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SUPPRESSION OF *Meloidogyne javanica* INFECTING EGGPLANT BY DILUTED CAMEL URINE APPLIED WITH IRRIGATION WATER.

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ABSTRACT

The root-knot nematode *Meloidogyne javanica* is a serious pest problem in Al-Qassim vegetable and agronomic production systems. Camel urine was tested as a nematicide against this plant parasitic nematode on eggplant under greenhouse conditions. Camel urine was weekly applied as soil drench with irrigation water at rates of 0, 2, 4, 6, 8, and 10%. Camel urine treatments significantly reduced numbers of galls and egg masses per root system compared to untreated control. Also, urine treatments supported a higher plant growth compared to untreated plants. There was a negative linear relationship between urine concentration and number of galls and egg masses. The results indicated that the treatments with 8 and 10% urine gave the best results in terms of reduced numbers of galls and egg masses per root system. However, data showed that there was non linear relationship between urine concentration and plant growth. Concentrations over 6% are not recommended.

Keywords: Camel urine, root-knot nematode *Meloidogyne javanica*, control.

INTRODUCTION

Plant parasitic nematodes are damaging to many vegetable and agronomic production systems (Netscher and Sikora, 1990). Root-knot nematodes, *Meloidogyne* spp., are serious pest problem in Al-Qassim vegetable and fruit crops (Al-Rehiayani and Farahat, 2004). The root damage from the nematodes leads to stunted growth, and crop producing low yields. To prevent losses caused by nematodes several control methods are used. Growers in Al-Qassim, Saudi Arabia rely on commercial available nematicides. Because of wide host range of root-knot nematodes, the use of crop rotation is unfortunately limited. Therefore, alternative control methods are needed. Soil amendments of different kinds used as nutrient sources for crop production have been found effective in controlling plant parasitic nematodes and enhancing plant growth. Green manure, chicken manure has been successfully used (Al-Rehiayani and Hafez, 1998; Al-Rehiayani, 2001; Rodriguez-Kabana *et al*, 1987). Reduction of nematode population densities has been attributed to direct toxicity of the decomposition products of organic matter, an increase of natural antagonists in the soil, and the alteration of plant nematode relationships (Widmer *et al.*, 2002).

Camel urine is well known as a potential cure for many human diseases and has been found to be effective against certain plant pathogens (Al-Zahrani, 2002) and root knot nematodes (Abubakar *et al.*, 2004).

Moreover, Camel is considered one of the most important farm animals in the Middle East region and it has high economic and historic impact especially in Al-Qassim region of Saudi Arabia. The objective of this study was to investigate the effect of diluted camel urine on *Meloidogyne javanica* on eggplant under greenhouse conditions.

MATERIALS AND METHODS

The experiments were conducted under greenhouse conditions at the research center of Qassim University, Al-Qassim, Saudi Arabia. The camel Urine was obtained from the camel solitary center at Buridah city, Al-Qassim. The chemical (pH, macro and micro nutrients and heavy metals) variables were determined (Table 1). The camel Urine was weekly applied with irrigation water as soil drench at different rates i.e 0, 2, 4, 6, 8, and 10% urine). The experiment was arranged in a complete randomized design with six treatments each, which was replicated four times. Three-week eggplant seedlings were planted in pots containing 2 kg sandy soil. Plants were inoculated with J_2 and eggs mixed of *Meloidogyne javanica* (10000/pot). The diluted urine was added as soil drench with irrigation water (150ml/pot).

Table 1: Chemical and physical analysis of the camel urine

Component	Concentration (ppm)
Na	6040
K	7683
Mg	200
Ca	4.20
Fe	0.26
Mn	0.03
Zn	0.36
Cu	0.13
Cl	11431
CO3	16632
HCO3	14713
EC (mmhos/cm)	71.2
Total N (%)	1.60
NH4-N	6300
NO3-N	4392
Urea	1275

* pH = 9.28

The number of galls and egg masses per root system were obtained according to the methodology described by Taylor and Sasser (1978) 65 days after inoculation. The fresh and dry shoot and root weight of plants were also determined at the end of the experiment. Dry weight of plant material was determined by placing the materials in an oven at 60 °C for 3 days.

