J. of Plant Protection and Pathology, Mansoura Univ., Vol. 13 (5):109 - 115, 2022

Journal of Plant Protection and Pathology

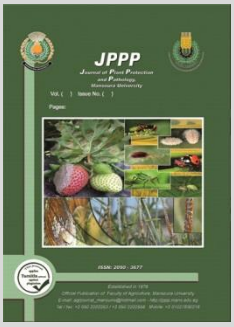
Journal homepage & Available online at: www.jppp.journals.ekb.eg

Efficiency of Amended Composts for Biocontrol of Root-Knot Nematode Infected Cantaloupe, *Cucumis melo* Var. *Cantalupensis* in Egypt

Marwa M. El-Deriny* **and Eman A. Hammad**

Cross Mark

Nematode Diseases Research Department, Plant Pathology Research Institute, Agricultural Research Center (ARC), Giza, Egypt.



ABSTRACT

Nematodes are considered a severe agricultural concern. *Meloidogyne* nematodes can attack a wide range of plants, necessitating a variety of management techniques to reduce their population. The current study compared AGRN compost, VERMI compost in solid and tea shapes, and COMPOSTIVE compost to oxamyl as a chemical nematicide on cantaloupe (*Cucumis melo var. cantalupensis*) infected with root-knot nematode to determine its effect on cantaloupe growth under greenhouse and plastic house conditions. The results showed that all treatments improved plant growth parameters significantly in greenhouse settings. They also lowered the final population and rate of *Meloidogyne incognita* reproduction in soil and roots. The COMPOSTIVE compost and VERMI compost tea had the best effect on decreasing root-knot nematode population in the soil, number of galls, and egg masses on roots under plastic house conditions. In comparison to untreated plants, all treatments increased fruit weight. They also improved the fruit quality, with 12.7 % Total soluble solids (TSS), 3.90 mg/100ml total protein, and 15.31 mg/100ml total sugar after treatment with COMPOSTIVE compost.

Keywords: Cantaloupe, *Cucumis melo* var. *cantalupensis*; compost; root knot nematode, *Meloidogyne incognita*

INTRODUCTION

Cantaloupe (*Cucumis melo* var. *cantalupensis*) is one of Egypt's most important and popular fruits, mostly eaten as a dessert and refreshing fruit. It contains vitamins, phenolics, and flavonoids as well as carbs and minerals (especially potassium). It is also low in fat and calories (about 17 kcal/100g). It moreover contains a significant amount of dietary fiber (Tamer *et al*., 2010, Shafeek, *et al.*, 2015). The worldwide production of cucurbits was estimated at 234,143,923 tons from a harvested area of 8,315,995 ha in 2018. In 2019, the production volume of melons including cantaloupes in Egypt was approximately a 0.74million metric tons (FAOSTAT, 2019).

Even though the pathogens causing illness in the root system are predominantly soil-borne pathogenic fungi (SBPF) and plant-parasitic nematodes (PPNs), there are several pathogens linked with cucurbitaceous crops (Alejandro *et al*, 2020). These infections share the same rhizosphere habitat, disrupting the host plant's vascular system and interfering with physiological processes such as water and nutrient intake. Phytonematodes control has traditionally relied heavily on chemical soil disinfestation. However, a change from chemical to non-chemical methods of management is happening to ensure that international rules are met in a more environmentally friendly manner.

By turning raw materials into a stable form, eradicating human and animal diseases, and recovering important plant nutrients, composting is a useful method for the management of urban and agro-industrial wastes (Lasaradi and Stentiford, 1998). Compost is a degraded organic material formed from plant biomass and animal waste that has been aerobically digested. It is high inaccessible soil nutrient and is commonly used to improve soil fertility in horticulture, agricultural field crops, gardens, and landscaping. Compost improves the physical and chemical qualities of the soil, resulting in increased agricultural yields (Martens, 2000). Furthermore, due to increased organic matter content and soil microbial populations, compost amendments are generally reported to improve soil quality (Chang *et al*., 2007). Improved plant growth, nutrient and water retention, and disease suppression are all agronomic effects of compost (Guo *et al*. 2019). Plant soil-borne diseases and pests, such as plant-parasitic nematodes, are also suppressed by it (Bailey and Lazarovits, 2003).

