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EFFECTS OF SOME AROMATIC AND MEDICINAL PLANTS AS AMENDMENTS AGAINST *MELOIDOGYNE INCOGNITA* ON PEANUT PLANT UNDER FIELD CONDITION

Noweer, E.M.A [1] and Mona E.M. Alshalaby[2]

[1] Nematology Laboratory, Plant Pathology Department, National Research Center, Dokki, Giza, Egypt.

[2] Department of Zoology and Agricultural Nematology, Faculty of Agriculture, Cairo University, Giza, Egypt.

ABSTRACT

The effects of nine dry plant parts ground of aromatic and medicinal plants on reproduction of root-knot nematode infested peanut and in improving the plant growth were studied under field condition. Data indicated that the highest reduction in galls number and population densities were optianed at dose 20 gm/plant from different ground plant parts (in all treatments). Jojoba gave the highest reduction of root-knot larvae at harvested XR% (98.3%). Lupine treatment gave the most reduction percent off root-galls number (96.2%). Also it reduced the number of egg-masses which product from root-galls (96.6%). Data obtianed showed that the different ground plant parts increased the plant growth and peanut yield in all treatments.

Keywords: Aromatic plants, Medicinal plants, Peanut, *Meloidogyne incognita*.

INTRODUCITON

Peanut (*Arachis hypogaea* L.) is an important crop in sandy soil and newly reclaimed areas in Egypt and can be considered the first source of income for the growers in such areas. Root-knot nematode (*Meloidogyne* spp.) is one of the most important pathogens attacking roots of many field crops growing in sandy soils of Egypt,

Oteifa et al.,(1970). Deterioration in peanut production has been observed and it was found that peanut plants are subjected to attack by important nematodes and fungal diseasses Osman, et al., (1994). Most of the used nematicides are expensive, highly toxic and have harmful effects on health. Therefore it is important to develop alternative nematode management strategies, to be effective, safe, low cost methods and effective for nematode control. Many plant parts are known to have nematicidal effects against plant parasitic nematodes. (e.g Rao et al., 1996; Amin and Youssef, 1997; Al-shalaby,(1999) and Idowu, 1999). Nematicidal potential of some dry gorund ornamental plants against *M. incognita* on sunflowers were reported by Kheir et al., (2000) under greenhouse condition . In the present study, nematicidal properties of some aromatic and medicinal plants on reproduction and development of root-knot nematode, *Meloidogyne, incognita* on peanut *A. hypogaea* L.) were studied.

MATERIALS AND METHODS

The experiment was carried out through the period June to October 2002 in Mansouria village, Embaba, Giza. The soil of the experimental site was silty sand with a natural infestation of root-knot nematodes *Meloidogyne incognita*.

The area of the experiment was composed of 33 rows each row was 5 meters in length, pre-treatments soil samples were taken in June 2002. Every three rows were taken as one soil sample (each sample was contained from three simple samples per treatment). The following nine plant parts were used as treatments with three doses of 5, 10, 20 gm/plant compared to a chemical nematicide Furidan at 0.5, 0.7, 1 gm/plant, and an untreated control as follows:

Common name	Scientific name	Family	The plant part
Santonica	*Artemisia cinae*	Compositae	leaves
Dodonaea	*Dodonea viscose*	Dodonaceae	Leaves
Black-cumin	*Nigella sativa*	Ranunculaceae	Seeds
Eucalyptus	*Eucalyptus globulus*	Myrtaceae	leaves
Fenugreek	*Trigonella foenum graecum*	*Leguminosae*	*Seeds*
Thyme	*Thymus vulgaris*	Labiatae	leaves
Lupine	*Lupinus termis*	Fabaceae	Seeds
Jojoba	*Simmondsia chinensis*	Euphorbiaceae	leaves
Ponegranata	*Punica granatum*	Punicaceae	Coat of frout

The plant parts were added on June 2002 before planting at different doses 5, 10 and 20gm/plant mixed with the soil under seeds of peanut *Arachis hypogaea* L. cv. Giza 5. The chemical nematicide Furidan was applied as a soil broadcasting treatment at an application rate of 0.5, 0.7 and 1gm/spot before planting of peanut seeds. Chemical fertilizers and all other agricultural practices were made according to the technical recommendations of peanut growing. Irrigation was executed.

