SUMMARY

Root-knot nematodes (*Meloidogyne* spp.) causes substantial losses to a variety of crops. Therefore, management of this group of plant-parasitic nematodes is an essential component of overall strategy for management of various pests and parasites. In the present context of environmental concerns and health risks involved with the use of nematicides, focus has shifted to look for effective biocontrol agents and to develop biopesticides for the management of plant-parasitic nematodes including root-knot nematodes. Researches are in progress and a number of promising biocontrol agents have been categorized as biopesticides candidates. In the present work, emphasis has been to assess biocontrol potential of some fungi and predatory nematode in order to develop them as biopesticides for management of root-knot nematodes. To achieve this aim root samples of vegetables crops infected with root-knot nematodes were collected from various vegetable fields. Fungi associated with egg masses of the root-knot nematodes were isolated. Three fungi, *Verticillium chlamydosporium*, *Acremonium strictum* and *Fusarium oxysporum* found infecting eggs in the egg masses were selected for further studies. Their parasitism on the eggs of root-knot nematode, *Meloidogyne incognita* were confirmed by artificial inoculation on the healthy surface sterilized egg masses.

Experiments were conducted to determine the efficacy of the culture filtrates of the three fungi on juvenile hatching and mortality of *M. incognita*. All the three fungi, *Verticillium chlamydosporium*, *Acremonium strictum* and *Fusarium oxysporum* proved to be toxic as the hatching of juveniles was inhibited.
and mortality of the juveniles (J2) occurred. Concentration of the culture filtrates and time duration were determinant of these effect. Higher concentration and extended time duration were more effective. Among the three fungi, culture filtrate of *V. chlamydosporium* was more toxic than other two fungi. Efficacy of culture filtrate on plant growth and development of root-knot nematode, *M. incognita* on tomato was determined by soaking the seeds of tomato in different concentrations of the culture filtrates. Tomato plants developed from such seeds in general showed improved growth and reduced root-knot disease. There effects were more obvious and prominent when 'S' concentration of the culture filtrates were used for seed soaking.

All the three fungi (*V. chlamydosporium* / *A. strictum* / *F. oxysporum*), when applied in soil in water suspension improved plant growth and reduced the severity of the root-knot disease. Though all the three fungi significantly reduced the disease, *V. chlamydosporium* was apparently more effective. The plant growth (lengths and fresh and dry weights of roots and shoots of the plants) showed an increase when either fungus and nematode (*M. incognita*) were applied. The adverse effect of the nematode on plant growth was reduced. Root galling and egg mass production were low. Root and soil population of the nematode declined.

For mass culturing of the three fungi agricultural waste materials of plant origin which can serve as a better substrate for their growth and which can be easily available for field dispensing, were screened by artificial inoculation. Gram husk, rice husk, mungbean husk, wood charcoal, saw dust were used in this screening. Rice husk emerged as best substrate for growth of *V. chlamydosporium*. 
as it showed maximum spore load on this waste organic material. Rice husk was also good for *A. strictum* and *F. oxysporum*. But better growth and highest spore load of these two fungi was found on gram husk. The viability of the fungal spores of all the three fungi were checked after their growth for different duration (i.e., 2, 4, 6 and 8 weeks) on the agricultural waste materials of plant origin. Spores of all the three fungi were viable at each interval of observation. The spore count of *V. chlamydosporium* peaked after 6 weeks. In case of *A. strictum* and *F. oxysporum*, highest spore count was found after 4 weeks.

When fungus colonized organic materials of agricultural origin were applied in soil and tomato plants were grown in it, rice husk colonized with *V. chlamydosporium* was most effective in reducing the root-knot disease. *A. strictum* and *F. oxysporum*, which were applied on gram husk, also reduced the disease severity. Root galling egg mass production and soil and root populations of the nematode were reduced. Consequently, plant showed improved growth. In sequential inoculations, prior application of the agricultural waste colonized with either fungus was more effective than the application made after the nematode inoculation. Simultaneous application was, however, also effective.

The study presented in the second part of the thesis deals with the potential of a predatory nematode, *Mononchoides longicaudatus*, as biocontrol agent for root-knot nematode. For mass production of *M. longicaudatus*, soil, agar, and farmyard manure were used in different combinations, and it was found that farmyard manure and soil agar medium were suitable culture media where the populations of the predatory nematode were higher than other two combinations of
culture media. Prey catching and feeding, pattern of feeding the predatory nematode was studied. The nematode was predatory on second stage juveniles (J2) of the root-knot nematode. The effect of some factors on predation were also studied.

*In vivo* experiment, it was found that when the higher numbers of *M. longicaudatus* were inoculated along with *M. incognita*, the root galling and egg mass production decreased. The population of nematode also declined. As a result, tomato plants showed better growth.