Because of its ability to demonstrate all of the known methods of nematode suppression by organic amendments, compost is being promoted as a long-term solution for managing plant-parasitic nematodes (PPNs). Oka (2010) lists the following mechanisms as examples: 1. the introduction or strengthening of hostile microorganisms, 2. the formation of nematode-killing substances during a breakdown, such as ammonia and fatty acids, 3. the release of nematicidal chemicals already present in soil amendments, 4. changes in soil physiology that are unfavorable for nematode behavior and 5. a rise in plant tolerance and resistance. Compost has a particular benefit over single-type techniques like nematicides. It also works well with other traditional pest-control strategies including crop rotation and the adoption of resistant crop varieties (Lopes *et al*. 2019). Furthermore, compost lends itself better to manipulation and management to achieve desirable microorganisms for phytonematodes control than other in situ settings, which arguably have equivalent or lower microbial diversity but greater protection and conservation concerns than compost. The ability of compost or compost-derived products to generate suppressive soils or plant development substrate is critical for long-term PPN

* Corresponding author.
E-mail address: marwaelderiny@gmail.com
DOI: 10.21608/jppp.2022.137239.1070

management (St. Martin and Ramsubhag 2015). According to St. Martin and Brathwaite (2012), the long-term viability of such a method is primarily achieved through modifying the rhizospheres and/or soil's microbial makeup and activity. This is especially relevant because numerous biological control agents found in soils, such as nematophagous fungus, nematodes, bacteria, earthworms, and mites have a significant impact on nematode populations (Stirling 2018). Therefore, the objective of this study is to evaluate the effect of different types of commercial compost on root-knot nematode associated with cantaloupe and subsequently their effect on plant metrics under greenhouse and productive plastic house conditions.

MATERIALS AND METHODS

Nematode inoculum preparation:

The Hussey and Barker (1973) approach was used to isolate root-knot nematode eggs from egg masses on the roots of the tomato plant. According to Coyne *et al*., (2007), the eggs were transferred to flasks and incubated at 28°C for three days, after which the eggs hatched in water and active *M. incognita* juveniles (J2) were collected. As an inoculum, a calculated suspension containing 3000 newly hatched juveniles was used.

Tested Materials:

A- AGRN compost ®:

A native commercial formulation is organic manure 100% vegetable compost produced from the compost of medicinal and aromatic wastes without any other additives were provided by Beni Suef Organic Fertilizers Company in Egypt. AGRN compost was applied at 2-3 tons per feddan in the old land and 3-4 tons per feddan in the new land.

B- VERMI compost ®:

The commercial formula is organic manure with a high content of organic matter and enzymes (such as amylase, lipase, glycolytic digestion enzymes, and protease enzymes) provided by Archimega Company in Egypt. VERMI compost is the product of the decomposition process using red wobbler worms, tiger worms, African worms which digest animal and plant waste. Application rates in solid form were at a rate of 8 kg. / Tree. If the compost is used in the form of compost tea, the preparation is done by soaking 10 kg of solid compost in 80 liters of water for 3 days with continuous stirring. Irrigation is done with compost tea weekly.

C- COMPOSTIVE compost ®:

The commercial liquid formula is organic manure with 70% organic additives, amino acids, humic acid, folic acid, macro, and micronutrients for plants provided by Afcoo Company in Egypt. It is used at a gallon rate of 20 liters per feddan, diluted at a rate of 1:20 liters of water, which is irrigated weekly from germination until the fruit set.

D- Vydate®:

Oxamyl 10%G: Methyl N N-dimethyl-N [(methyl) carbamyloxy)-1-thioxamidate was utilized at a rate of 20kg/feddan.

Greenhouse experiment:

The form of compost tea was prepared from VERMI compost by soaking 10 kg / 80 liters of water for 3 days with continuous stirring, use the resulting in irrigation for seedlings immediately after planting them. COMPOSTIVE compost was used in liquid form while other types of compost i.e. VERMI compost and AGRN compost were used in solid form to measure their effect on *M. incognita* (J2) infected cantaloupe, *Cucumis melo* var. *cantalupensis* cv. Rasto under greenhouse conditions during spring season 2021. The seeds were previously sown for germination in plastic pots with a diameter of 20 cm containing a mixture of 3 kg of clay and sandy soil (1:1 w/w). During germination, the pots were prepared for planting, where sterilized soil was mixed with sand in a ratio of 1:1 and added 4.5 kg of AGRN compost to 10.5 kg of sterile pre-prepared soil (1compost: 2 sterilized soil) and 5 pots of 20 cm-d were filled with this mixture (each one weighing 3 kg). Five pots of (20 cm-d), as the application with VERMI compost which as solid shape applied at the same rate (1compost: 2 sterilized soil). Twenty-five pots of sterilized soil (1:1) were filled for the rest of the treatments. After two weeks, seedlings were planted for each pot. Immediately after seedlings, 5 pots were irrigated with the previously prepared compost tea (VERMI compost) once a week. As for the COMPOSTIVE compost, it is also irrigated weekly after dilution at the rate of 1-liter compost: 20 liters of water and each pot received 250 ml/pot, and the rest of the week is irrigated with ordinary tap water. After 10 days of seedling, 30 pots of cantaloupe plants were inoculated with 3000 newly hatched (J2s) of *M. incognita* per plant. After a week of infection, 5 pots were treated with oxamyl at the rate of 0.5 g/pot. Five pots infected with *M. incognita* were left as control + (infected plant). Another five pots were left without any treatments as control - (untreated uninfected plants).

