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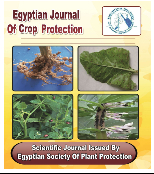

ECOFRIENDLY MANAGEMENT OF ROOT-KNOT NEMATODES ON EGGPLANT USING COMPOST

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ABSTRACT

Root-knot nematodes (RKN) became a true limited factor for eggplant production worldwide. Experiments were designed to evaluate the effectiveness of different compost types on RKN management in Eggplant under greenhouse conditions. Different compost types i.e. plant, animal, rice straw and maize wood compost at different doses 10, 20, 30, 50 and 100g/ pot were used. Results indicated that all evaluated treatments showed a great potential in decrease all related nematode parameters i.e. number of galls, egg masses, females/root system and second stage juveniles(J2s)/250g soil compared with control. The most effective treatment in reducing all nematode parameters was animal compost. Results illustrated that all compost types markedly increased eggplant growth parameters. The highest plant growth parameters enhancement obtained when plants treated with animal compost at 10g/ pot, followed by maize wood compost at the same rate of 10g/ pot. The lowest plant enhancement recorded with rice straw compost at 100g/ pot.

Key words: Root-Knot Nematodes, *Meloidogyne* spp, Compost, Eggplant, Biological Control.

INTRODUCTION

Recently, Eggplant (*Solanum melongena L.*) are considered one of the most important economic vegetable crops in Egypt. It is one of the top ten vegetables grown in the world. It is an herbaceous plant that follows family Solanaceae. Nowadays it is widely grown in different seasons throughout the year in opened field and under greenhouse conditions. It contains proportions of dietary fiber, vitamins, and micronutrients. According to the report of the Food and Agriculture Organization (FAO,2018), the total cultivated area of eggplant in Egypt reached 46849 ha which yielded 1409202 tons, with an average of 300795 hg/ha. Several diseases were recorded attacking this crop causing several harmful effects. Root-knot nematodes (RKN) *Meloidogyne* spp. consider one of the most economically important pathogens causing damage and losses of plant growth and yield of

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vegetable crops in Egypt (Bakr *et al*., 2011,2020). High yield loss of eggplant may occur when grown in sandy soils infested with high nematode population, especially in the summer season. International annual loss in eggplant due to nematodes were 16.9% (Sasser and Freckman,1987). In 2011-2012 the estimated annual yield losses in eggplant due to damage by plant parasitic nematodes in Egypt reached 20% with 298.41 Million L.E. (Abd-El Gawad, 2014).

Root-knot nematodes are capable of harshly damaging a broad range of crops, causing dramatic yield losses mainly in tropical and subtropical agriculture (Sikora and Fernandez, 2005). Infected plants with RKN almost showed poor growth as a result to reduction of nutrient and water uptake which substantially resulting damage to the root system, and therefore give low yields and quality (Abd-Elgawad,2021). Also, RKN can break the resistance of host plant and make it more susceptible to other pathogens (Castello *et al*., 2003; Manzanilla- Lopez *et al*., 2004).

Consequently, Nematologistis all over the world are keeping searching for alternative control methods to avoid the harmful effect of nematicides on plant, animals, environment (Bakr and Ketta, 2018) and ensure high quality free residual products. Compost acts as a food source and shelter for the antagonists that compete with plant pathogens, for those organisms that prey on and parasitize pathogens, for those beneficial that produce antibiotics and for those microorganisms that induce resistance in plants. Compost has a lot of elements like nitrogen, phosphorus and potassium, this material increases salt and soil acidification . Moreover, it contains a high in phosphorous and potassium while relatively low in nitrate nitrogen. It has a very high cation exchange capacity, relatively high levels of soluble salts, a slow mineralization rate, and it is “light in weight yet bulky in volume” (Wuest *et al*., 1995). Therefore, the present investigation was planned to study some safety alternative methods on controlling root-knot nematodes by using different compost types.

MATERIALS AND METHODS

Multiplication of *Meloidogyne* spp.:

Roo-knot nematodes *Meloidogyne* spp. multiplied on tomato (*Lycopersicon esculentum*) CV. Beto-86. Infected plants grown in plastic pots 30 cm in diameter filled with sterilized clay–sand mixed soil (1:2 v/v) under greenhouse conditions at the experimental farm, Faculty of

Agriculture, Menoufia University, Shebin El-Kom, Egypt.

Preparation of *Meloidogyne* spp. inoculum:

Three months old tomato roots infected with *Meloidogyne* spp. were used to prepare nematode inoculum. Tomato infected galled roots were removed from the pots and gently washed with tap water to remove the adherent soil particles. Roots were cut into small pieces and then were macerated for two periods of 10 seconds each at high speed by using a Waring blender Monilinex. The macerated root solution was then placed in a bottle containing sodium hypochlorite (NaOCl) adjusted to the final concentration of 0.5% to extract nematode eggs as described by Hussey and Barker (1973). The solution in the bottle was vigorously shaken for 3 minutes to release the eggs from the egg matrix as NaOCl helps in removes the gelatin matrix of egg masses. The solution was then poured through arranged different size sieves to remove the root tissue. Eggs were collected on the 20 micrometer (μm) sieve and washed several times with tap water to remove residual NaOCl. Eggs were then transferred to a flask containing tap water then number of eggs /1ml counted under light microscope.

Effect of different compost types on eggplant plants infected with *Meloidogyne* spp.

The experiment was carried out under greenhouse conditions at Department of Agricultural Botany, Faculty of Agriculture, Menoufia University, Shebin El-Kom, Egypt to evaluate the effect of different compost types i.e. plant, animal, rice straw and maize wood compost on root-knot nematodes management.

