NEMATICIDAL POTENTIALS OF DRY FLOWERS BELONGING TO CERTAIN PLANT SPECIES AGAINST *MELOIDOGYNE INCOGNITA* INFECTING TOMATO .

Ashraf.I.Afia * and M.A.Mostafa **
*Faculty of Agriculture , University of Cario , Giza , Egypt .
**Faculty of Agriculture , University of Al- Azhar , Cario , Egypt .
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ABSTRACT

In vitro treatments of fresh flower extracts of Delonix regia, Salvia farinaceae, Salvia splendens, Bauhinia variegata, Lantana camara, Pelargonium graveolens, Narium oleander, Hibiscus rosa-sinensis, Vinka rosa, Bougainvilla spp., canna indica, Tagetes erecta, Petunia hybrida, Tropaeolum nasturtium and Gerbera jamesonii , were significantly toxic to M. incognita larvae. Larval mortality was in direct proportion with concentration and time of expauser. In vivo treatments, number of formed galls and eggmasses on tomato roots were significantly reduced with the added dried chopped flowers at 1, 2, 3% w/w. The higher concentrations were phytotoxic to tomato plants.

Key Words : Flower extracts, Nematicdal Potential *Meloidogyne incognita,* Tomato.

INTRODUCTION

Use of organic management against nematodes as an easy, cheap and eco-friendly approach is now quite satisfactory option (Sitaramaiah & Sing 1977, Haseeb *et al.,* 1984, Muller & Gooch 1982, Haseeb and Alam 1984). Seeds, flowers, leaves (dry- green) and root extracts of different plant species proved their efficacy against hatching, survival, development and reproduction of nematode species *M. incognita, M.Javanica, Heterodera cajani* and *Rotylenchulus reniformis* , also improved host growth response (Khumar *et al.,* 1997, Chandel and Mehta 1990, Alsayed *et al.,*1992, Dalal *et al.,* 1998, Joymati *et al.* 1998, Montasser *et al.* 1999, Pandey *et al.*, 2000 and Padhi *et al.,*2000. The extracte from flowers of *Tagetes erecta, Pomoea carnea, Bauhinia variegata* and *Tithonia diversifolia* showed maximum nematicidal activity to *M.incognita* (Nikure and Lanjewar 1981, Tiyagi *et al.,*1985, Debprasad 2000 and Pandey *et al.,*2001).

The aim of this research is to test the efficacy of fresh extracts and dried chopped flowers of fifteen plant species on larval mortality and reproduction of *M.incognita* infecting tomato.

MATERIALS AND METHODS

Effect on nematode mortality

Twenty five gms. of fresh flowers of royal poinciana *(Delonix regia)*, violet salvia (*Salvia farinaceae*),red salvia (*Salvia splendens*),camel foot tree (*Bauhinia variegata*), wild sage (*Lantana camara*), geranium (*Pelargonium graveolens*), oleander-rosebay (*Narium oleander*),china rose (*Hibiscus rosa-sinensis*),vinka (*Vinka rosa*),paper flower (*Bougainvilla* spp.),canna (*canna indica*),marigold (*Tagetes erecta*),petunia (*Petunia hybrida*),canary nasturtium (*Tropaeolum nasturtium*) and transeval daisy (*Gerbera jamesonii*) were macerated in grinder separately, soaked in 100 ml distilled water , filtered in 4 ply musclin cloth and then in whatmann filter paper no 1. The filterate solution was termed as standard solution (S) from which other concentrations were made (20,40,80 %) by adding required amount of distilled water . dead and surviving nematodes were counted after exposure periods of 12, 24, 36, 48, 60, 72,84 and 96 hrs., then the percentage mortality was calculated . Mortality of nematodes was assessed after juvenile were transferred into plain water .