All of the pots were organized in a randomized block configuration in the greenhouse at 26±4 °C. The plants were harvested after sixty days of nematode inoculation. *M. incognita* juveniles were recovered from 250gm of dirt per pot using sieving and modified Baermann procedures (Goodey, 1963). Roots were stained with acid fuchsine in lactic acid and microscopically inspected for counting nematode developmental stages, females, galls and egg masses, according to Byrd *et al*. (1983). The root gall and egg mass index scales for 0-5 were used to record root galls and egg masses indices, with 0=no galls or egg masses, 1=1:2, 2=3:10, 3=11:30, 4=31:100, and 5>100 per root system (Taylor and Sasser, 1978).

Productive plastic house experiment:

In a plastic house (9mx60m), located in Nubariya at Buhaira Governorate. It is described as a newly reclaimed land and dry semi-desert region (sandy soil and 33±5˚C) with heavily infested by root-knot nematode. Before the test began the number of root-knot nematodes in soil was estimated as the initial population independently for each treatment according to methods described by Christie & Perry, (1951) and Southey, (1970). Before planting, all treatments were set up as a complete randomized block design (RCBD**)** and replicated five times. Application by AGRN compost and VERMI compost was mixed with soil in solid form at a rate of 2-3 tons per feddan before seedling planting. After transplanting VERMI compost tea and COMPOSTIVE compost, were applied as a soil drench every week at intervals until holding flowers. Oxamyl was treated as a chemical nematicide at a rate of 20kg/feddan, and all treatment were replicated five times, each replicate containing ten plants. The economic production period of plants was 70 days from the seedling. The number of nematodes in soil and root, galls, and egg masses per root was counted. The rate of nematode reproduction and percentages of reduction in nematode's final population (Pf) were also calculated by the following formula:

$$\text{Reduction\%} = \left(\frac{\text{Pf in control - Pf in treatment}}{\text{Pf in control}}\right) \text{x100}$$

$$\text{Reproduction factor (RF)} = \frac{\text{Pf}}{\text{Pi}}$$

Fruits progressively produced on five cantaloupe plants were picked and weighted to calculate the final yield per plant for yield determination and quality characteristics.

Quality characteristics:

At the harvesting stage, 6 cantaloupe fruits were randomly selected from each treatment and quality characteristics in the fruit tissue were measured.

A- Total soluble solids (T.S.S.) were determined in fruits by hand refractometer (A.O.A.C., 2000).

B- To analyze crude proteins, Bradford's 1976 method was employed.

C- The percentages of total sugars in fruit juice were determined according to the method described by Dubois *et al*. (1959).

Data Analysis

All of the experiments were examined separately. Duncan's Multiple Range Test (DMRT) was used to compare the treatment means (Gomez and Gomez 1984). WASP1 was employed for the analysis, with the crucial difference set at P ≥0.05 and the results interpreted.

RESULTS AND DISCUSSION

Results

A- Efficacy comparative of certain commercial compost and chemical nematicide, and estimation of its reflection on growth parameters of cantaloupe, *Cucumis melo* var. *cantalupensis* infected by *M. incognita* under greenhouse conditions.

This study was conducted to evaluate the effect of the tested materials (AGRN compost, VERMI in solid and tea shapes, COMPOSTIVE compost, and oxamyl) on the population density of *M. incognita* infected cantaloupe plants. Generally, the current work showed that all tested treatments caused significantly increased growth parameters for cantaloupe plants compared with control and untreated plants as shown in Table (1). COMPOSTIVE compost and VERMI compost tea recorded the best treatments in enhancement length of shoot (60.2&54.5 cm) weight of shoot (22.7&23.8 g), length of root (13.7 &11.8 cm), the weight of root (8.6 & 7.3 cm) and shoot dry weight (3.2& 3.7 g), respectively compared with the untreated plants. While nematicide oxamyl showed moderate increase in shoot fresh weight (18.5g) and shoot dry weight (2.6g).

