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POPULATION DYNAMICS AND CONTROL OF PLANT PARASITIC NEMATODES ON BANANA IN THE SULTANATE OF OMAN

by
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Summary. The population dynamics of *Helicotylenchus multicinctus*, *Meloidogyne incognita* and *Tylenchorhynchus coffeae* on banana was studied at Barka in the Batinah region of Oman from October, 1992 to September, 1995. Populations of each nematode species reached their highest densities during February-April, declined sharply during the summer months of May, June and July and then builtup again from August onwards. The efficacy of three granular nematicides was evaluated at the rate of 40 g/clump under field conditions against the three species infecting banana. It was observed that ethoprophos was the most effective nematicide in reducing nematode populations followed by fenamiphos and oxamyl.

Helicotylenchus multicinctus (Cobb) Golden and *Meloidogyne incognita* (Kofoid *et* White) Chitw. cause significant crop losses to banana in the Sultanate of Oman (Waller and Bridge, 1978; Mani, 1993). The two species and *Tylenchorhynchus coffeae* Siddiqi *et* Basir have been recorded on banana in high population densities (Anonymous, 1991 and 1992; Mani, 1993) and therefore investigations were undertaken to evaluate the efficacy of granular nematicides for their control in Oman.

Materials and methods

The investigation was carried out from October, 1992 to September, 1995 in a three year-old banana (*Musa* sp.) garden, infested with the three nematode species, at Barka in the Batinah region. The plants were irrigated twice a week by a bubbler irrigation system and farm yard manure was applied at 20-25 kg/clump of 3-4 plants at the start of each growing season in October. Soil and root samples were collected from ten clumps each month, from three places around each clump in a triangular fashion at 30 cm distance from the base of the plants and up to 25 cm depth (Mohanty *et al.*, 1993). Nematodes were extracted from 250 cm^3 soil by Cobb's sieving and decanting technique with final extraction in a Baermann funnel. Ten g of roots were washed free of soil, cut into pieces and incubated in a Baermann funnel filled with water for 36-48 hours. Nematode suspensions were collected twice in the two days and the populations were counted in one ml aliquots using a stereoscopic binocular microscope. A further 10 g of roots were stained in acid fuchsin-lactophenol and comminuted in a Waring blender; the different developmental stages of *M. incognita* present in the suspension were identified and numbers were estimated. Moisture content of soil samples was determined on an oven dry basis. Data on rainfall, maximum and minimum air temperatures were also recorded. The mean for the soil temperature re-

corded at all the sampling sites at 10 and 20 cm depths was calculated. The data were subjected to statistical analysis.

The granular nematicides, ethoprophos, fenamiphos and oxamyl were applied to a three year-old standing banana crop at the rate of 40 g/clump of 3-4 plants during October from 1992-95. Each chemical was mixed with an equal quantity of fine sand and sprinkled uniformly around the plants up to 35 cm distance and incorporated in soil to a depth of 2-3 cm. The treatments, including the untreated control were distributed randomly and replicated seven times. Each replicate consisted of a single clump. Nematode populations in the soil were estimated before and at 15 days, 2, 4 and 6 months after treatment.

Results and discussion

Maximum and minimum ambient temperatures declined gradually from September and reached very low levels during January and February (Fig. 1). Temperatures increased from March onwards and reached a peak in June, thereafter gradually declining. Rainfall was 3.1 and 2.2 mm in December during 1993-94 and 1994-95 respectively in the area during the experimental period. Soil moisture ranged from 10.5 to 16%.

Population densities of *H. multicinctus* and *M. incognita* in the soil and roots and *T. coffeae* in the soil steadily increased from October and reached the peak levels during April in 1992-93 and February in 1993-95 (Fig. 2). Population densities were generally high from February to April in soil and/or roots. However, population densities in both soil and roots declined sharply from May onwards and reached their lowest levels during June-July, coinciding with the highest soil temperature. Of the three species, *M. incognita* appeared to be most affected by high soil temperatures with soil and root populations reaching very low levels. Significant negative correlations were evident between nematode populations in soil and roots, and mean soil temperature. The correlation coefficients between populations of *H. multicinctus* and *M. incognita* in soil and root and soil temperature were -0.529, -0.578 and -0.621 and -0.685, respectively, while it was -0.374 for soil population of *T. coffeae*.

