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Testing Environment friendly materials as alternatives to chemical pesticides for controlling the disease of root knot nematodes

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Abstract:*This study was conducted to Testing Environment friendly materials as alternatives to chemical pesticides for controlling the disease of root knot nematodes. Results indicated thata significant difference in the number of the second stagejuveniles (J2) of root knot nematodes between abamectinpesticide was superior to the other treatments. root gall index of treated plants, showed Abamectin treatment was superior to the others with less root gall index in comparison to the control treatment which recorded the highest index and revealed the significant superiority of the Abamectinpesticide treatment in giving the highest fresh and dry weights of the roots and shoot.The results indicated that the increased concentration of powder led to a decrease in the number of (J2) and the Root Gall Index, which in turn reflected the weight of the shoot and fresh root and dry plants.*

Keywords:*Meloidogynespp,eggplant ,datura ,neem*

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I. Introduction

Eggplant *Solanummelogena L.* is an important vegetable crop grown in large areas. The cultivated area of eggplant in Iraq reaching 3786.75 ha with a production of 11640 tons / year (Agricultural Statistics Directorate, 2010). Eggplant is infected by many pests. Root knot nematodesis one of the most important pests that causes great losses for this crop (Abu Gharbiya , 2010) . The importance of these worms is due to their widespread and wide range of hosts they infect as well as their involvement with other pathogens to cause disease complexes and to their capability to break host resistance. In view of the damage caused by the chemical control and to reduce damage to the environment, researchers have recently turned from the traditional ways to find alternative ways of controlling these worms, such as the use of plant extracts or the use of biological control and pesticides of plant origin, that are less toxic to humans and animals and more effective against worms on different crops. (Adegbite and Adesiya ,2005). Abamectin is a mixture of Maccrolcyclic Lactone compounds produced by bacteria *Streptomyces avermitilis* (Bessi et al.,2010). Abamectin was adopted as an agricultural pesticide in a number of crops in 1985, and its applications are continuing to expand in various countries of the world. The ability of this pesticide to control Root knot nematodes also recorded on tomato plants (Khalil et al.,2012). Several studies have shown the activity of Neem*Azadriachtaindica* against insects, nematodes and even fungi. The extract of this plant inhibits the fungi and nematode growth (Vyas, 1993), (Gupta *et al*, 1993)(KhurmaandSingh, 1997), (Akhtar and Akhtar, 2000). Moreover, these extracts have no negative effects on the environment. (Umar and Ngwamdai,2015) pointed to the effect of Datura leaves in reducing the density of Root knot nematodes in melon plants. So, the aim of this study was to evaluate the efficiency of Datura leaf extract and Neem powder with two pesticides, Abamectin and Nemahit, in lowering the number of Root knot nematodes and reducing root knots in eggplant plants grown in the greenhouse.

II. Material And Methods

Study area

The experiment was conducted in the (glasshouse 27±5 C)theDepartment of Plant Protection, College of Agriculture, University of Baghdad, for the period from 2016-2017 and plant were uesd*Solanummelongena*.

Culture of nematodes

second stage juveniles (J2) were isolated from soil heavily infested with *Meloidogyne* spp. by sieves (Sana Haroun, 2005). Homogeneous aliquot was placed in counting dish and the number of IJ2 in 1ml was under the microscope.

Preparation of powder

It was prepared to powder the leaves of the datura and neem plant by collecting the leaves of the plants and then washing them with tap water and leaving them exposed to the air to dry and then was grinded using the blender until it became a fine powder and kept in glass containers for use.

Treatment

The 20-day eggplant seedlings were planted in a 1-kg pot by 5 replicates per treatment and treated as follows:

First treatment: control without infected (T1) ,Second treatment: Add the Neem leaves powder 5 g / kg (T2) The third treatment: add Neem powder 10mg / kg (T3) ,Treatment fourth: Add the powder datura leaves 5 g / kg (T4) ,Treatment fifth: Add the powder of datura leaves 10 g / kg (T5) ,Treatment sixth: Add the mixture of Neem powder and Datura 5 g / kg for each (T6) ,Treatment seventh: Use epamectin pesticide 4 ml / liter (T7) ,Treatment eighth: Control with infected (T8) . After three days of treatments, the seedlings were inoculation with the J2.