Plastic pots (15 cm in diameter) were filled with two kg of an un-sterilized mixed sand / clay soil (2/1 v/v). Different compost types were mixed with soil pots at 10, 20, 30, 50 and 100g/ pot. Soil pots watered daily to allow compost decomposition. One week later, three weeks old eggplant seedlings (*Solanum melongena* L.) cv. Balady were transplanted in pots (one seedling/pot). Each treatment was replicated three times. Three days later, three thousand (3000) eggs of *Meloidogyne* spp. as initial population (PI) were inoculated/plant by pipetting into 3-4 holes around the new hairy roots.

Plants watered as needed and weekly fertilized with 5 ml of 2g/l of N: P: K (20:20:20); manufactured by

International Egypt company for Agricultural and Industrial Developing.

Sixty days from nematode inoculation plants were uprooted and their roots were carefully washed under running tap water to remove adhesive soil particles. Nematode parameters i.e., number of galls, females and egg masses/ root system as well as J_2s/250 g soil, were recorded. Egg masses were assessed by staining the root system with Phloxin-B solution (0.15 g/l tap water) for 20 minutes according to Daykin and Hussey (1985). Females of *Meloidogyne* spp. were collected using technique described by Mahdy (2002) by cutting the root system of each plant in 2 cm pieces and submerging the root pieces in a beaker full of tap water for 4 days at room temperature until they became soft. The roots were then washed through 250 and 500 µm sieves to separate the females from the root debris then counted.

Nematode population in the soil pot was enumerated by extraction root-knot nematode J_2s by using the tray modification of Baermann funnel as described by Barker (1985). The nematode enumeration was done using the stereomicroscope. The rate of nematode reproduction was calculated according to Norton (1978) whereas:

Reproduction Factor (RF)=Final Population (PF)/Initial Population (PI).

Plant growth parameters i.e. plant and shoot lengths (cm), fresh shoot and root weights (g) and dry shoot weight (g) were recorded.

Determination of antioxidant enzymes activity:

A- Peroxidase

Peroxidase activity was measured according to the method described by Fehrman and Dimond (1967). Ten grams of fresh leaves were ground in a mortar with 10 ml of phosphate buffer (pH 6) extracts and then centrifuged for 15 min. at 4000 rpm. The supernatant was diluted by adding 8 ml distilled water to 2 ml supernatant. The reaction mixture consisted of 1.5 ml of 0.04 M caticol solution, 1.5 ml H_2O_2, 1.5 ml phosphate buffer (pH 6) and 1 ml of extract. The control was done similarly except the extract was previously boiled. The difference in optical densities between the reaction mixture and that of the control was taken as a measure of the activity of reaction. Enzymes activity was expressed as the increase in optical density from 60 - 120 seconds after the substrate was added. Aliquots of the supernatant were assayed colorimetrically at 470 nm.

B- Phenoloxidase

Phenoloxidase measured using the method described by Broesh (1954). Ten grams of leaves was ground in mortar with 10 ml borate buffer (pH9). Extracts were centrifuged for 15 min. at 4000 rpm. The supernatant was diluted by adding 9 ml distilled water to 2 ml supernatant. The reaction mixture consisted of 2 ml borate buffer (pH 9), 1 ml of 1% para aminobenzoic acid, 2 ml of 1% caticol and 1 ml extract. Control was done similarly except the extract was previously boiled. Then liquates of the supernatant were measured colorimetrically at 575 nm.

Statistical analysis

Data were statistically analyzed using analysis of variance (ANOVA) and comparisons of means at the 5% level of significance using costat 6.3 version program according to Duncan's multiple range test.

RESULTS

Results showed that all compost treatments significantly reduced the nematode root galling and inhibited the nematode reproduction on eggplant plants. All treatments reduced all related nematode parameters i.e. number of galls, egg masses, females/root system, J_2s/250 g soil, final population and reproduction factor compared with control as illustrated in table (1). Results showed that animal compost was the highest effective one in reducing all recorded nematode parameters specially at the low doses(10g), followed by maize wood compost, plant compost and rice straw compost, respectively. The lowest value of nematode reproduction was noticed with animal compost followed by maize wood compost, while the greatest values were found by rice straw compost. Results showed that the lowest number of galls was recorded with the rate of 10 g/pot of animal compost , followed by 10 g/pot of maize wood compost and the highest number of galls/root system observed with the rate of 100 g/pot from rice straw compost. Reduction percentage of galls 98%, followed by maize wood compost 97% as presented in Fig (1). Results revealed that, there are no significant differences between both of applied doses 10 g/pot from animal compost and 10 g/pot from maize wood compost, but the significant differences showed between doses and the plant treated with nematode alone. Results found that the most effective treatment absolutely in reducing root galling was animal compost at the low rate of 10 g/pot, and the lowest effect recorded with rice straw compost at the rate of 100 g/pot.

Examination of root system cleared that all treatments at all doses decreased the mean number of egg masses/ root system compared to untreated pots. Animal compost, plant compost and maize wood compost showed the high effect in reducing the egg masses, while rice straw compost showed a little effect. Obtained results indicated that the low rate of 10 g/pot from animal compost, plant compost and maize wood compost present high effect in reducing the number of egg masses /root system. The lowest effect obtained with 100 g/pot from animal compost. No significant differences between all applied low rates 10 g/pot of all treatments, but significant differences recorded between treatments and plants treated with nematode alone. Reduction percentage of egg masses in plants treated with both of animal and plant compost was reached 98%, followed by maize wood compost by 97% as shown in Fig (2). Generally, results showed that the highest mean number of egg masses recorded with plant compost at 100g/ pot, that mean the high doses don't play a role in reducing the egg masses. Results revealed that animal compost, plant compost and maize wood compost at the rate of 10g/ pot was the best treatment in all amendments doses and the least one rice straw compost alone at 100g/ pot in inhibiting number of females/ root system. Reduction percentage of females by animal and plant compost was 96%, followed by maize wood compost by 94% as presented in Fig (3). Results cleared that the number of second stage juveniles markedly affected by all the treatments. Data illustrated that the animal compost at 10g/ pot was the most effective one in reducing the number of second stage juveniles/ 250g soil. The same results recorded with animal compost at 20g/ pot. The least effective treatment was maize wood compost at 100g/ pot. Reduction percentage of second stage juveniles by animal and plant compost reached 97%, whereas the least effective treatment was animal and maize wood compost by 80% as illustrated in Fig (4).