Three soil and root samples were taken from each treatment on June6, August 2 and October 8, 2002. Data on population densities of *M. incognita* in both soil and roots samples was recorded in table (1). At the end of the experiment in October the weight of whole plants, kernels per plant and peanut yield per treatment and per feddan were recorded and analyzed statistically. The shelling percent was calculated by dividing weight of seeds from 100 pods on the total weight of pods . Seeds oil content was determined according to AOAC, (1970).

RESULTS

The efficacy of nine plant parts in controlling the root-knot nematode infested peanut, and in improving the plant growth was studied under field conditions. Data concerning the effect of the ground plant parts on *M.*

incognita development and reproduction ware listed in tables (1,2,3). Table (1) showed the population densities of *M. incognita*. Larvae in soil just before treatments in June, August and October 2002 at harvest.
The highest reduction in all treatment were showed at dose 20gm/plant from different ground plant parts. Jojoba (20gm/plant) caused 98.8% reduction in larval community after two months and 97.8% reduction at the end of the experiment. Black-cumin caused 97.8% reduction after two months and 95.6% reduction at the end of the experiment.

Lupine (20 gm/plant) caused 97.6% reduction after two months and 96.3% reduction at harvest. Santonica (20gm) caused 94.4% reduction and 92% reduction after 2 and 4 months respectively. Fenugreek caused 94.9% reduction and 92.9% reduction after 2 and 4 months. Furidan as the tested nematicidal (0.5, 0.7 and 1 gm/plant) caused 98.9, 99.6 and 100% reduction in larval population in soil after two months, and 98.2%, 99.2 and 100% reduction at the end of the experiment respectively.

On the other hand, the larval population in soil increased in the check treatment (untreated) control giving a rate of multiplication of 13.27 or 1327% of the initial population after four months of peanut growing. Table (2) indicated the same trend shown in table (1) for the superiority of the nine ground plant parts in reducing number of *M. incognita* root-knot galls per plant which was observed after two months from planting and at the end of experiment. Jojoba (20gm/plant) caused 96.8% reduction in number of root-galls/plant after two months and 94.1% reduction at harvest. Black-cumin (20 gm/plant) caused 96.1% reduction after two months and 95.7% reduction at harvest. Lupine (20 gm/plant) caused 94.6% reduction after two months and 97.8% reduction at the end of experiment while Thyme appeared to be of lowest effect increase which caused 53.5% reduction after two months and 55.4% at harvest. The nematicidal effect (Furidan, 0.5, 0.7 and 1gm/plant) induced 99.6%, 99.8 and 100% reduction in number of root-galls per plant after two months and 98.8%, 99.5% and 100% reduction at the end of the experiment respectively.

Table (3) showed that the effects of the tested nine plant parts in reducing the number of nematode eggmasses/plant. The mean reduction percentage were 96.6%, 96% and 95.6% caused under treatment of lupine Blackcumin (20gm) and Jojoba(20gm), respectively. While it were 100% by used the nematicidal (Furidan, 1gm/plant). Table (4) indicates that yield was increased by all treatments. The ground parts of Jojoba gave the highest yield/feddan of peanut kernels (25.6 ardabs/feddan), followed by Black-cumin and Dodonaea was 24.8 ardabs/feddan. While the nematicidal (Furidan 1gm/plant) was 19.2 ardabs/feddan and untreated control was 13 ardabs/feddan. It was also found that ground plant parts of Dodonea treatment gave the highest oil contents (28%, 22% and 28%) from 5 gm, 10gm and 20gm/plant treatment.

