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Nematicidal Activity of Plant Extracts against the Root-Knot Nematode Meloidogyne Sp on Tomato Plants

Hussein Salim, Abbas Ali, Abdalsalam Abdalbaki, Hana Eshak, Khalaf Khamees and Balkees Reski
Directorate of Diyala Agriculture, Ministry of Agriculture, Iraq

Abstract
Pots experiment of tomato plants was conducted in Directorate of Diyala Agriculture, plant pathology Lab during 2016 , nematicidal activities of aqueous extracts from plants viz., Garlic, Ginger , Castor bean , Nerium and Eucalyptus were assayed against root knot nematode *Meloidogyne sp*. The results showed that nematicide (Oxymethoed LS) and Castor bean recorded maximum shoot weight of plants (10.6 and 9.0 g) respectively while root weight was increased in treatments of Oxymethoed and ginger (2.45 and 1.5 g) respectively after control treatment (l7.53 g) whereas Oxymethoed and Nerium reduced number of juveniles/pot (0.0,80) respectively.
Keywords: *Meloidogyne sp*, Garlic, Ginger, Castor bean, Nerium, Eucalyptus and Oxymethoed LS

1. Introduction

Tomato (*Lycopersicon esculentum*) is an important and widely grown vegetable crop all over the world. Among various diseases, which damage crops, plant-parasitic nematodes present a formidable problem for different crops, most species attack and feed on plant roots and underground plant parts, root-knot nematode (*Meloidogyne* spp) is an important pest of vegetables (Akem 1991; Akem and Dashiell, 1992). It is obligate parasites and very damaging plant pest limiting agricultural productivity, most cultivated plant species are susceptible to root-knot nematode infection and lead to reduce of tomato yield by 30–50% (Saravanpriya and Si-vakumar 2005; Sasser and Carter 1985). Indiscriminate use of synthetic pesticides for controlling nematodes is likely to give rise to environmental pollution, nematode resistance and phytotoxicity, unsafe use of pesticides may result in poisoning of humans is a problem especially in developing countries (Yudelman *et al*., 1998; Conway 1995). The use of plant extracts is one of the methods for nematode control. They are cheap, easy to apply, produce no pollution hazards and have the capacity to improve the soil health (Sultana *et al*., 2010).The efficacy of different plant extracts for use in nematode control has been studied. (Fatema and Ahmad 2005; Khan *et al*. 2011; Mousa *et al*. 2011). The objective of this research is to compare potential of the aqueous extracts against root knot nematode *Meloidogyne* sp infecting tomato.

2. Materials and methods

2.1 Collection of plants materials

Plants material viz., Garlic (*Allium sativum*), Ginger (*Zingiber officinale*), Castor bean (*Ricinus communis*), Nerium (*Nerium oleander*) and Eucalyptus (*Eucalyptus* sp) were collected from local market in Baqubah district, Iraq. Tomato seedlings cultivar (Hadeer) about 14 days old were collected from Buhriz district, Iraq.

2.2 Preparation of aqueous extracts

One hundred gram of fresh leaves of Castor bean, Nerium and Eucalyptus were washed under running tap water and one hundred gram of Garlic and Ginger powders were mixed separately in an electric grinder in 500 mL of distilled water. These were filtered through 4 layers of muslin cloth, this process was repeated three times .These extracts were diluted with distilled water to make10 % and stored in bottles.

2.3 Extraction of Root-Knot Nematodes

The nematodes of *Meloidogyne sp* were isolated from infested eggplant roots that collected from Banysaad region of Iraq. Culture of *Meloidogyne sp* was prepared by washing the roots under tap water and removed the galls of nematodes from the infested roots and cut into small pieces, then ground by the blender with water to prepare nematodes suspension. The nematode population was isolated by Cobb's 1918 sieving and decanting method, nematodes suspension was poured through the sieve (180 micron) and allowed to run down then washed the residue in the sieve (53 micron) that containing nematodes then placed into the beaker .

2.4 Pots experiment

Tomato cv. Super strain B of two-week-old seedlings was transplanted to pots 12-cm diam. containing 2 kg of sterilized soil. Two weeks later, each pot was inoculated with 1500 second stage juveniles of the root-knot nematode. The aqueous extracts 10% were added as a soil drenches after one day from inoculation of nematode also the nematicide, oxymethoed LS (1.5 cc/L) was tested as a comparison. There were seven treatments with three replicates and pots with nematode only served as the control and one seedling / pot. All the pots were

arranged in a completely randomized design and watered as needed. At the harvest stage, 51 days later, the plants were carefully uprooted. Soil was extracted using the sieving and decanting method by washing the residue in the sieve containing nematodes in to the beaker, a round wire mesh with tissue paper was placed on the top of Petri plate, the pooled filtrate obtained from the fine sieve containing the nematodes and fine soil particles was poured through the Petri plate, the wire mesh just touching the water in the Petri plate and left for 24 hours. The active nematodes were made their way through the tissue paper and sink in the bottom of Petri plate when they were come in contact with the water due to gravity. The sample was placed in a dish for examination. Observations were taken on following plant growth parameters *viz*., shoot length (cm), root length (cm), shoot weight (g), root weight (g), number of juveniles per pot.