Table (1): Effect of different compost types at different doses on eggplant plants infected with root-knot nematodes under greenhouse conditions.

Treatment	Doses g/kg soil	Second stage/250g	Nematode parameters/ root system			Final Population (PF)	Reproduction Factor (RF)
			Galls	Egg masses	Females		
Plant compost	10	66.66^{c}	2.0^{hij}	0.66^{k}	1.66^{l}	70.98	0.023
	20	133.3^{c}	6.66^{fghij}	6.66^{hijk}	7.66^{ijkl}	154.31	0.05
+	30	133.3^{c}	10.33^{efg}	8.66^{ghij}	9.66^{hijk}	161.98	0.05
	50	200.0^{bc}	14.33^{de}	11.3^{efgh}	12.6^{efghi}	238.32	0.07
Nematode	100	266.6^{bc}	14.33^{de}	22.3^{bc}	25.0^{bc}	328.32	0.1
Animal compost	10	66.66^{c}	1.0^{j}	0.66^{k}	1.66^{l}	69.98	0.02
	20	66.66^{c}	5.33^{ghij}	2.66^{jk}	3.33^{kl}	77.98	0.02
+	30	133.3^{c}	7.0^{fghi}	3.33^{ijk}	4.33^{jkl}	147.99	0.04
	50	533.3^{b}	18.6^{cd}	16.3^{cde}	18.6^{cde}	586.98	0.19
Nematode	100	533.3^{b}	20.0^{cd}	18.6^{cd}	21.3^{bcd}	593.32	0.19
Rice straw compost	10	133.33^{c}	7.33^{fgh}	5.33^{hijk}	8.0^{ijkl}	153.99	0.05
	20	133.33^{c}	12.0^{ef}	9.66^{fghi}	11.0^{fghi}	165.99	0.05
+	30	133.33^{c}	18.0^{cd}	14.3^{defg}	15.0^{defgh}	180.66	0.06
	50	133.33^{c}	19.0^{cd}	16.6^{cde}	18.0^{de}	186.99	0.06
Nematode	100	266.66^{bc}	28.3^{b}	25.0^{b}	26.6^{b}	346.65	0.1
Maize wood Compost	10	133.3^{c}	1.33^{ij}	1.33^{k}	2.66^{l}	138.65	0.04
	20	200.0^{bc}	8.0^{fg}	6.66^{hijk}	8.0^{ijkl}	222.66	0.07
+	30	200.0^{bc}	10.3^{efg}	8.66^{ghij}	10.0^{ghij}	228.99	0.07
	50	266.6^{bc}	21.0^{c}	15.0^{defg}	16.3^{defg}	318.99	0.1
Nematode	100	533.3^{b}	21.0^{c}	15.66^{def}	17.0^{def}	586.99	0.19
Nematode alone		2666.66^{a}	52.66^{a}	49^{a}	50.33^{a}	5024.74	1.75

Columns followed by different letters are significantly different according to Duncan's Multiple Test (P≤0.0).

Data extracted after calculation of final population showed that 10g/ pot of animal compost recorded the highest effective treatment, followed by 20g/ pot from animal compost in reducing final population as presented in fig (5). In the same manner, results illustrated that animal compost at 10g/ pot also the most effective one in reducing the reproduction factor. The same results recorded with 20g/ pot of animal compost as illustrated in fig (6).

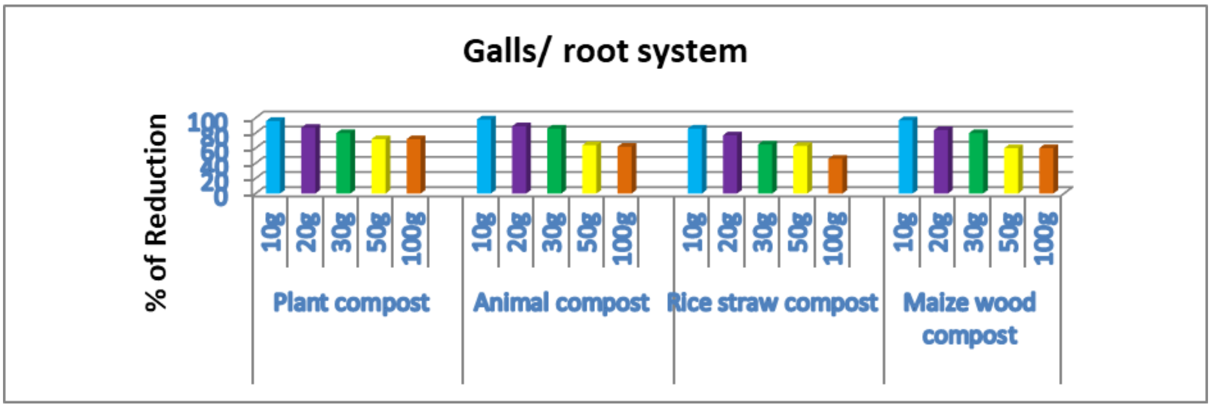


Fig (1): Effect of different compost types at different doses on reduction percentage of galls/ root system.

