THE INFLUENCE OF TEMPERATURE ON THE SURVIVAL OF SOME SPECIES OF THE GENUS MELOIDOGYNE, IN THE ABSENCE OF A HOST 1)

BY

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Environmental temperature is important to a cold-blooded animal such as a nematode because of its direct influence on the nematode's growth and activities. NIELSEN (1949) found that the oxygen consumption of Mononchus papillatus Bastian 1855, was increased by a factor of 5.5 when the temperature was increased from 55.4 to 86° F. The level of activity dictated by temperature can become critical to a soil nematode in the absence of a food source. More precise knowledge than is available concerning these temperature relationships would be of value in estimating the duration of nematode infestations, and would help in the development of cultural control measures.

Several authors have considered the temperature relationships of rootknot nematodes prior to their revision by CHITWOOD (1949). CUNNINGHAM (1936) stated that winter conditions on Long Island with soil temperatures of 22° F. did not destroy or noticeably reduce the root-knot nematode infestation of potato plants. BESSEY & BYARS (1915) and GODFREY (1923) support Cunningham's contention by reporting that root-knot nematodes are known to maintain themselves in such cold winter regions as northern Indiana, Michigan, and Nebraska. NEWHALL (1934) however, cited a case where badly infested peat soils were found free of infestation following a period when air temperatures were —15° F. for 24 hours. FICHT (1939) was unable to demonstrate that root-knot nematode was capable of surviving the winter in northern Indiana. NEAL (1889) thought that root-knot nematodes could not establish themselves in a region where the soil was

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annually frozen at depths of 6 to 10 inches. These conflicting points of view indicated the need for additional work on this subject.

**MATERIAL AND METHODS**

Investigations on soil temperature influences on survival of root-knot nematodes were designed so that factors other than temperature were as near optimum as possible. Consequently, the soil used was a light sandy loam which had been sterilized to exclude possible nematode parasites, and soil moisture was maintained between 60-100% of moisture equivalent (hereafter abbreviated as M.E.) which in previous tests had proved to be the best moisture range.

*Meloidogyne incognita acrita* Chitwood, 1949, collected from southern California was the species mostly used, although *M. hapla* Chitwood, 1949 and *M. javanica* (Treub, 1885) Chitwood, 1949 were included for comparison. The eggs and larvae were tested separately to determine differences, if any, in survival between the two stages. Egg inoculum was obtained by picking off egg masses from galled roots and placing them on strips of moist filter paper. Larval inoculum was obtained by placing egg masses on pieces of gauze supported by a copper screen in a petri dish containing enough water to wet the gauze but not submerge it. In 3 to 4 days at room temperature large numbers of larvae could be collected in the water below the screen. Larval or egg inoculum was thoroughly mixed into soil contained in pint jars which were then transferred to constant temperature cabinets. Jars were sealed with polyethylene which allowed carbon dioxide and oxygen exchange with the atmosphere, but prevented moisture loss in excess of 10% of the original moisture level.

After an exposure period at a specific temperature, the soil was transferred to 4 inch clay pots, placed in the greenhouse, and planted with tomatoes. Five weeks later the roots of the tomatoes were examined and any galls present were counted. Gall counts were equated to surviving larvae or eggs. It is probable that this method did not give an exact survival count, but it was felt that it gave a reliable relative indication of survival, and also indicated whether or not the surviving nematodes were infective.

Two types of controls were used, the first estimated the viability of the inoculum by introducing the indicator plant into the soil immediately after inoculation (= viability check in Tables I-IV). The term control was only used in those experiments where infested soil was exposed to an optimum survival temperature alongside exposure to other tem-