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Effect of Certain Organic Soil Amendments on Sugarbeet (*Beta vulgaris* L.) Infested with Root- knot Nematode, *Meloidogyne javanica* under Field Conditions

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ABSTRACT

Some organic additives *i.e.* cattle manure, chicken manure, rice straw, pigeon-dung, poudrette best and sheep manure were tested as soil amendments (as dried materials) at 1, 2 and 3% of soil weight (10, 20 and 30 tons/fed) dosage level for controlling of the root-knot nematode, *Meloidogyne javanica* and improvement of sugar beet growth, c.v. Chems, yield and quality under naturally infested sandy soil conditions during 2004/05 and 2005/06 seasons. All treatments significantly ($P \leq 0.05$) reduced numbers of galls, eggmasses, eggs and multiplication rate on plant root as compared to the check and mineral fertilizer treatments The efficacy of the treatments differed according to the source and dosage level, thus by increasing the dosage level, the substance efficacy was also , increased . All rates of chicken manure , pigeon-dung and poudrette best treatments were most effective in reducing galls, egg masses and egg numbers as well as multiplication rate followed by moderate and high levels of sheep manure and high level of both cattle manure and rice straw treatments. The tested organic substances with their three levels significantly increased plant growth and yields as compared to the check treatment. Application of chicken manure, pigeon-dung and poudrette was the best specially at the high dosage level and sheep manure at the two high dosage levels suppressed plant growth and yield when compared with those of the other levels. Remarkable plant growth and yield suppression was observed on plants grown in soil amended with high dosage level of chicken manure, pigeon–dung and poudrette best. Generally, addition of some organic amendments specially, chicken manure, pigeon–dung and poudrette best at the middle dosage level (20 tons/fed.) and both cattle manure and rice straw at the high dosage level (30 tons/fed.) to naturally infested sandy soil by *M. javanica* gave pronounced nematode suppression and plant growth promotion and could be used safely as soil amendments in nematode management programs.

Key Words: Organic amendments, Sugar beet, *Meloidogyne javanica.*

INTRODUCTION

Safe agriculture is one of the main attitudes in the world (El-Kounty, 2002). Also, he added that there has been an increasing awareness of the undesirable impact of mineral fertilizers on the environment, as well as the potentially dangerous effects of chemical residues in plant tissues on the health of human and animal consumers.

Organic wastes such as organic plant residues and animals' wastes in agriculture may have a role in decreasing the enormous consumption of chemical fertilizers in Egypt. Awad (1994) pointed out that the importance of organic matter to Egyptian agriculture comes directly next to water importance. At the same time, organic amendments are usually added to soils to improve their physical, chemical and biological properties and /or provide plants with nutrients.

Due to the environmental pollution caused by applying nematicides and accordingly the resulted hazards, efforts have been devoted to create new approaches for nematode control, attention was diverted to the use of some organic animal or plant residues in nematode control. As a matter of fact, organic matter affects nematode's populations in two different ways, directly by possessing nematicidal properties during its degradation (Sitaramaiah and Singh, 1978), or indirectly by enhancing the development of nematode natural enemies, *e. g.,* bacteria, microbivorous nematodes, nematode trapping fungi (D`Errico and Maio, 1980 and Rey, 1988) and increasing host resistance (Novaretti *et al.,* 1989 and Mc Sorley and Gallaher, 1996). The beneficial effect of different organic amendments composts for controlling plant- parasitic nematodes was documented by Gamliel and Stapleton (1993); Gallaher and Mc Sorley (1994) ; Mc Sorley and Gallaher(1996); Aboul-Eid *et al.* (1998) and Maareg *et al.* (1999 and 2000). Hence, this study was carried out to evaluate the effect of certain organic soil amendments against root-knot nematode, *Meloidogyne javanica* infesting sugarbeet and on yield performance under sandy soil conditions.

MATERIALS AND METHODS

This work was carried out in sandy soil field naturally infested with the root-knot nematode, *M. javanica* located at West Nubaryia district, El- Behera Governorate, Egypt, cultivated with the sugar beet, *Beta*

vulgaris L. cv. Chems from the two successive seasons 2004/05 and 2005/06. The nematode initial populations were 985 and 1117 second stage larvae per 150 gm soil in the first and second seasons, respectively.