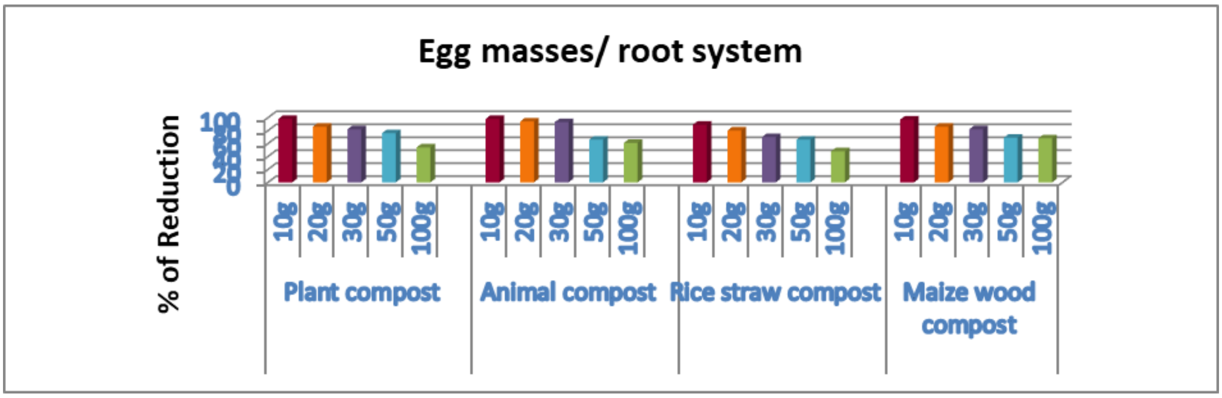


Fig (2): Effect of different compost types at different doses on reduction percentage of egg masses/ root system.

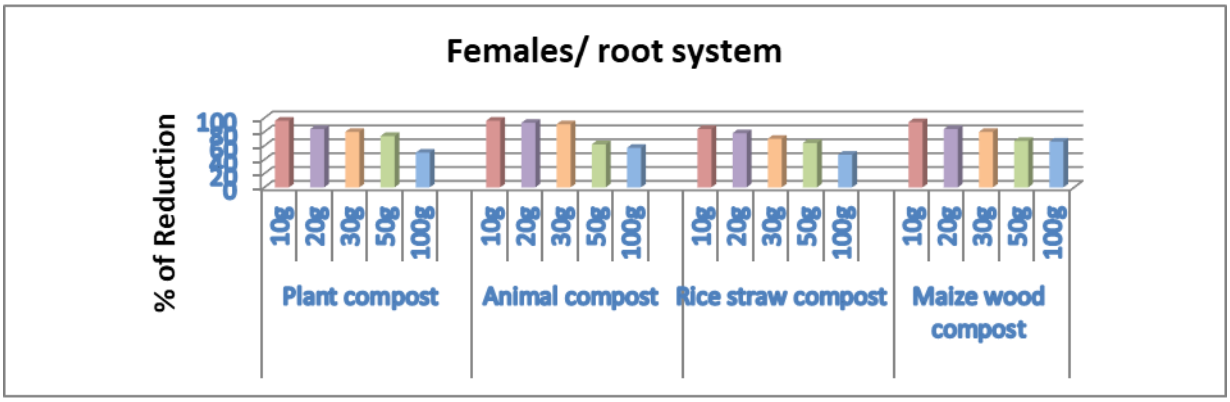


Fig (3): Effect of different compost types at different doses on reduction percentage of females/ root system.

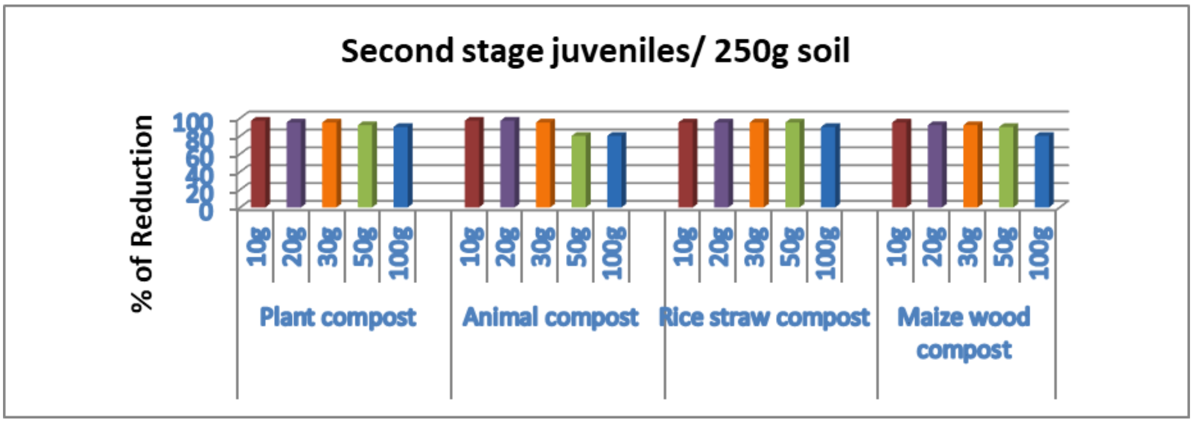


Fig (4): Effect of different compost types at different doses on reduction percentage of second stage juveniles/ 250g soil.

