J. Phytol. Res. 2(1), 1989

# EFFECT OF *MELOIDOGYNE INCOGNITA* ON THE GROWTH OF TOMATO PLANTS AND MORPHOMETRICS OF THE NEMATODE

**SHEILA SHAHAB, REKHA ARYA and S. K. SAXENA**
Botany Department, Aligarh Muslim University, Aligarh-202002, India.

Seedling of tomato cv. Marglobe were inoculated with single egg mas population of *Meloidogyne incognita* in the first week of every month from January to December. It was found that growth of plant, root-knot index, multiplication of the nematode and various morphometric characters of the female studied were high when plants were inoculated during September and October; intermediate in March, April, July and August and low in the remaining months, with no development of mature females on plants during December and January. This variation could be due to temperature prevailing in these months.

**Keywords** : *Meloidogyne incognita*; Temperature; Morphometrics.

For most of the species of root-knot nematodes, relatively higher temperatures are required for hatching, larval penetration and development in roots (Bird and Wallace, 1965; Ogunfowora, 1978; Santo and Bolander, 1979; Meon, 1980). However, little is known on the effect of different sowing dates on the morphometrics of root-knot nematode, *Meloidogyne incognita*. An attempt was made, therefore, to determine the effect of sowing dates on the development of *M. incognita* on tomato and on variations in the size of females.

Seedlings of tomato cv. Marglobe were raised in autoclaved soil. After two weeks they were transplanted in earthen pots containing autoclaved soil and later, the plants were inoculated with 1000±10 freshly hatched larvae of *M. incognita* in the first week of every month from January to December. After 30 days the roots were washed and root-knot index was determined per plant as follows : 0=No infection; 1=1-50 galls; 2=51-100 galls; 3=101-150 galls; 4=151-200 galls; 5=Above 200 galls.

The females from the infested roots were dissected and mounted in warm lactophenol (Southey, 1970).

**Table 1.** The growth of tomato plants and root-knot development as influenced by the sowing data.

| Months of inoculation | Treat-ments | Dry weight of plant (g) | No. of gall/ plant | No. of egg-mass/ plant | Root-knot index | Total population of nematode |
|---|---|---|---|---|---|---|
| January | UI | 2.34** | — | — | — | — |
| (9.24-19.76)* | IN | 1.16 | 41.33 | — | 1.00 | 94.00 |
| February | UI | 2.58 | — | — | — | — |
| (10.68–23.32) | IN | 1.86 | 65.00 | 30.66 | 2.00 | 518.00 |
| March | UI | 3.82 | — | — | — | — |
| (15.50–26.59) | IN | 2.54 | 116.00 | 83.33 | 3.00 | 1048.00 |
| April | UI | 3.90 | — | — | — | — |
| (20.90–35.88) | IN | 2.56 | 123.30 | 86.66 | 3.00 | 1216.00 |
| May | UI | 2.47 | — | — | — | — |
| (25.37–39.70) | IN | 1.46 | 54.33 | 29.33 | 2.00 | 598.00 |
| June | UI | 2.40 | — | — | — | — |
| (27.59–40.52) | IN | 1.33 | 55.66 | 30.33 | 2.00 | 549.00 |
| July | UI | 2.52 | — | — | — | — |
| (26.56–33.20) | IN | 1.80 | 88.66 | 70.00 | 2.00 | 573.00 |
| August | UI | 3.98 | — | — | — | — |
| (26.13–33.26) | IN | 2.66 | 101.00 | 78.00 | 3.00 | 1020.00 |
| September | UI | 4.10 | — | — | — | — |
| (24.69-35.74) | IN | 2.94 | 165.66 | 97.33 | 4.00 | 1428.00 |
| October | UI | 4.18 | — | — | — | — |
| (18.26–33.02) | IN | 2.94 | 167.00 | 98.00 | 4.00 | 1500.00 |
| November | UI | 2.57 | — | — | — | — |
| (13.26–24.39) | IN | 1.88 | 44.00 | 13.33 | 1.00 | 350.00 |
| December | UI | 2.49 | — | — | — | — |
| (7.99–20.26) | IN | 1.50 | 41.00 | — | 1.00 | 98.00 |
| L.S.D. at 5% level | | 0.14 | 6.44 | 6.06 | 0.98 | 14.72 |

* Figures in parenthesis indicate minimum and maximum temperature.
** Each value is an average of five replicates.
UI—Uninoculated.
IN—Inoculated.

