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INFLUENCE OF INOCULUM LEVEL AND TEMPERATURE ON THE POPULATION BUILD-UP AND PATHOGENICITY OF THE ROOT - LESION NEMATODE (*PRATYLENCHUS LOOSI* LOOF) OF TEA

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The results of the present investigation have shown an inverse relationship between inoculum level of the meadow eelworm, *Pratylenchus loosi* and soil temperature, in respect of pathogenicity to young tea plants. Significant population increase was observed only at 18 and 24°C, whilst at 12°C the population build-up was low irrespective of the inoculum level. For a significant build-up of nematodes the inoculum threshold at 18°C is 1000 nemas/plant, whilst at 24°C, the threshold is as low as 500 nemas/plant. It was only at the highest inoculum level of 8000 nematodes/plant that signs of pathogenicity became evident at 12°C.

INTRODUCTION

The root-lesion nematode of tea, *Pratylenchus loosi* Loof is found to be prevalent at elevations of 900 - 1800 m and serious damage to tea is caused at 1000-1500 m.

Soil temperature varies with elevation and the most favourable temperature for a rapid build-up of the population of *P. loosi* was found to be between 18 - 24°C (Sivapalan and Gnanapragasam, 1975). At higher and lower temperatures the reproductive potential was found to decline (Sivapalan, 1972; Sivapalan and Gnanapragasam, 1975).

In fields known to have had a history of nematode infestation, every attempt is made to drastically minimize the residual soil population prior to replanting such fields. The rate and extent of reinfestation is a function of the residual population and the susceptibility of the clone used. Even nematode-tolerant clones can suffer a set-back, if re-infestation occurs rapidly at the time of establishment in the field. This is especially so during adverse weather conditions.

In order to assess the extent of reduction that is warranted at different elevation ranges (and consequently at different soil temperatures), the present experiment was carried out by testing varying levels of inocula and estimating the threshold of pathogenicity at the different soil temperatures.

MATERIALS AND METHODS

Three thermostatically-controlled temperature tanks as described by Sivapalan and Gnanapragasam (1975), were used to maintain a steady temperature of the soil contained in 15 cm wide cement pots (12, 18, 24°C respectively). Each pot was filled with 1,250 cc of nursery soil, mixed in the proportion of 3 parts gravel and one part clay and pretreated to soil fumigation with Methyl bromide at the rate of 0.5kg/2.83m^3.

Twelve-month-old plants of the nematode-susceptible clone, TRI 2024 of uniform size were transplanted into these pots and maintained in the green house for a period of 2 weeks prior to transferring them to the respective temperature tanks. A set of 18 pots were transferred into each constant temperature tank. In each tank the sub treatments were inoculation of suspensions of nematodes to each plant. The inoculation was done at the end of 5 months after transferring the pots to the tank as follows: Groups of three pots/tank were inoculated with one of the following levels - 0, 500, 1000, 2000, 4000 and 8000 nematodes per plant, the uninoculated group of three pots serving as the control to estimate the degree of pathogenicity.

The different treatments in the respective soil temperature tanks were arranged in a completely randomised block design. The treated plants were maintained for a period of 12 months at the end of which they were removed for assessments. Fresh shoot and root weights were determined and the nematodes were recovered from the roots by the modified Baerman Funnel technique, as described by Hutchinson (1962).

RESULTS

The results of analysis of the mean shoot and root weights as well as the mean counts in roots of plants maintained at the different temperatures, are presented in Table 1.

TABLE 1 — *Mean shoot and root weight of tea plants and of mean count of nematodes per gram root, at different soil temperatures*

Temperature °C	*Shoot weight (g)* $\sqrt{n}$	*Root weight (g)* $\sqrt{n}$	*Nematode/g root* $\sqrt{n+1}$
12	5.22 a	5.19 a	5.16 c
18	4.78 ab	4.63 a	15.57 b
24	4.30 b	3.94 b	20.78 a
LSD (P=0.05)	0.73	0.61	4.42

As seen from Table 1, a significant population build-up of *P. loosi* was observed only at 18 and 24° C. The nematode population build-up was low at 12°C, irrespective of the initial inoculum level.

The results of nematode analysis of the different treatments at the respective temperatures are presented in Table 2.

TABLE 2 — *Mean count of nematodes/g root ($\sqrt{n+1}$) at different levels of inocula in plants maintained at different soil temperatures*

Soil temperature	Mean inoculum level of nematodes/plant					
°C	0	500	1000	2000	4000	8000
12	1.00	1.48	2.80	10.30	5.50	9.87
18	1.00	5.05	12.21	20.00	27.44	27.72
24	1.00	21.65	23.36	27.91	23.89	26.89
LSD (P=0.05)			10.09			

As seen from the above Table, the results of assessment of the interaction between soil temperature and population showed that, for a significant build-up of nematodes at a soil temperature of 18°C, the inoculum level is between 1000 to 2000 nemas/plant whilst at 24°C the corresponding inoculum threshold is 500 nemas/plant. At 12°C on the other hand, even an inoculum level of 8000 nemas/plant failed to bring about any significant build-up of population of this species of nematodes.

The results of shoot and root weight analysis of the different treatments are presented in Table 3.

TABLE 3 — *Mean shoot and root weights of young tea plants maintained at different soil temperatures and inoculated with varying numbers of Pratylenchus loosi per plant*

Inoculum level/plant	*Shoot weight (g)* $\sqrt{n}$			*Root weight (g)* $\sqrt{n}$		
	12°C*	18°C	24°C	12°C	18°C	24°C
0	5.40	6.35	6.19	5.83	5.36	5.17
500	5.39	5.07	5.22	5.52	4.90	4.56
1000	5.21	3.57	3.94	4.83	4.59	3.44
2000	5.87	4.81	3.50	5.06	4.53	3.20
4000	6.00	4.68	4.41	5.99	4.57	3.64
8000	3.46	4.26	3.59	3.49	3.87	3.39
LSD (P=0.05)		1.22			1.49	

*Soil temperature

As seen from the above Table, other than at the highest inoculum level of 8000 nematodes/plant no pathogenicity was observed at the lowest soil temperature of 12°C. Pathogenicity was evident even at 1000 nematodes/plant and above at 18 and 24°C.

DISCUSSION

The results of the present investigation have shown that a rapid build-up of population of *P. loosi* can occur in young tea from even a very low inoculum level of 1000 nemas/plant at 18° C and 500 nemas/plant at 24° C. This low inoculum level corresponds to about 40 nemas/100g soil at 24° C level and 80 nemas/100g soil at 18° C.

A drastic reduction of nematode population is therefore warranted at this soil temperature range of 18 - 24° C, which prevails in the elevation range of 900 - 1800 m. Every effort should be made to not only reduce soil population by having the land under either Guatemala or Mana grass for a minimum period of 2 years, but also by a thorough root removal operation following uprooting of infested tea. Large numbers of nematodes are known to remain in a quiescent hibernating state around the periphery of lesions in the storage roots of tea bushes. This is especially so, when feeder roots and other suitable roots on which this nematode could readily feed and multiply, become limiting. When such storage roots bearing nematode

lesions are left in the soil, these pests can remain in an infective state for long periods, even as long as 2-3 years. Hence the mere planting of a grass cover crop by itself is inadequate but this should be followed up by a thorough root removal operation, especially between the elevation range of 1000 - 1500 m.

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