Organic soil amendments used in these experiments were cattle manure, chicken manure, pigeon-dung, sheep manure, poudrette best, and rice straw. All organic soil amendments were added to the soil as dried material (naturally dried) at the dosage levels 1, 2 and 3 % w/w organic matter (10, 20 and 30 tons/fed.) by weight .All treatments were mixed with the soil surface (0-30 cm layer), 15 days before sugarbeet cultivation, with a control (check) plots standing up to represent no amendment added in each season. The treatment of mineral fertilizer was applied according to the recommended dose. This treatment received inorganic fertilizers including ammonium sulphate (20% N), super phosphate (15% P_2O_5) and potassium sulphate (48% K_2O) at the equivalent rates 100, 30 and 48 kg/fed. of N, P_2O_5 and K_2O, respectively. Phosphorus and potassium fertilizers were added just before cultivation while ammonium sulphate was added in four equal doses after 5, 7, 9 and 11 weeks from planting. Each treatment was replicated four times in a randomized complete block design.

The physical and chemical properties of the experimental soil and chemical analysis of the tested organic soil amendments are shown in Tables 1 and 2, respectively. The analysis of both the soil and organic soil amendments were made according to Page *et al.* (1982) procedures. The previous crop was maize in both seasons. Plot size was 12.6 m^2. Each plot included six ridges 60 cm apart and 3.5 m long. Sugar beet cv. Chems was planted on 15th September in both seasons. Seeds were sown in hills 20 cm apart on one side of the ridge at a rate of 3-4 seeds per hill. Plants were thinned to one plant per hill at four true leaves stage. Other agricultural practices were done as recommended. At maturity stage (210 days from sowing), the total area of each plot was harvested to estimate top and root weights (gm) per plant, root length and root diameter (cm). Top and root yields per plot were transformed to metric tons per plot to calculate top and root yields per feddan. The quality characters on the basis of total soluble solids (TSS) percentage was measured by hand refractometer , sucrose percentage was determined according to Le Docte as described by Mc Ginnus (1971) and purity percentage was calculated as a ratio between sucrose % and TSS% . Sugar yield (tons/fed.) was calculated by multiplied sucrose % X root yield (tons/fed.). A random sample of 10 plants was uprooted from each plot. Roots of each sample free from the adhering soil particles by running tap water. The total number of galls, egg masses and eggs were counted and calculated per root system.

Data was computed and analyzed using SAS program and the differences between the means of treatments were determined by using Least Significant Differences test (L.S.D) according to Snedecor and Cochran (1980). A combined analysis of data of both experimental seasons was used.

RESULTS AND DISCUSSION

Data in Tables1 and 2 present some physical and chemical properties of the soil, while tables 3 and 4 illustrated the efficacy of the tested organic soil amendments with their three dosage levels 1, 2 and 3 % of soil weight (10, 20 and 30 tons / fed., respectively) on reduction of root-knot nematode, *M. javanica* infesting sugar beet, and in improving the plant growth, yield and quality.

1- Effect of soil amendments on nematode reproduction

It is worthy to notice that all the tested organic materials significantly succeeded ($P \leq 0.01$), in controlling the nematode compared to the check and mineral fertilizer treatments (Table 3). Galls formation was obviously reduced by using the tested treatments according to the source and dosage level. Thus, by increasing the dosage level, the efficacy was also increased. Considerable reduction in galls number was found at applied chicken manure, poudrette best and pigeon-dung at all dosage levels (1, 2 and 3% w/w). Additionally, using of cattle manure and rice straw gave remarkable reduction in galls formation at the dosage level of 3% (30 tons / fed.), however, sheep manure achieve considerable reduction in galls number when used at the levels of 2 or 3% w/w (20 or 30 tons / fed.).

Also, reproductive potential of the root – knot nematode, *M. javanica* was remarkably affected by the different dosage levels of the used organic soil amendments. So, egg masses and eggs numbers per root system and rate of nematode multiplication were significantly reduced by using such treatments. Pronounced reduction in such reproductive parameters was observed at applied of chicken manure, poudratte best and pigeon-dung at any dosage level. Remarkable reduction in the nematode reproductive potential was obtained

Table (1): Some physical and chemical properties of the experimental soil (2004/2005 and 2005/2006 seasons).