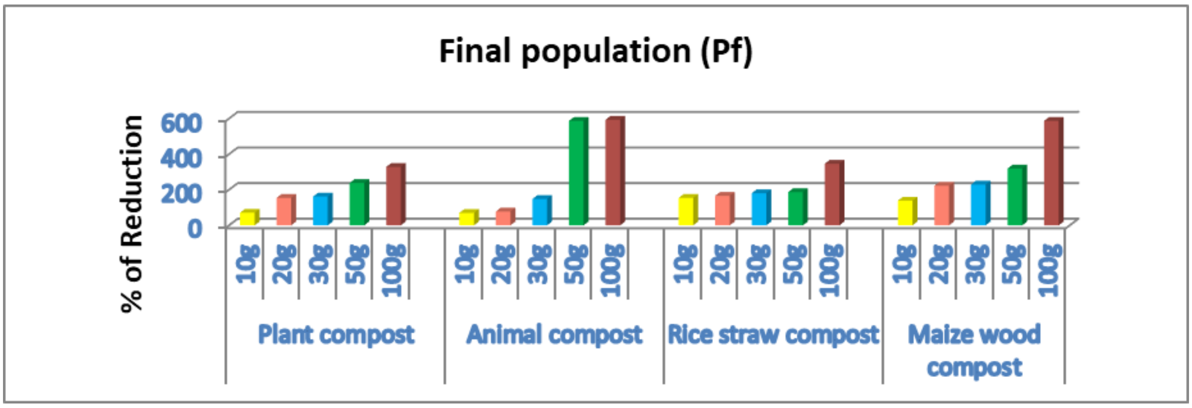


Fig (5): Effect of different compost types at different doses on reduction percentage of nematode final population.

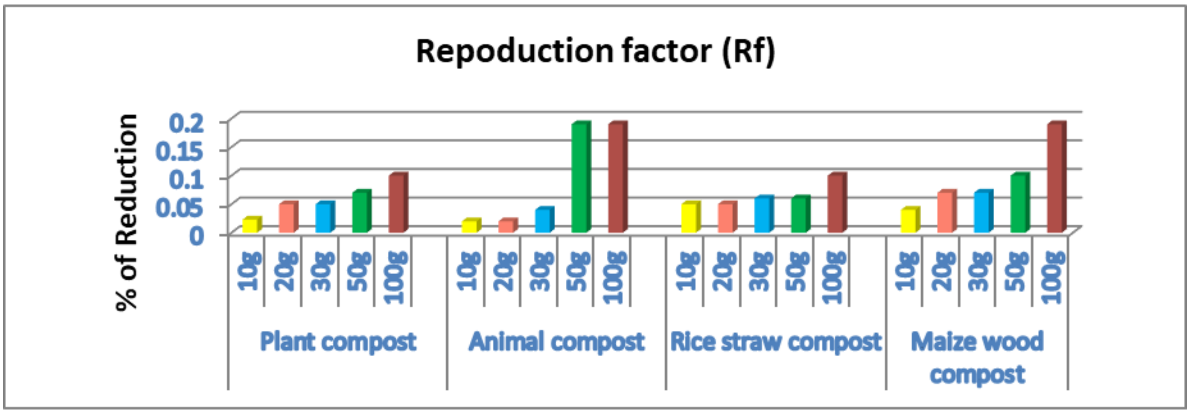


Fig (6): Effect of different compost types at different doses on reduction percentage of reproduction factor.

Results presented in table (2) showed that all treatments of different compost types affected the plant growth parameters of eggplant infected with RKN under greenhouse conditions. Data revealed that the highest plant length was obtained when plants treated with animal compost at 10g/ pot, followed by maize wood compost at the rate of 10g/ pot.

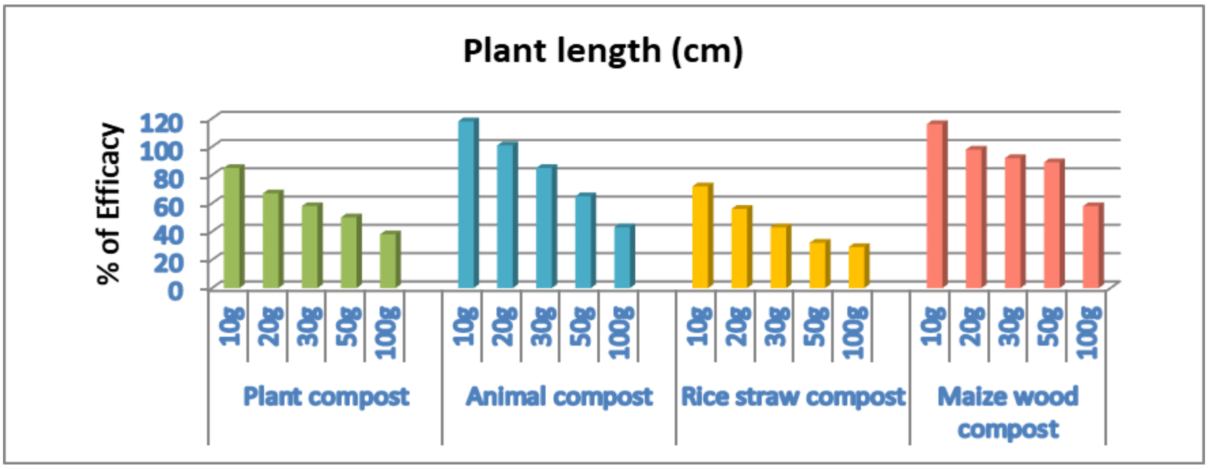
Table (2): Effect of different compost types at different doses on growth parameters of eggplant plants infected with root-knot nematodes under greenhouse conditions.

