



Evaluation of some plant extracts for their nematicidal properties against root-knot nematode, *Meloidogyne* sp.

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Abstract

Laboratory assay was conducted in Directorate of Diyala Agriculture, plant pathology Lab during 2016. The nematicidal activities of seven plants extracts viz garlic, ginger, cinnamon, neem, castor bean, nerium and eucalyptus were tested *In vitro* against juveniles of Root-knot nematode *Meloidogyne* sp. after 48 hour from exposures. All tested treatments had nematicidal effects on nematode juveniles; the highest percentage of nematode mortality was achieved by application of nerium extract (78.2%) with significant differences from other treatments followed by neem (43.4%), ginger (39.1%), garlic and eucalyptus (30.4%), castor bean (26.0%) and cinnamon (21.7%) in concentration 5% while in concentration 10 % ,the highest percentage of nematode mortality was in eucalyptus extract (100%) followed by cinnamon (97.1%), nerium (95.6%), ginger (92.7%), neem (91.3%), castor bean (81.1%) and garlic (65.2%) as compared with control (13.0%).

Keywords: *Meloidogyne* sp., Garlic, Ginger, Cinnamon, Neem , Castor bean, Nerium, Eucalyptus.

Introduction

Nematodes are the main pathogens on most vegetable crops and without control cause loss of yield and quality. Losses of yield approximately due to nematodes have been estimated to be 100 billion dollar worldwide each year (Sasser and Freckman, 1987). Root-knot nematodes (*Meloidogyne* sp.) infect almost all types of plants and may cause damage by drains the plant's photosynthetic and nutrient (Adekunle and Akinlua, 2007; Eisenback and Triantaphyllous, 1991). The population of plant parasitic nematodes in the field can be minimized through several approaches such as using natural enemies, enhancing cultural practices, cultivating resistant cultivars and applying pesticides (Khan and Kim, 2007; Khan *et al.*, 2007; Okada and Harada, 2007; Williamson and Kumar, 2006; Browning *et al.*, 2006). Application of chemical nematicides have been found as an effective measure for the control of nematode but due to its high toxic residual effect and toxicity of these chemicals to beneficial flora and fauna in the soil there is therefore need to develop an alternative nematode control strategies (Akhtar, 1991; Siddiqui and Alam, 1985). One of the outstanding alternative control measures against nematode pests is the application of

plant extracts (Oka *et al.*, 2006). Present research was carried out to test activity of seven plants extracts *In vitro* against juveniles of root knot nematode *Meloidogyne* sp.

Materials and Methods

Plant extracts preparation: The plants materials of garlic (*Allium sativum*), ginger (*Zingiber officinale*), cinnamon (*Cinnamomum verum*) and neem (*Azadirachta indica*) powders, castor bean (*Ricinus communis*), nerium (*Nerium oleander*) and eucalyptus (*Eucalyptus* sp.) leaves were mixed separately with distilled water in an electric grinder then filtered through muslin cloth for three times and these extracts were diluted to make 5% and 10 % (Figures 2 and 3) . Culture preparation of root knot nematodes: Individuals of *Meloidogyne* sp. were extracted from soil samples and roots of infested brinjal that collected from banyasad region, Iraq. These samples were processed by Cobb's sieving and decanting method (Southey, 1986). The juveniles of nematodes were caught in the 53µm sieve; large number of nematodes were obtained and used for screening crude extracts Effect of plant extracts on juvenile mortality: Ten milliliter of each dilution 5% and 10% of plants extracts were separately poured into 9cm diameter Petri dish and 1ml of suspensions containing 23 freshly juveniles were added to

each Petri dish, water with nematode larvae was taken as control. All treatments were replicated three times. Percent mortality was calculated after 48 hours. All the data collected were analyzed in completely randomized design by using analysis of variance (Fisher and Yates, 1968). Experiment was performed under laboratory conditions. Nematode was considered dead if they did not move when probed with a fine needle (Cayrol *et al.*, 1989).