Table (1): Population densities of *M. incognita* in soil planting peanut.

Treatment	Treat, doses (gm)	Before Treat, 6/6/2002	M. ses. 7/8/2002	R%	Fin, 8/10/2002	R%	XR%
Santonica	5		789^{ghij}	87.7	1203^{def}	85.6	86.6
	10	340	590^{hijkl}	90.8	1029^{defgh}	87.7	89.3
	20		360^{ijklm}	94.4	667^{efgh}	92.0	93.2
Dodonaea	5		1827^{bc}	71.5	2427^{bc}	70.9	71.2
	10	700	1210^{defg}	81.1	1857^{bcd}	77.8	79.5
	20		1067^{fgh}	33.4	1433^{cde}	82.8	83.1
Black	5		322^{jklm}	95.0	758^{efgh}	90.9	93
Cumin	10	1140	181^{klm}	97.2	542^{efgh}	93.5	95.3
	20		139^{lm}	97.8	371^{efgh}	95.6	96.7
Eucalyptus	5		1769^{bc}	72.4	2867^{b}	65.7	69.1
	10	1600	1506^{bcde}	76.5	2500^{b}	70.1	73.3
	20		1040^{efgh}	83.8	2317^{bc}	72.3	78.1
Fenugreek	5		670^{hijk}	89.5	1010^{defgh}	87.9	88.7
	10	600	476^{ijklm}	92.6	840^{efgh}	89.9	91.3
	20		328^{jklm}	94.9	603^{efgh}	92.8	93.9
Thyme	5		2000^{b}	68.8	2560^{b}	69.3	69
	10	1050	1591^{bcd}	75.2	2321^{bc}	72.2	73.7
	20		1384^{cdef}	78.4	1907^{bcd}	77.2	77.8
Lupine	5		410^{ijklm}	93.6	640^{efgh}	92.3	92.9
	10	850	206^{klm}	96.8	496^{efgh}	94.1	95.4
	20		154^{klm}	97.6	311^{fgh}	96.3	96.9
Jojoba	5		262^{jklm}	95.9	513^{efgh}	93.9	94.9
	10	1560	189^{klm}	97.1	270^{fgh}	96.8	97
	20		79^{lm}	98.8	182^{fgh}	97.8	98.3
Ponegranat a	5		862^{fghi}	86.6	1140^{defg}	86.3	86.4
	10	465	586^{hijkl}	90.9	966^{defgh}	88.4	89.6
	20		439^{ijklm}	93.2	708^{efgh}	91.5	92.3
Furidan	0.5		69^{lm}	98.9	151^{fgh}	98.2	98.5
	0.7	700	28^{m}	99.6	69^{gh}	99.2	99.4
	1		0^{m}	100	0^{h}	100	100
Control	-	585	6410^{a}	-	8350^{a}	-	-

Data with the same letters within a column were not significantly according to Duncan's new multiple range tests.

$$\text{R\%(Reduction\%)} = \frac{P.Dj(treatment) - P.Di(check\ treatment)}{P.Di(check\ treatment)} X\,100$$

$$\text{XR\%} = \frac{P.Df(treatment) + P.Di(treatment)}{Number} X\,100$$

Table (2): Galls number of root-knot nematode on peanut roots.