The data were subsequently subjected to analysis of variance ($P<0.05$)

mean differences for each variable were compared by Duncan's multiple-range test ($P<0.05$). Values for number of galls and egg masses per root system and shoot and root weights were log transformed before statistical analysis. Polynomial regression was analyzed using SAS (SAS Institute, Inc., 1996, Cary, NC) to evaluate the relationship between the urine rates and number of galls and egg masses per root system.

RESULTS AND DISCUSSION

In a preliminarily study, (Unpublished data) a range of concentrations 10, 25 and 50% of camel urine had been applied on eggplant seedling grown in pots (20cm in diameter) and kept under greenhouse conditions. It was observed that concentrations over 10% had a remarkable negative effect on plants (un-published da2ta). Therefore, concentrations of 2, 4, 6, 8 and 10% were used in further experiments. Data in table (2) clearly showed that all tested urine concentrations had a considerable effect on number of both galls and egg masses of *M. javanica*. It was noticed that the mean number of galls were significantly reduced from 313.75 to 234.75, 199.25, 158.00 and 151.50 gall /root system when the urine concentration was raised from 2% to 4%, 6%, 8% and 10%, respectively.

Table 2: Effect of camel urine on number of galls and egg masses of *Meloidogne javanica* on eggplants.

Urine treatment %	Mean No. of galls	Mean No. of egg masses
0.00	309.75 a	253.75 a
2.00	313.75 a	279.25 a
4.00	234.75 b	194.75 b
6.00	151.50 c	128.50 d
8.00	199.25 b	163.00 c
10.00	158.00 c	104.50 e
RSD	0.061	0.046

Data are expressed as means of four replicates and these values were log transformed for the statistical analysis
Values were analyzed by Duncan's test where means followed by the same letter aren't significantly different (P> 0.05)
RSD = Residual standard deviations

These data were analyzed where the linear regression analysis of log transformed data obviously showed an inversely linear relationship between camel urine concentration and number of galls obtained from the infected plants ($\hat{y} = 2.48 - 0.031$ X) as shown in fig. 1 and Table 3. The same trend was observed with regard to the effect of urine concentration and number of egg masses of *M. javanica*. Data showed that there was an average of 253.75 egg mass/root system in untreated plants which was significantly reduced to 194.75, 128.50, 163.00 and 104.50 egg mass/root system when plants were treated with urine of 2, 4, 6, 8 and 10%, respectively. The regression analysis clarified this negative linearity where $\hat{y} = 2.44 - 0.041$ X as shown in fig. 2 and Table 3.

