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IMPACT OF CERTAIN MEDICINAL AND AROMATIC PLANT PRODUCTS ON *Meloidogyne incognita* INFECTING EGGPLANT UNDER GREENHOUSE CONDITIONS

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ABSTARCT

The impact of nine medicinal and aromatic plant products as ground-oil-seeds i.e. fenugreek, arugula, coriander, celery and dill; and dried leaf powders i.e. peppermint, rosella, periwinkle and throne apple separately in comparison with oxamyl on *M. incognita* infecting eggplant cv. Black Long under greenhouse conditions, indicated that all tested materials obviously improved plant growth parameters of eggplant plants and significantly diminished nematode development and reproduction. Fenugreek as ground-oil-seeds application represented the maximum percentage increase values of plant length (54.3%), total plant fresh weight (177%), shoot dry weight (142.7%) and number of leaves/ plant (117.4%) whereas ground-oil-seeds of dill gave the least percentage increase values in this respect. However, peppermint as powder also represented the maximum increase values of ameliorating plant length (53.6%) , total plant fresh weight (158.4%), shoot dry weight (138.8%) and number of leaves / plant (108.7%), respectively, followed by that of rosella and throne apple whereas periwinkle showed the least values of the same plant growth criteria. Oxamyl ranked first and surpassed other tested applications in percentage increase values of the same plant growth criteria, respectively, and in diminishing nematode criteria with the lowest reproduction factor (RF) value of 0.37 vs 4.6 for nematode alone. Fenugreek treatment overwhelmed other tested ground-oil-seeds in suppressing nematode population density (81.1%), root galling (92.8%) and eggmasses number (92.0%), followed by arugula application. However, the least values of the same nematode parameters was achieved by dill ground-oil-seeds treatment. Moreover, peppermint treatment also surpassed other tested dried leaf powders of medicinal and aromatic plants in diminishing final nematode population (80.5%), number of galls (84.0%) and eggmasses (86.7%), followed by rosella powder (78.1, 84 and 84.4%) for the same nematode parameters, respectively. However, periwinkle powder gave the relatively low value of final nematode population density (60.5%) but with high % reduction values of number of galls (80.0%) and eggmasses (82.2%) than of throne apple in the latter two nematode criteria, respectively. Treatments of fenugreek and peppermint products represented the lowest values of RF that amounted to 0.86 and 0.89 vs 4.6 for nematode alone, respectively.

Keywords : *Meloidogyne incognita*, medicinal and aromatic plants, eggplant, ground-oil-seeds and dried leaf powders

INTRODUCTION

Root-knot nematodes (*Meloidogyne* spp.) are one of the most wide spread and damaging agricultural pests in the world causing an estimate US $100 billion loss/ year worldwide (Oka *et al* ., 2000). They were widely distributed in the cultivated areas of Egypt causing remarkable crop losses,

particularly with eggplant yields. During the two last decades, nematode control was based mostly on the use of nematicides. However, because of environmental toxicity and cost of these chemicals, other control techniques are of a great goal. The improvement in plant growth and yield criteria after the addition of organic matter due to the disinfection of such plants with nematode and / or to the nutritive value of any animal manure, plant dry leaves and oil-cake, and their ground oil-seeds which served as fertilizers were recorded by several investigators (Siddiqui and Alam 1988 a, b ; Almihanna *et al.,* 1999 and El-Sherif *et al*., 2001, and 2004). Moreover it is well known that organic matter decrease nematode population in two different ways, directly by possessing nematicidal properties during its degradation or indirectly by enhancing the development of nematode natural enemies. However, integrated nematode management using several control techniques i.e., oil seed cake, powder of various parts of medicinal and aromatic plants and their plant extracts as abiotic factors with minimal use of nematicides is greatly required among nematologists to provide effective control measures against the target nematode, keep the nematode low at the safe level and avoiding environmental pollution. The objective of the present investigation was to study the impact of nine medicinal and aromatic plant products in comparison with oxamyl on *M. incognita* infecting eggplant under green house conditions.

MATERIALS AND METHODS

In order to study the effect of the products of nine medicinal and aromatic plant species viz .celery (*Apium graveolens)*, coriander (*Corandrun sativum)*, dill (*Anethum graveolens)*, peppermint *(Mentha piperata)*, periwinkle (*Catharanthus roseus)*, throne apple (*Datura stramonium)* , arugula (*Eruca sativa)* and rosella (*Hibiscus sabdariffa*) in comparison with oxamyl on protecting eggplant cv. Black long from *M. incognita* infection under partly controlled green house conditions at 26± 3ºC, thirty six plastic pots were used. To prepare the four dried leaf powder products out of the tested nine medicinal and aromatic plant fresh leaves of periwinkle, throne apple, peppermint, rosella as well as the rest five i.e. dill, celery, coriander, arugula and fenugreek seeds were sun dried and ground to powder or ground-oil-seeds. One dose of 5g /product was separately used per 900g soil. Each 900g of steam-sterilized sandy: loamy soil (1:1) (v:v) per plastic pot 10cm-d. was separately mixed with the components of such product over a sheet of polyethylene, then watered to keep dose moist and to facilitate proper decomposition of soil components. For the tested host plant , twenty seven plastic pots filled with the sterilized soil previously incorporated with the tested products (3pots / product) was left on greenhouse bench for one week in order to complete proper decomposition, in addition to the untreated nine plastic pots for the same host plant .