Root knot index and penetration

The rate of infestation of the root knot nematodes is determined using a 5 level scales [13]: 1 = no galls on roots, 2 = galls on 1% - 25% of the root, 3 = galls on 26% - 50% of the root, 4 = galls on 51% - 75% of the root, and 5, galls on 76% - 100% of the root. To determine the nematode penetration of eggplant roots, roots were stained with acid fuchsine (Muter,2017) , washed with water to remove excess stain and 1 g of each root was individual examined under a compound microscope to count nematodes inside the roots.

Effect of treatment on Fresh and Dry Weight of Shoot and Root Systems

Plants were carefully uprooted and roots were washed under tap water to remove adhering soil. To determineshoot and root dry and wet weight, shoots and roots were separately weights and dried at 70 C for 48 h or until weight fixed.

Statistical analysis

Statistical Analysis System (SAS) (2012) was used in the analysis of the data to study the effect of the studied coefficients in the different characteristics according to the complete randomized design (CRD). The differences between the mean were compared with the least significant difference (LSD) below the probability level of 0.05.

III. Result

The results in tab. 1 referred to a significant difference in the number of the second phase juveniles of root knot nematodes. The treatment of the Abamectin pesticide was superior to the other treatments, since there was no any juvenile recorded inside the root, followed by the treatment of mixing Neem powder with Datura leaves (6.67 juveniles). Datura treatment at a concentration of 10 gm/kg resulted in 20 juveniles, followed by the treatment of Neem powder which resulted in presences of 28.96 juveniles, in comparison to the control treatment which recorded the highest number of juveniles inside the roots (reached 115.66 juveniles).

TABLE 1.Effect of neem powder, datura and Abamectinpesticidetreatment on nematode penetration.

Treatment	number of juveniles(J2)
T1	0.00
T2	86.33
T3	28.96
T4	55.61
T5	20.00
T6	6.67
T7	0.00
T8	115.66
LSD	10.65

LSD: significant differences between treatments at $P < 0.05$.T1: control without infected,T2: Add the Neem leaves powder 5 g / kg, T3: add 10mg / kg Naem powder, T4: Add the powder datura leaves 5 g / kg, T5: Add the powder of datura leaves 10 g / kg, T6: Add the mixture of Neem powder and Datura 5 g / kg for each, T7: Use epamectin pesticide 4 ml / liter and T8: Control with infected.

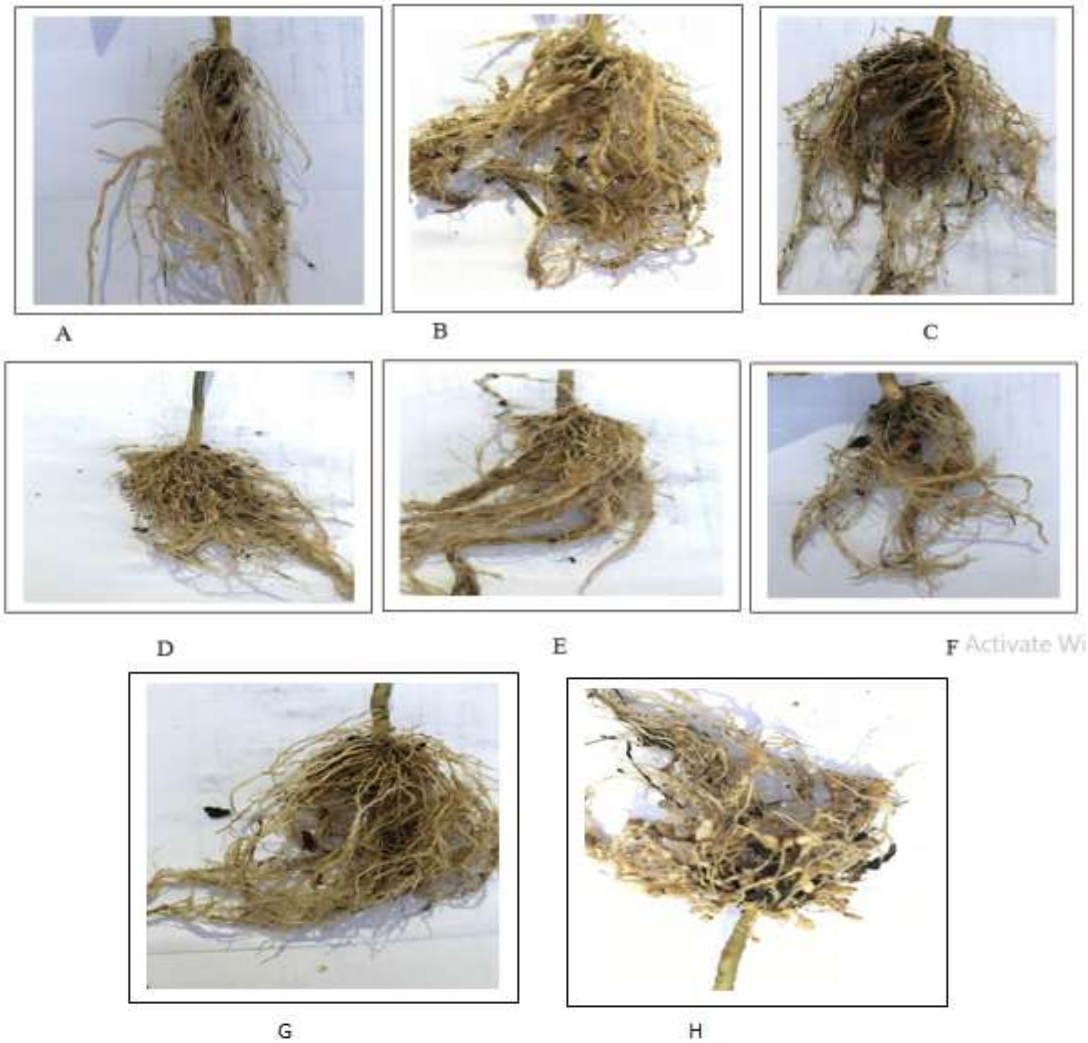
The results in Tab. (2) and fig.1, showing the root gall index of treated plants, showed significant differences between the treatments. Abamectin treatment was superior to the others with less root gall index (1.00) in comparison to the control treatment which recorded the highest index (5), followed by the treatment of