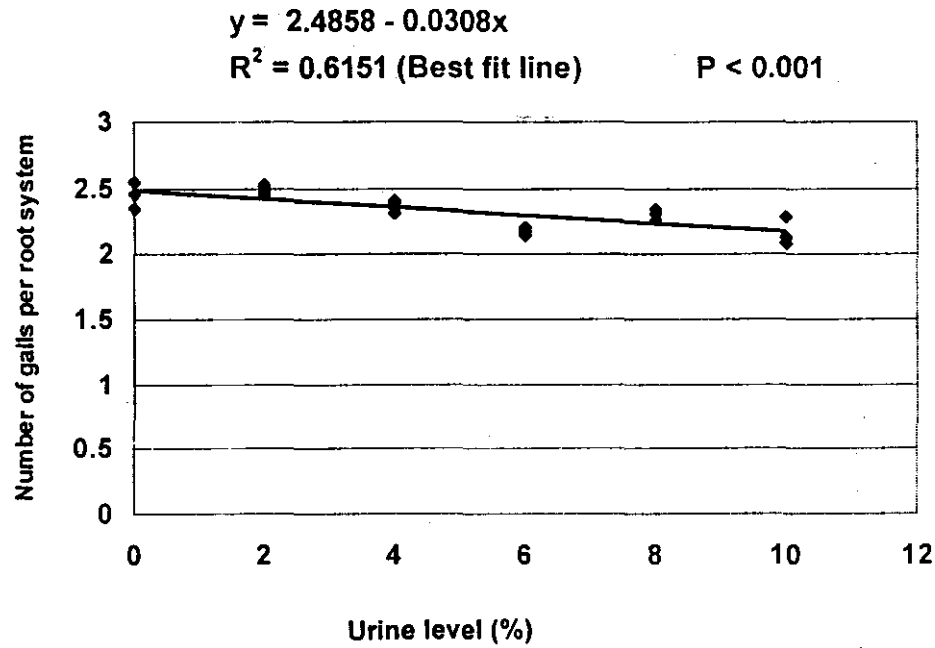

Figure (1): Effect of camel urine on number of galls per root system *(log-transformed* data)

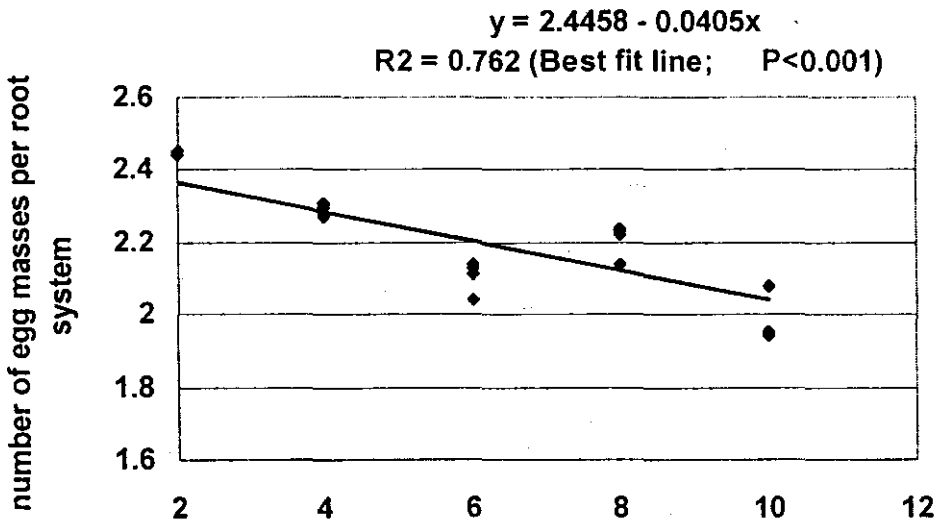

Figure (2): Effect of camel urine on number of egg masses per root system (log-transformed data

Table 3: Regression analysis showing the relationship between camel urine concentration and numbers of galls and egg masses of *Meloidogyne javanica*.

Dependent variable ($\hat{y}$)	Relationship	Probability of linearity	R^2
No. of galls	$\hat{y}$ =2.48 – 0.031X	0.0001	0.62
No. of egg masses	$\hat{y}$ =244 – 0.041X	0.0001	0.76

R^2 = Coefficient of determination

From the previous results, it can be generally noticed that the greatest number of *Meloidogyne* galls and egg masses per root system were obtained when eggplant seedlings were grown in untreated soil or soil exposed to only 2% of camel urine. Accordingly, the use of camel urine with rates of 4, 6, 8 and 10% has provided a significant control of plant parasitic nematodes. The effect of camel urine on *Meloidogyne javanica* may be due to certain components such as high rates of ammonia and salts (Table 1) that have significant effect in suppressing the nematode populations. These results agree with those obtained by Millner (1982); Mc Sorley and Gallaher (1996) and Barbosa *et al*, (2004). Moreover, it is also possible that eggplant grown under the local greenhouse conditions in addition to adding camel urine have become unsuitable host for *M. javanica*.