3. Results and discussion

Data in table 1 and fig 1,2,3 indicate shoot and root length of tomato with non significant differences among the treatments, Oxymethoed and Castor bean caused higher increases in shoot weight of plants (10.6 and 9.0 g) respectively from other aqueous extracts while root weight of tomato and total number of juveniles/pot was 7.53 g and 460.0 respectively in control with significant differences from other treatments whereas Oxymethoed and Nerium recorded less total number of juveniles/pot (0.0,80) respectively from other treatments followed by Castor bean,Eucalyptus,Garlic and Ginger (106.2 ,140 , 146.2 and 200) respectively . Moosavi (2012) reported that extracts of shoots and leaves of *Nerium oleander* resulted in higher nematode mortality. Tibugari *et al*. (2012) reported that aqueous extracts of castor and garlic were more than control treatment, regarding gall inhibition, 60 days after nematode inoculum by *M. javanica* on tomato. Patel *et al*. (1993) reported that the test plant extracts of ginger and garlic on the micro plots suppressed the population *M. javanica* and *M. incognita* in tomato. Hassan and Tauro , (1992) reported that aqueous extracts of ginger rhizome at 25, 50 and 100% w/w and found significant reduction of *M. incognita* in tomato with increase in plant height and shoot weight.

4. Conclusion

The results presented in this research lead to the conclusion that plants extracts exhibited some nematicidal compounds which caused death of second stage juveniles of *Meloidogyne sp.* therefore there is needed to find out toxic compounds released by plants extracts and carry out experiments *In vivo* for the control of root knot disease by *Meloidogyne sp*.

Table 1. Effect of aqueous extracts on growth parameters of tomato and Total No. of juveniles of *Meloidogyne sp* /pot

Treatments		Shoot length (cm)	Root length (cm)	Shoot weight (g)	Root weight (g)	Total No. of juveniles/pot
1	Nerium	29.5	10.5	4.2	0.61	80.0
2	Eucalyptus	32.5	6.6	4.9	0.24	140.0
3	Castor bean	42.6	9.3	9.0	1.23	106.2
4	Ginger	37.0	8.6	8.6	1.50	200.0
5	Garlic	33.3	8.0	8.4	1.26	146.2
6	Oxymethoed	44.3	12.0	10.6	2.45	0.0
7	Control	33.3	12.0	8.9	7.53	460.0
CD (0.005)		N.S	N.S	4.0	1.32	11.4

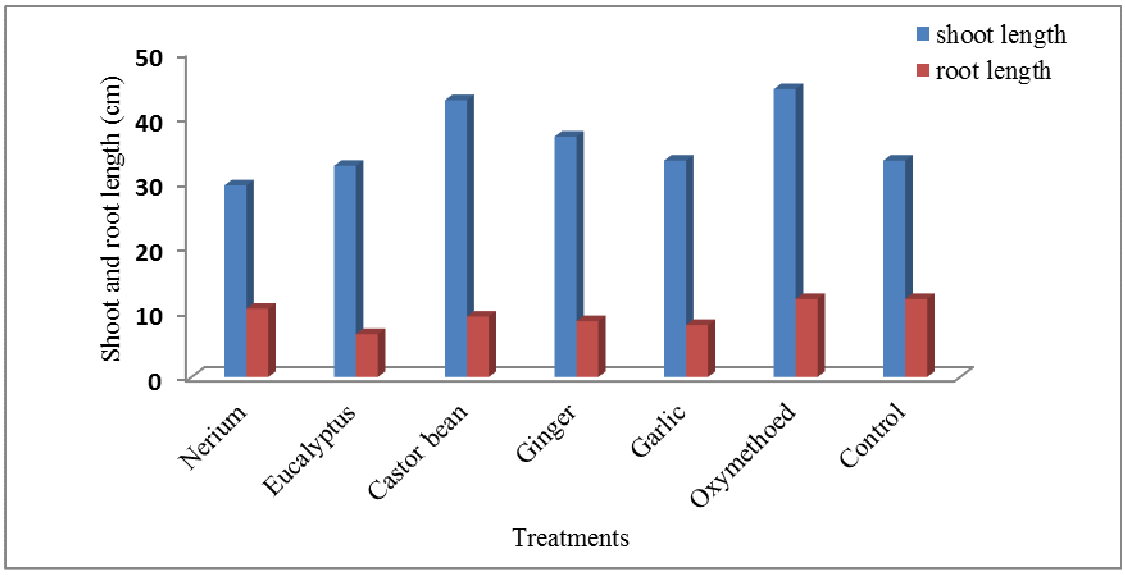

Figure 1. The shoot and root length of tomato as influenced by aqueous extracts for management of root knot nematode *Meloidogyne sp*

