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Nematicidal Activity of Herbal Crude Extract Against Meloidogyne Incognita in Musa Acuminate (Red Banana)

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Abstract: ***The current study was assumed to identify the novel activities from different plant species for the control of nematodes. To resolve the egg hatchability and Nematode mortality rates of root knot Nematodes. Root knot Nematodes are most abundant and destructive Nematode around all the tropics and sub tropic regions of the world. These root knot Nematodes isolated from the Musa acuminata were treated with extracts of five plant leaves namely Azadirachta indica (neem), Arthemisia pallens (marikolunthu), Ocimum tenuiflorum (tulasi), Hibiscus rosasinensis (Sembaruthi), Ficus hispida (fig) with methanol were evaluated against root knot Nematodes Meloidogyna incognita under laboratory conditions. The Nematicidal activity of Methnolic and leaves of five plant species extract, decreases the Nematodes viability as the concentration of the extracts increases. Hence they examine the Nematicidal capability of the plant species against Meloidogyna incognita. This article reports a reduction in egg hatching and increased Nematicidal activity.***

Keywords ***Nematodes, Nematicidal activity, Mortality, tropical and subtropical regions, plant extract.***

I. INTRODUCTION

Edible bananas (*Musa acuminata*) are perennial herbs in nature. The edible bananas are grown in south East Asia and western pacific regions (equatorial and sub tropics region) in the world. [1]. Banana is the fourth stable food in the world after the rice, wheat and maize. About 150 countries cultivate the edible bananas. Edible banana is a food crop of income to the people and also the cash crop of some countries like Ecuador, Costa Rica, Philippines, Columbia, Guatemala, Belgium, USA, Honduras, Thailand, Panama, Cameroon, Germany, Brazil, France, China, Spain and India [2]. The production of Banana is affected by several pests and insects. Diseases were caused throughout the period of growth and Nematodes are one of the pest that affects the growth of banana yield. There are so many types of Nematodes are living in the world. One of the most important Nematodes to affect the banana yield is *Meloidogyne incognita* [3]. *Meloidogyne incognita* is the root-knot Nematode and it is the major parasitic Nematode affects the quantitative and the qualitative yield of the plants [4]. Nematodes are very tiny, slender worms, It's about 5 to100µm thick, and 0.1 to 2.5mm long.

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The Nematodes are imperceptible and it can only be viewed under microscope, approximately 2,271 genera are located in 256 families [5]. Many parasitic forms of Nematodes affect plants and animals, A third of the genera which mostly lives in Human, Nematodes cause reduction in plants growth and productivity [6]. Nematodes occur naturally at low level of soils, most of the Nematodes affect the plants through infested soil or infested transplants .Once Nematodes affect the plants it cannot be able to remove or cure easily, there are numerous soil Nematodes species but not all are harmful to plants but some species helps through plants improvements. Root-knot Nematodes affects the plants mostly in low fertile region of the soil [7]. All cultivated plants are inclined partially to at least one Nematode species, thus the tenacity passage out in all climates on any crop. The damage caused by several Nematodes to a given crop in any required field is related to the Nematode population density. The indication of nematode devastation differs greatly in high distinctive. A few Plant parasitic Nematodes produce symptoms and some may not, the main ground symptoms of Nematodes are root damage or poor or stunned growth, reduced foliage, dieback, chlorosis, and poor plant productivity and growth. The plant pathogenic Nematodes lifecycle consists of the egg, four juvenile stages and the adults. [8]. Plant parasitic Nematodes can be controlled using the chemical Nematicides or pesticides. The chemical pesticides are a substance or the mixture of substances that are mainly used to control the pest in the agricultural or removing the weeds in the farm land. Most of the pesticides have correlated with health and environmental affairs. The chemical pesticides, herbicides and fungicides are used to kill the plant parasitic Nematodes. Some of the chemical pesticides, herbicides and fungicides are sulphur(f),endosulfan(I),mancozeb(F),Phorate(I),Methylparathion(I),monocrotophos(I),cypermethrin(I),isoproturon(H),chlorpyrifos(I),malathio(I)andcarbondazim(F). There are numerous negative side effects using the chemical pesticides in the agricultural crops. They stimulate lots of side effects related to dermatological,gastrointestinal,neurological, carcinogenic, respiratory, reproductive and endocrine effects spontaneous abortions, stillbirth and birth defects**.** [9]. More over high occupational, accidental and intentional exposure of chemical pesticides can result in hospitalization and death. Pesticide residues can be detected in the mother's breast milk samples. The pesticide exposure transfer from mother to children and health effects in the children. [10]. Most parasitic Nematodes in regulating parasitic Nematodes in *Musa* species that are made for fresh utilization. This raises concern about the presence of residues of these toxic chemicals in the food supply

