Chapter VI

SUMMARY
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A survey was conducted in twenty one different rubber growing regions of Kerala, Tamil Nadu, Dakshin Kannada and Maharashtra to determine the frequency of occurrence and distribution of plant parasitic nematodes in rubber plantations. The common genera of plant parasitic nematodes encountered in rubber growing soil included Meloidogyne, Helicotylenchus, Aphelenchoides, Hemicyclophora, Longidorus, Radopholus, Tylenchus, Hoplolaimus, Criconemoides, Trichoderus and Xiphinema. The density and frequency of Meloidogyne was found more in all the locations compared to other nematode genera. Maximum population density of 2225 nematodes per 250 ml soil was recorded with hundred percent frequency of occurrence in Punalur region followed by Kanhikulam, Calicut, Vaniampara, Padiyoor, Muvattupuzha and Kottayam. Lowest population and frequency of Meloidogyne was observed in Nettana and Dapchari region.

Infectivity test of soil samples conducted with the indicator plant, tomato (Lycopersicon esculentum) showed variations in the formation of galls. Two larvae of Meloidogyne incognita per g. soil was recorded as the minimum inoculum potential.

Effect of the root-knot nematode, M. incognita on the growth, biomass, nodulation and nitrogen fixation on the cover crop grown in
young rubber plantations, *Pueraria phaseoloides* was studied by applying different inoculum levels of root-knot nematodes. The results showed significant differences in the growth characteristics between inoculated and uninoculated plants. Inoculation of *Bradyrhizobium* simultaneously or 10 days after nematode inoculation could reduce the adverse effect of nematode and increase growth by 5 to 13 percent over control. Significant reduction in nodulation was also observed due to nematode infestation. Reduction percentage of nodules was more where nematode inoculation preceded bradyrhizobial inoculation. Maximum gall formation was recorded in plants inoculated with nematode alone. Significant decrease in number of galls was observed on simultaneous application of *M. incognita* and *Bradyrhizobium* or by the application of the two organisms 10 days prior or later to each other.

Nitrogen content in the shoot and root of *P. phaseoloides* was considerably reduced by the infestation of root-knot nematode, *M. incognita* at different inoculum levels. A per cent decrease of 5.91, 11.33, 22.66 and 33.50 of nitrogen in shoot and 2.48, 8.45, 21.39 and 26.86 in root over control was observed at 1000, 2000, 3000 and 4000 levels of nematode inoculum respectively. By bradyrhizobial inoculation a per cent increase of 28.07 and 37.81 nitrogen content of shoot and root over control was recorded. Nitrogen content of both shoot and root of *P. phaseoloides* was
significantly higher when Bradyrhizobial inoculation preceded nematode inoculation.

Root-knot nematode, *M. incognita* showed seasonal fluctuations in soil population and in host infestation. An increase in the population density was recorded in summer months and decrease in winter. Peak populations of *M. incognita* were recorded during March and April months (1400 and 1200 per 250 ml soil) when the mean temperature was 34.5°C and 33.6°C respectively. Soil population of nematodes and infestation was very low during June-July. The results of the present study showed a post-monsoon build up of nematode population in soil. Correlation coefficient analysis showed that environmental temperature is significantly correlated with nematode population and host infestation. A high correlation was also observed between the intensity of infection and soil population of nematodes. Even though no significant effect of quantity of rainfall on nematode population and host infestation was observed, monthly distribution of rainfall showed reducing effect in the population and infestation in succeeding months.

A pot culture study on the effect of interaction of root-knot nematode, *M. incognita* and VAM (*Glomus fasciculatum*) in *P. phaseoloides* indicated that the pre-inoculation of VAM or inoculation of VAM simultaneously with nematode or one or two weeks later to
nematode can reduce the adverse effect of root-knot nematode considerably and favour plant growth. Significant reduction in mycorrhizal colonization percentage and spore count were recorded due to the infestation of *M. incognita* in *P. phaseoloides*. The multiplication rate of *M. incognita* was found decreased by the inoculation of VAM. Plants inoculated with mycorrhiza first and two weeks later with nematode showed minimum multiplication rate (0.60) as against the maximum value (2.1) observed in plants inoculated with nematode alone.

Enhancement of some biochemical constituents was recorded due to the infestation of root-knot nematode, *M. incognita* on *P. phaseoloides*. Significant increase in the content of total phenols, ortho-dihydroxy phenols, reducing sugars, non-reducing sugars and amino nitrogen was observed at 1000, 2000, 3000 and 4000 levels of nematode inoculum. Low starch content was recorded in nematode inoculated plants. Increase in the level of larval inoculum resulted in proportional decrease in plant growth and increase in root-knot disease on *P. phaseoloides*. The possibility of using VAM as biocontrol agent for the management of *Pueraria phaseoloides* in rubber plantation is discussed.