Neempowder mixed with Datura leaves (1.33). The root gall index got from treatment of Datura powder at a concentration of 10 g / kg was 1.66 and from the treatment of Naem powder was (2.00) at 10 g / kg .

TABLE 2.Effect of Neem powder, Datura and Abamectin pesticide treatment on Rat of Root Gall Index.

Treatment	Root gall index
T1	1.00
T2	3.00
T3	2.00
T4	2.66
T5	1.66
T6	1.33
T7	1.00
T8	5.00
LSD	0.69

LSD: significant differences between treatments at $P < 0.05$.T1: control without infected , T2: Add the Neem leaves powder 5 g / kg, T3: add 10mg / kg Naem powder, T4: Add the powder datura leaves 5 g / kg, T5: Add the powder of datura leaves 10 g / kg, T6: Add the mixture of Neem powder and Datura 5 g / kg for each, T7: Use epamectin pesticide 4 ml / liter and T8: Control with infected.



FIGER.1 Effect of Neem powder, Datura and Abamectin pesticide treatment in the infected of root knot nematodes.

A: control without infected ,B: Add the Neem leaves powder 5 g / kg, C: add 10mg / kg Neem powder, D: Add the powder datura leaves 5 g / kg, E: Add the powder of datura leaves 10 g / kg, F: Add the mixture of Neem powder and Datura 5 g / kg for each, G: Use epamectin pesticide 4 ml / liter and H: Control with infected.

The results in tab. 3 revealed the significant superiority of the Abamectinpesticide treatment in giving the highest fresh and dry weights of the shoot (17.70 and 3.08g respectively). The treatment of mixing Neem powder with Datura leaves recorded fresh and dry weights reached 8.32 and 1.85g respectively, while the control treatment, without Pathogens, gave 7.91 and 1.65g respectively; the fresh and dry weights got from treatment of Neem powder at concentration of 10 g/kg reached 4.94 and 1.49g respectively, in comparison to control treatment which gave less fresh and dry weights of shoot (3.62 and 1.00 g respectively).

TABLE 3.Effect of Neem powder, Datura and Abamectin pesticide treatment on Fresh and Dry Weight of Shoot Systems.

Treatment	dry weights	Fresh weights
T1	1.65	7.91
T2	1.04	3.63
T3	1.49	4.94
T4	1.12	4.29
T5	1.22	5.73
T6	1.85	8.32
T7	3.08	17.70
T8	1.00	3.62
LSD	0.30	1.69

LSD: significant differences between treatments at $P < 0.05$.T1: control without infected , T2: Add the Neem leaves powder 5 g / kg, T3: add 10mg / kg Naem powder, T4: Add the powder datura leaves 5 g / kg, T5: Add the powder of datura leaves 10 g / kg, T6: Add the mixture of Neem powder and Datura 5 g / kg for each, T7: Use epamectin pesticide 4 ml / liter and T8: Control with infected.