Soil characteristics	Values	
	2004 /05	2005/06
Particle sign distribution.		
Coarse sand	76.7	73.7
Fine sand	14.9	18.5
Silt	2.1	2.8
Clay	6.3	6.0
Texture class	sandy	sandy
Saturation percent	24.2	26.3
Ca Co_3	1.6	1.5
Organic matter percent (O.M %)	0.5	0.4
pH	7.7	7.9
EC (m mhos / cm)	0.4	0.4
Cations and anions (meq/L)		
Calcium	1.0	0.9
Magnesium	0.9	1.1
Sodium	1.5	1.7
Potassium	0.5	0.5
Carbonates	0.0	0.0
Bicarbonates	1.4	1.3
Chloride	1.0	1.2
Sulphate	1.5	1.6
Available nutrients (ppm)		
N	85	87
P	25	23
K	125	128
Fe	2.4	2.5
Mn	1.5	1.4
Zn	0.4	0.3
Cu	0.2	0.2

Table (2): Chemical properties of the tested organic soil amendments.

Organic soil amendments	E.C m. mohs/cm	pH 1:10	Total macronutrients %			O.M %	O.C %	C/N ratio	Total micronutrients (ppm)			
			N	P	K				Fe	Mn	Zn	Cu
Cattle manure	7.74	7.84	1.8	1.1	0.8	30.21	22.9	12.7	97.80	22.20	92.20	32.30
Chicken manure	6.62	8.24	3.7	2.0	2.1	45.90	39.30	10.6	3531	955.0	952.0	177.0
Pigeon-dung	3.30	6.73	5.0	2.2	2.0	50.21	38.7	7.6	2801	480.0	410.0	110
Poudrette best	3.90	7.3	1.7	0.48	0.08	22.69	13.16	12.33	96.8	180.0	259.0	750.0
Rice straw	6.61	7.57	2.33	0.50	0.63	56.64	32.9	14.1	401.0	116.0	100	22.7
Sheep manure	8.72	7.7	1.6	0.54	0.88	38.31	24.6	15	280.0	36.0	47.0	3.0

Table (3): Effect of some soil amendments on development and reproduction of root-knot nematode, *Meloidogyne javanica* infesting sugar beet under field conditions. (Combined data of 2004/05 and 2005/06 experimental seasons).

Soil amendments	Dose % (w/w)	Nematode parameters							
		Galls per root		Eggmasses per root		Eggs per root		Multiplication Rate (MR)*	
		No.	R%	No.	R%	No.	R%	No.	R%
Cattle manure	1	131	64.7	112	44.8	8400	30.5	8.4	28.1
	2	100	73.1	46	77.3	6000	50.4	6.0	49.6
	3	65	82.5	23	88.7	3264	73.0	3.3	72.7
Chicken manure	1	43	88.4	36	82.3	1854	84.7	1.9	84.3
	2	36	90.3	17	91.6	820	93.2	0.8	93.4
	3	19	94.9	7	96.6	240	98.0	0.2	98.3
Rice straw	1	134	63.9	69	66.0	9230	23.6	9.2	24.0
	2	96	74.1	41	79.8	6840	43.4	6.8	43.8
	3	67	81.9	30	85.2	3488	71.1	3.5	71.1
Pigeon-dung	1	66	82.2	40	80.3	1518	87.4	1.5	87.6
	2	47	87.3	22	89.2	1034	91.4	1.0	91.7
	3	27	92.7	20	90.1	580	95.2	0.6	95
Poudrette best	1	48	87.1	45	77.8	2343	80.6	2.3	81.0
	2	45	87.9	36	82.3	1518	87.4	1.5	87.6
	3	23	93.8	16	92.1	754	93.8	0.8	93.4
Sheep manure	1	121	67.4	101	50.2	6526	54.0	6.5	46.3
	2	62	83.3	40	80.3	2685	77.8	2.7	77.7
	3	40	89.2	25	87.7	1734	85.7	1.7	86.0
Mineral fertilizer		181	51.2	91	55.2	10413	13.9	10.4	14.1
Check		371	—	203	—	12088	—	12.1	—
L.S.D. $_{0.05}$		29		23		60		2.1	
L.S.D. $_{0.01}$		40.4		32.0		83.6		3.1	

R = Reduction *MR = [Final nematode population (eggs/root) / Initial nematode population]

Table (4): Effect of some soil amendments on growth, quality and yield of sugar beet grown in naturally infested sandy soil by root-knot nematode, *Meloidogyne javanica*. (Combined data of 2004/05 and 2005/06 experimental seasons).