Effect on growth of tomato in infested soil

The dry flower powders were added separately and mixed throughly with steamed soil (sand:clay,1:1,v:v) at the rate of 1, 2 and 3%(w/w)and transferred in 15 cm diameter plastic pots filled with 900 g soil. Non amended soil served as a check. The pots were watered at two days intervals for 10 days to allow decomposition of organic matter.Three week old seedlings of tomato (*Lycopersicon esculentum* Mill.) cv.GS growen in steam sterilized soil were transplanted singly into

pots .One week after establishment, plants were then inoculated with 2000 j2 of *M.incognita* per plant. A set of unamended pots was kept as a check. Each treatment was replicated four times using a completely randomized design under greenhouse conditions 30 ± 5C° .Two months after inoculation the plants were carefully uprooted. Number of eggmasses and root galls were counted , as well as tomato growth respons were alsc recorded . The data were analyzed statistically by using the Duncan,s multiple range test .

RESULTS AND DISCUSSION

In vitro studies

Results presented in table (1) prode that, flower aqueous extracts of the tested plant species showed significant toxic effects on *M.incognita* juveniles. J2 mortality increased with the increase in flower extract concentration and time of exposure . However it was variable according to plant species . These variations may be attributed to the differences in the chemical nature, composition and concentration of toxic compounds present in these flowers , chemical analysis of these flowers will certainly help in the elucidation of their toxic mode of action , it was found that, undiluted extracts (S) of all tested extracts recorded 100% larval mortality after 36 hours, exposure . In (S) concentration the maximun nematode mortality percentage was occurred with the extracts of *S. splendens, N. oleander , H. rosa- sinensis* and *P. hybrida* after 12 hrs. exposure period . The juveniles in extracts of *D. regia , S. farinacea , P. graveolens , T. erecta , T. nasturtium* and *G. jamesonii* showed 100% mortality at 24 hrs. Evidently extracts of *B. variegata, L. camara* and *C. indica* indicated to complete mortality after 36 hrs . Whereas the modest mortality percentages were appeared with *L. camara, V. rosa , C. indica* at the concentrations of S/40 . The minimum percentages of mortalities were observed with extracts of *L. camara, V. rosa, C. indica* and *B. variegata* at the concentration S/80. Accordingly, at the 96 hours, the maximum juveniles mortality was achiaved with *D. regia* (76.8), *P. graveolens* (77.0), *T. nasturtium* (77.6), *H. rosa- sinensis* (80.9) and *P. hybrida* (83.0) at S/80 concentration , on the other hand, the minimum was observed with *L. camara* (66.0) , *C. indica* (63.9) and *B. variegata* (57.4) on the same concentration . Almost similar results have been reported by (Joymati *et al.,* 1998 ; Siddiqui and Alam 1988 ; Debprasad 2000 and Pandey *et al.,* 2001) who used the same tested flowers. As well, these results aroundly agree with (Aziz *et al.,* 1995 ; Padhi *et al.,* 2000) who examined other parts of the same plants . Also our results relatively conforming with those of (Nikure and Lanjewar 1981 ; Tiyagi *et al.,* 1985)

