ABNORMALITIES IN SECOND-STAGE LARVAE OF HETERODERA TRIFOLII GOFFART, 1932 (NEMATODA:HETERODERIDAE)[1]

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Abstract

Second-generation females of a cyst-forming nematode, *Heterodera trifolii* Goffart, 1932, from a mixed population of this species and the sugar-beet nematode, *H. schachtii* Schmidt, 1871, produced small, normal, giant, and abnormal second-stage larvae. The giant larvae averaged 670 μ in length, while the small larvae had an average body length of 404 μ. Abnormalities in the larvae occurred mostly in the tail development. It is suggested that the sperm of *H. schachtii* may have affected the normal chromosome complement of the *H. trifolii* oöcytes during oögenesis and was thereby responsible for the production of the different types of larvae recorded.

Introduction

Abnormalities in the head region of some second-stage larvae of two cyst-forming nematodes, *Heterodera schachtii* Schmidt, 1871, and *H. rostochiensis* Wollenweber, 1923, have been reported by Kampfe (3). Abnormalities in tail developments have as yet not been recorded.

The author (4) reported the occurrence of giant second-stage larvae in a population produced from second-generation females of the clover cyst nematode, *Heterodera trifolii* Goffart, 1932. These females originated from a mixed population of *H. schachtii* and *H. trifolii*. Further examination of the population in which the giant forms were found revealed the presence of both small and abnormally developed active second-stage larvae.

This report deals with the anatomical and relative size differences between normal, giant, small, and abnormal second-stage larvae of *H. trifolii*.

Materials and Methods

The method used to obtain the second-stage larvae was the same as that described by Mulvey (4). The active second-stage larvae were removed from the water in petri dishes, relaxed by heat, and subsequently mounted in lactophenol on glass slides. These were examined under the microscope and the dimensions were determined from camera lucida drawings of the specimens.

Anatomical Differences Observed

Abnormal Larvae

Abnormalities occurred mostly in the tail region. However, one specimen was found to be abnormally large in the area of the esophageal glands (Fig. 5), and the spear knobs of another were asymmetrically developed (Fig. 8, K).

Abnormalities in tail development ranged from double blunt tails (Figs. 7; 8, C, D) to tails with either very blunt or acute setoff termini (Figs. 6; 8, A, F, H), blunt terminus (Fig. 8, G), bluntly recurved (Figs. 4; 8, M), and

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abnormally curved tails (Fig. 8, P). However, as shown in Fig. 8, the head area and stylet were generally normal.

Giant Larvae

Some variation was found both in the head and tail areas of several giant second-stage larvae. The tail of one specimen (Fig. 8, Q) had a very blunt terminus, and the spear knobs (Fig. 8, R) of the same specimen were large and pointed.

Small Larvae

These were fairly common in the population examined. As shown in Table I, the body length was on an average considerably less than that of the normal second-stage larvae. Franklin (1) reported the body length of normal second-stage larvae of *H. trifolii* within the range of 491–504 μ. Hirschmann (2) found the range to be 443–547 μ with a mean body length of 496 μ.

Dimensions

TABLE I

Measurements of various types of *Heterodera trifolii* second-stage larvae from the same population

Type of larvae	Number of larvae	Average length and range	
		Body (μ)	Stylet (μ)
Normal (Fig. 3)	30	495 (450–520)	27.0 (25–29)
Small (Fig. 2)	10	404 (370–440)	23.2 (21–28)
Giant (Fig. 1)	17	670 (610–760)	31.7 (30–35)
Abnormal (Figs. 4–6)	10	435 (370–500)	25.3 (22–28)

Discussion

The abnormalities in the second-stage larvae of this species encountered in this study present features of interest from the cytological standpoint. The male sperm of *H. schachtii* is apparently capable of effecting a change in the normal chromosome complement of *H. trifolii* oöcytes during oögenesis. These changes are apparently responsible for the production of the various types of larvae recorded.