A total of thirty six eggplant seedlings (45days-old) were then transplanted in all pots one each after dipping their roots in vitavax captan solution as a fungicide. All of the thirty three plastic pots were then separately inoculated with 1000 eggs of *M. incognita* (N), three of the inoculated

untreated pots received a 0.3 ml/pot of oxamyl (Vydate24% L) at the recommended dose. In addition , three seedlings of eggplant were left free of nematode and any material to serve as check (ck) . Treatments were as follows:

1. N + dill, 2. N+ celery, 3. N+ coriander,
4. N+ peppermint, 5. N+ rosella, 6. N+ arugula,
7. N+ periwinkle, 8. N + fenugreek, 9. N + throne apple,
10. N+ oxamyl, 11. N alone, and 12. plant free of N and any material.

Each treatment was replicated three times. Pots were irrigated with water as needed, treated horiculturally the same and were arranged in a randomized complete block design in a greenhouse bench at 26±3ºC. During the period of the experiment, plants were protected against mite and insect pests by conventional pesticides. Plants were harvested after 45 days of nematode inoculation. Plant growth criteria viz: plant length , plant fresh (shoot and root) weight and shoot dry weight as well were measured and recorded. Nematode parameters i.e. number of galls, eggmasses, developmental stages and females / root system were also determined by stained infected root system/ replicate / product of each tested medicinal and aromatic plant in lactic acid fuchsin (Byrd *et al.*, 1983). Second stage juveniles (J_2s) of *M. incognita* was also separately extracted from soil of each treatment by sieving and modified Baermann technique (Goodey, 1957). Number of nematode juveniles was determined by Hawksely counting slide under 100x magnification and recorded for each replicate / treatment.

At harvest, nutritional profiles in shoot i.e. N, P and K was measured. N, P and K was determined from 0.2g seedling of dry weight of shoot by chemical analysis using Kjeldahl method (A.O.A.C, 1980) modified by distilling the ammonia into saturated boric acid solution and titration with 0.1 NaCL standard. Total phosphorus was colorimetrically determined using the chlorostannous reduced, molybdophosphoric blue colour method, while total potassium was flam photometry estimated as described by Jakson (1967). Chlorophyll content was spectrophotometrically measured in leaves of the harvested plant using Fadeel's method (1962) Chlorophyll concentration was calculated according to Wellburn and Lichtenthaler (1984) formula.

Statistically, the obtained data were subjected to analysis of variance (ANOVA) (Gomez and Gomez, 1984) followed by Duncan's multiple ranges to compare means (Duncan, 1955).

RESULTS AND DISCUSSION

Data presented in Tables (1&2) and Figs. (1 & 2) illustrate the impact of nine medicinal and aromatic plant products as ground-oil-seeds i.e. fenugreek, arugula, coriander, celery and dill; as well as dried leaf powders i.e. peppermint, rosella, periwinkle and throne apple separately in comparison with oxamyl on plant growth response of eggplant cv. Black Long infected with *M. incognita* and its reproduction, development and population density under greenhouse conditions. In general, results indicated that all

tested materials obviously improved plant growth parameters of eggplant plants and significantly diminished nematode criteria as well. Among the tested five ground-oil-seeds of medicinal and aromatic plants , fenugreek application represented the maximum percentage increase values of plant length (54.3%), total plant fresh weight (177%), shoot dry weight (142.7%) and number of leaves/ plant (117.4%), followed by arugula treatment with values of 41.7, 142.8, 128.8 and 102.2% for the same plant growth criteria, respectively. (Table 1 & Fig. 1). Meanwhile, plants received the ground-oil-seeds treatments of either coriander or celery showed considerable percentage increase values of plant length (27.6 or 28.3%), total plant fresh weight (86.1 or 82.5%), shoot dry weight (45.0 or 42.7%) and number of leaves / plant (80.4 or 73.9%), respectively. However, plants treated with ground-oil-seeds of dill gave the least percentage increase values of plant length (22.5%), total plant fresh weight (67.5%), shoot dry weight (43.6%) and number of leaves / plant (30.4), respectively (Table 1 & Fig. 1). However, among the tested four dried leaf powder of medicinal and aromatic plants, peppermint application ranked the first and represented the maximum increase values of ameliorating plant length (53.6%) , total plant fresh weight (158.4%), shoot dry weight (138.8%) and number of leaves / plant (108.7%), respectively, followed by that of rosella, since its values averaged 52.3, 144.0, 130.0 and 102.2% for the same plant growth characters, respectively, (Table 1 & Fig.1). Likewise , plant receiving the dried leaf powder of throne apple recoded the intermediate percentage increase values of plant length (41.7%), total plant fresh weight (89.0%), shoot dry weight (47.2%) and number of leaves / plant (95.7%), whereas the considerable least values of the same plant criteria was assigned by periwinkle dried leaf powder with values of 29.1, 87.8, 47.2 and 73.9%, for plant length, total plant fresh weight and shoot dry weight, respectively (Table 1 & Fig. 1). Moreover, it is worthy to note that ground-oil-seeds of fenugreek ranked the first and represented the maximum values of percentage increase of plant growth characters, followed by peppermint dried leaf powder of tested medicinal and aromatic plants in this respect, whereas, rosella powder ranked the third to them followed by that of ground-oil-seeds of arugula in the forth position in values of percentage increase of the plant growth criteria. Meanwhile, dill ground-oil-seeds and periwinkle dried leaf powder applications separately represented the minimum percentage increase values of plant growth parameters, respectively. Meanwhile, oxamyl as a systemic nematicide surpassed other tested applications in ameliorating plant growth values that averaged 65.8, 179.9, 166.6 and 124.0% for plant length , total plant fresh weight , shoot dry weight and number of leaves / plant, respectively. (Table 1 & Fig. 1).