All the three granular nematicides effectively reduced the numbers of nematodes in the soil

TABLE I - *Nematode populations under bananas treated with three granular nematicides.*

Treatment	H. multicinctus					M. incognita					T. coffeae					Total population				
	B	15D	2M	4M	6M	B	15D	2M	4M	6M	B	15D	2M	4M	6M	B	15D	2M	4M	6M
Ethoprophos	1262	100	143	335	746	1369	131	219	396	897	277	23	40	112	208	2908	254	402	843	1851
Fenamiphos	1031	114	219	596	885	731	167	247	501	725	754	75	161	305	601	2516	356	627	1402	2216
Oxamyl	2445	540	924	1321	2316	1172	375	580	1227	1730	1646	316	608	878	1402	5263	1231	2112	3426	5448
Control	1729	1801	2150	2414	2451	1463	1510	2108	2413	2786	1145	1156	1389	1783	1887	4337	4467	5647	6610	7124

Mean of three years data: B=before treatment; D and M = days and months after treatment, respectively.
Level of significance:
Treatments: significant at $P < 0.01$
Periods: singificant at $P < 0.01$
Species: non-significant
Treatment x Species: significant at $P < 0.01$
Treatment x Period: non-significant
Treatment x Species: non significant
Treatment x Period x Species: non-significant

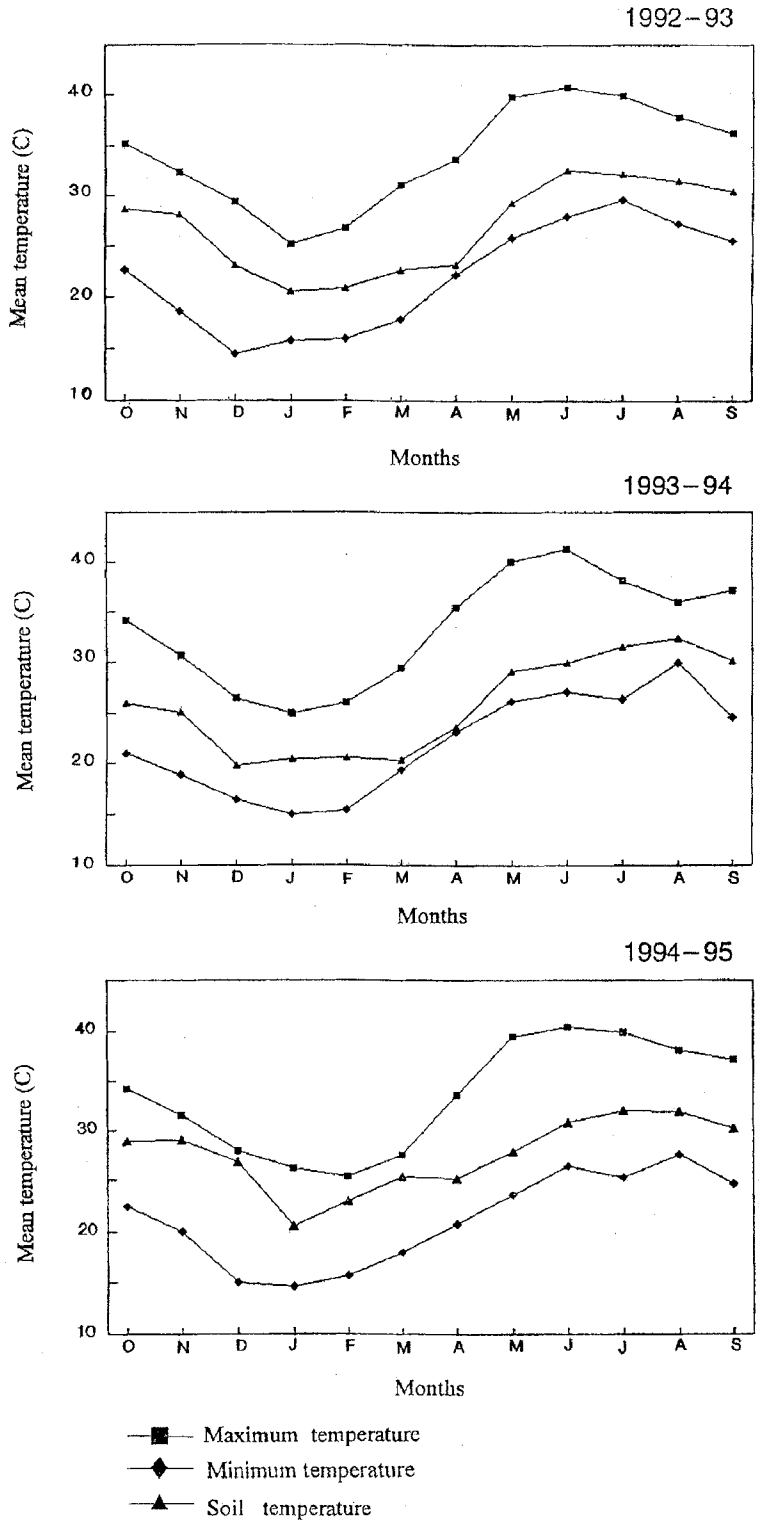

Fig. 1 - Monthly maximum and minimum air temperature and mean soil temperature recorded during 1992-95.