The results in Tab. 4 showed that the treatment of Abamectin pesticide exceeded the other treatments significantly recording higher fresh and dry weights of roots reached 5.69 and 1.07g respectively, followed by the treatment of mixing Neem powder with Datura leaves giving 3.98 and 0.52g, whereas the control treatment, without pathogens, gave 4.13 and 0.92g. The fresh and dry weights of root got from the treatment of Neem powder at the concentration of 10g/kg reached 3.88 and 0.75 g, and from Datura at 10 g/kg 3.07 and 0.58 g, in comparison to the control treatment which got 4.47 and 0.98 g.

TABLE 4.Effect of Neem powder, Datura and Abamectinpesticidetreatment on Fresh and Dry Weight of Root Systems.

Treatment	dry weights	Fresh weights
T1	0.92	4.13
T2	0.77	4.60
T3	0.75	3.88
T4	0.80	3.88
T5	0.58	3.07
T6	0.52	3.98
T7	1.07	5.69
T8	0.98	4.57
LSD	0.17	1.45

LSD: significant differences between treatments at $P < 0.05$.T1: control without infected , T2: Add the Neem leaves powder 5 g / kg, T3: add 10mg / kg Naem powder, T4: Add the powder datura leaves 5 g / kg, T5: Add the powder of datura leaves 10 g / kg, T6: Add the mixture of Neem powder and Datura 5 g / kg for each, T7: Use epamectin pesticide 4 ml / liter and T8: Control with infected.

IV. Discussion

The results of the present study showed that all these plants have got some nematicidal potential against root knot nematodes.Jansson and Rabatin, (1998) revealed that effect abamectinoncontrollingMeloidogyne incognita on tomato, M. javanica and Radopholussimilis on banana. abamectin (Vertemic 1.8% EC) as soil application proved its nematicidaleffectivity, that suppress the root-knot nematodes, Meloidogyne spp., on varies vegetables crops Khalil (2012).Bessi et al.,(2010) proved that Seed treatment with abamectin decreased the penetration of the second stage juveniles into the roots, resulting in lower colonization and reproduction of M. incognita, on cotton plants.Bloomquist (1996) observed that the avermectins mode of action is blocking the transmittance of electrical activity in nerves and muscle cells, by stimulating the release and binding of gamma-amino butyric acid (GABA) at nerve endings . Korayem et al. (2008) showed that abamectin at the tested concentrations significantly reduced

most nematode parameters and enhanced plant growth parameters. Fatoki, (2013provedthat neem leaf extracts compared reduced nematode population in infected cowpea plant. Salako et al., (2008) found that many farmers in Nigeria use neem for various crop protection practices with a lot of success.Francisco et al., (2015) showed that the control of these plant-parasitic nematodes through the use of neem and sorghum can be effective.Javed et al., (2008) who report of neem (Azadirachtaindica) formulations on biology of root-knot nematodes (Meloidogynejavanica) on tomato and found the nematicidal potential in vitroand in glass house. Nwankwoet al., (2016) revealed that the neem leaf extract have nematicidal property and would be effective in the management of root-knot nematodes.Nazir et al.,(2008)revealed that use of neem have most effective in protecting the roots against nematode infection. Khalil MS(2013) explain that effect of neem against plant parasitic nematodes was noticed and recorded , as well as its insecticidal, fungicidal and bactericidal efficacy.The extracts from the leaves of daturastramonium, and azadirachtaindica produced 80 - 94% mortality after 72 h of exposure. Preissel and Preissel, (2002) revealed all parts of the datura plant contain dangerous levels of the tropane alkaloids atropine, hyoscyamine and scopolamine, which are classified as delirients or anticholinergins . Umar,(2012) reported that effect of datura in different levels of the extract on juvenile mortality could be due to the presence of tannins, alkaloids and flavonoids

V. Conclusion

This study showed that increased concentration of treatments reduced theinfected of root knot nematodes and penetration in the number of (J2) and the Root Gall Index which in turn reflected the weight of the shoot and fresh root and dry plants.

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