth day.

There was considerable variation in the time of death of the females. This was judged by disintegration of the body contents. The first death was recorded on the eleventh day and the last on the thirty-second day, well after the last egg was laid. Towards the end of their life the females became sluggish and the usual small

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fat globules fused to become large, irregular globules. Some died with developing oocytes within their bodies; in some instances at least, the oocytes continued to develop and the larvae hatched within the dead female. Such larvae wandered within the female cuticle until they were able to escape.

The average number of eggs produced by each female was 199 but there was considerable variation in the total number (645–982) of eggs produced in each replicate by the four females. Generally, the faster the rate of production in the first 5 days, the higher the total number of eggs laid. These data represent only vaible eggs, as non-viable eggs (if any) would not be recovered by the extraction procedure.

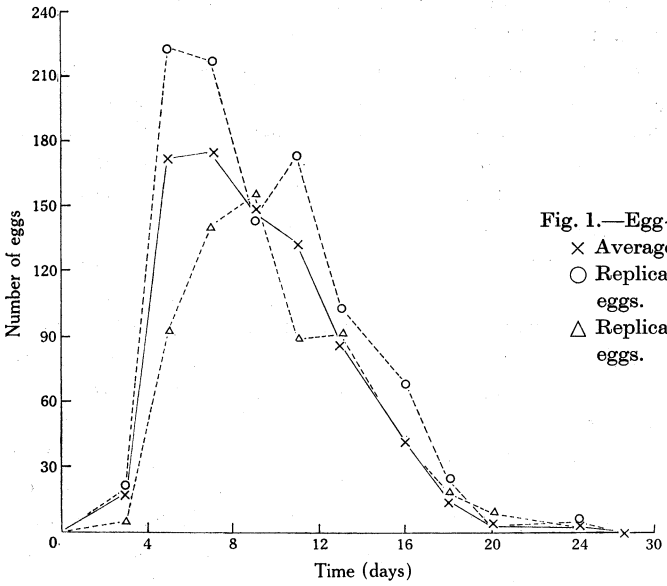

Fig. 1.—Egg-production curve of *A. avenae*.
× Average number.
○ Replicate with highest total number of eggs.
△ Replicate with lowest total number of eggs.

Discussion

Available information on fecundity of plant parasitic nematodes consists of estimates of the total number of eggs or of the number of eggs laid in a single day (Wallace 1963). The above data show that the rate of egg-laying changes with age so that rate has little meaning unless the age of the female is specified. Furthermore, in other experiments with individual nematodes, both rate of production and total number of eggs produced varied considerably between females so that data for rates and total numbers should have a sound statistical basis.

Embryological development to eclosion takes approximately 2 days at 27°C and development to the adult female takes about a further 4 days. Thus egg-laying in this nematode continues for approximately four times the span of the developmental cycle. In this experiment food was abundant, and with four females per Petri dish there was probably little influence of one nematode on another. Thus, conditions for egg-laying were probably optimal throughout the experiment and total numbers of eggs produced probably indicate the maximum for this population on this host.

References

CHIN, D. A., and ESTEY, R. H. (1966).—Studies on the pathogenicity of *Aphelenchus avenae* Bastian, 1865. *Phytoprotection* **47**, 66–72.

FLENTJE, N. T., STRETTON, HELENA M., and HAWN, E. J. (1963).—Nuclear distribution and behaviour throughout the life cycles of *Thanatephorus*, *Waitea*, and *Ceratobasidium*. *Aust. J. biol. Sci.* **16**, 450–67.

TOWNSHEND, J. L. (1964).—Fungus hosts of *Aphelenchus avenae* Bastian, 1865 and *Bursaphelenchus fungivorus* Franklin and Hooper, 1962 and their attractiveness to these nematode species. *Can. J. Microbiol.* **10**, 727–37.

WALLACE, H. R. (1963).—"The Biology of Plant Parasitic Nematodes." (Edward Arnold: London.)