Concerning the effect of camel urine on eggplant growth (Table 4), the greatest root and shoot weight were found in plants grown in pots infected with nematodes and treated with 2 and 4% urine. The lowest growth rate was obtained when 10% urine was used against nematodes. Data in Figs.3 - 6 indicated that there was non-linear relationship between urine concentrations and eggplant growth.

Table 4: Leas square means (g/plant) and their standard errors (±SE) for yield trails in different nematode-infested plants (N) treated with camel urine(U)

	Roots weight (g)		Shoot weight (g)	
	Fresh	Dry	Fresh	Dry
Nematode treatments	----------		----------	
With nematodes	6.99 a	0.974 a	11.25 a	1.405 a
Without nematodes	5.92 b	0.830 b	8.40 b	1.095 b
±SE	0.26	0.037	0.43	0.064
Urine treatments	----------		----------	
0%	5.98 c	0.675 c	7.96 cd	1.175 b
2%	8.17 a	1.336 a	12.82 a	1.650 a
4%	7.48 ab	1.005 b	11.78 a	1.343 ab
6%	6.80 bc	1.026 b	10.77 ab	1.256 b
8%	6.17 bc	0.874 b	9.17 bc	1.406 ab
10%	4.13 d	0.497 c	6.45 d	0.670 c
±SE	0.44	0.065	0.74	0.111