Effect on reproduction *M. incognita*

Dry flower powders belonging to the previous plant species , were evaluated for their nematicidal activity against the root- knot nematode, *M. incognita* infecting tomato plants under greenhouse conditions . Data presented in (Table 2) indicate that , all the applied dry flower powder amendments significantly reduced the counts of eggmasses and galls per root when compared with the unamended control . Also, such nematode numbers gradually decreased with increase of the amended materials . Moreover, number of eggmasses reduced significantly in all the treatments as compared to the check . *N. oleander , S. farinaceae , P. hybrida* and *H. rosa-sinensis* treatments showed the least number of eggmasses . But *G. jamesonii , P. graveolens , S. spelendens* and *P. regia* treatments manifested the midmost numbers. However , *V.rosa , T. nasturium* and *T. erecta* treatments indicated the over midiocre of eggmasses numbers , *B.* spp. and *C. indica* treatments demonstrated the largest numbers . Greater calculated reduction in eggmasses was observed in the higher dosses of *H. rosa- sinensis , S. farinaceae , N. oleander , P. hybrida , T. nasturtium , P.graveolens* and *G. jamesonii* which were 83.4, 83.1, 82.3, 81.1, 81.1, 79.1 and 77.4%, respectively , whereas, the modest reduction were obtained from plants grown in soil amended with dry flower powders of *C. indica , L.camara* and *B.* spp. which were 55.7, 58.6 and 58.9 % , respectively. The number of galls per root were relatively having the same trend of eggmasses, Treatments of *S. farinaceae, H. rosa- sinensis, N. oleander, P. hybrida , T. nasturtium* and *G. jamesonii* showed the lower numbers, meanwhile treatments of *B. variegata , B.* spp., *L. camara* and *C. indica* achieved geater numbers of galls per plants .Inhibition in, numbers of eggmasses and formed galls observed during the present study may be attributed to the accumulated toxicity of the decomposing oraganic matter (Alam *et al.,* 1979 ; Siddiqui & Alam 1988 ; Montasser *et al.,* 1999 and Alsayed *et al.,* 1992) and or to the increased host resistance (Alam *et al.,* 1979 , 1980). The natural nematicidal compounds released from *T. erecta* have been found to suppress nematode development and reproduction (Abadir *et al.,* 1996 and Pandey *et al.,* 2001).

Table 1 :Effect of fresh flower extracts on the juvenile mortality of *M.incognita*

Treatment	Dilut-Ions	Percentage of juvenile mortality after different exposure time (hrs.)							
		12	24	36	48	6o	72	84	96
Delonix regia	S	97.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	S/20	80.0	90.1	92.4	93.1	96.2	96.6	98.0	98.3
	S/40	65.0	74.1	82.0	82.2	83.2	83.6	85.0	85.5
	S/80	53.2	55.5	66.0	70.5	72.4	73	76.2	76.8
Salvia farinaceae	S	96.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	S/20	75.5	81.0	86.5	90.0	96.0	96.0	97.0	97.2
	S/40	61.6	73.0	81.6	87.0	87.0	89.0	89.0	89.0