References

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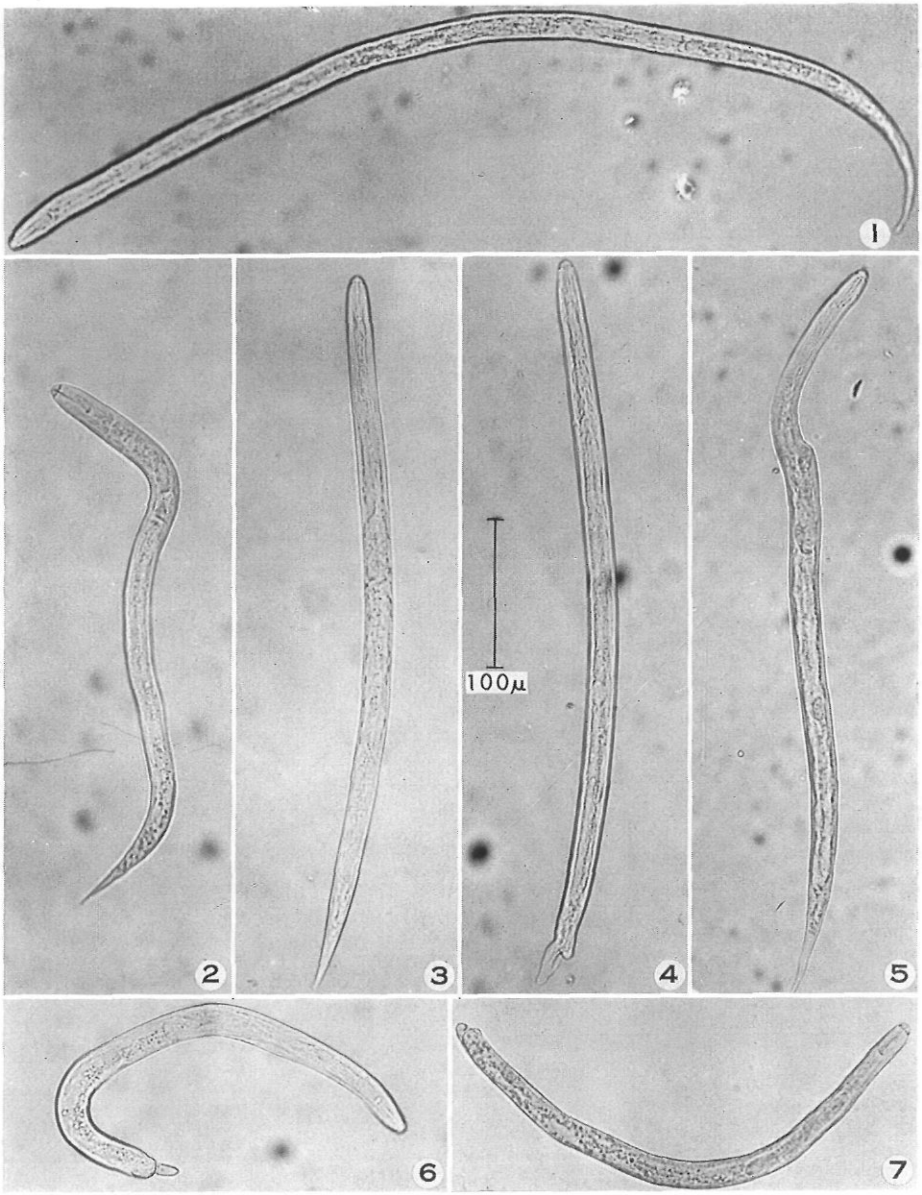

FIGS. 1–7. Photomicrographs of normal, small, giant, and abnormal second-stage larvae of *Heterodera trifolii*. All figures of the same magnification.

FIG. 1. Giant larva. FIG. 2. Small larva. FIG. 3. Normal larva showing acutely pointed tail. FIGS. 4, 6, and 7. Abnormal larvae showing variations in tail development and body length. FIG. 5. Abnormal larva showing abnormal enlargement of the body in the esophageal region.

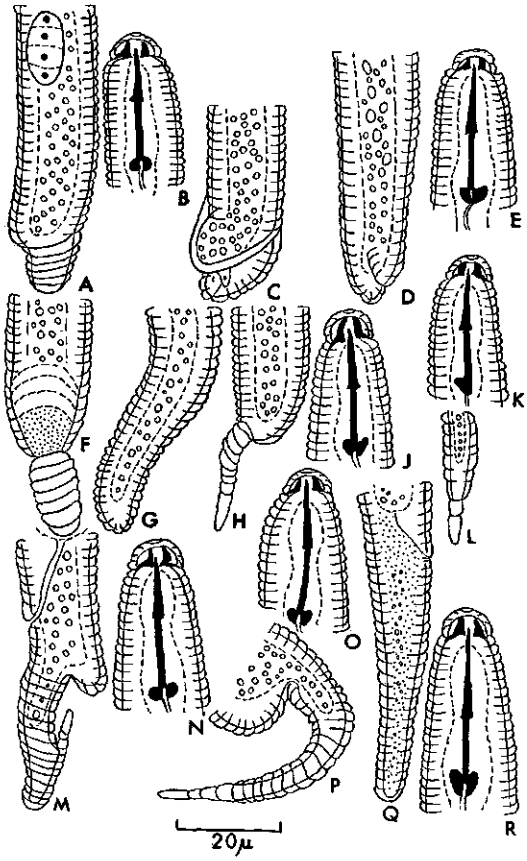

FIG. 8. Camera lucida drawings of heads and tails of various types of second-stage larvae of *H. trifolii*. All drawings of the same magnification.

A and B, head and tail of abnormal larva, the head is normal but the tail is blunt and underdeveloped; C, larva with double blunt tail and very small terminal process; D and E, larvae with normal head region and blunt double tail; F, larva with blunt, setoff terminus; G, larva with bluntly rounded tail; H and J, larva with acute, setoff tail terminus and normal head region; K and L, larva with underdeveloped stylet knob and short tail; M and N, larva with small acute tail terminus set off to dorsal side and with normal head region; O and P, larva with curved acute tail and normal head region; Q and R, giant larva showing very bluntly rounded tail terminus and long stout stylet shaft with large knobs.