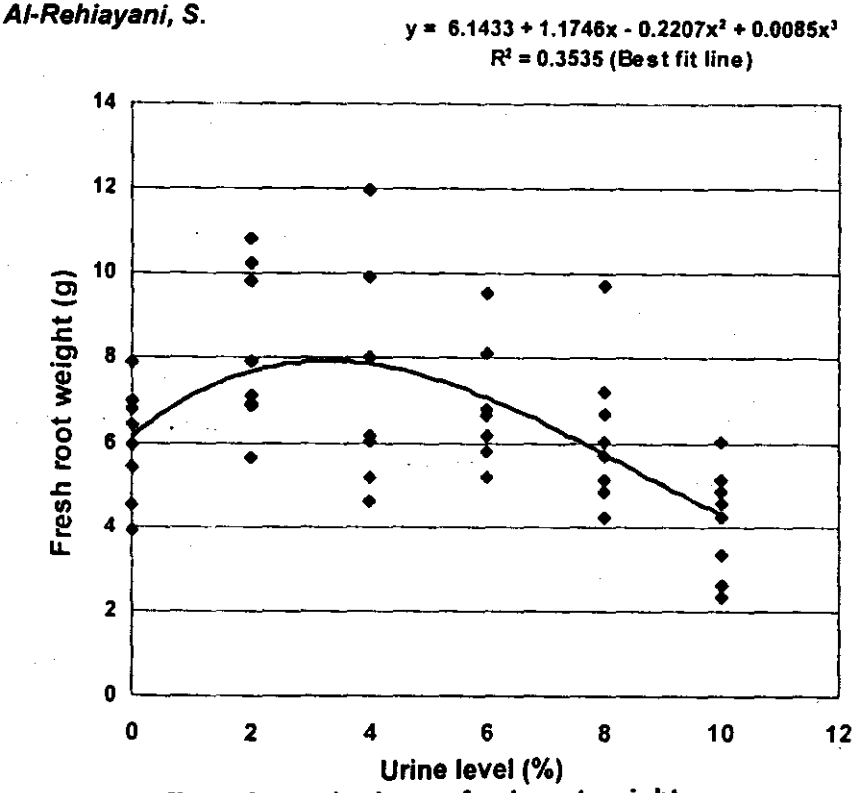

Figure (3): Effect of camel urine on fresh root weight

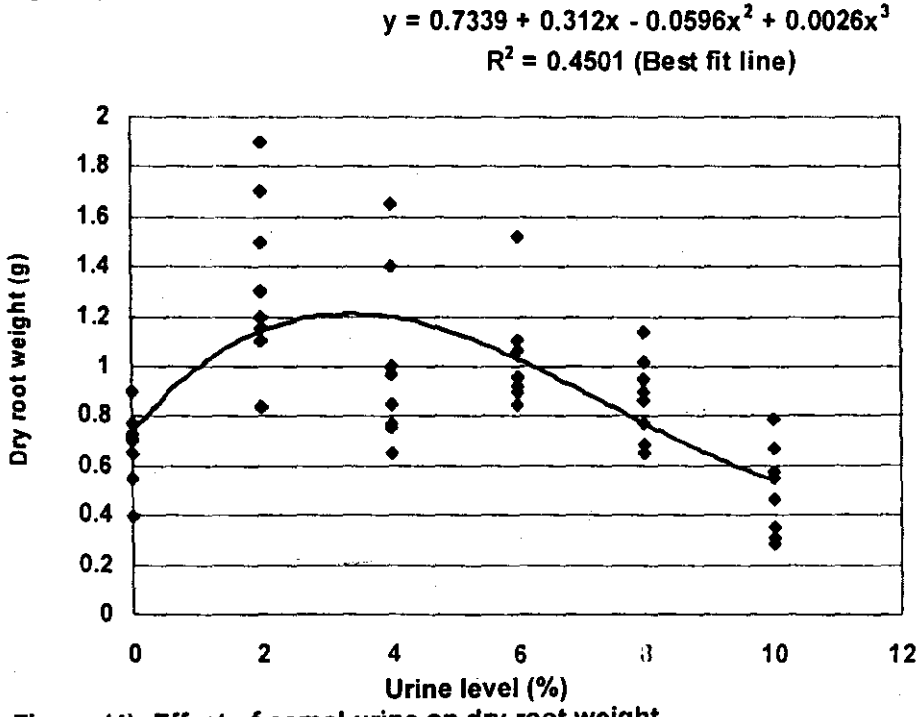

Figure (4): Effect of camel urine on dry root weight

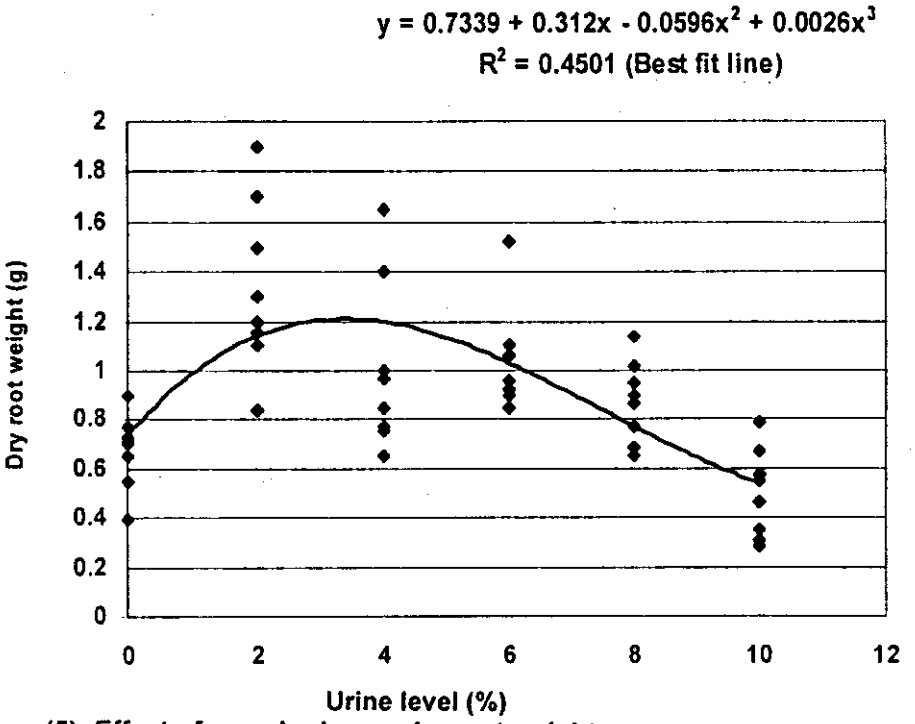

Figure (5): Effect of camel urine on dry root weight

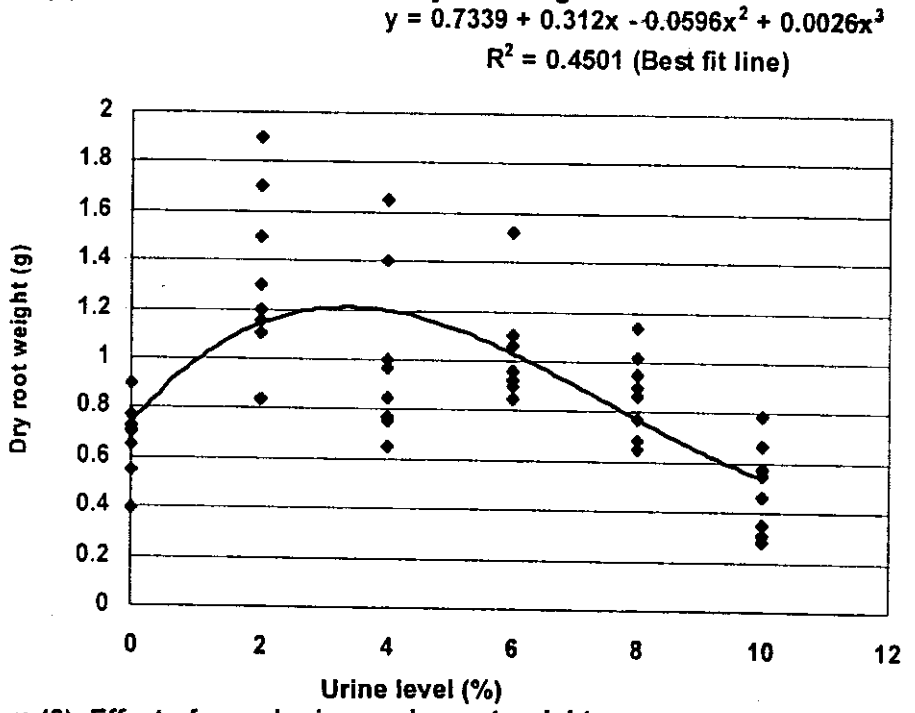

Figure (6): Effect of camel urine on dry root weight

These results proved that urine concentrations over 6% may be toxic to eggplant seedlings. Therefore, urine concentrations between 4 and 6% may be recommended for nematode control, although 8 and 10% were the most effective concentrations in suppressing nematode populations. This reduction in nematode populations may suggest a nematicidal potentiality of camel urine. Similar results were previously obtained by other researchers who used cow urine to control *M. incognita* (Aboubakar *et al*, 2004).

In general, the effect of such components found in urine against plant parasitic nematodes may require further studies in the field. Field studies should be conducted to investigate certain factors, including nematode species, chemical decomposition of urine, the time interval between applications and the evaluation of nematode populations as suggested by Mc Sorley and Gallaher, (1996).

In conclusion, this kind of management using camel urine as an alternative nematicide in irrigating water may be not accepted by vegetable and fruit growers in Al-Qassim r region, Saudi Arabia, but it might be useful for nematode control in ornamental crops and hay grasses.

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REFERENCES

Abubaker U.; T.Adamu, and S. B. Manga (2004) Control of *Meloidogyne incognita* (kofoid and white) chitwood (root knot nematode) of *lycopersicon esculentus* (tomato) using cowdung and urine. African Journal of Biotechnology 3:379-381.

Al-Rehiayani, S.M. (2001) Organic and Inorganic fertilizers in relation to the control of the root-knot nematode, *Meloid gyne javanica*, infecting tomato. Egypt. J. Agronematology. 5:1-10.