Treatment	Treat, doses (gm)	No. of galls/plant				
		M. ses. 7/8/2001	R%	Fin. 8/10/2002	R%	XR%
Santonica	5	848 ^{efgh}	80.9	2120 ^{ef}	72.2	77.6
	10	673 ^{efghi}	84.8	1806 ^{fg}	78.0	81.4
	20	602 ^{efghi}	86.4	1599 ^{fgh}	80.5	83.5
Dodonaea	5	3406 ^{a}	23.1	5990 ^{b}	27.1	25.1
	10	2828 ^{b}	36.2	4100 ^{cd}	50.1	43.2
	20	2000 ^{cd}	54.9	3222 ^{d}	60.8	57.9
Black	5	407 ^{fghij}	90.8	740 ^{ghij}	91.0	90.9
Cumin	10	210 ^{ij}	95.3	586 ^{hij}	92.9	94.1
	20	173 ^{ij}	96.1	350 ^{ij}	95.7	95.9
Eucalyptus	5	2562 ^{bc}	42.2	4870 ^{c}	40.7	41.5
	10	2100 ^{cd}	52.6	4066 ^{cd}	50.5	51.5
	20	1798 ^{d}	59.4	3811 ^{cd}	53.6	56.5
Fenugreek	5	1076 ^{e}	75.7	1909 ^{f}	76.8	76.3
	10	865 ^{efg}	80.5	1582 ^{fgh}	80.7	80.6
	20	693 ^{efghi}	84.4	1343 ^{fghi}	83.6	84
Thyme	5	3512 ^{a}	20.8	6100 ^{b}	25.7	23.3
	10	2510 ^{be}	43.4	3907 ^{cd}	52.4	47.9
	20	2061 ^{cd}	53.5	3660 ^{d}	55.4	54.5
Lupine	5	369 ^{ghij}	91.7	550 ^{hij}	93.3	92.5
	10	294 ^{hij}	93.4	400 ^{ij}	95.1	94.3
	20	240 ^{ij}	94.6	182 ^{ij}	97.8	96.2
Jojoba	5	239 ^{ij}	94.6	698 ^{ghij}	91.5	93.1
	10	180 ^{ij}	95.9	573 ^{hij}	93.0	94.5
	20	143 ^{ij}	96.8	481 ^{hij}	94.1	95.5
Ponegranata	5	966 ^{ef}	78.2	3811 ^{cd}	53.6	65.9
	10	822 ^{efgh}	81.5	3116 ^{de}	62.1	71.8
	20	679 ^{efghi}	84.7	2011 ^{f}	75.5	80.1
Furidan	0.5	16 ^{j}	99.6	100 ^{j}	98.8	99.2
	0.7	8 ^{j}	99.8	45 ^{j}	99.5	99.7
	1	0 ^{j}	100	0 ^{j}	100	100
Control	-	4432 ^{a}	-	8213 ^{a}	-	-

Data with the same letters within a column were not significantly according to Duncan's new multiple range tests.

$$\text{R\%(Reduction\%)} = \frac{P.Dj(treatment) - P.Di(check\ treatment)}{P.Di(check\ treatment)} X\,100$$

$$\text{XR\%} = \frac{P.Df(treatment) + P.Di(treatment)}{Number} X\,100$$

Table (3): Galls number of root-knot nematode on peanut roots.