	S/80	52.0	60.0	64.0	70.4	71.5	72.0	72.0	72.1
Salvia splendens	S	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	S/20	76.9	84.2	87.7	90.3	95.0	95.5	96.2	96.5
	S/40	67.6	80.9	85.0	86.0	92.1	94.0	94.0	94.3
	S/80	59.1	62.0	67.5	73.4	74.0	77.6	78.0	80.6
Bauhinia variegata	S	78.1	89.5	100.0	100.0	100.0	100.0	100.0	100.0
	S/20	54.2	60.7	63.4	70.6	70.8	72.0	74.5	74.5
	S/40	42.5	60.0	62.7	64.0	64.6	65.0	65.8	67.9
	S/80	34.1	42.0	43.6	48.4	53.0	55.6	55.7	57.4
Lantana camara	S	80.6	88.4	100.0	100.0	100.0	100.0	100.0	100.0
	S/20	67.5	71.0	73.5	75.0	81.0	84.0	84.2	84.6
	S/40	53.2	66.7	70.0	71.5	72.5	73.2	74.2	74.2
	S/80	46.5	54.0	57.4	60.0	60.6	64.8	66.8	66.0
Pelargonium graveolens	S	98.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	S/20	82.3	87.2	91.0	94.0	94.6	97.0	97.4	97.5
	S/40	63.0	75.7	80.0	80.6	84.0	86.0	86.2	86.7
	S/80	56.1	60.5	65.7	70.5	72.1	75.5	75.5	77.0
Narium oleander	S	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	S/20	80.0	80.7	88.5	92.2	93.3	95.5	96.0	96.2
	S/80	65.5	67.5	76.5	80.0	80. 9	83.0	85.3	87.0
	S/80	54.4	56.5	60.-0	63.6	70.0	70.3	70.5	71.0
Hibiscus rosa- sinensis	S	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	S/20	83.2	88.2	93.6	95.4	96.7	97.0	98.2	98.7
	S/40	70.6	75.6	80.0	82.6	83.0	83.4	85.0	86.4
	S/80	61.4	68.4	73.5	76.5	80.0	80.4	80.5	80.9
Vinka rosa	S	89.8	97.0	100.0	100.0	100.0	100.0	100.0	100.0
	S/20	76.5	85.1	87.0	88.5	92.0	93.0	93.2	95.2
	S/40	55.3	66.3	70.7	73.2	77.5	80.5	82.5	86.1
	S/80	44.6	50.0	54.5	57.6	62.8	67.2	67.6	69.8
Bougainvilla spp.	S	81.5	96.7	100.0	100.0	100.0	100.0	100.0	100.0
	S/20	67.4	70.3	73.0	76.1	80.7	83.5	86.0	86.5
	S/40	59.4	65.7	67.3	70.0	72.0	74.0	74.1	76.3
	S/80	51.0	57.1	58.0	62.2	66.2	66.8	68.0	69.3
Canna indica	S	80.4	87.4	100.0	100.0	100.0	100.0	100.0	100.0
	S/20	70.2	76.2	76.5	80.0	80.8	81.0	82.2	84.2
	S/40	55.5	61.0	63.0	63.9	67.3	70.5	70.5	71.9
	S/80	34.5	39.0	44.3	53.3	60.4	60.6	63.0	63.9
Tagetes erecta	S	91.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	S/20	64.6	83.3	85.2	87.0	90.2	90.2	91.2	94.2
	S/40	63.6	67.0	72.0	75.1	80.5	86.5	86.5	90.0
	S/80	48.0	52.4	55.8	57.0	61.0	62.6	64.6	67.4
Petunia hybrida	S	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	S/20	77.1	80.8	82.2	82.9	85.6	91.6	92.2	92.4
	S/40	74.0	77.4	80.0	81.5	80.3	87.5	89.0	89.6
	S/80	65.0	70.5	75.5	77.0	78.0	80.1	82.0	83.0
Tropaeolum nasturtium	S	91.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	S/20	78.1	86.8	89.2	92.6	96.0	96.4	97.2	97.2
	S/40	66.2	75.0	80.4	81.0	82.5	83.6	86.0	86.4
	S/80	57.0	62.5	69.6	74.1	75.0	75.4	77.6	77.6
Gerbera jamesonii	S	95.7	100.0	100.0	100.0	100.0	100.0	100.0	100.0
	S/20	75.3	77.0	78.0	83.0	87.2	89.2	90.8	92.3
	S/40	62.3	63.4	65.2	68.2	73.0	78.0	30.2	81.3
	S/80	45.0	49.2	50.5	56.4	60.6	66.0	66.5	71.0
Distilled water	---	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 2: Effect of soil amendment with dried chopped plant flowers on reproduction of *Meloidogyne Incognita* on tomato .