Soil amendments	Dose % (w/w)	Growth characters				Quality characters			Yield tons/fed.	
		Top weight g/plant	Root weight g/plant	Root length (cm)	Root diameter (cm)	T.S.S. %	Sucrose %	Purity %	Roots	Sugar
Cattle manure	1	296.7	602	16.7	8.9	21.6	17.4	80.6	16.3	2.8
	2	300.6	722.2	19.4	10.0	23.0	18.6	80.8	18.2	3.4
	3	310.3	803.0	21.2	10.3	23.2	18.9	81.4	22.6	4.3
Chicken manure	1	324.2	838.8	23.3	10.0	22.8	19.4	85.0	24.2	4.7
	2	373.8	1117.0	32.7	12.5	23.5	20.0	85.1	31.0	6.0
	3	282.3	797.5	16.1	8.2	22.2	18.0	80.9	20.5	3.7
Rice straw	1	289.3	597.0	17.9	8.6	21.5	17.5	81.4	14.7	2.8
	2	291.4	696.0	22.7	9.3	22.8	19.0	83.3	16.8	3.2
	3	307.3	773.3	23.9	10.2	22.7	19.0	83.7	19.1	3.6
Pigeon-dung	1	321.4	832.0	22.5	9.5	22.2	18.9	85.1	22.9	4.3
	2	358.9	1080.1	33.5	12.5	23.0	19.8	85.2	29.5	5.8
	3	301.3	742.2	17.9	8.3	22.7	19.2	84.6	18.4	3.5
Poudrette best	1	286.7	733.3	26.0	10.2	23.2	19.0	81.9	22.0	4.2
	2	335.4	999.9	29.5	11.7	22.8	19.3	84.7	27.6	5.3
	3	273.4	699.2	16.1	8.6	21.6	17.4	80.7	20.4	3.5
Sheep manure	1	300.8	757.4	19.4	9.1	22.0	18.3	83.1	20.4	3.7
	2	296.7	699.2	16.7	8.9	21.5	18.0	83.7	17.2	3.1
	3	231.3	609.6	12.8	7.2	20.8	16.6	79.8	15.3	2.5
Mineral fertilizer		317.3	865.7	25.2	12.2	23.0	18.9	82.2	21.6	3.6
Check		181.0	373.9	12.5	7.0	21.0	14.0	76.2	5.5	0.8
L.S.D. $_{0.05}$		7.8	33.4	3.0	2.1	0.3	0.2	1.1	5.2	1.1
L.S.D. $_{0.01}$		10.9	47.1	4.2	2.9	0.4	0.3	1.5	7.2	1.6

with 3% (30 tons / fed.) dosage level of both cattle manure and rice straw. However, sheep manure reduced the nematode reproductive when used at the dosage levels of 2 or 3 % w/w. Also, the rest organic treatments and mineral fertilizer affected the nematode reproductive parameters but with a lesser degree as shown in Table 3.

In general, chicken manure, pigeon-dung and poudrette best were highly efficiency, followed by sheep manure, cattle manure and rice straw treatments. All doses (10, 20 and 30 tons / fed.) of chicken manure, pigeon – dung and poudrette best attained the least final values of egg masses , eggs and consequently the multiplication rate followed by 20 and 30 tons / fed. of sheep manure treatment, then 30 tons/fed. of both cattle manure and rice straw treatments compared to the other treatments.

2- Effect of soil amendments on growth, quality and yield of sugar beet

As for the effect of the tested soil amendments on sugar beet growth, quality and yield, Table (4) shows that the magnitude of their effect varied according to the source and dosage level. Cattle manure and rice straw increased the plant growth and yield parameters by increasing the dosage level when compared with those of the other treatments. However, chicken manure , pigeon – dung and poudrette best treatments at the high level (30 tons / fed.) and sheep manure at both moderate and high levels (20 and 30 tons / fed. , respectively) suppressed plant growth and yield when compared with those of the other levels.

The data also showed that all dosage levels of cattle manure and rice straw, low and moderate levels of chicken manure, pigeon – dung and poudrette best and low level of sheep manure treatments as well as chemical fertilizer treatment significantly ($P \leq 0.01$) increased sugar beet plant growth characteristics (expressed as top weight, root weight, root diameter and root length) and root yield as well as sugar yield. The highest values were obtained at using chicken manure followed by pigeon – dung and poudrette best at the moderate level (20 tons / fed.) of each. On the other hand, the lowest values were resulted by check treatment.

