Assessment of active compounds of Azadirachta indica and Cymbopogon citratus for Meloidogyne infestation prevention

Deepika, Lakshmi and Archna Kumar

Biological Control Laboratory, Amity Institute of Biotechnology, Amity University, NOIDA, Uttar Pradesh-201313, India

E-mail: akumar21@amity.edu

INTRODUCTION

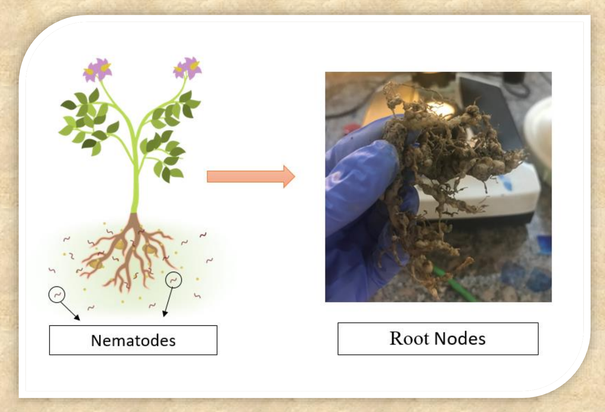
Plant-parasitic nematodes are major threats to global food security. In horticultural crops, approximately 21.3% yield loss occurs due to nematode population only.

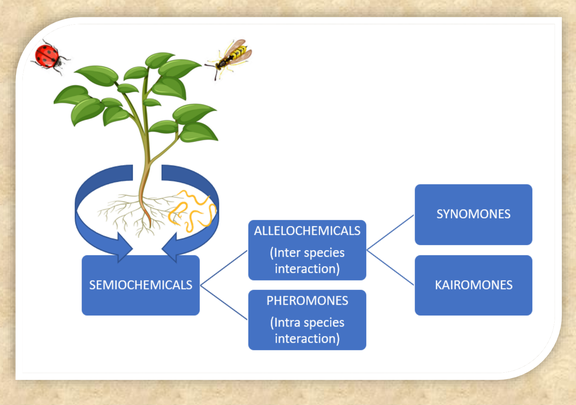
More than 4100 species of plant parasitic nematodes are reported, out of this Meloidogyne species is prominent and worldwide in distribution.

The utilization of harmful chemical pesticides to reduce the nematode population may cause acute and delayed health hazards and harmful impacts on the environment.

Thus there is a great need for an eco-friendly, highly efficient sustainable control measure for this pest.

Therefore in the present study, to control the Meloidogyne infestation, leaf extract of Azadirachta indica and Cymbopogon citratus were analyzed. Organic compounds present in extracts were characterized.





Biological control is the use of non-chemical and environmentally friendly methods of controlling insect pest and disease by the action of natural control agents.

Chemical cues are set of volatiles organic compounds used mainly for communication, homing, symbiotic relationships etc. and also known as semio-chemicals.

METHODOLGY

Lemon grass and Neem leaf Extract Preparation

- From the both plants, leaves were collected, washed with water, air dried and 30g
- leaves were soaked in 300ml HPLC grade distilled Hexane for 24 h and the extract was filtered through Whattman no. 1 filter paper
- 3 g anhydrous sodium sulphate was added to the filtrate and kept for 2 h for dehydration. After dehydration again it was filtered through Whattman no. 1 filter paper for removal of sodium sulphate. The filtrate was passed through silica gel (60-120 mesh) column
- The extract was then distilled at 60-70ºC in a round bottom flask
- The solvent was evaporated completely and the residues was diluted with HPLC grade hexane for preparing different concentrations (4,00,000mg/L; 2,00,000mg/L; 1,00,000mg/L; 50,000mg/L; and 25,000 mg/L) for use in bioassay and Gas Chromatography -Mass Spectrometry (GCMS) studies

.