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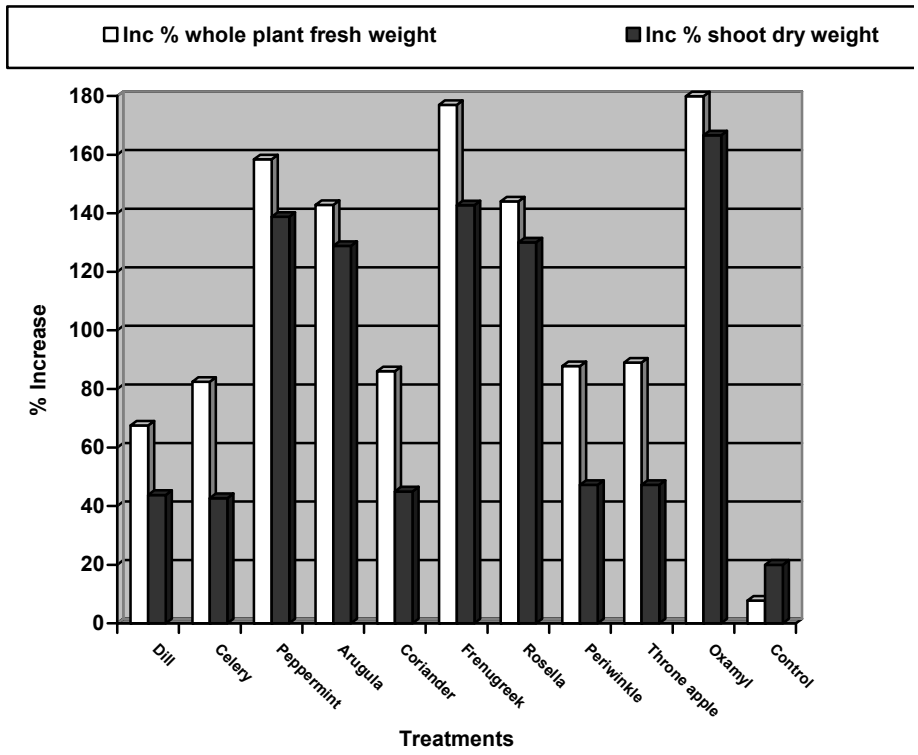

Fig.(1): Increase percentage of whole plant fresh and shoot dry weights of eggplant cv. Black Long infected by *Meloidogyne incognita* as affected by nine medicinal and aromatic plant products in comparison with oxamyl under greenhouse conditions (26±3 °C).

Data presented in Table (2) and Fig. (2) reveal that all tested components showed protection performance in eggplant cv. Black Long against nematode infection in terms of reducing final nematode population on such host plant. It was clear that population density and rate of nematode reproduction were significantly affected by all tested treatments .Among the five ground-oil-seeds of medicinal and aromatic plants tested, fenugreek treatment overwhelmed other ground-oil-seeds in suppressing nematode population density (81.1%), root galling number (92.8%) and egg-masses (92.0%), followed by arugula application with values of 75.2, 80.0 and 82.2 for the same nematode criteria, respectively and then celery or coriander that gave the intermediate reduction values which were amounted to 60.1 or 43.2; 74.0 or 64.0% and 75.6 or 64.4% for nematode population density , number of galls and egg-masses, respectively, (Table 2 & Fig 2). However, the least values of the same nematode criteria was achieved by dill ground-oil-seeds treatment with values of 42.9, 40.0 and 37.8 for final nematode population, number of galls and egg-masses, respectively. Moreover, among the four

dried leaf powder of medicinal and aromatic plants tested, peppermint treatment surpassed other medicinal and aromatic plant powders in diminishing final nematode population (80.5%), number of galls (84.0%) and egg-masses (86.7%), followed by rosella powder with values of 78.1, 84 and 84.4% for the same nematode percent reduction parameters, respectively, then that of throne apple application, since it gained moderate values reached to 71.6, 76 and 73.3% for nematode population density, number of galls and egg-masses, respectively. (Table 2 & Fig. 2). However, plants receiving periwinkle dried-leaf powder gave the relatively low value of final nematode population (60.5%) but with high percent reduction values of galls (80.0%) and egg-masses (82.2%) than of throne apple in the latter two nematode criteria, respectively. (Table 2 & Fig. 2). Moreover, oxamyl as a systemic nematicide gave the maximum values in diminishing nematode criteria i.e. nematode population density (91.9%), number of galls (94.0%) and egg-masses (93.3%), respectively and ranked first among tested materials in this respect. It is worthy to notice that ground-oil-seeds of fenugreek and peppermint dried leaf powder represented the maximum values of diminishing nematode parameters along with the lowest values of RF that averaged 0.86 and 0.89 vs 4.6 for nematode alone, respectively, whereas the minimum values of reducing nematode criteria was achieved by dill or coriander ground-oil-seeds with high values of RF that averaged 2.6 or 2.6 vs 4.6 for nematode alone, respectively. Also, (RF) values were drastically diminished in applications of ground-oil-seeds of fenugreek (0.86), peppermint powder (0.89), rosella powder (0.99), ground-oil-seeds of arugula (1.13) vs 4.6 for nematode alone. Such effects ranged between 0.89 to 1.8 vs 4.6 for peppermint dried leaf powder and periwinkle dried leaf powder vs nematode alone , respectively. However such effects for ground-oil-seeds treatments values were ranged between 0.86 or 1.13 to 2.6vs 4.6 for fenugreek or arugula and dill ground-oil-seeds , and coriander ground-oil-seeds vs nematode alone, respectively. However, oxamyl gave the lowest value of nematode reproduction factor (0.37). Promising results were also observed among fenugreek and arugula ground-oil-seeds as well as rosella , peppermint and periwinkle dried leaf powders applications, especially with indices of root galls and egg-masses numbers where the lowest indices for those two nematode criteria was achieved by those five treatments of tested medicinal and aromatic plant with equal values (2&2 and 2&2) each vs (4&4) for nematode alone, respectively (Table 2 & Fig 2).