**Table 2**. Morphometrics of females *Meloidogyne incognita* in tomato plant.

| Months of inoculation | Body length | Body width | Neck length | Median bulb length | Median bulb width |
|---|---|---|---|---|---|
| February (10.68–23.32)* | 532.70±30.48 (5.72) | 391.20±19.62 (5.01) | 154.70±11.27 (7.29) | 41.02±2.87 (6.99) | 38.34±2.67 (6.97) |
| March (15.50–26.59) | 676.00±21.65 (3.20) | 486.50±12.52 (2.57) | 194.10±16.68 (8.59) | 44.78±1.94 (4.35) | 41.20±2.25 (6.12) |
| April (20.90–35.88) | 695.10±30.71 (4.42) | 501.70±28.89 (5.75) | 188.50±15.50 (8.22) | 46.38±1.58 (3.49) | 41.54±2 54 (6.12) |
| May (25.37–39.70) | 566.00±9.46 (1.68) | 399 00±11.64 (2.91) | 159.80±18.38 (11.50) | 41.67±2.42 (5.92) | 38.76±2.63 (6.71) |
| June (27.59–40.52) | 566.50±9.46 (1.68) | 402.30±11.07 (2.75) | 169.20±12.44 (7.35) | 42.83±1.84 (4 31) | 37.80±1.97 (5.24) |
| July (26.56 33.20) | 660.80±23.03 (3.64) | 436.30±22.00 (5.04) | 171.50±10.73 (6.25) | 43.55±2.00 (4.61) | 38.51±2.99 (7.76) |
| August (26.13–33.26) | 693.90±14.28 (2.05) | 490.50±18.09 (3.68) | 185.80±16.20 (8.72) | 44.20±1.75 (3 94) | 41.42±2.31 (5.58) |
| September (24.69–35.74) | 726.40±13.12 (1.80) | 514.80±11.59 (2.25) | 204.00±14.28 (7.00) | 46.03±1.71 (3.78) | 42.13±2 36 (5 62) |
| October (18.26–33.02) | 745.30±30.14 (4.04) | 520.30±8.86 (1.70) | 228.90±30 42 (13.29) | 46.08±1.54 (3.36) | 40.03±1.62 (3.70) |
| Novemer (23.26–24.39) | 533.30±10.47 (1.90) | 390.40±18.06 (4.62) | 154.70±12.93 (8.36) | 40.68±2.30 (5.66) | 37.61±0 94 (2 50) |

* Minimum and maximum temperature. Figures in parenthesis indicate C.V. Each figure is a mean of two hundred females. No female were available in December and January.

Measurements of different characters of female were made. The nematodes from the soil and roots were isolated by using Cobb's sieving and decantation method and the waring blendor method respectively and the population was determined (Southey, 1970). The data so obtained was subjected to statistical analysis. Minimum and maximum temperatures and the rainfall was recorded every month.

It is clear from Table 1 that both multiplication of nematode and root-knot development have been high on plants which have been inoculated in the month of September and October (18-35°C) and March and April (15–35°C) with average temperature of 30°C±2 and low when inoculated in the months of November, December and January (8–23°C), May and June (25-41°C). Thus wherever the temperatures have been low or high, the root-knot development has been poor with no development of mature females on plants during January. Similar results have been obtained by Ferris (1972) and Abu Gharbeih (1975), who also reported poor root-knot development during colder months.

It is clear from Table 2 that low values of measurements of various characters of female, such as body length, body width, neck length, median bulb length and median bulb width, have been observed during the months with adverse temperatures (8–23°C and 25–41°C) and higher values during the months with favourable temperatures (18–35°C and 15–35°C), while other characters remain unaffected. This is in agreement with the finding of Wong and Mai (1973) and Evans and Franco (1977) who reported larger size of the females at high (optimal) temperatures. It shows that temperature plays an important role in the development of disease caused by *Meloidogyne incognita* and development of the nematode.

Accepted March, 1989

## References

Abu-Gharbeih W I 1975, *Central Jordans Valley Dirasat* **2** 61

Bird A F and Wallace H R 1965, *Nematologica* **11** 581

Evans K and Franco J 1977, *Nematologica* **23** 417

Ferris H 1972, Population dynamics of *Meloidogyne* spp. in relation to the epidemiology and control of root-knot tobacco. Ph. D. Thesis, N. C. State University Releigh.

Meon S 1980, *Malasian Applied Biology* **9** 1

Ogunfowora A O 1978, *Nematologica* **24** 72

Santo G S and Bolander W J 1979, *J. Nematol* **11** 289

Southey J F 1970, *Laboratory methods for work with plant and soil nematodes* Tech. Bull, No. 2 Min. Agr. Fish Food. H.M.S.O. London.

Wong T K and Mai W F 1973, *J. Nematol* **5** 139