Table 1. Growth parameters of cantaloupe plants, *Cucumis melo*, var. *cantalupensis* affected by different types of composts and infected with *Meloidogyne incognita* under greenhouse conditions 26±4 °C.

Treatments	Plant growth parameters				
	Shoot		Root		Dry
	Length (cm)	Weight (g)	Length (cm)	Weight (g)	Weight (g)
AGRN compost	45.8 c	14.5 c	7.9 d	6.4 ab	1.9 d
VERMI compost	44.3 d	12.3 d	9.8 c	5.3 b	2.1 d
VERMI compost tea	54.5 b	23.8 a	11.8 b	7.3 ab	3.7 a
COMPOSTIVE compost	60.2 a	22.7 a	13.7 a	8.6 a	3.2 b
Oxamyl	49.5 c	18.5 b	10.2 c	5.5 b	2.6 c
Control +	28.3 e	9.8 e	5.1 e	2.5 c	1.6 e
Control -	53.2 b	20.9 b	14.7 a	5.9 b	2.7 c
LSD	4.8	1.75	1.1	2.4	0.26

- Each value presented the mean of five replicates.
Control (+) = infected plant Control (-) = untreated uninfected plants
- Mean values followed by the same letter(s) did not significantly different at the 5% level by DMRT.

Data in Table (2) presented that all treatments resulted in a considerable reduction in the total number of root-knot juveniles in soil and roots of cantaloupe plants, with reproduction factor ranging from 0.27 for oxamyl to 1.56 for VERMI compost solid shape. However, some notable disparities between applications have emerged, oxamyl provided the greatest reduction in the nematode population with a reduction reached 92.6% followed by COMPOSTIVE compost and VERMI compost tea shape with a reduction percentage reached 79.4 and 69.4%, respectively. On the other hand, AGRN compost and VERMI compost solid shape ranked the next and had lower nematode population levels, with a reduction percentage of 63.9 and 57.3 %. All treatments considerably reduced root galling and the number of egg masses, with RGI ranging from 3.3 to 5.00 and EI ranging from 3.1 to 4.7. It was noted that treatment by VERMI compost in solid shape was the least effective in reducing the number of nematodes in soil and root.

Table 2. Influence of different types of composts on root-knot nematode (*Meloidogyne incognita*) population infected cantaloupe plant *Cucumis melo* var. *cantalupensis* under greenhouse conditions 26±4 °C.

Treatments	Nematode population in			Final population	RF	Reduction %	No. of galls/1g root	RGI	No. of Egg mases/1g root	EI
	250g soil	1g Root								
		Developmental Stage.	Females							
AGRN compost	1150.4 c	92.5 c	75.2 c	1318.1 c	1.32	63.9	80.3 c	4.5	69.8 b	4.3
VERMI compo	1336.3 b	142.3 b	82.4 b	1561.0 b	1.56	57.3	112.1 b	5.0	79.4 a	4.7
VERMI compost tea	989.7 d	75.7 e	54.8 d	1120.2 d	1.12	69.4	89.3 c	4.3	51.1 c	4.1
COMPOSTIVE compost	623.3 e	87.8 d	41.5 e	752.6 e	0.75	79.4	76.5 d	4.5	39.4 d	3.8
Oxamyl	228.4 f	17.4e f	26.2 f	272.0 f	0.27	92.6	27.5 e	3.3	15.5 e	3.1
Control +	3323.5 a	243.4 a	89.4 a	3656.3 a	3.66	0.0	235.7 a	5.0	87.6 a	4.8
LSD	45.07	4.38	5.79	51.13	-	-	18.80	-	10.80	-

Each value presented the mean of five replicates.
N = *M. incognita* (3000 Juveniles/ plant).
RGI=Root gall index, EI= Egg masses index
Control (+) = Infected plant.
Mean values followed by the same letter(s) did not significantly differ at the 5% level by DMRT.

B- Efficacy comparative of certain commercial compost and chemical nematicide, and estimation of its reflection on growth parameters of cantaloupe *Cucumis melo* var. *cantalupensis* infested by *Meloidogyne* spp. under plastic house conditions.