Treatment	Dose %w/w	No. of Eggmasses/ plant	Reduction %	No. of galls/ plant	Reduction %
Delonix regia	1	28.3 E	52.2	24.3 GH	53.9
	2	20.9 K	64.7	18.4 N	34.8
	3	16.2 M	72.6	14.9 O	71.8
Salvia farinaceae	1	20.6 K	65.2	17.4 N	67.0
	2	13.2 NO	77.7	12.5 P	76.3
	3	10.0 QR	83.1	8.1 S	84.6
Salvia splendens	1	26.2 F	55.7	24.0 H	54.5
	2	20.7 K	65.0	20.6 KL	61.0
	3	18.4 L	68.9	14.5 O	72.5
Bauhinia variegata	1	34.2 C	42.2	29.6 D	43.9
	2	26.6 F	55.1	22.4 IJ	57.6
	3	20.7 K	65.0	20.0 LM	37.9
Lantana camara	1	33.2 C	43.9	30.6 D	42.0
	2	28.1 E	52.5	24.1 GH	54.3
	3	24.5 GHI	58.6	20.9 JKL	6o.4
Pelargonium graveolens	1	25.5 FG	56.9	23.1 HI	56.2
	2	18.7 L	68.4	19.8 LMN	62.5
	3	12.4 OP	79.1	13.7 N	74.0
Nerium oleander	1	14.3 N	75.8	14.5 O	72.5
	2	12.0 OP	79.7	10.2 QR	80.7
	3	10.0 QR	82.3	10.0 QR	81.1
Hibiscus rosa-sinensis	1	25.0 GH	57.8	22.0 IJK	58.3
	2	14.9 MN	74.8	11.3 PQ	78.6
	3	9.8 R	83.4	9.0 RS	82.9
Vinca rosa	1	29.2 DE	50.7	26.1 F	50.6
	2	24.3 HI	58.9	2o.4 L	61.4
	3	19.5 KL	76.0	17.3 N	67.2
Bougainvilla spp.	1	39.6 B	33.1	35.9 C	32.0
	2	30.4 D	48.6	28.1 DE	46.8
	3	24.3 HI	58.9	20.3 L	61.5
Canna indica	1	41.4 B	30.1	38.1 B	27.8
	2	30.2 D	49.0	37.2 B	29.5
	3	26.2 F	55.7	27.4 E	48.1
Tagetes erecta	1	30.4 D	48.6	27.8 E	47.3
	2	23.5 IJ	60.3	20.0 L	62.1
	3	22.2 J	62.5	18.6 MN	64.8
Petunia hybrida	1	23.0 IJ	61.1	24.3 GH	53.9
	2	14.5 N	75.5	17.6 N	66.7
	3	10.6 QR	81.1	11.0 PQ	79.2
Tropaeolum majus	1	34.8 C	41.2	30.6 D	42.0
	2	20.7 K	65.0	20.8 KL	60.6
	3	11.2 PQ	81.1	10.0 QR	81.1
Gerbera jamesonii	1	24.4 HI	58.8	25.6 FG	51.5
	2	15.8 M	68.2	12.5 P	76.3
	3	13.4 NO	77.4	11.3 PQ	78.6
Control + nematode		59.2 A	---	52.8 A	---