Table (2): Development and reproduction of *Meloidogyne incognita* on eggplant cv. Black Long influenced by the tested nine medicinal and aromatic plant products in comparison with oxamyl under greenhouse conditions.

Treatments	*Nematode population in				Rate of build-up	** Red %	No. of galls	** Red %	RGI	No. of egg masses	*** EI	** Red %
Treatments	Soil/pot	Root		Total (Pf)								
		Develop. stages	Females									
(A) Dry leaf powder												
Periwinkle	1768c	24.8d	9efg	1801.8c	1.8	60.5	10e	80	2	8f	2	82.2
Peppermint	867f	16.0e	7g	890g	0.89	80.5	8e	84.0	2	6g	2	86.7
Rosella	938f	53.6b	8fg	999.6f	0.99	78.1	8e	84	2	7f	2	84.4
Throne apple	1275d	7.6f	13d	1295.6d	1.29	71.6	12d	76	3	12d	3	73.3
(B) Ground oil seeds												
Arugula	1088 e	32d	10def	1130 e	1.13	75.2	10e	80	2	8f	2	82.2
Celery	1754c	53.4b	12de	1819.4c	1.82	60.1	13d	74	3	11e	3	75.6
Coriander	2550b	22.2d	17.0 c	2589.2b	2.6	43.2	18c	64	3	16	3	64.4
Dill	2550b	22.3d	30 b	2602.3b	2.6	42.9	30b	40	3	28b	3	37.8
Fenugreek	816f	40.6c	5.0h	861.6h	0.86	81.1	3.6b	92.8	2	3.6h	2	92.0
Oxamyl	357b	12.2ef	4h	371.2i	0.37	91.9	3f	94	2	3h	2	93.3
N alone	4420a	93.0a	47a	4560a	4.6	---	50	--	4	45a	4	---

Pi=1000 eggs of *M. incognita*
Reproduction factor (Rf) = Final population (Pf) / initial population (Pi).
***Each value is a mean of three replicates.**
Means in each column followed by the same letter(s) did not differ at p<0.05 according to Duncan's multiple-range test.
** *Reduction % = $\frac{\text{N alone - Treatment}}{\text{N alone}} \times 100$**
*** Root gall index (RGI) or eggmass index (EI): 0= no galling or egg-masses , 1=1-2 galls or egg-masses ; 2=3-10 galls or egg-masses ; 3= 11-30 galls or egg-masses ; 4= 31-100 galls or egg-masses and 5= more than 100 galls or egg-masses . .(Talyor and Sasser,1978).**

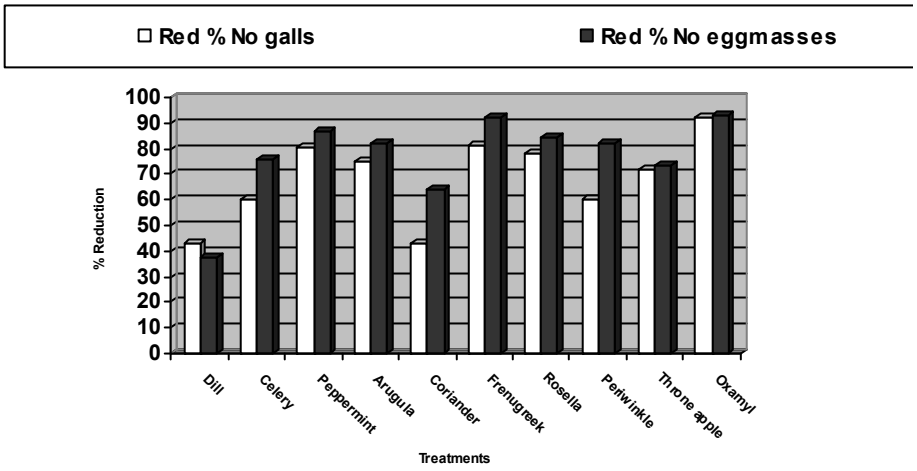

Fig.(2): Reduction percentage of number of root galls and eggmasses, of *Meloidogyne incognita* infecting eggplant cv. Black Long as affected by nine medicinal and aromatic plant products in comparison with oxamyl under greenhouse conditions.

Data in Table (3) and Fig. (3) show the efficacy of amending soil by nine medicinal and aromatic products where five of them were used as

ground-oil-seeds i.e. dill , arugula, fenugreek, celery and coriander and other four were applied as dried leaf powders i.e. peppermint , rosella, throne apple and periwinkle that separately applied at 5 g / plant each as preplanting application in comparison with oxamyl against *M. incognita* infecting eggplant cv. Black Long under greenhouse conditions. Obviously, *M. incognita* infection alone increased total chlorophyll content and carbon percentage and decreased organic matter values (Table 3 and Fig.3). On the other hand, N, P and K values increased within all tested nine medicinal and aromatic products treatments in leaves of eggplant infected with *M. incognita*. The maximum values of N, P and K were achieved by dill, fenugreek and throne apple treatments as follows : N (39.8, 37.5 and 32.8%), P (56.8, 53.6 and 48.6%) and K (28.7, 26.5 and 22.4%), respectively, whereas the intermediate one averaged N (28.1 or 23.0%) , P (43.2 or 35.0%) and K (19.5 or 15.6%), for rosella powder orcelery treatments, respectively.