Results and Discussion

In this study, it was observed that each concentration of 5 and 10 % from aqueous extracts *viz* cinnamon, castor bean, nerium, garlic, neem, ginger and eucalyptus were increased mortality % of nematode juveniles as compared with control, extract of nerium was significantly increased mortality % of juveniles (78.2%) as compared with other treatments while garlic and eucalyptus were reduced mortality % to (30.4%) in concentration 5%. Extracts of eucalyptus, cinnamon and nerium were recorded maximum mortality % of juveniles (100, 97.1 and 95.6%) respectively while garlic was recorded minimum mortality % (65.2%) in concentration 10%, whereas the untreated check (control) was significantly reduced mortality % of juveniles (13%) from other treatments in both concentrations (table 1 and figure 1). *Eucalyptus* species are known to have essential oils which are composed of mixture of volatile compounds, the parts of *Eucalyptus* compounds were lethal to root knot nematode. Similarly in previous studies, nematicidal property by a certain number of plants has been investigated for nematode

control in agricultural crops (Al-Obaedi *et al.*, 1987; Firoza and Maqbool, 1996; Dawar *et al.*, 2007). Samreen Abbas *et al.* (2009) showed that cinnamon increased the mortality rate of *M. javanica*. The essential oils of cinnamon have shown nematicidal activity, the effectiveness of the cinnamon oil on the nematodes have also shown the potential of these botanicals as replacement for synthetic insecticides (Paranagama *et al.*, 2003; Kong *et al.*, 2007). Moosavi (2012) reported that the number of *M. javanica* juveniles was lower in soil amended with seed powder and leaves of neem and the shoots and leaves of *Nerium oleander* resulted in higher nematode mortality. Agbenin *et al.* (2004) reported that aqueous extracts of neem and ginger powders when applied to tomato suppressed the population of *M. incognita* at concentrations above 10%. Katoll *et al.* (2010) reported that extract of castor bean was reduced population of nematode *M. incognita* on cucumber in soil, and caused the longitudinal growth of cucumber.

Conclusions

It has been concluded from present research that plant extracts are a source of cheap and effective nematicides of root knot nematodes. The root extracts of garlic, ginger, cinnamon, neem, castor bean, nerium and eucalyptus were found to have nematicidal properties. This finding is important from the point of view of controlling root-knot nematodes without the use of nematicides in view of the environmental pollution likely to cause. These may be replacement to the synthetic dangerous and expensive chemicals in future.

Table (1): Effect of concentrations 5% and 10% of plants extracts on juveniles mortality of *Meloidogyne* sp. after 48hrs

| | Treatments | | Mortality % | |
|---|-------------|----------------------------|-------------|-------|
| | Common name | Scientific name | 5% | 10% |
| 1 | Cinnamon | <i>Cinnamomum verum</i> | 21.7 | 97.1 |
| 2 | Castor bean | <i>Ricinus communis</i> | 26.0 | 81.1 |
| 3 | Nerium | <i>Nerium oleander</i> | 78.2 | 95.6 |
| 4 | Garlic | <i>Allium sativum</i> | 30.4 | 65.2 |
| 5 | Neem | <i>Azadirachta indica</i> | 43.4 | 91.3 |
| 6 | Ginger | <i>Zingiber officinale</i> | 39.1 | 92.7 |
| 7 | Eucalyptus | <i>Eucalyptus</i> sp. | 30.4 | 100.0 |
| 8 | Control | | 13.0 | 13.0 |
| | CD(0.005) | | 6.620 | 5.4 |