and plant production, as a result of increasing concerns for the environment and public health ,have augmented interest in alternative methods for the control of pathogenic plant parasitic Nematodes [11]. Some plant leaves have the property to control the Nematodes. The following plant leaves were chosen to formulate the extract in treating the Nematodes. The plant leaves belong to *Azadirachta indica* (neem), *Arthemisia pallens* (marikolunthu), *Ocimum tenuiflorum* (tulasi), *Hibiscus rosasinensis* (sembaruthi), *and Ficus hispida* (fig).

II. MATERIALS AND METHODS

A.Leaves extraction

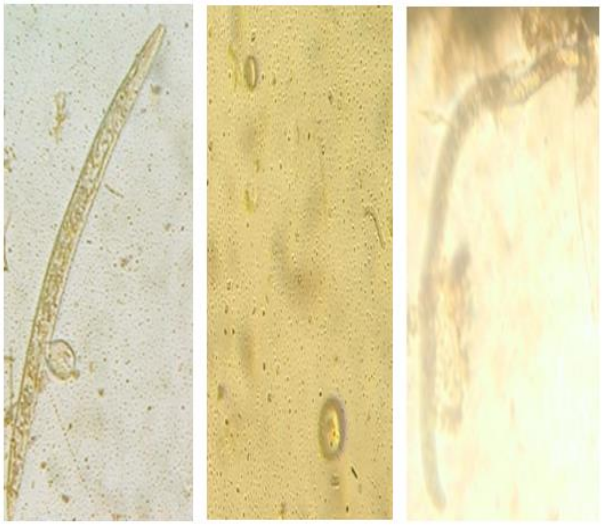
Leaves of *Azadirachta indica, Ficus hispida, Ocimum tenuiflorum, Hibiscus rosasinensis* and *Arthemisia pollen* were collected from Research Institute for Biotechnology, Trichy. The leaves of plants were removed from the stem and stored**.** The collected samples were initially washed with tap water and further washed with distilled water. The dried leaves were granulated into powder. Weigh each sample of 10g and dissolved in 100ml of methanol. The samples were kept for 1hour for methanolic extraction.

The samples were filtered into 3 steps. Primarily filtered with muslin cloth secondarily filtrate with tissue paper and finally filtered with wattman's filter paper. The filtered samples were poured into Petri plates and kept for evaporation. After 24hrs, scrap the samples and transfer into a microfuge tube. 50mg of evaporated samples are diluted in 1ml of methanol and transferred into microfuge tube. Each sample was prepared at different concentrations.

S. No	Formulation	Name of the leaves	Concentration
1	F1	*A.indica* *O.tenuiflorum* *A.pallen* *H.rosasinensis* *F.hispida*	10mg 10mg 10mg 10mg 10mg
2	F2	*A.indica* *O.tenuiflorum* *A.pallen* *H.rosasinensis* *F.hispida*	10mg 5mg 25mg 5mg 5mg
3	F3	*A.indica* *O.tenuiflorum* *A.pallen* *H.rosasinensis* *F.hispida*	15mg 5mg 5mg 20mg 5mg
4	F4	*A.indica* *O.tenuiflorum* *A.pallen* *H.rosasinensis* *F.hispida*	5mg 10mg 5mg 5mg 25mg

B. Nematode isolation

The infected *Musa acuminate* (red banana) roots are collected and primarily rinsed with tap water and secondarily washed with distilled water and the roots were cut into small pieces and suspended in sterile distilled water. It was incubated for 2-3 days for egg hatchability. The live Nematodes were viewed under microscope. Collect the Nematodes and transfer into the 24 well plate for evaluating the mortality rate. A total no of healthy 40 Nematodes were chosen for the study. At different levels of concentration of formulated samples were poured into each wells. The 24 well Plate was placed under a microscope and the mortality rate of Nematodes was visualized at regular intervals of 30min for two days. The mortality was 100% for the concentrations of 500µl, 100µl and 50µl. But the mortality occurred in 500µl concentration at once while in 100µl concentration an hour and 50µl a half.



FigA.1 FigA.2 FigA.3

Fig A.1 represents Nematodes ;

Fig A.2 represents Juvenile stage;

Fig A.3 represents Dead Nematodes.