Meanwhile, the moderately values of N, P and K was shown by treatments of arugula and periwinkle that averaged 18.4 or 12.9%, 27.1 or 20.4 and 11.2 or 8.3% , respectively, whereas, the minimum values of percentage increase of N, P and K were shown by either coriander or peppermint applications which averaged 7.4 or 4.2%, 12.9 or 6.0% and 15.6 or 2.2% , respectively .Similar trend was obtained in the case of oxamyl that ranked first over all tested treatments with values of N (41.0%), P (59.6%) and K (30.4%), respectively as well as that of the free of nematode and any treatments which recorded to be 42.6, 62.1 and 32.6 for N, P and K respectively, along with lowest C/N value of 11.2 :1 and was on par with that of oxamyl (11.9 :1). It is worthy to note that C/N ratio values of the tested nine medicinal and aromatic plants products against *M. incognita* on eggplant cv Black Long ranged between 10.5 : 1 to 15.3 : for dill ground-oil-seeds and peppermint dried leaf powder vs 25.9 : 1 for nematode alone respectively. In the present investigation, nine medicinal and aromatic plant products as ground-oil-seeds i.e. fenugreek, arugula, coriander, celery and dill; and dried leaf powders i.e. peppermint, rosella, periwinkle and throne apple as biotic factors solely in comparison with oxamyl showed nematicidal properties against the target nematode, *M. incognita* infecting eggplants since all tested components obviously caused increments in plant growth parameters and suppressed nematode criteria as well. Moreover, fenugreek and peppermint treatments represented the maximum values of ameliorating eggplant growth criteria and suppressing nematode parameters, with the lowest values of RF (0.86 and 0.89) vs. 4.6 for nematode alone, respectively.

This is not surprising since fenugreek ground-oil-seeds containing nine vitamins, protein, choline, iron, volatile oils etc. (Encyclopedia, 2011) which possessed nematicidal properties against such nematode pathogen, whereas peppermint dried leaf powder also contained menthol (35.2-46.2%) and menthone (8.7-25.9%) (Gochev *et al.*, 2008) which has high antifungal and antibacterial potentials (Souza *et al.*, 1995), in addition to having certain vitamins, beta carotene and minerals (K, Ca, Fe, Mn, Mag) (Aziz *et al*., 2011), which showed the antagonistic effect against *M. incognita* growth and ameliorating plant growth in the present study.

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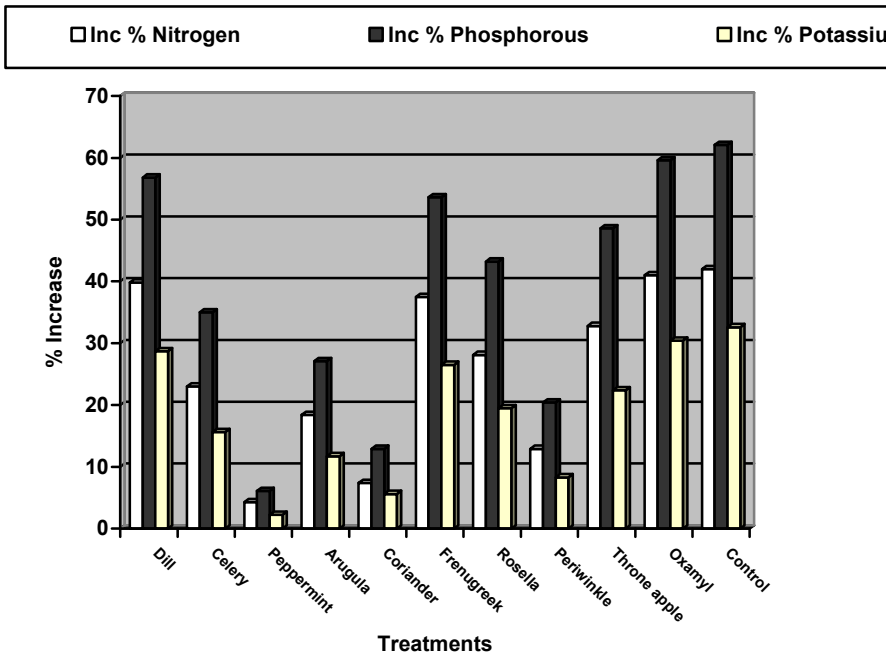

Fig.(3): Percentage increase of Nitrogen, phosphorus and potassium in leaves of eggplant cv. Black Long plant infected with *Meloidogyne incognita* as influenced by nine medicinal and aromatic plants products in comparison with oxamyl under greenhouse conditions .

These findings in the present work are also due to the richness in anthocyanins, protocatechunic acid , flavonoids, gossypethin, hibiscetine and sabdaretine in rosella dried leaf powder (Mukhtar, 2007), whereas periwinkle powder also contained vinleukoblastine (VLB) and vin leucoristine (VCR) , alkaloids and bisinole which possessed nematicidal properties in this study (Bukola *et al*., 2006). Meanwhile, all tested organic amendments enhanced soil fertility, improve biological and physiological properties of soil that help in controlling root-knot nematode *M. incognita* on eggplants and increase their plant growth, since the majority of nitrogen of such tested organic matters would be sufficient to supply the decomposing microorganisms if temperature , PH and moisture are suitable (Sims and Wolf, 1994). The ammonium produced has been shown to kill parasitic nematodes (Endo, *et al.,* 1955). The organic matter of fenugreek ground-oil-seeds or peppermint powder or rosella powder or periwinkle powder showed positive effects with their high ammonium concentrations on *M. incognita* development in this study. These findings are in accordance with those reported by Akhtar & Mahmoud (1996) in respect to ammonia. Moreover, the positive increments values of N, P and K concentrations in leaves of eggplants was correlated within any tested

applications of such abiotic factors, a situation that is supported by the findings of Ismail (2008) who reported that the organic matters such as dried leaf powders of adhatoda, marigold and throne apple were obviously enhanced N, P and K concentrations. by such tested materials, whereas the opposite results was recorded for total chlorophyll content comparing to nematode alone.