Al-Rehiayani, S.M.; A. A. Farahat. (2004) A Survey of Plant-Parasitic Nematode Genera in Al-Qassim Governorates, Saudi Arabia (The farms of Buraidah City and Unayzah , Al-Bukeriah, Al-Badaee Governorates). *Journal King Saud University, Agricultural sciences*. 17:85-110.

Al-Rehiayani, S.M., and S. L. Hafez (1998) Host status and green manure effect of selected crops on Columbia root-knot nematode, *Meloidogyne chitwoodi* race 2, and lesion nematodes, *Pratylenchus neglectus*. Nematropica 28:213-230.

Al-Zahrani, S. M. (2002) Study on the effect of female camels' urine (virgin and fertilized on the *Aspergillus niger* fungus. Journal pf Arabic Gulf for Scientific research 20:115-122.

Mc Sorrley, R. and R. N. Gallaher (1996) Effect of yard waste compost on nematode densities and maize yield. J. Nematology, 28: 655-660.

Millner, P. D.; R. D. Lumsden and J. A. Lewis (1982) Controlling plant diseases with sludge compost. Biocycle, 23: 50-52.

Netscher, C. and R. A. Sikora. (1990) Nematode parasites of vegetables. Pp. 237-238 in M. Luc, R. A. Sikora, and J. Bridge, eds., Plant Parasitic Nematodes in Subtropical and Tropical Agriculture. CAB International, Wallingford, Oxon, UK.

Rodriguez-Kabana; R., Morgan-Jones; and I. Chet (1987) Biological control of nematodes: Soil amendment and microbial antagonists. Plant Soil 100:237-247.

SAS, 1996. SAS' Procedure Guide. Versin 6.12 Edition, SAS Institute, INC, Cary, NC, USA.

Taylor, A.L. and J. N. Sasser, (1978) Biology identification and control of root-knot nematodes (*Meloidogyne* spp.). Raleigh: North Carolina State Graphics. 111 pp.

Widmer, T. L. N.A. Mitkowski, and G. S. Abawi. 2002. Soil organic matter and management of plant parasitic nematodes. Journal of Nematology 34:289-295.

خفض الاصابة بنيماتودا تعقد الجذور ميلودوجاين جافانيكا التي تصيب نباتات البازنجان في الصوبات الزراعية باستخدام بول الابل

سليمان بن محمد الرحياني

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تهدف هذه الدراسة إلى محاولة استخدام طرق مكافحة بديلة للمبيدات الكيماوية وذلك باستخدام بول الابل الذي يضاف مع ماء الري بغرض خفض الاصابة بنيماتودا تعقد الجذور *Meloidogyne javanica* التي تصيب نباتات البازنجان تحت ظروف الصوبات الزراعية في منطقة القصيم بالمملكة العربية السعودية. تم استخدام الري مضافا إليه تركيزات ٢و٤و٦و٨و١٠% من بول الابل اسبوعيا أعطت النتائج مؤشرات حيدة حيث كانت نسبة الخفض في عدد العقد النيماتودية وكذلك كتل البيض معنوية بمقارنتها بالنباتات غير المعاملة. وضح أيضا أن إضافة بول الابل كان له تأثير ايجابي على نمو نباتات البازنجان. كما أوضحت الدراسة أن هناك علاقة خطية سالبة بين تركيز بول الابل وعدد العقد النيماتودية وكتل البيض لكل نبات. كما كان للتركيزين ٨% و ١٠% من بول الابل أعلى تأثير على عدد كتل البيض وعدد العقد النيماتودية ولكن لا ينصح باستخدامهما لتأثيرهما السلبيعلى نباتات البازنجان. كما لم تكن هناك علاقة خطية بين تركيز البول المستخدم ونمو نباتات البازنجان. أوصت الدراسة بعدم استخدام تركيزات أعلى من ٦% حيث كان للتركيزات من ٢-٦% تأثير ملموس في خفض تعداد نيماتودا تعقد الجذور التي تصيب نباتات البازنجان تحت ظروف الصوبات.