Treatment	Doses g/kg soil	Plant Length (cm)	% Increasing	Shoot Length (cm)	% Increasing	Fresh shoot Weight (g)	% Increasing	Fresh Root Weight (g)	% Increasing	Dry shoot Weight (g)	% Increasing
Plant compost + Nematode	**10**	34.0^{de}	85	29.0^{b}	117	11.4^{bc}	315	2.82^{b}	984	4.06^{bcde}	272
	20	30.6^{fg}	67	25.3^{b}	90	5.82^{fg}	111	1.56^{cdef}	500	3.22^{defg}	195
	30	29.0^{fghi}	58	23.6^{b}	77	5.55^{fg}	101	1.41^{cdef}	442	3.10^{defg}	184
	50	27.6^{hij}	50	22.0^{b}	65	4.52^{ghi}	64	1.73^{cdefg}	426	2.15^{fghi}	97
	100	25.3^{jk}	38	20.3^{b}	52	4.25^{ghi}	54	0.91^{fgh}	250	1.63^{hi}	49
Animal compost + Nematode	**10**	40.0^{a}	118	41.0^{a}	207	14.6^{a}	432	4.73^{a}	1719	5.63^{a}	416
	20	37.0^{bc}	101	34.3^{b}	157	12.8^{ab}	365	1.99^{c}	665	3.86^{cde}	254
	30	34.0^{de}	85	32.3^{b}	142	8.67^{de}	215	1.65^{cde}	534	3.40^{cdef}	211
	50	30.3^{fgh}	65	29.0^{b}	117	8.25^{de}	200	1.52^{cdef}	484	2.16^{fghi}	98
	100	26.3^{ijk}	43	26.3^{b}	97	7.35^{ef}	167	1.01^{efg}	288	1.56^{hi}	43
Rice straw compost + Nematode	**10**	31.66^{ef}	72	26.66^{b}	100	9.16^{de}	233	1.96^{c}	653	4.63^{abc}	324
	20	28.66^{ghi}	56	24.0^{b}	80	5.09^{gh}	85	1.23^{defg}	373	2.07^{ghi}	89
	30	26.33^{ijk}	43	21.33^{b}	60	3.81^{ghi}	38	1.18^{defg}	353	0.93^{i}	64
	50	24.33^{k}	32	19.0^{b}	42	3.33^{hi}	21	1.14^{defg}	338	1.33^{i}	22
	100	23.66^{k}	29	19.0^{b}	42	2.93^{i}	6	0.86^{fgh}	230	1.26^{i}	15
Maize wood compost + Nematode	**10**	39.66^{ab}	116	34.33^{b}	157	14.51^{a}	427	3.43^{a}	1219	5.26^{ab}	382
	20	36.33^{cd}	98	30.33^{b}	127	10.03^{cd}	264	1.74^{cd}	569	4.30^{bcd}	294
	30	35.33^{cd}	92	30.0^{b}	125	9.21^{de}	234	1.48^{cdef}	469	3.87^{cde}	255
	50	34.66^{cd}	89	29.66^{b}	122	8.99^{de}	226	1.16^{defg}	346	2.83^{efgh}	159
	100	29^{fghi}	58	23.33^{b}	57	5.77^{fg}	109	0.66^{gh}	153	2.03^{ghi}	86
Nematode alone		18.33^{l}		13.33^{b}		2.75^{i}		0.26^{h}		1.09^{i}	

Columns followed by different letters are significantly different according to Dun can's Multiple Test (P≤0.05).

The lowest plant length recorded with rice straw compost at 100g/ pot. Animal compost at the rate of 10g/ pot was the effective one in enhancing plant length as shown in fig (7). Data revealed that the highest shoot length was obtained when plants treated with animal compost followed by maize wood compost regardless of the used doses. The lowest shoot length recorded when plants treated with rice straw compost. The lowest effect recorded with 100g/ pot. Animal compost at rate of 10g/ pot was the effective one in enhancing shoot length as shown in fig (8). Data confirmed that the highest fresh shoot weight of eggplant plants recorded with animal compost, followed by plant compost and the least value recorded with rice straw compost. The best doses observed with 10g/ pot, followed by 20g/ pot. The least value of fresh shoot weight recorded with 100g/ pot from rice straw compost. Generally, the best treatment absolutely was animal and maize wood compost at the rate of 10g/ pot, whereas the lowest treatment was rice straw compost at 100g/ pot as shown in fig (9). Animal compost recorded the highest fresh root weight regardless of used rates, followed by maize wood compost. The lowest value observed with rice straw compost. Treating plants with 10g/ pot from animal and maize wood compost recorded highest increase in fresh root weight, followed by 20g/ pot as presented in fig (10). The best treatment animal compost when applied at 10g/ pot and the least effective one rice straw compost at 100g/ pot. Data revealed that the highest dry shoot weight obtained when plants treated with animal compost followed by maize wood compost regardless of doses used. The lowest dry shoot weight recorded when plants treated with rice straw compost at 100g/ pot. animal compost at rate of 10g/ pot the effective one in enhancing dry shoot weight as shown in fig (11).

Data presented in table (3) noticed that antioxidant enzymes activity i.e. peroxidase and phenoloxidase were affected by different types of compost application in nematode infected plants compared to plants treated with nematode alone. Data showed that, the highly significant increase in peroxidase and phenoloxidase activities obtained with animal compost, maize wood compost, followed by plant compost. Rice straw compost was the lowest effective one.



Fig(7): Effect of different compost types at different doses on the plant length of eggplant plants infected with *Meloidogyne* spp. under greenhouse conditions.