Treatment	Dose of Treat-ment	No. of galls/plant				
		M. ses, 6/8/2001	R%	Fin. 8/10/2002	R%	XR%
Santonica	5	672^{ghi}	82.5	1504^{efg}	76.2	79.4
	10	501^{ghij}	87.0	1320^{fgh}	79.1	83.1
	20	477^{ghij}	87.6	1151^{ghi}	81.8	84.7
Dodonaea	5	2500^{bc}	35.0	3640^{b}	42.4	38.7
	10	1899^{de}	50.7	2700^{c}	57.2	54.0
	20	1375^{f}	64.3	2332^{cd}	63.1	63.7
Black	5	348^{hijkl}	91.0	432^{ijk}	93.2	92.1
Cumin	10	186^{jkL}	95.2	317^{ijk}	95.0	95.1
	20	153^{jkl}	96.0	250^{jk}	96.0	96
Eucalyptus	5	2071^{cd}	46.2	2776^{c}	56.0	51.1
	10	1609^{ef}	58.2	2110^{cdef}	66.6	62.4
	20	1326^{f}	65.5	1715^{defg}	72.8	71.7
Fenugreek	5	840^{g}	78.2	1320^{fgh}	79.1	78.7
	10	692^{gh}	82.0	1107^{ghi}	82.5	82.3
	20	462^{ghijk}	88.0	952^{ghij}	84.9	86.5
Thyme	5	2660^{b}	31.0	4340^{b}	31.3	31.2
	10	2073^{cd}	46.1	2711^{c}	571	51.6
	20	1640^{def}	57.4	2315^{cde}	63.3	60.3
Lupine	5	294^{hijkl}	92.4	408^{ijk}	93.5	93
	10	229^{ijkl}	94.1	328^{ijk}	94.8	94.5
	20	186^{jkl}	95.2	127^{jk}	98.0	96.6
Jojoba	5	199^{jkl}	94.8	507^{hijk}	92.0	93.4
	10	150^{jkl}	96.1	427^{ijk}	93.2	94.7
	20	113^{jkl}	97.1	371^{ijk}	94.1	95.6
Pomegranata	5	833^{g}	78.4	2005^{cdef}	68.2	73.2
	10	717^{gh}	81.4	1715^{defg}	72.2	77.1
	20	530^{ghij}	86.2	1109^{ghi}	82.4	84.3
Furidan	0.5	10^{kl}	99.7	46^{k}	99.3	99.5
	0.7	3^{l}	99.9	29^{k}	99.5	99.7
	1	0^{l}	100	0^{k}	1030	100
Control	-	3849^{a}	-	6314^{a}	-	-

Data with the same letters within a column were not significantly according to Duncan's new multiple range tests.

$$\text{R\%(Reduction\%)} = \frac{P.Dj(treatment) - P.Di(check\,treatment)}{P.Di(check\,treatment)} X\,100$$

$$\text{XR\%} = \frac{P.Df(treatment) + P.Di(treatment)}{Number} X\,100$$

Table (4): Peanut yield in different treatments.

Treatment		Weight of plant		Yield			Shelling %	Seeds oil%
		Per plant (gm)	Per (row)20 plant (gm)	Per plant (gm)	Per 20 plants (gm)	Per feddan (ardabe)		
Santonica	5	205	4100	425	850	17	63	28%
	10	223	4460	528	1056	21.1	72	30%
	20	225	4500	58	1160	23.2	70	10%
Dodonaea	5	194	3880	442	884	17.7	65	28%
	10	192	3840	43	860	17.2	73	22%
	20	215	4300	62	1240	24.8	72	28%
Black	5	175	3500	45	900	18	64	24%
Cumin	10	187	3740	53	1060	21.2	65	23%
	20	206	4120	62	1240	24.8	72	27%
Eucalyptus	5	165	3300	32	640	12.8	63	22%
	10	168	3360	48	960	19.2	65	28%
	20	198	3960	50.2	1004	20.1	69	22%
Fenugreek	5	174	3480	32.6	652	13	63	25%
	10	210	4200	48.2	964	19.8	71	24%
	20	225	4500	55.2	1104	22.1	72	24%
Thyme	5	189	3780	4.2	840	16.8	65	21%
	10	214	4280	52	1040	20.8	66	25%
	20	215	4300	44	880	17.6	68	26%
Lupine	5	163	3260	43	860	17.2	64	30%
	10	189	3780	52	1040	20.8	63	24%
	20	208	4160	54	1080	21.6	68	21%
Jojoba	5	202	4040	43	860	17.2	62	26%
	10	214	4280	55	1100	22	70	24%
	20	216	4320	64	1280	25.6	69	20%
Ponegranata	5	155	3100	33	660	13.2	65	18%
	10	179	3580	42	840	16.8	68	21%
	20	203	4060	48	960	19.2	70	22%
Furidan	0.5[x]	174	3480	34.5	690	13.8	66	25%
	0.7	206	4120	45.2	904	18.1	69	23%
	1	215	4300	48	960	19.2	72	24%
Control	-	158	3160	32.4	648	13	63	26%

$L.S.D._{0.05}$ = (44) (6.4) (3.2)

* One Ardab = 75 Kgm of peanut kernels .