Data in Table (3) refer to the effectiveness of commercial compost understudying and oxamyl on RKN population density and yield of cantaloupe plants grown in plastic house. Where, oxamyl had the greatest nematode population reduction (88.3%), followed by COMPOSTIVE compost and VERMI compost tea (72.9 and 67.4 %, respectively), with the rate of nematode reproduction being the slowest (0.50 & 0.60), then AGRN compost which gave 64.4% nematode population reduction and 0.77 for reproduction factor. On the other side, solid VERMI compost had the least effect on nematode reduction (58.6 %), as well as the highest rate of nematode reproduction (0.77). In terms of the root galls, all treatments significantly reduced the number of galls on cantaloupe plants as compared to untreated plants (control). A similar trend was noticed with egg masses numbers where treatment with COMPOSTIVE compost recorded the least number of egg masses (118.3 egg masses / 5 g. root) after nematicide oxamyl.

Table (3) shows that all tested commercial compost understudying and oxamyl have substantial differences in cantaloupe yield (Kg/plant). COMPOSTIVE compost and oxamyl (315.7 and 257.8 %) had the highest yield percentage, followed by VERMI compost tea and solid one (207.8 and 130.4%). AGRN compost exhibited considerable yield improvements (69.6%), compared with control, whereas control produced the lowest yield where the fruit weight was 1.42 kg/plant.

Table 3. Effect of different types of composts on the population density of *Meloidogyne* spp. infested cantaloupe *Cucumis melo* var. *cantalupensis* and their effects on fruit weight under plastic house conditions 33±5˚C**.**

Treatments	Final Population. (Pf)	RF	Red. %	No. galls/5g Root	No. Egg mases /5g root	Fruit Weight (kg/plant)	Increasing %
AGRN compost	2062.7 c	0.66	64.4	195.3 b	182.9 b	2.73 d	69.6
VERMI compost	2398.4 b	0.77	58.6	215.8 b	200.5 b	3.01 c	130.4
VERMI compost tea	1886.8 d	0.60	67.4	172.5 c	169.2 c	3.92 b	207.8
COMPOSTIVE compost	1569.2 e	0.50	72.9	125.3 d	118.3 d	6.24 a	315.7
Oxamyl	679.3 f	0.26	88.3	35.6 e	27.6 e	5.65 a	257.8
Control +	5793.9 a	1.9	-	256.9 a	248.5 a	1.42 e	-
LSD	84.76	-	-	30.29	29.71	0.70	-

Number of initial population = 3127 / 250g soil.
Reproduction factor (RF) = final population/initial population
Mean values followed by the same letter(s) did not significantly differ at the 5% level by DMRT.

Data also represented that all tested treatments affected fruit quality. The highest proportion of total soluble solids (TSS) was induced by Oxamyl and COMPOSTIVE compost at 12.5 and 12.7 %, followed by VERMI compost tea and solid one at 11.8 and 11.3 %, and AGRN compost which had the lowest percentage at 10.9 % (Fig.1).

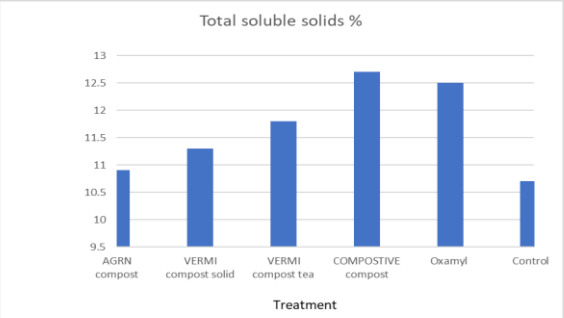


Figure 1. Total soluble solids (TSS) in cantaloupe fruits *Cucumis melo* var. *cantalupensis* affected by various types of compost and infection with root-knot nematode under plastic house conditions.

In terms of the estimated percentage of total protein in cantaloupe juice, it was found that the oxamyl treatment had the highest percentage of total protein at 4.73mg./100ml juice fruits, while the fruits of the AGRN compost had the lowest percentage at 1.52mg./100ml. (Fig2).

Also, when estimating the effect of treatments on the percentage of total sugar in cantaloupe juice, it was found that the highest content of total sugar measured in mg/100ml, was performed in the juice produced from the COMPOSTIVE compost treatment (15.31 mg/100ml) while the fruits of the untreated plants (control) had the lowest percentage at 5.13 mg/100ml (Fig3).

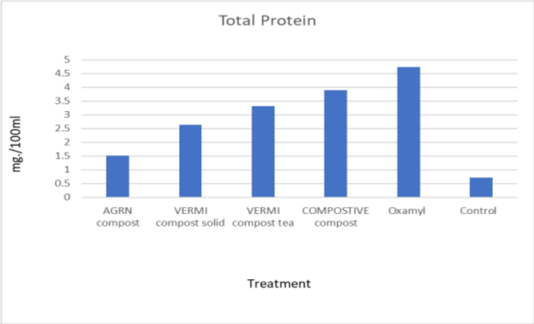


Figure 2. Total protein in cantaloupe fruits *Cucumis melo* var. *cantalupensis* as affected by various types of compost and infection with root-knot nematode under plastic house conditions.