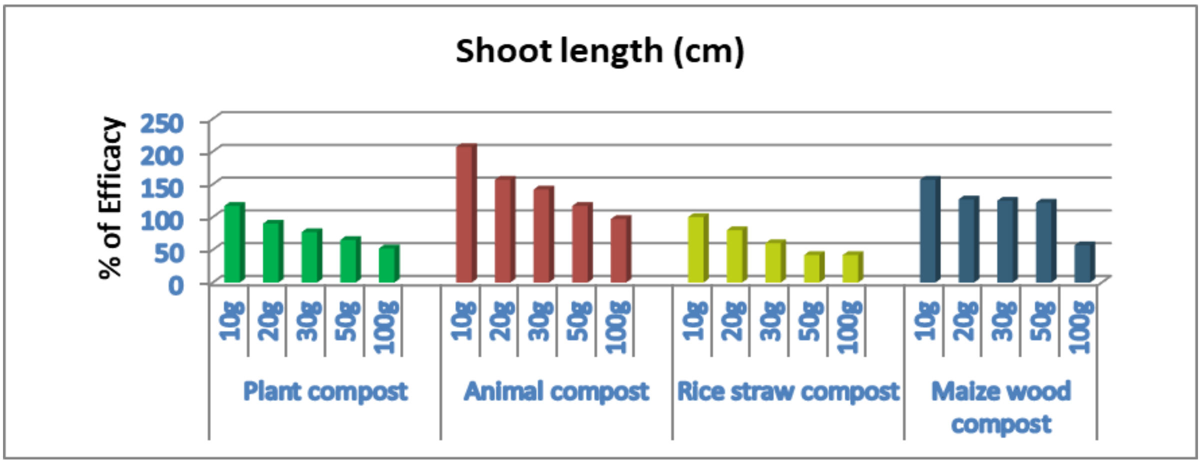
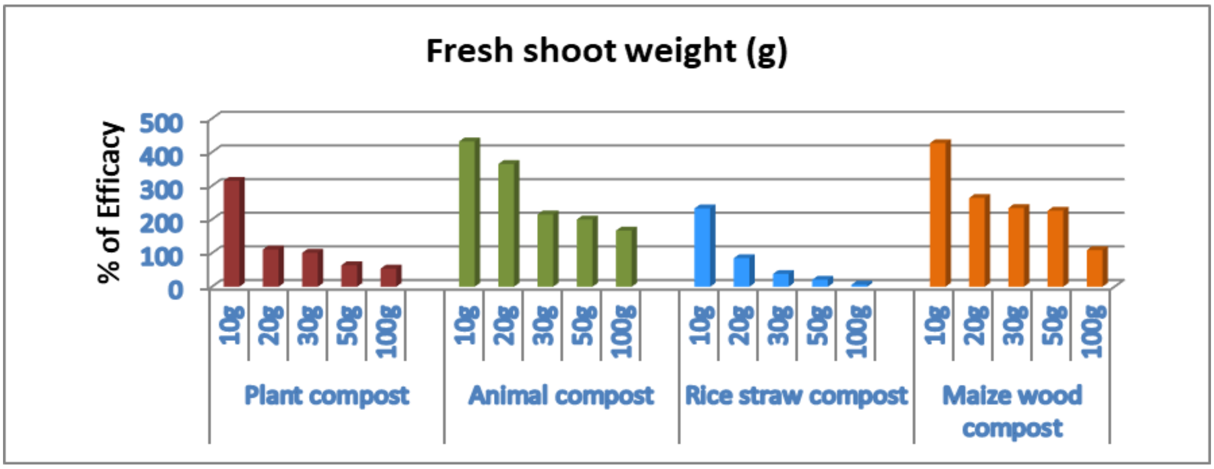
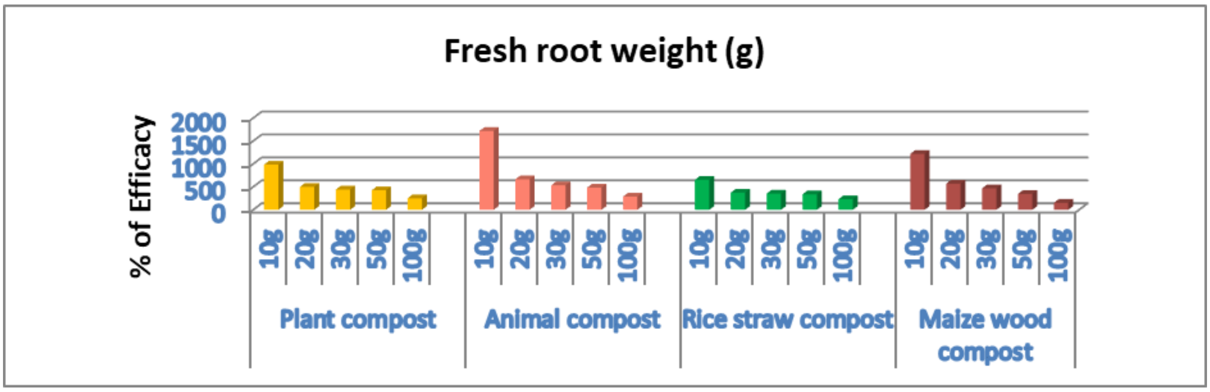


Fig (8): Effect of different compost types at different doses on the shoot length of eggplant plants infected with *Meloidogyne* spp. under greenhouse conditions.



Fig(9): Effect of different compost types at different doses on the fresh shoot weight of eggplant plants infected with *Meloidogyne* spp. under greenhouse conditions.



Fig(10): Effect of different compost types at different doses on the fresh root weight of eggplant plants infected with *Meloidogyne* spp. under greenhouse conditions.

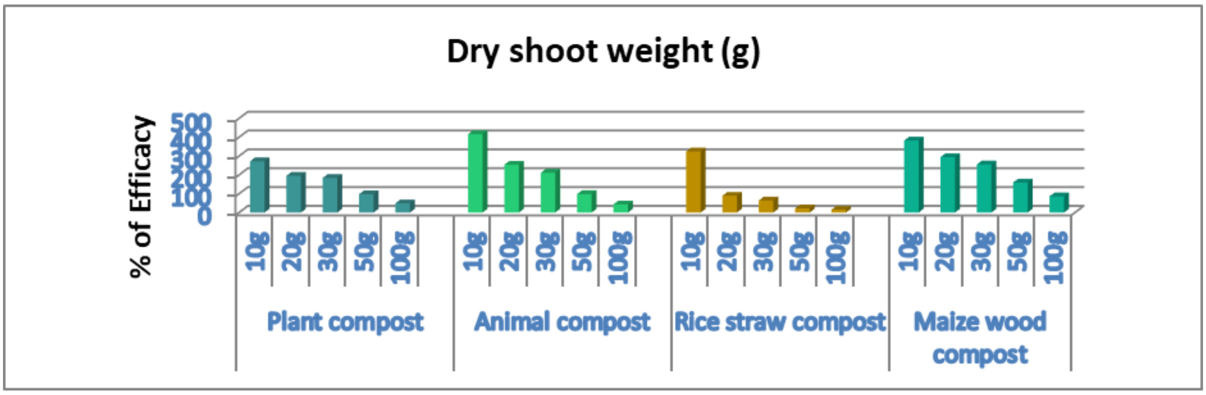


Fig (11): Effect of different compost types at different doses on the dry shoot weight of eggplant plants infected with *Meloidogyne* spp. under greenhouse conditions.