* Significant (P = 0.05).

DISCUSSION

The present study appears that all the ground plant parts gave highly significant reduction of larval population density in soil, number of galls/plant, and eggmasses of *M. incognita*. These results were in accordance with those of Alam et al., (1980); and Firoza and Maqboal (1996) who reported that the application of aromatic and medicinal plants as soil amendments significantly suppressed several species of phytonematodes including root-knot nematodes. It has been suggested that during decomposition of ground plant parts a certain compound toxic to nematodes is released [Abd-Elgawad and Omer, 1995; Onifade and Fawole, 1996, Hussaini *et al.*, 1997 and Al-shalaby, 1999]. Moreover, aromatic and medicinal plant may contain special materials that have nematicidal potential against plant parasitic nematodes. On the other hand the plant growth and yield/plant of peanut was improved with aromatic and medicinal plant treatments (Akhtar and Mahmood 1996; and Amin, 1999). Finally, it could be of great impact on the future of biotic or/and organic farming approach in Egypt treated with some ground plant parts (aromatic and medicinal plants) in order to have clean, save, low cost and toxic free agricultural commodities.

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" تأثير إضافة مطحون بعض أنواع النباتات الطبية والعطرية على إصابة الفول السوداني بنيماتودا تعقد الجذور وعلى إنتاجيته في الحقل"

عزت محمد عبد الباقى نوير [١] منى السيد محمد الشلبى [٢]

[١] قسم أمراض النبات والنيماتودا - المركز القومى للبحوث دقى-جيزة

[٢] قسم الحيوان الزراعى والنيماتولوجيا الزراعية - كلية الزراعة -جامعة القاهرة

تمت الدراسة في حقل فول سوداني بقرية المنصورية - جيزة - وبه عدوى طبيعية بنيماتودا تعقد الجذور *Meloidogyne incognite* وتتلخص النتائج فيما يلي :

١- اضافة الأجزاء المطحونة من الجوجوبا-الديدونيا- حبة البركة بمعدل ٢٠جم/نبات (٦٠٠كجم/فدان- ٣٠,٠٠٠ نبات/ فدان) أدى إلى زيادة انتاجية الفول السودانى (القرون) ونسبة التصافى.

٢- كلما زادت الجرعة المضافة من مطحون الأجزاء النباتية كلما أدى ذلك إلى نتائج أفضل في تقليل الإصابة ٢- بنيماتودا تعقد الجذور وكذلك الإنتاجية.

٣- أدى استخدام الجوجوبا- حبة البركة - الترمس- الحلبة- الشيح إلى أكبر معدلات في خفض الكثافة العددية ٩٨,٣% ، ٩٦,٧%، ٩٣,٩%، ٩٣,٢% على التوالي بينما كان تأثير الفيوردان ٩٨,٥% عند استخدامه بمعدل ١٥كجم/فدان.

٤- أدى استخدام مطحون بذور الترمس (٢٠جم/نبات) إلى أعلى نسبة خفض فى تكون العقد النيماتودية فى الجذور حيث بلغ متوسط نسبة الخفض على مدار الموسم ٩٦,٢ تلى ذلك حبة البركة ٩٥,٩% .

٥- أدى استخدام مطحون بذور الترمس (٢٠جم/ نبات) إلى أعلى متوسط في نسبة الخفض لأعداد كتل البيض الناتجة من العقد النيماتودية حيث كان ٩٦,٦% تلي ذلك حبة البركة ٩٦% ثم الجوجوبا ٩٥,٦% .

٦- لم يلاحظ وجود فروق معنوية في تغير نسبة الزيت الى المعاملات المختلفة.