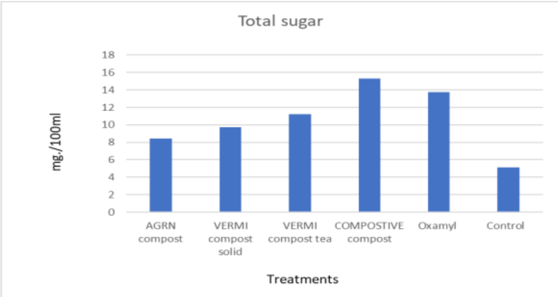


Figure 3. Total sugar in cantaloupe fruits *Cucumis melo* var. *cantalupensis* as affected by various types of compost and infection with root-knot nematode under plastic house condition.

Discussion

When compared to the control treatment, the current study discovered that different types of compost had a positive effect on plant growth, which is similar to Jimenez *et al*. (1997), who discovered that compost manure application significantly increased vegetative growth parameters of melon plants such as stem length, the number of leaves/plant, and dry weight, as well as fruit yield. In another study, Shafeek *et al.* (2015) discovered that organic manure (Nile compost) increased plant growth and fruit yield. The higher level of organic manure's superiority in vegetative development could be related to its favorable effect on soil's physical characteristics (Marculescu*et al*., 2002 Ozores-Hampton *et al*., 2011) or the gradual release of nutrients (Eissa, 1996). This finding is in line with Liu *et al.* (2019), who found that adding organic manures such as barnyard manure, green manure, and compost to soils improved soil conditions by releasing organic acids, nitrogen compounds, and other compounds having stimulating properties.

The effect of various compost on the population density of root-knot nematode was also observed. Under greenhouse conditions, the number of nematodes in the soil and on the roots was considerably decreased by all of the treatments evaluated. Among the tested treatments, COMPOSTIVE compost which contains organic additives, amino acids, humic acid, and folic acid was the best treatment and gave a significant decrease in the nematode population. Ozores-Hampton (2002) found that using organic amendments reduced the number of phyto-parasitic nematode populations in soil. On the root of the cantaloupe plant, VERMI compost tea reduced the number of galls and egg masses dramatically. This was confirmed by Zuhair *et al*., 2022, who found a significant decrease in the number of root-knot-affected plants in the vermicompost injected soil. Many elements interact to impact the composition of compost and compost end products, including the nature of the feedstock, the composting process employed, compost additives, particle size, microbial community, pH, temperature, oxygen concentration, and the C/N ratio, moisture content (St. Martin and Ramsubhag 2015). These variables can also be tweaked to create compost capable of producing PPN-resistant soils.

Organic materials' influence on the soil nematode community, as well as their usefulness in suppressing plant-parasitic nematodes, has been linked to their chemical composition in several studies (Li *et al*., 2018; Tariq *et al*., 2018). Changes in the physical and biological qualities of the soil, making it less suitable for plant-parasitic nematode growth, could potentially explain the reduction in plant-parasitic nematodes with the addition of compost (Oka, 2010). Compost is a rich source for varied microorganisms with the ability to modulate numerous PPNs via distinct mechanisms of action, according to Neher *et al*. (2010).

In a productive house experiment, using compost resulted in a considerable increase in crop weight when compared to untreated nematode-infected plants. This viewpoint is shared by Tabarant, (2011); Djigal *et al*. (2012), who acknowledged that nematodes have lower yields. Agronomic effects of compost include increased plant development, nutrition and water retention, and disease control, according to studies by Guo *et al*. (2019). Furthermore, all of the treatments dramatically lower the final populations of root-knot nematodes. Compost supplements may suppress nematodes in a variety of ways, including direct toxicity of breakdown products, a rise of naturally nematode-antagonist microorganisms on the compost substrate, or even the generation of systemic acquired resistance in plants (Zhang *et al*. 2011).