Improving the plant growth of eggplant may be attributed to nematode alimentation and to the improvement of soil nutritive status as recorded by several workers (Firoza and Magbood, 1996; Vats *et al*., 1996 and Youssef and Amin, 1997) in this respect.

REFERENCES

Akhtar, M. and I. Mahmood (1996). Control of root-knot nematode by bare-root dip in undecomposed and decomposed extracts of neem cake and leaf. Nematologia Medit., 22 (1): 55-57.

Almihanna, A.A.; M.M. Belal and A.A. Farahat (1999). The addition of chicken manure and eucalyptus dry leaves in relation to the management of *Heterodera avenae* and the incidence soil-borne fungi. J. Agric. Sci., Mansoura Univ., 24(8): 4221-4228.

A.O.A.C. (1980). Association of official Agriculture Chemist, official methods of Analysis. 13th ed. Washington, D.C.

Aziz, Eman, E.; N. Gad and S. M. kaled (2011). Effect of cobalt on growth and chemical composition of peppermint plant growth in newly reclaimed soil. Australian J. Basic and Applied Science. 5(11): 628-633.

Bukola C. A. ; A. O. Abiodun; A. O Adeniyi; Ogunjobi and O. A. Damilola (2006). Bacteriological and proximate analysis of periwinkles from two different creeks in nigeria. World Applied Sciences Journal 1 (2): 87-91.

Byrd, D. W. ; T. Kirkpatrick, and K. Barker (1983). An improved technique for clearing and staining plant tissues for detection of nematodes. J. Nematol., 15(3):142-143.

Duncan, D. B. (1955). Multiple range and multiple F. test. Biometrics 11, 1-42.

El-Sherif, A.G.; A. Mostafa Fatma and A.A. Khalil (2001). Impact of *Vinca rosea* powder and oxamyl on controlling *Rotylenchulus reniformis* (Abstr.), IV. International Nematol. Symposium, Moscow, Russia 99 PP.

El-Sherif, A.G.; A. Mostafa Fatma and M. Zahir Gehan(2004). Impact of certain plant oil products and oxamyl on *Meloidogyne incognita* infecting sunflower plant. J. Agric. Sci. Mansoura Univ., 29 (2):935-942.

Encyclopedia (2011). Data cited from :http://www.encyclopedia.com/topic/Fenugreek.aspx

Endo, C. F.; W. G. Bleu and J. M. Good (1955). Effect of anhydrous ammonia on nematodes , fungi and bacteria in some Florida soils. Soil Sci.; 9 : 55-58.

Fadeel, A.A. (1962). Location and properties of chloroplasts and pigment determination in roots. Physiol. Pl., 15:130-147.

Firoza, K. and M. M. Maqbool, (1996). Nematicidal properties of leaves of some plant species against *Helicotylenchus dihystera* (Cobb, 1913) Sher, 1963 on tomato. Pakistan J. Nematol.,14:107-110.

Gochev V.; A. Stoyanova ; T. Girova and T. Atanasova (2008). Chemical composition and antimicrobial activity of bulgarian peppermint oils. Bulgaria scientific papers, vol. 36, book 5, chemistry

Gomez, K. A. and A. A. Gomez, (1984). Statistical procedures for Agricultural Research.2nd Ed., John Wiley&Sons: Inc., New York.

Goodey, J. B. (1957). Laboratory methods for work with plant and soil nematodes. Tech. Bull. No.2 Min. Agric. Fish Ed. London pp.47.

Ismail, Amona F. A. (2008). Management of root-knot nematode on certain plant crops by some fungal culture and waste organic amendments. M.sc Thesis, Fac Agric. Mansoura Univ. 163 pp.

Jakson, M. L. (1967). Soil chemical analysis. Prentic Hall of India , New Dalhi, 498 pp.

Mukhtar A. M. (2007). The effect of feeding rosella (*Hibiscus Sabdariffa*) seed on broiler chick's performance. Research Journal of Animal and Veterinary Sciences, 2: 21-23,

Oka, Y.; S. Necar; E. Putievesky; V. Ravid; Z. Yaniv and Y. Spiegel (2000). Nematicidal activity of essential oils and their components against the root-knot nematode. J. Phytopathol., 90(7): 710-715.

Siddiqui, M.A. and M.M. Alam (1988a). Control of plant parasitic nematodes by soil amendment with marigold plant wastes. Pakistan J. Nematol., 6(2): 55-63.

Siddiqui, M.A. and M.M. Alam (1988b). Control of root-knot and reniform nematodes by bare-root dip in leaf extracts of margosa and Persian lilac. Zeit. Fur Pflanzenkrankheiten und Pflanzenschutz. 95 (2): 138-142.

Sims, J. T. and D. C. Wolf (1994). Poultry waste management: Agricultural and environemental issues Adv. Agron., 52: 1-83.

Souza, R. M.; J. K. Mattos and A. C. Karl (1995). Preliminary evaluation of the response of medicinal and aromatic plants to *Meloidogyne javanica* and *M. incognita*. Horticultura Brasileira.13(2): 209-211.

Vats, R.; S. Nandal and M.R. Dalal, (1996). Preparation of leaf extracts of *Azadirachta indica* and *Eucalyptus tereticornis* against *Meloidogyne incognita* in tomato nursery. J. Res. Haryana Agric. Univ., 26: 99-102.

Wellburn, A.R. and H. Lichtenthaler (1984). Formula and program to determine total carotenoids and chlorophylls A and B of leaf extracts in different solvents. In: Advances in photosynthesis Research, vol. 2 (ed. By C. Sybesma), pp. 9-12. martinus Nijh off/dry W. Junk. The Hague, Boston, Lancaster.