Means followed by the same letter (s) in each column are not significantly different at 5% level according to Duncans multiple range test .

Table 3 : Effect of soil amendment with dried chopped plant flowers on growth of tomato plants infected with *Meloidogyne incognita* .

Treatment	Dose % w/w	Shoot		Root	
		Weight (g)	Length (cm)	Weight (g)	Length (cm)
Delonix regia	1	6.6 A	27.6 HI	4.0 A	15.0 BC
	2	3.7 EFGH	31.0 C	3.9 A	15.5 B
	3	3.3 GHI	28.6 FGH	3.3 BC	13.6 DE
Salvia farinaceae	1	6.0 AB	30.0 DE	3.2 BC	14.0 CD
	2	4.0 DEFG	25.0 KL	2.8 BC	10.0 LM
	3	3.2 GHI	19.3 OPQ	2.2 DEF	9.0 MN
Salvia splendens	1	5.8 AB	28.7 EFG	4.0 A	11.6 HIJ
	2	4.3 DEF	26.0 JK	2.7 CD	9.0 MN
	3	3.0 HIJ	18.7 QR	1.6 EF	6.5 Q
Bauhinia variegata	1	6.3 A	33.3 B	2.7 CD	11.7 GHIJ
	2	6.7 A	35.6 A	3.0 BC	15.6 B
	3	4.6 CDE	31.0 C	2.0 DE	13.0 EF
Lantana camara	1	4.8 BCD	29.6 DEF	3.5 BC	10.6 L
	2	5.6 ABC	30.3 D	4.2 A	12.0 K
	3	4.9 BCD	30.0 DE	2.8 BC	7.5 OP
Pelargonium graveolens	1	3.2 GHI	23.6 MN	2.9 BC	12.0 K
	2	3.9 EFGH	28.0 GHI	4.3 A	14.0 CD
	3	3.8 EFGH	26.0 JK	3.8 AB	11.5 IJ
Narium oleander	1	2.3 J	23.0 ON	1.3 FG	9.0 MN
	2	3.1 HIJ	24.0 LMN	1.6 EF	8.0 NOP
	3	1.0 K	18.0 R	1.0 G	4.0 S
Hibiscus rosa-sinensis	1	2.8 IJ	27.0 IJ	2.6 CD	13.3 DE
	2	1.9 K	28.3 GH	1.9 EF	13.0 EF
	3	3.9 EFGH	29.0 EFG	1.9 EF	14.6 C
Vinka rosa	1	3.0 HIJ	23.0 N	2.4 DE	12.7 EF
	2	2.5 J	20.6 O	1.6 EF	13.0 EF
	3	2.0 J	16.0 S	1.0 G	8.4 NO
Bougainvilla spp.	1	4.5 DE	26.0 GK	3.0 BC	11.0 J
	2	4.0 DEFG	23.0 ON	2.7 CD	9.0 MN
	3	3.0 HIJ	19.7 OPQ	2.6 CD	6.5 Q
Canna indica	1	4.3 DEF	27.0 IJ	3.5 BC	13.0 EF
	2	5.6 ABC	32.0 C	4.6 A	10.0 LM
	3	3.9 EFGH	24.0 LMN	2.7 CD	7.6 OP
Tagetes erecta	1	3.7 EFGH	28.6 FGH	2.8 BC	12.3 FGHI
	2	4.4 DE	32.0 C	3.5 BC	13.0 EF
	3	3.5 FGHI	27.6 IJ	2.4 DE	18.6 A
Petunia hybrida	1	1.9 K	20.0 OP	1.4 FG	7.3 PQ
	2	2.6 IJ	23.0 ON	1.6 EF	8.0 NOP
	3	1.3 K	19.0 PQ	1.0 G	6.0 R
Tropaeolum nasturtium	1	5.0 ABC	33.5 B	2.1 DEF	18.4 A
	2	4.1 DEFG	29.0 EFG	1.8 EF	16.0 B
	3	2.7 IJ	24.4 LM	0.7 G	15.0 BC
Gerbera jamesonii	1	2.8 IJ	23.0 N	2.8 BC	10.0 LM
	2	1.7 K	20.0 OP	2.0 DE	9.3 MN
	3	1.0 K	16.8 S	1.4 FG	7.9 OP
Control + nematode	--	3.4 GHI	31.5 C	4.6 A	10.5 L

Means followed by same letter (s) in each column are not significantly different at 5% level according to Duncans multiple range test .

The treatments of *N. oleander, H.rosa- sinensis* , *P.hybrida* , *D. regia* and *P. graveolens* were highly efficent in controlling *M.incognita* (Aziz *et al.*, 1995 and Montasser *et al.*, 1999) . But , the treatments of *B. variegata* , *L. camara* and *C. indica* were the least effictive (Alsayed *et al.*, 1992 ; Dalal *et al.*, 1998 and Pandey *et al.*, 2001)

Tomato growth respose

Data presented in table(3) cleared that, most treatments improved the plant growth comparable to the check, heighly significant increase in shoot weights were apparent in soil treated with doses 1 and 2 % of *D.regia* , *S.farinaceae* , *S.splendens* and *C.indica* treatments.yet at the highest dose 3 %., the shoot weights were decrease significantly. Also,data showed reduction in root weights in soil treated with 1,2 and 3 % concentrations of all treatments except *P.graveolens* .Shoot and root length showed inhibition with increasing concentrations of the most flower extracts especialy those of *S.splendens, V.rosa, B.*spp.and *G.jamesonii* . The improvement in plant growth especially(shoot weight and root length) at 1, 2 % concentrations may be due to the nematode suppression and / or the effect of these amendments as organic manures. (Siddiqui & Alam, 1988) .Phytotoxicity was obvious in *N.Oleander* ,*V.rosa* ,*P.hybrida* and *G.jamesonii* at 1,2 and 3% treatments ,as well as the majority of all treatments at 3% concentrations ,that may be refered to of some chemical components adverse effects on plant growth (Alam,1987 ;Awan *et al.*, 1992 and Dalal *et al.*, 1998) .

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