Silica Gel Chromatography

Filtration of Extract

Nematode Extraction

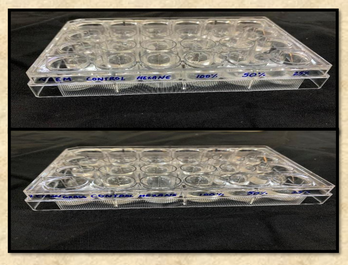
- Nematodes are extracted from the soil by Baermann-funnel method
- After 24-48 hours elute was collected and passed from 400 micrometer sieve
- Nematode population was utilized for further bioassays

Nematode Extraction

Bioassay

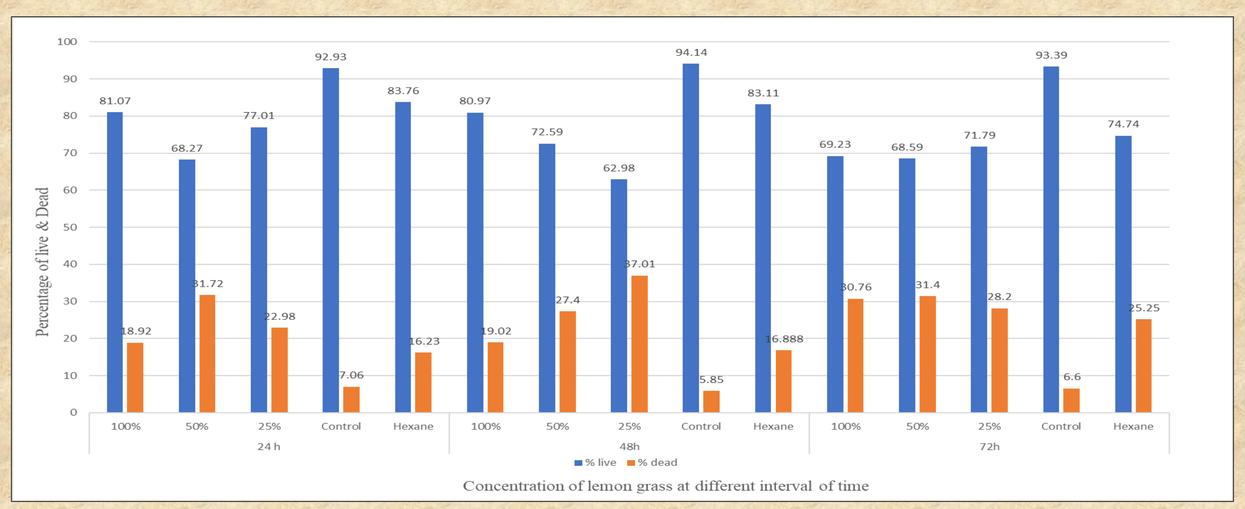
In vitro testing with three concentrations (100%, 50%, 25%) of Lemongrass and Neem were performed

Mortality status of nematode population by counting the live as well as dead individuals after applying a definite volume was noticed at different time durations i.e. 24, 48 and 72 hours