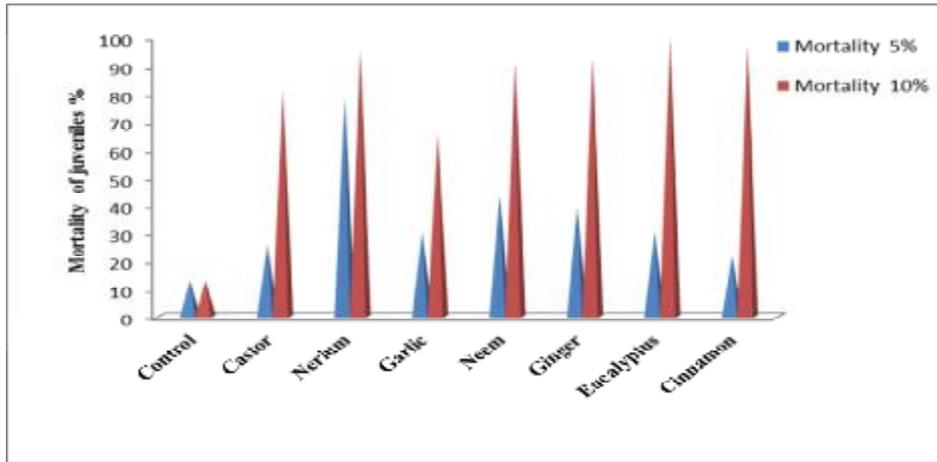


Figure (1): Effect of concentrations 5% and 10% of plants extracts on juveniles mortality of *Meloidogyne* sp. after 48hrs

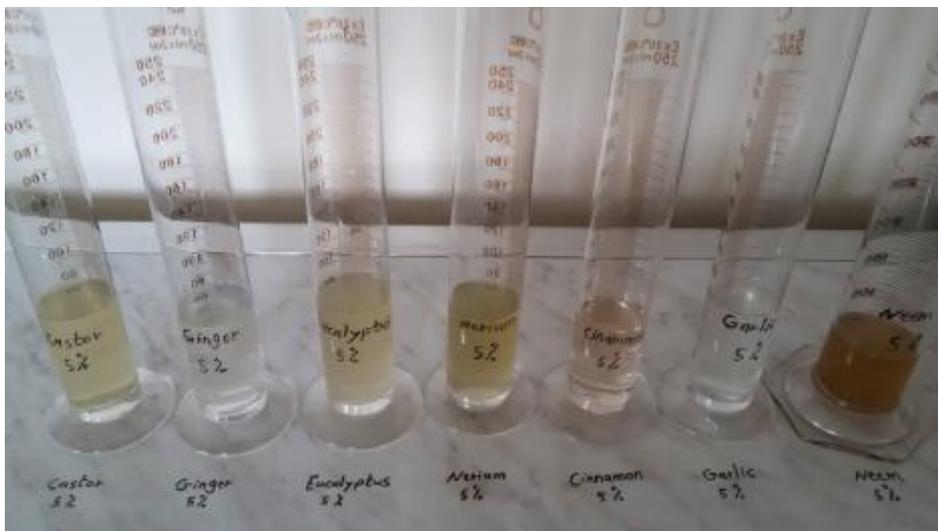


Figure (2): Concentrations 5% of plants extracts (garlic, ginger, cinnamon, neem, castor bean, nerium and eucalyptus)

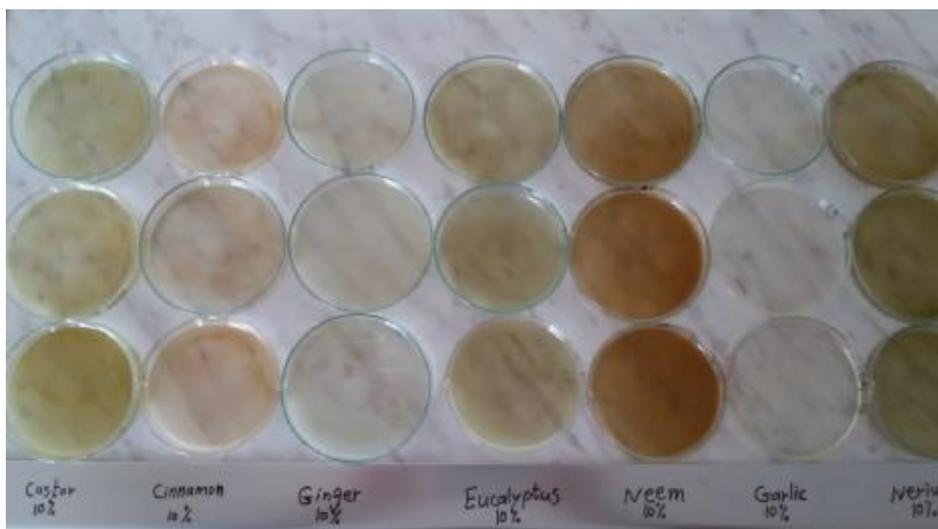


Figure (3): Concentrations 10% of plants extracts (garlic, ginger, cinnamon, neem, castor bean, nerium and eucalyptus)

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