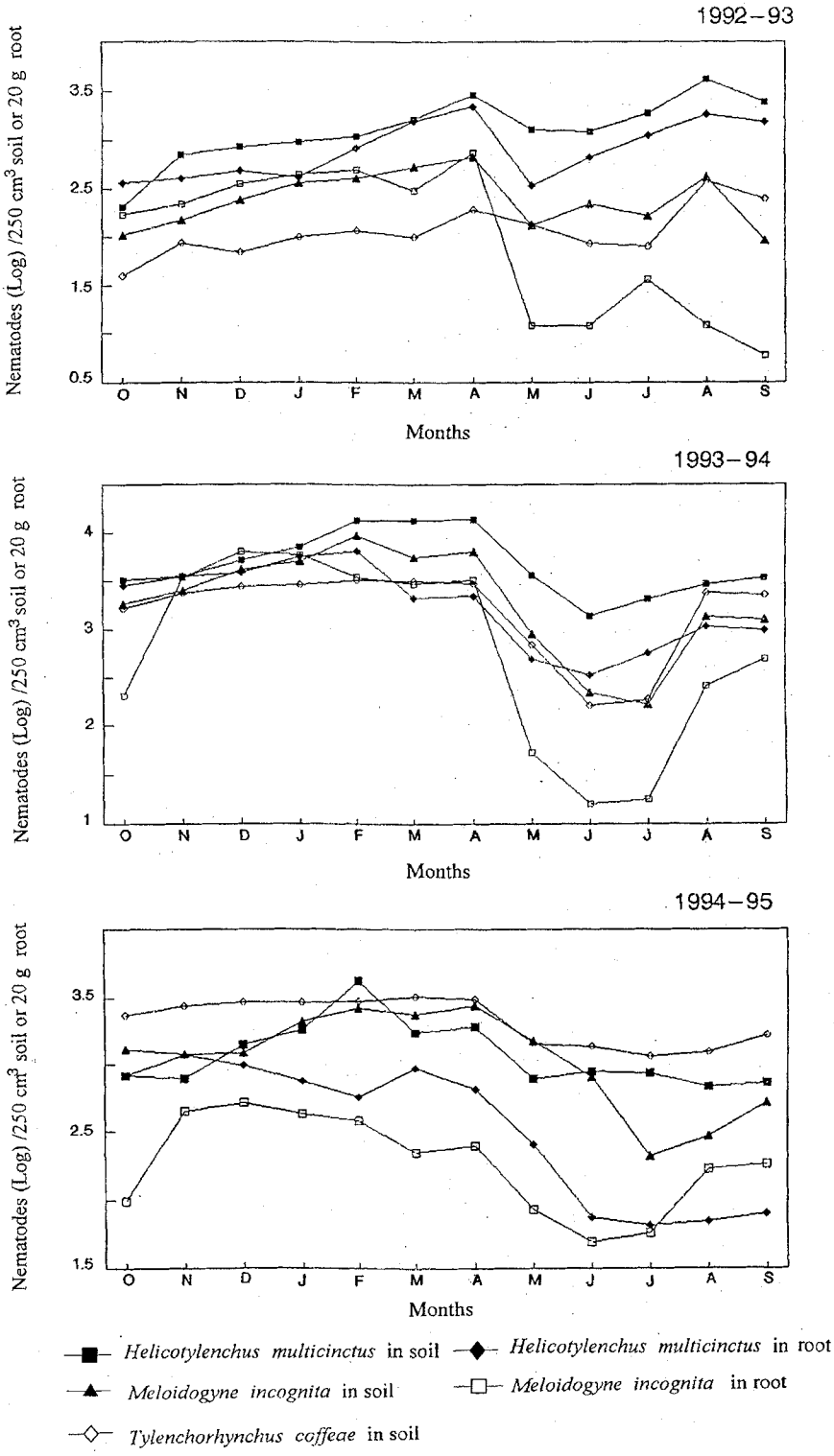

Fig. 2 - Seasonal variations in population levels of *Helicotylenchus multicinctus*, *Meloidogyne incognita* and *Tylenchorhynchus coffeae* in the rhizosphere soil and roots of banana during 1992-95.

when compared with the control (Table I). Ethoprophos was the most effective and decreased the populations of the three nematode species by 90% at 15 days after application and continued to be effective for a period of four months after application. Fenamiphos and oxamyl were effective only for a period of two months after which the nematode populations increased significantly.

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