Total soluble solids (TSS), total protein, and total sugar were found to be enhanced by various composts. These results were similar to those of Shafeek *et al*. (2015), who found that adding organic manure to cantaloupe plants boosted plant growth, fruit yield, and physical and chemical fruit quality characteristics. These findings could be attributed to organic manure's role in increasing soil porosity, aeration, water holding capacity, and cation exchange capacity (CEC), all of which encourage soil microorganisms' biological activities and lead to the breakdown of organic matter, releasing N, P, and K, as well as other nutrients, into the soil solution (Ozores-Hampton *et al*., 2011). Absorption would be increased and nutrient uptake might be stimulated if these nutrients were accessible in the soil solution. These findings corroborated those of Melloni *et al*. (1995); Pinamontia*et al*. (1997); Jianming *et al*. (2008); Sarhan *et al*. (2011) and Adebayo *et al*. (2014), who found that increasing the amount of compost used resulted in the highest TSS, total sugars, protein, vitamin C, and moisture content in cucurbit fruits.

As a result, using compost will lessen the negative impacts of nematicides, such as pollution, health risks to the environment, and consumer food. The findings also support those of Sarwa*et al.* (2010), who found that using compost not only supplements chemical fertilizers but also reduces pollutants. In this cultural system, this will result in higher production and higher income for the agricultural community.

CONCLUSION

Chemical nematicides are being phased out of agricultural systems in favor of environmentally friendly biocontrol alternatives. Compost could be improved as a biocontrol product for the development of nematode-resistant soils. To produce a compost that can build and sustain nematode suppressive soils, the feedstock and composting procedures should be carefully selected. Compost will not only supplement artificial fertilizers, but it will also help to minimize pollution. In this cultural system, this will result in higher production and higher income for the agricultural community.

REFERENCES

A.O.A.C. (2000). Official methods of analysis of A.O.A.C. (Association of Official Analytical Chemists) International (17thed). AOAC International.

Adebayo, J.O., Adebayo, A.O. and Obembe, A. (2014). Efficacy of organomineral fertilizer and un-amended compost on the growth and yield of watermelon (*Citrullus lanatus* Thumb) in Ilorin Southern Guinea Savanna zone of Nigeria. Inter. J. Recycl. Org. Waste Agric., 3: 121-125.

Alejandro, A.D., Miguel D.C.G., Miguel T.R. and Soledad,V.L. (2020). Management of soil-borne fungi and root-knot nematodes in cucurbits through breeding for resistance and grafting. Agronomy, 10: 1641.

Bailey, K. and Lazarovits, G. (2003). Suppressing soil-borne diseases with residue management and organic amendments. Soil and Tillage Research, 72, 169–180. doi:10.1016/S0167-1987(03)00086-2.

Bradford, M.M. (1976). A rapid and sensitive method for the quantitation of microgram quantities of protein utilizing the principle of protein-dye binding. Anal Biochem., 7(72):248-254.

Byrd, D.W., Kirapatrick, T. and Barker, K. (1983). An improved technique for clearing and staining plant tissues for detection nematodes. J. Nematol. 15(3): 142-143.

Chang, E.H., Chung, R.S. and Tsai, Y.H. (2007): Effect of different applications rates of organic fertilizer on soil enzyme activity and microbial population. Soil science and Plant Nutrition 53, 132-140.

Christie, J.R. and Perry, V.G. (1951). "Removing Nematodes from Soil." Proceedings of the Helminthological Society of Washington 18(2) :106 – 8.

Coyne, D., Nicol, J. and Claudius-Cole, A. (2007). Practical Plant Nematology: Field and Laboratory Guide. II TA, Ibadan, Nigeria, pp. 28.

Djigal, D., Chabrier, C., Duyck, P.F., Achard, R., Quénéhervé, P. and Tixier, P. (2012). Cover crops alter the soil nematode food web in banana agroecosystems. Soil Biol. Biochem. 48:142- 150.

Dubois, M., Gilles, A., Homilton, J. K., Rebers, P.A. and Smith, P.A. (1956). A colorimetric method for determination of sugars and related substances. Anal. Chem., 28(3): 350-356.

Eissa, N.M. (1996). Studies on sustainable agriculture for some vegetable crops using animal manure. M.Sc. Thesis, Institute of Environmental Studies and Research, Ain Shams Univ., Cairo, Egypt

FAOSTAT (2019) Food and Agriculture Organization Corporate Statistical Database. New Food Balances. Available online: http: // www. fao. org/ faostat/ en/#data/FBS.

Gomez, K.A. and Gomez, A.A. (1984). Statistical Procedures for Agricultural Research. 2nd Ed., John Wiley & Sons. Inc. New York.

Goodey, J.B. (1963). Laboratory methods for work with plant and soil nematodes.Technical Bull., Min. Agric., Fisch. Food.No. 2. 4thedn. London ,72 pp.

