HETERODERA, A READILY AVAILABLE SUBSTITUTE FOR ASCARIS IN DEMONSTRATING CLEAVAGE

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Most textbooks of general biology devote space to a discussion of cleavage of the fertilized egg as an important feature of reproduction. For demonstrating cleavage in its simplest form in the invertebrates the eggs usually chosen for illustration are those of *Ascaris*, a nematode parasitic in the horse, or certain of the Echinoderms such as the starfish, the sea cucumber, or the sea urchin. In an inland state the marine animals mentioned must usually be purchased from a biological supply house at a rather high cost. The parasitic round worm, *Ascaris*, is also rather expensive if purchased, and the average teacher of biology would probably find it inconvenient or impractical to attempt to collect fresh *Ascaris* for class use. Moreover the purchased materials have the disadvantages which always appertain to preserved material as compared with living material. There are doubtless many other invertebrates which are readily available and which are suitable for demonstrating cleavage.

The plant parasitic nematode, *Heterodera marioni* (Cornu) Goodey, has numerous advantages for this purpose. It may be easily collected at any time during the year and retained alive for several months in the refrigerator. The adult female worms are easily seen and removed to slides and each mature gravid female contains upwards of 500 eggs in all stages of development from the undivided egg to the hatched larva. The eggs are large, about 90 mu in length. They are holoblastic exhibiting total cleavage which is nearly equal. The nuclei are large and readily apparent in the living eggs. Features of the cleavage are brought out in Fig. 1.

Heterodera marioni causes the disease root knot of hundreds of species of plants in gardens and greenhouses. The disease is readily identified by the presence of numerous bumpy swellings on the roots of sickly plants. Such plants may be found very commonly where vegetables or ornamentals have been grown continuously on the same soil for several years. Greenhouse operators are familiar with the trouble and could easily supply material. Among the favorite hosts of the nematode are tomatoes, snapdragons, legumes of all kinds, watermelons, plants of the cabbage family, and peach trees. Plants of the grain and grass family are not attacked.

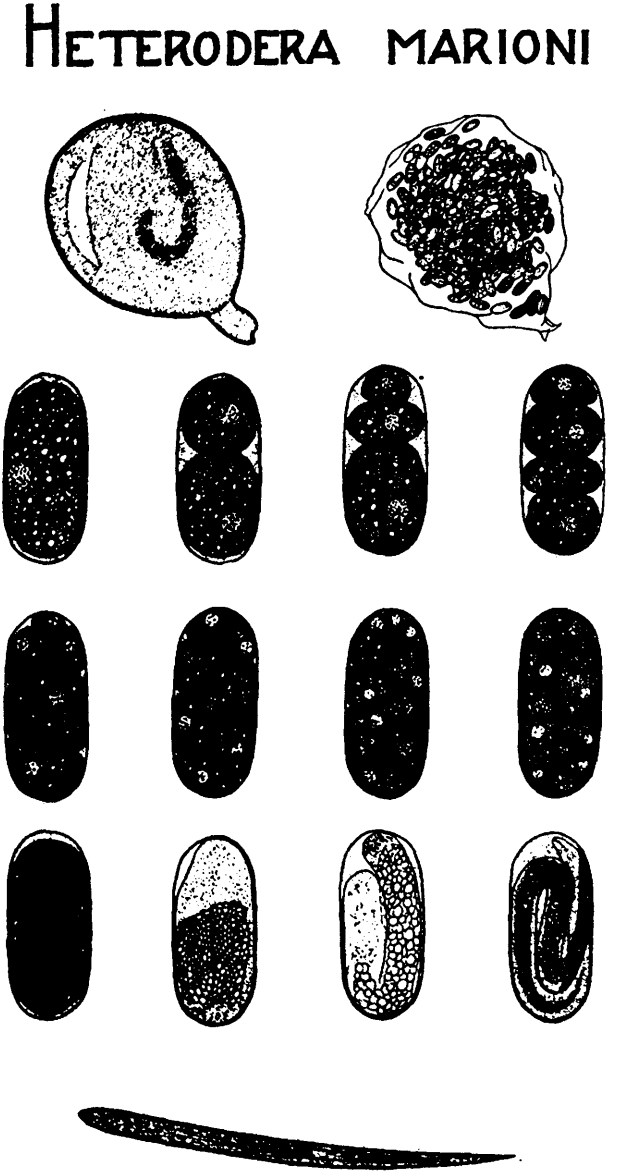

FIG. 1. Stages of the development of the root knot nematode, *Heterodera marioni*. Upper row: Left, immature female; right, mature degenerating female containing eggs in all cleavage stages and larvae. Second and third rows: Successive stages of cleavage. Fourth row: Left, blastula; left center, gastrula; right center, embryo; right, fully developed larva in egg; bottom, freshly emerged larva.