Table (3): Effect of different compost types at different doses on some antioxidant enzymes activity on eggplant plants infected with *Meloidogyne* spp.

Treatment	Doses g/kg soil	Antioxidant enzymes	
		Peroxidase (O.D.g-1 fr.wt. after 2min)	Phenoloxidase (O.D.g-1 fr.wt. after 45min)
Plant compost + Nematode	10	1.20a	1.60a
	20	0.80b	0.53cde
	30	0.56b	0.50cde
	50	0.43b	0.46de
	100	0.36b	0.30de
Animal compost + Nematode	10	1.60a	1.06a
	20	0.63b	0.60bcde
	30	0.54b	0.33de
	50	0.53b	0.26e
	100	0.40b	0.23e
Rice straw compost + Nematode	10	0.93b	0.63bcde
	20	0.43b	0.60bcde
	30	0.40b	0.50cde
	50	0.25b	0.36de
	100	0.21b	0.21e
Maize wood compost + Nematode	10	0.93b	0.96bc
	20	0.36b	0.73bcd
	30	0.33b	0.63bcde
	50	0.20b	0.33de
	100	0.10b	0.33de
Nematode alone		0.20b	0.17e

Columns followed by different letters are significantly different according to Duncan's Multiple Test (P≤0.05)

DISCUSSION

There are many previous studies indicated the efficacy of organic and composted materials in reducing and managing different plant pathogens such as bacteria, fungi and Phyto-nematodes (D'Addabbo *et al*., 2011; Devi *et al*.,2020). Numerous studies by researchers worldwide also showed that organic amendments of soil are a means of the nematode control (Arancon *et al*., 2003; Nahar *et al*., 2006; Renčo *et al*., 2007 and Bakr 2017). The efficacy of organic amendments in nematode suppression depends on the C: N ratio and a time of microbial decomposition of organic matter (Rodriguez-Kabana *et al*., 1995; D'Addabbo and Sasanelli, 1997; Akhtar and Malik, 2000). The changed in the C:N ratio in organic treatments observed when more nitrogen sources were available, which help in nematode control (Kirmani *et al*., 1975). Previews studies revealed that materials with lower C:N ratios are more nematicidal than those with higher ratios (Kirmani *et al*. 1975; Ismail *et al*. 2006; Renčo *et al*. 2011). The composts release different compounds may be toxic to plant nematodes like phenols, tannins, terpens, (Mian and Rodriguez-Kabana, 1982) or derived during or from decomposition processes in the soil such as: ammonia, nitrites, hydrogen sulphide (Rodriguez- Kabana, 1986). Oka and Yermiyahu (2002) reported that ammonia is more toxic to nematodes than ammonium ion (NH_4^+). Under acidic soil conditions, ammonia is ionized to NH_4^+ (Oka *et al*. 2007). Moreover, an enhanced development of nematode competitors, antagonists and parasites on the feeding sub-strate provided by the compost was also suggested as a further mechanism of the RKN population decrease (Rodríguez-Kábana *et al*., 1986). The poultry litter compost was also beneficial in suppressing nematode egg populations on cacao seedling roots. In a previous study, poultry litter or poultry litter compost, combined with specific crop rotations, suppressed *M. incognita* and Pratylenchus penetrans populations in microplots (Everts *et al*., 2006). This show the potential of composts adding to soil infested with nematodes, thereby decreasing nematode damage while allowing for the beneficial effects of the compost on the plants. The best results were achieved when composts applied at the high rate before nematode inoculation which resulted in reducing final nematode population by 78 to

84%. These findings agree with those obtained by other researchers (Akhtar and Malik, 2000; Cayuela *et al*., 2008; Renčo *et al*., 2009). Compost tea contains soluble nutrients and beneficial microorganisms, including bacteria, fungi, protozoa, and nematodes (Szmidt and Dickson 2001 and Bahman *et al*.,2015). The organic materials act as carriers to these microorganisms and decomposition increased in the soil. Toxic gasses and compounds against nematodes formed, which in turn increased soil fertility and plant growth criteria (Chen *et al*., 2000). This could be attributed to those plant residues having a synergistic effect. The addition of organic compost and Nile fertile to biocides increased the activity and reproduction of the tested microorganisms and bio-control agents of soil borne pathogens when applied to soils in combination with organic materials reduced nematode (Chen *et al*., 2000, Radwan *et al*., 2004 and Youssef *et al*., 2008). Hassan, *et al*., (2010) found that the rice husk (RH) and Sawdust (SD) were significantly reduced final populations/ 500 cm^3 soil, nematode populations, number of galls, egg masses/10 g of root and root galls indices of *Meloidogyne* spp. on tomato plant. Abou El-Atta, *et al*., (2012) showed that soil amended with rice hull compost and rice straw compost 10 days before transplanting un-significantly reduced population densities of *M. incognita*, galls, number of egg masses and eggs in eggplant root system compared with inoculated plants. Using of animal manures and town refuse as pre-planting or post planting treatments succeeded to improve plant growth criteria and diminish nematode parameters as well as achieved the high percentage increase values of nitrogen(N), phosphorus(P), potassium (K) , carbon(C), and total phenol comparing to nematode alone.

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