Youssef, M.M.A. and W.A. Amin, (1997). Effect of soil amendment in the control of *Meloidogyne javanica* and *Rotylenchulus reniformis* infection on camel pea. Pak. J. Nematol., 15: 55-63.

تـأثير بعض المنتجـات لتسـعة مـن النباتـات الطبيـة والعطريـة علـى نيمـاتودا تعقد الجـذور *Meloidogyne incognita* التي تصيب الباذنجان تحت ظروف الصوبة السلكية

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****معهد بحوث وقاية النباتات – مركز البحوث الزراعية – وزارة الزراعة – الدقي - الجيزة**

تم دراسة تـأثير تسعة من منتجات النباتات الطبية وهي المطحون الزيتي لنباتات الحلبة ، الجرجير، والكزبرة، والكرفس، والشبت، ومسحوق الأوراق الجاف لنباتات النعناع، الكركديه، الونكا والداتوراه بشكل منفرد في مكافحة نيماتودا تعقد الجذور *M. incognita* بالمقارنة بالمبيد النيماتودي الاوكساميل علي نبات الباذنجان صنف Black Long تحت ظروف الصوبة السلكية (٢٦ ±٣م°)،وأوضحت النتائج ما يلي :

١. أن جميع المواد المختبرة أدت إلي تحسن واضح في مقاييس النمو النباتية للباذنجان وخفض واضح في معدل المقاييس النيماتودية.

٢. حققت معاملة المطحون الزيتي للحلبة اعلي نسبة زيادة بالنسبة لقيم الطول بمعدل (٥٤.٣٪)، وزن المجموع الكلي الرطب للنبات (١٧٧٪)، وزن المجموع الخضري الجاف (١٤٢.٧٪)، وعدد الأوراق / نبات (١١٧.٤٪)، بينما حققت معاملة المطحون الزيتي للشبت اقل القيم في هذا السياق.

٣. اعطت معاملة مسحوق أوراق النعناع أعلي قيم الزيادة في طول النبات (٥٣.٦٪)، وزن المجموع الكلي الرطب للنبات (١٥٨،٤٪)، وزن المجموع الخضري الجاف (١٣٨.٨٪)، وعدد الأوراق / نبات (١٠٨.٧٪)، على التوالي، تليها معاملة من الزعتر والداتوراه، في حين أظهرت معاملة الونكا أقل القيم ، على التوالي.

٤. احتلت معاملة المبيد النيماتودي الاوكساميل المركز الأول وتفوقت علي باقي المعاملات الاخري في تحسين المقاييس النباتية المختبرة ، وخفض المقاييس النيماتودية المختبرة.

٥. تفوقت معاملة المطحون الزيتي للحلبة علي المعاملات الاخري في خفض كثافة النيماتودا بمعدل (٨١.١ ٪)، وعدد العقد النيماتودية (٩٢.٨%) وعدد كتل البيض (٩٢.٠%) يليها معاملة المطحون الزيتي للجرجير، في حين حققت المعاملة المطحون الزيتي لكل من الكرفس أو الكزبرة القيم الوسطي في هذا الصدد .

٦. حققت معاملة المطحون الزيتي للشبت اقل القيم في خفض المقاييس النيماتودية بقيم ٤٢.٩ و٤٠.٠ و ٣٧.٨ % بالنسبة لكثافة النيماتودا وعدد العقد النيماتودية وكتل البيض علي الترتيب.

٧. وعلاوة على ذلك، تفوقت المعاملة بمسحوق جاف اوراق النعناع علي المعاملات الاخري من مساحيق الاوراق المختبرة في خفض كثافة النيماتودا بقيم (٨٠.٥٪)، وعدد من العقد النيماتودية (٨٤.٠٪) و كتل البيض(٨٦.٧%) تليها مسحوق أوراق الكركديه الجافة بقيم (من ٧٨.١ و ٨٤.٠ و ٨٤.٤٪) لنفس المقاييس النيماتودية علي الترتيب.

٨. أعطى مسحوق أوراق نبات الونكا قيم منخفضة في معدل خفض كثافة النيماتودا بمعدل (٦٠.٥٪)، ولكن بمعدل نقص عالي من العقد النيماتودية (٨٠.٠٪) و كتل البيض (٨٢.٢٪) عن مثيله من الداتوراه للمعايير النيماتودية المختبرة علي التوالي ،

٩. واحتلت المعاملة بالمبيد النيماتودي الاوكساميل المرتبة الأولى حيث حققت القيم الاعلي في خفض المقاييس النيماتودية المختبرة بقيم ٩١.٩، ٩٤.٠و ٩٣.٣٪ على التوالي ، بين كل المواد المختبرة.

حققت المعاملة بالمطحون الزيتي لنبات الحلبة ومسحوق الاوراق الجافة لنبات النعناع القيم الاقل في تكاثر النيماتودا بمعدل ٠.٨٦ و ٠.٨٩ مقابل ٤.٦ للنيماتودا وحدها، على التوالي، في حين حققت المعاملة بالمطحون الزيتي لكلا من بذور الشبت أو الكزبرة القيم الاعلي في معدل تكاثر النيماتود بمعدل ٢.٦ مقابل ٤.٦ لكل للنيماتودا وحدها، على التوالي. بينما، أعطت معاملة الاوكساميل أقل قيمة بالنسبة لمعدل تكاثر النيماتودا بمعدل ٠.٣٧ مقابل ٤.٦ للنيماتودا وحدها.

قام بتحكيم البحث

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Table (1): Plant growth response of eggplant cv. Black Long infected by *Meloidogyne incognita* as affected by nine medicinal and aromatic plant products in comparison with oxamyl under greenhouse conditions.