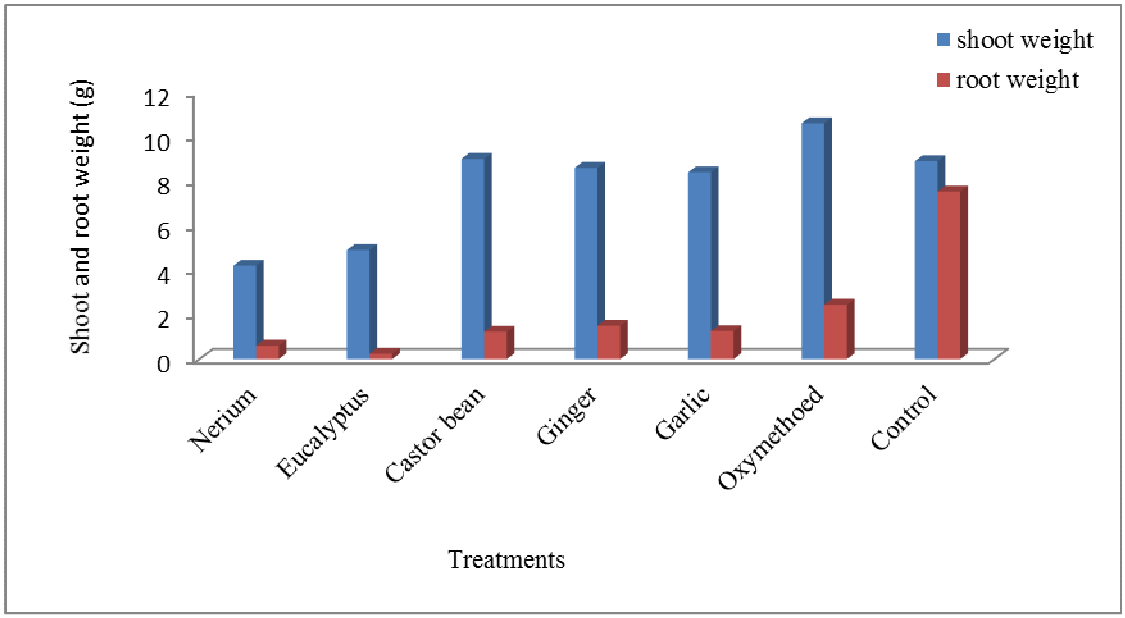

Figure 2. The shoot and root weight of tomato as influenced by aqueous extracts for management of root knot nematode *Meloidogyne sp*

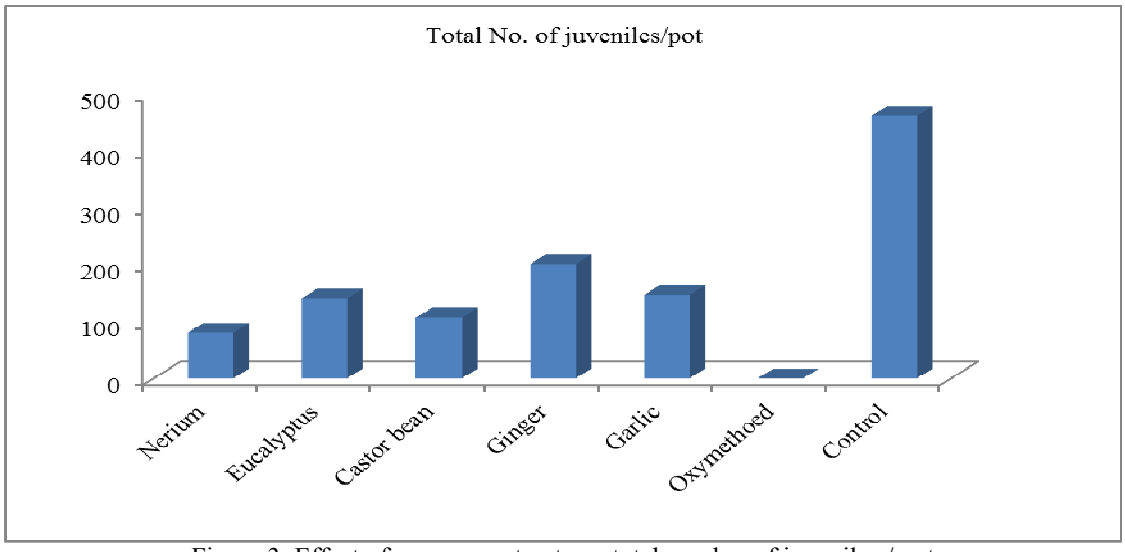

Figure 3. Effect of aqueous extracts on total number of juveniles / pot

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