The highest amounts of yield quality characteristics, *i. e.* T.S.S, sucrose and purity percentages were resulted from the plants fertilized with chicken manure and pigeon – dung treatments at the moderate dosage level (20 tons / fed.) as well as mineral fertilizer. However, the lowest quantities of these characteristics were resulted from the root juice of check plants as shown in Table (4).

The highest roots yield (31, 29.5 and 27.6 tons / fed.) and sugar yield (6 , 5.8 and 5.3 tons/ fed.) were produced by fertilizing sugar beet plants with a moderate dosage level of chicken manure, pigeon – dung and poudrette best treatments, respectively, followed by, low dosage level of chicken manure (24.2 and 4.7 tons / fed.) , low level of pigeon-dung (22.9 and 4.3 tons/fed.) , high level of cattle manure (22.6 and 4.3 tons/fed.) low level of poudrette best (22.0 and 4.2 tons / fed.), mineral fertilizer (21.6 and 3.6 tons/fed.) and low dosage level of sheep manure (20.4 and 3.7 tons / fed.) treatments , respectively . On the other hand, the lowest yields of roots and sugar per fed. were produced by the check plant treatment (5.5 and 0.8 tons/fed.) (Table 4).

Results obtained from this study proved the efficacy of the tested organic and non-organic soil amendments for controlling *M. javanica.* These additives succeeded in reducing galls formation and reproductive potential of the nematode and consequently improved growth and yield parameters as compared to the check plants. Although, chicken manure, pigeon-dung and poudrette best at the high dosage level, and sheep manure at both moderate and high levels gave remarkable results in nematode control and suppression in plant growth and yield parameters. Because sugar beet is sensitive to high level of these organic materials, a study was conducted with this crop to determine the effect of each organic treatment as a slow release nitrogen fertilizer.

The efficacy of the above mentioned additives (chicken manure and pigeon–dung) in suppressing nematode reproductive potential is undoubtedly due to the nematicidal properties of some acids which formed during its degradation, such as acetic , propionic and butyric. Chicken manure and pigeon – dung had the highest total acid constituent and were the most toxic to nematode (Husian and Massod, 1973; Pillai and Desai, 1975 and Badra *et al.*, 1979). The volatile compounds from these organic soil amendments especially hydrogen sulphide and methan, have also been shown to be toxic to nematodes (Fortuner and Jacq, 1976 and Badra *et al.*, 1979).

In our studies poudrette best exhibited suppressive effect on nematode reproduction and egg masses formation. It coincided with our results that severity of nematode diseases were limited by the addition of

poudrette best (Habicht, 1975). The reduction of galling seemed to be related to chemicals, such as ammonia, salt, or organic acids, released during incubation rather to action of antagonistic organisms. Also, application of organic soil amendments to the soil usually stimulates microbial action and creates conditions favorable for growth and reproduction of natural enemies of nematodes already present in the soil (D`Errico and Maio, 1980). Moreover, the application of organic soil amendments increased the tolerance of the plants against nematode diseases (Novaretti *et al.,* 1989 and Mc Sorley and Gallaher, 1996).

Generally, plots having received chicken manure, pigeon-dung and poudrette best treatments at 20 tons / fed. had less nematodes and higher plant growth and yields than those plots treated with artificial fertilizer. The increase in the growth of plant and yields may be due to suppression the nematode and to improving soil porosity, cation exchange capacity, soil water holding capacity , soil structure and soil nutritive status (Gallaher and Mc Sorley, 1994; Akhtar and Mahmoud, 1996; Youssef and Amin, 1997 and Maareg *et al.* , 2000) . In addition, the organic soil amendment is slow to release their nutrient thus, offer the benefits to plants and soil organisms throughout longer period. Also, organic matters do not easily leach the nutrients.

In conclusion, addition of some organic soil amendments especially chicken manure, pigeon- dung and poudrette best at the moderate dosage level (20 tons per fed.), cattle manure and rice straw at high dosage level (30 tons/fed.) to naturally infested sandy soil by *M. javanica* gave pronounced nematode suppression and plant growth promotion and could be used safely as soil amendments in nematode management programs.