Treatments	*Plant growth response											
	Length (cm)		Total length	% Inc **	Fresh weight (g)		Fresh weight of whole plant	% Inc **	Shoot dry weight (g)	% Inc **	No. of leaves	% Inc **
	Shoot	Root			Shoot	Root						
(A) Dry leaf powder												
Periwinkle	34.0bc	24.5cde	58.5cde	29.1	8.6cd	7.1	15.7a	87.8	2.65b	47.2	8b	73.9
Peppermint	39 b	30.6 abc	69.6 abc	53.6	11.3abc	10.3 abc	21.6a	158.4	4.31a	138.8	9.6ab	108.7
Rosella	33.5bc	35.5ab	69.0abc	52.3	10.5abcd	9.9abcd	20.4a	144.0	4.14	130	9.3ab	102.2
Throne apple	33.2bc	31.0abc	64.2bed	41.7	9.2bcd	6.6bcde	15.8b	89.0	2.65b	47.2	9ab	95.7
(B) Ground oil seeds												
Arugula	36 b	28.2abcd	64.2bcd	41.7	10.3abcd	10abcd	20.3a	142.8	4.12a	128.8	9.3ab	102.2
Celery	30 bc	28.1abcd	58.1cde	28.3	8.26cd	7.0bcde	15.26b	82.5	2.56 b	42.7	8b	73.9
Coriander	33abc	24.8cde	57.8cde	27.6	7.4	8.16bcd	15.56b	86.1	2.61b	45.0	8.3	80.4
Dill	28.8 bc	26.7bcd	55.5 de	22.5	8.0cd	6.0 de	14.0b	67.5	2.59b	43.8	6c	30.4
Fenugreek	33.8bc	36.1	69.9abc	54.3	12.0	11.16a	23.16a	177	4.37a	142.7	10a	117.4
Oxamyl	44.3a	30.8abc	75.1a	65.8	12.8a	10.6ab	23.4a	179.9	4.8a	166.6	10.3a	124
N alone	27.3bc	18e	45.3f	-	4.2f	4.16e	8.36c	--	1.8b	--	4.6b	--
Plants free of N and any treatments	29bc	20de	49ef	8.2	5.0ef	4.0e	9.0c	7.7	2.16b	20.0	5.3cd	15.2

N=1000 eggs of *M. incognita*

***Each value is a mean of three replicates.**

Means in each column followed by the same letter(s) did not differ at p<0.05 according to Duncan's multiple-range test.

Table (3): Nitrogen, phosphorus and potassium concentrations, organic matter, carbon concentrations, C/N ratio and total chlorophyll content in leaves of eggplant cv. Black Long plant infected with *Meloidogyne incognita* as influenced by nine medicinal and aromatic plants products in comparison with oxamyl under greenhouse conditions (26±3ºC).

Treatments	* N mg/g	Inc. % **	* P mg/g	Inc. % **	* K mg/g	Inc. % **	* Chlorophyll content		Total chlorophyll mg/g	Dec.% ***	O M%	Inc. % **	C %	C/ N ratio
							A mg/g	B mg/g						
(A) Dry leaf powder														
Periwinkle	2.89	12.9	0.337	20.4	4.45	8.3	0.459	0.353	0.812	-21.2	69.6	39.2	40.5	14.0 :1
Peppermint	2.67	4.3	0.297	6.1	4.20	2.2	0.435	0.331	0.766	-25.6	70.3	40.6	40.9	15.3:1
Rosella	3.28	28.1	0.401	43.2	4.91	19.5	0.516	0.381	0.897	-12.9	71.1	42.2	41.3	12.6:1
Throne apple	3.40	32.8	0.416	48.6	5.03	22.4	0.531	0.395	0.926	-10.1	70.8	41.6	41.1	12.1 :1
(B) Ground oil seeds														
Arugula	3.03	18.4	0.356	27.1	4.59	11.7	0.474	0.366	0.840	-18.4	71.3	42.6	41.5	13.7:1
Celery	3.15	23.0	0.378	35.0	4.75	15.6	0.490	0.374	0.864	-16.1	71.5	43.0	41.6	13.2:1
Coriander	2.75	7.4	0.316	12.9	4.34	5.6	0.446	0.345	0.791	-23.2	70.0	40.0	40.7	14.8:1
Dill	3.58	39.8	0.439	56.8	5.29	28.7	0.566	0.413	0.979	-4.9	64.7	29.4	37.6	10.5 :1
Fenugreek	3.52	37.5	0.430	53.6	5.20	26.5	0.549	0.403	0.952	-7.6	67.8	35.6	39.4	11.2:1
Oxamyl	3.61	41.0	0.447	59.6	5.36	30.4	0.591	0.419	1.010	-1.9	73.9	47.8	42.9	11.9 :1
N alone	2.56	--	0.280	--	4.11	--	0.602	0.428	1.030	--	50.0	-	66.8	25.9 :1
Plant free of N and any treatments	3.65	42.6	0.454	62.1	5.45	32.6	0.481	0.350	0.831	-19.3	70.3	40.6	40.9	11.2 :1

Pi=1000 eggs of *M. incognita*

***Each value is a mean of three replicates.**

Means in each column followed by the same letter(s) did not differ at p<0.05 according to Duncan's multiple-range test.

N= Nitrogen, P= Phosphorus, K= Potassium, O.M. = Organic matter , C = Carbon

*** *Increase % = $\frac{\text{Treatment- N alone}}{\text{N alone}} \times 100$**

*** **Decrease % = $\frac{\text{N alone -Treatment}}{\text{N alone}} \times 100$**

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