TABLE A.1

S. No	Concentration	No. of nematodes	% of mortality
1	500µl	0	100%
2	100 µl	0	100%
3	50 µl	0	100%
4	10 µl	27	32.50%
5	5 µl	35	12.50%
6	Control	40	0%

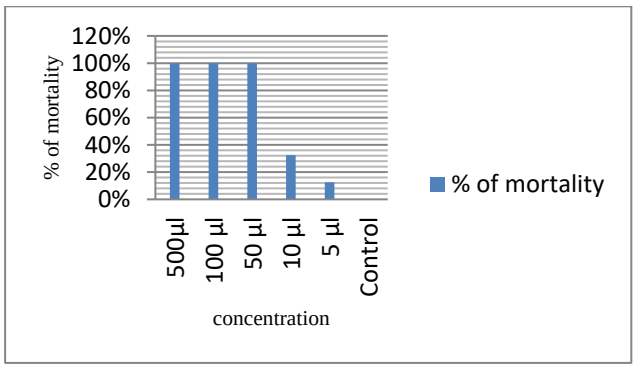


Fig B.1;Comparison of concentration of sample from 500µl to 5µl with Nematodes mortality %

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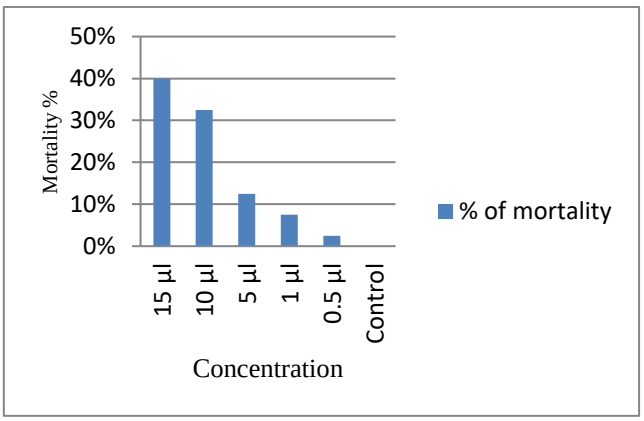
Table A. 2

S. No	Concentration	No. of nematodes	% of mortality
1	15 µl	24	40%
2	10 µl	27	32.50%
3	5 µl	35	12.50%
4	1 µl	37	7.50%
5	0.5 µl	39	2.50%
6	Control	40	0%



FigB.2;Comparison of concentration of sample from 15µl to 0.5µl with Nematodes mortality.

% of mortality = no. of dead nematodes / total no. nematodes X 100

III. RESULT AND DISCUSSION

The ethanolic extracts of *A.indica*, *C.prosera*, *P.hydropiper* and *I.Sepiaria* were effective against *A.craccivora*on bean plants concluded at 74% mortality [12]. *Mimusops elengi* gives a high number of mortality (70-80%) after the 48 hrs treatment. Egg hatching and larval death rate decreased when dilution was increased. The fatality rate of juvenile stage multiplies corresponding to an increase in the risk vulnerability. [13]. Five seeds *(Trigonella foenum graceum, Sesbania sesban, Albizzia lebbak, Cassia fistula* and *Ponagamia glabra)* have higher efficiency to kill the nematodes. At the concentration of LC_{50} and the mortality rate of nematodes is 90-97%. [14].43 plant essential oils are extracted and they are bioassayed, toxicity varied according to the type of oil, dosage of oil, stages of nematodes. Among the 43 plant essential oils (*Cymbopogon citrates, Cinnamomum verum, Allium sativuum, Leptospermum petersonii* and *Eugenia caryophyllata)* five plants have 100% immobility capacity. *Asiasarum sieboldi* and *Mentha spicata* has 100% mortality rate of nematodes, but 78.3 and 85.5% mortality rate of juveniles. [15].The plant extracts have ability to control the plant parasitic nematodes. In our experiment methanolic extraction of *A.indica, A.pallans, F.hispida, H.rosasinensis, O.tenuiflorum* were found effective against *Radopholus similis* by reducing the Nematode population. The total number of Nematode mortality rate decreased when the concentration of the sample was decreased. Thus the optimum effective mortality rate of the nematodes lies in between the concentration of 50µl to 500µl and the dosage varies according to the severity of the infection.

IV. CONCLUSION

The study highlighted the importance of using an herbal formulation and was found effective with nematocidal activity.

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