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الملخص العربى

تأثير بعض محسنات التربة العضوية على نباتات بنجر السكر المصابة بنيماتودا تعقد الجذور "*Meloidogyne javanica*" تحت ظروف الحقل

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تم دراسة تأثير بعض الأسمدة العضوية فى صورة مساحيق مواد جافة وهى سماد متخلفات الماشية ومتخلفات الدجاج وسماد متخلفات محصول الأرز (قش الأرز) ومتخلفات الحمام (زرق الحمام) والصرف الصحي المعالج ومتخلفات الأغنام فى ثلاث معدلات ١، ٢، ٣% من وزن التربة (بما يعادل ١٠، ٢٠،٣٠ طن/فدان) على مكافحة نيماتودا تعقد الجذور (*Meloidogyne javanica*) ونمو محصول بنجر السكر في أرض رملية مصابة طبيعياً بهذه النيماتودا بمنطقة غرب النوبارية خلال موسمي ٢٠٠٤/٢٠٠٥ و ٢٠٠٥/٢٠٠٦ و أسفرت النتائج على مايلي:

- أدت المعاملة بكل من الأسمدة العضوية الى حدوث خفض معنوى فى أعداد كل من التعقدات الجذرية وكتل البيض والبيض ومعدل تكاثر النيماتودا على جذور النبات عند المقارنة بالكنترول. ووجد أن فاعلية السماد العضوي تتوقف على كل من مصدره ومعدل إضافته فوجد أنه كلما زاد معدل إضافة السماد زادت فاعليته و قدرته على مكافحة النيماتودا وخفض أعدادها على النباتات المصابة.
- كما أدت المعاملة بالمعدلات الثلاثة لكل من سماد متخلفات الدجاج و سماد متخلفات الحمام و سماد المتخلفات الأدمية (البودريت المحسن) من تحقيق أعلى خفض في أعداد التعقدات الجذرية و كتل البيض و البيض ومعدل التكاثر للنيماتودا على جذور النبات و يليها المعدلين ٢ ،٣ % لسماد متخلفات الأغنام و كذلك المعدل ٣ % لسماد متخلفات الماشية و قش الأرز.
- تبين أيضاً أن إضافة أسمدة المتخلفات العضوية المختبرة بمعدلاتها الثلاثة (١، ٢، ٣) ادت إلى زيادة معنوية في صفات نمو النبات وكلاً من محصولي الدرنات و السكر لبنجر السكر عند مقارنتها بالكنترول، كذلك وجد أن إضافة سماد متخلفات الدجاج و سماد متخلفات الحمام و سماد البودريت المحسن خاصة بالمعدل الأعلى (٣%) وسماد متخلفات الأغنام بالمعدلين ٢، ٣ % أدى إلى تثبيط نمو النبات وتقزمه و بالتالي إلى خفض المحصول عند مقارنته بمثيله من المعدلات الأخرى ، وتبين أن أقصى تأثير مثبط لنمو النبات في الأحواض المعاملة لكلاً سماد متخلفات الدجاج و سماد متخلفات الحمام و سماد البودريت المحسن بالمعدل الأعلى (٣%- بما يعادل ٣٠ طن/فدان).
- عموماً أدى إضافة بعض الأسمدة العضوية الجافة خاصة سماد متخلفات الدجاج وسماد متخلفات الحمام وسماد المتخلفات الأدمية (البودريت المحسن) بمعدل ٢ % (٢٠طن/فدان) وسماد متخلفات الماشية وسماد قش الأرز بمعدل ٣ % (٣٠طن/فدان) إلى الأرض الرملية الملوثة بنيماتودا تعقد الجذور "*Meloidogyne javanica*" الى خفضاً شديداً فى أعداد النيماتودا ومعدل تكاثرها على جذور النباتات، وكذلك أدى الى تحسين نمو المجموع الخضرى والجذرى لنباتات بنجر السكر المصابة مما أدى الى تحقيق أعلى زيادة معنوية في محصول الجذور و محصول السكر و الجودة

مما سبق يتضح أن إضافة مساحيق أسمدة مثل هذه المتخلفات العضوية خلطاً بالتربة الملوثة بالنيماتودا يعتبر طريقة آمنة لمكافحة النيماتودا ويمكن إدخالها كعنصراً من عناصر برامج المكافحة المتكاملة للنيماتودا .