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The work described in this thesis was carried out by me under the supervision of Dr. (Mrs.) N. Salim and Dr.(Mrs.) H.M.R.K. Ekanayake and a report on this has not been submitted in whole or in part to any University for another Degree/Diploma.

24.01.2007

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I / We certify that the above statement made by the candidate is true and that this thesis is suitable for submission to the University for the purpose of evaluation.

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Studies on biology and histopathology of *Meloidogyne* spp. affecting *Centella asiatica* L. and environmentally acceptable control measures

BY

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Thesis submitted to the University of Sri Jayawardhenepura for the award of the Degree of Master of Philosophy in Botany in

2005

DEDICATION

To my loving parents and dear teachers

whose enthusiastic encouragement

made me to success in

higher education

TABLE OF CONTENTS

LIST OF TABLES

Page No.

LIST OF FIGURES

LIST OF PLATES

Page No.

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ABSTRACT

Germplasms of gotukola were confirmed to be infested by a root knot nematode species, *Meloidogyne incognita.* Surveys and laboratory experiments were conducted to gather detailed information of this nematode incidence in *C. asiatica* and attempts were made to find out potential control measures that are environmentally safe.

The use of resistant plants is highly satisfactory method which does not cause environmental pollution. In this study, twelve different germplasms of *C. asiatica* designated as G_1-G_{12} were tested for their reaction to *Meloidogyne incognita.* Among the tested germplasms, only G_1 was resistant to nematode infestation. The germplasms G_2, G_3, G_7, G_8 and G_{10} were moderately susceptible whereas all the other germplasms were found to be highly susceptible to this infestation. The infestation has caused loss in yield of all the susceptible germplasms tested. The highly susceptible germplasms had significant ($P< 0.05$) yield loss ranging from 18.3 to 35.7%.

The infestation was effectively controlled by application of sterilized soil, sterilized sand and compost or cow dung or tea waste as soil amendments at the rate of 1:1:½ improving plant growth under the conditions tested. Use of compost at the rate of 1:1:1½ (sterilized soil, sterilized sand and compost) has given the maximum plant growth while suppressing the nematode population. Further, application of 10g of poonac and 10g of poultry manure to 430ml of potting mixture, has given a significant reduction of nematode population while giving maximum yield of gotukola under the conditions tested.

Population of *M. incognita* could also be controlled successfully by planting two plants of *Sesamum orientale* along with one plant of *C. asiatica* under the conditions tested.

Some common weeds that are susceptible to *M. incognita* were identified. Also some ornamental plants resistant to this nematode, which can be useful in crop rotation were identified.

The infestation and development of *M. incognita* in *C. asiatica* caused histopathological changes in the form of giant cells and root knots. In this study, formation of root knots and different stages of nematode development were examined preparing microtome sections of infested roots. Giant cell formation was observed in both vascular and cortical regions. Groups of two to six giant cells of thick walled multinucleated dense cytoplasm were noted while some giant cells were vacuolated.

The effect of five different inoculum levels of *M. incognita* on the plant growth, absorption and translocation of nutrients and water in the gotukola were determined. Significant reductions in fresh and dry weights of shoots were observed in higher population levels (≥2000 eggs and larvae) of the nematode. The absorption of Na, Mg, Ca and Fe from soil by the infested plants were significantly ($P<0.05$) lower than that by the healthy roots. The effect increased with the increasing population levels of the nematode.