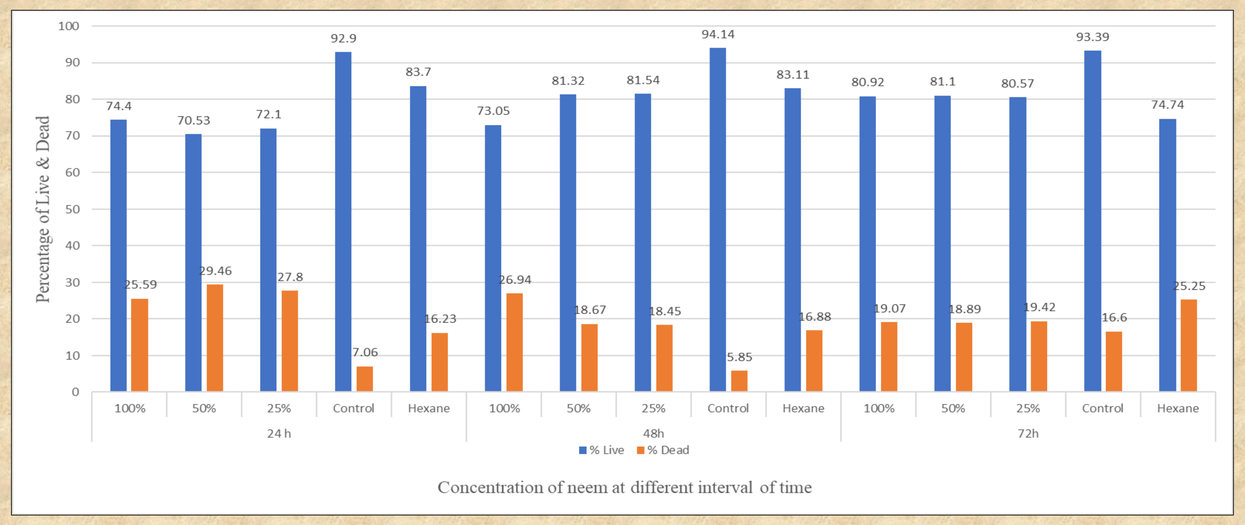


Experimental Setup

RESULT



Effect of Lemongrass on lifetable of *Meloidogyne*



Effect of Neem on lifetable of *Meloidogyne*

Time	C1 (100%)	C2 (50%)	C3 (25%)	-ve Control Hexane extract (A)	C1-A	C2-A	C3-A
T1-24hr	11.30 ± 1.67	15.80 ± 2.52	13.70 ± 2.97	10.6 ± 1.59	0.7	5.2	3.1
T2- 48hr	9.0 ± 0.63	11.70 ± 2.05	11.40 ± 1.60	7.60 ± 1.02	1.4	4.1	3.8
T3- 72hr	16.0 ± 2.07	13.60 ± 1.09	4.40 ± 0.49	9.90 ± 1.33	6.1	3.7	-5.5

Table 1. Shows the mortality of *Meloidogyne* by the different concentration of Lemon grass

Time	C1 (100%)	C2 (50%)	C3 (25%)	-ve Control Hexane extract (A)	C1-A	C2-A	C3-A
T1-24hr	5.40 ± 0.69	6.10 ± 0.61	5.80 ± 0.49	10.60 ± 1.59	-5.2	-4.5	-4.8
T2- 48hr	4.50 ± 0.86	3.10 ± 0.66	3.10 ± 0.57	7.60 ± 1.02	-3.1	-4.5	-4.5
T3- 72hr	3.70 ± 0.52	2.40 ± 0.22	2.70 ± 0.54	9.90 ± 1.33	-6.2	-7.5	-7.2

Table 2. Shows the mortality of *Meloidogyne* by the different concentration of Neem.

- 25% concentration of lemon grass emerge as the most effective nematicide as it show highest mortality(37.01) and least survival (62.98)
- Impact of 100% concentration of lemongrass extract revealed the highest mortality in the nematode population when exposure was up to 72 hours (16.0 ± 2.07)
- Whereas after the treatment with 50% and 25% concentration of same extract maximum mortality was recorded at 24 hour exposure (15.80 ± 2.52, 13.70 ± 2.97)
- Finding also reflected that any concentration of hexane leaf extract of neem was able to elicit a significant change in mortality ratio of *Meloidogyne sp*.
- 25% concentration of lemon grass leaf extract emerge as the most effective nematicide as it shows the highest mortality (37.01%) and least survival (62.98%)

CONCLUSION

Treatment of host plant with 25% concentration of lemongrass extract may be an efficient tool to control the *Meloidogyne sp*. The compound /s present in this extract may be formulated for will be available for minimizing infestation of *Meloidogyne* species.

ACKNOWLEDGEMENT

I would like to thank Amity Institute of Biotechnology (AIB), Amity University, Noida Uttar Pradesh India for providing the infrastructure and laboratory facilities. I also want to thank USDA. **This work is supported by USDA Agriculture and Food Research Initiative Competitive Grants Program - Foundational and Applied Science Program grant no. 2022-67013-36740/project accession no. 1028332 from the USDA National Institute of Food and Agriculture**.