Guo, X. X., Liu, H. and Wu, S. (2019). Humic substances developed during organic waste composting: Formation mechanisms, structural properties, and agronomic functions. Science of The Total Environment, 662 pp. 501-510, https://doi.org/10.1016/j.scitotenv.2019.01.137

Hussey, R.S. and Barker, K.R. (1973). Comparison of methods of collecting inocula of *Meloidogyne* spp. including a new technique. Plant Dis. Reptr. 57: 1925-1928.

Jianming, L., Putea, W., Behboudianc, M.H., Zhonghongd, W. and Mortonc, A. (2008). Response of cantaloupe to cattle or sheep manure compost mixed with sandy soil. J. Organic Sys., 3(2): 261-269.

Jimenez, D.F., Cano, R.P. and Maeda, M.C. (1997). Effect of different solarization periods on melon development. ITEA Production Vegetal., 93(2): 116-125

Lasaridi, K.E. and Stentiford, E.I. (1998). A simple respirometric technique for assessing compost stability. Water Research 32(12): 3717-3723

Li, J., Wang, D., Fan, W., He, R. and Wu, J. (2018). Comparative effects of different organic materials on nematode community in continuous soybean monoculture soil. Applied Soil Ecology, 125: 12-17.

Liu, D., Han, W., Zhang, Y. and Jiang, Y. (2019). Evaluation of vermicompost and extracts on tomato root-knot nematode. Bangladesh J. Bot., 48 (3):845-851

Lopes, E.A., Dallemole-Giaretta R., dos Santos Neves W., Parreira D.F. and Ferreira P.A. (2019). Ecofriendly approaches to the management of plant-parasitic nematodes. In: Ansari R., Mahmood I. (eds) Plant Health Under Biotic Stress. Springer, Singapore, https://doi.org/10.1007/978-981-13- 6043-5_9.

Marculescu, A., Sand, C., Barbu, C., Babit, H.D. and Hanganu, D. (2002). Possibilities of influencing the biosynthesis and accumulation of the active principals in *Chrysanthemum balsamita* L. specie Roum. Biotech. Lett., 7(1): 577- 548.

Martens, D. A. (2000): Management and crop residue influence soil aggregate stability. J. Environ. Qual. 29: 723–727.

Melloni, R.; Duarte, K.M.R. and Cardoso, E.J. (1995). Influence of compost and or effective microorganisms on the growth of cucumber and on the incidence of Fusarium wilt. Phytopath., 21(1): 21-24

Neher, D.A. (2010). Ecology of plant and free-living nematodes in natural and agricultural soil. Annu. Rev. Phytopathol. 48:371-394.

Oka, Y. (2010). Mechanisms of nematode suppression by organic soil amendments—A review. Applied Soil Ecology 44(2), 101-115. https://doi.org /10.1016/ j.apsoil.2009.11.003

Ozores-Hampton, M. (2002): Organic materials in horticulture: An industry perspective. Intro. Hor. Tech. 12(3): 8-9

Ozores-Hampton, M.P., Stansly, P.A. and Salame, T.P. (2011). Soil chemical, biological and physical properties of a sandy soil subjected to long-term organic amendments. J. Sustain. Agric., 353: 243-259

Pinamontia, F., Stringari, G. and Zorzi, G. (1997). Use of compost in soilless cultivation. Compost Sci. Utilization, (5): 38- 46.

Sarhan, T., Mohamed, G.H. and Teli, J.A. (2011). Effect of bio and organic fertilizer on growth, yield and fruit quality of squash plants. Sarhad J. Agric., 27(3): 451-460.

Sarwar, G., Schmeisky, H., Tahir, M.A., Iftikhar, Y. and Sabah, N.U. (2010): Application of green compost for improvement in soil chemical properties and fertility status. The J. Animal & Plant Sciences 20(4): 258-260.

Shafeek, M.R., Shaheen, A.M., Abd El-Samad, E.H., Rizk, F.A. and Abd El-Al, F. S. (2015). Response of growth, yield and fruit quality of cantaloupe plants (*Cucumis melo* L.) to organic and mineral fertilization. Middle East Journal of Applied Sciences. 5 (1): 76-82.

Southey, J. F. (1970). "Laboratory Methods for Work with Plant and Soil Nematodes. Tech. Bull. 2, 148 Pp."

St. Martin, C.C. and Brathwaite, R.A. (2012). Compost and compost tea: principles and prospects as substrates and soil-borne disease management strategies in soil-less vegetable production. Biol Agric Hortic 28:1–33. https://doi.org/10.1080/01448765.2012.671516

St. Martin, C.C.G. and Ramsubhag, A. (2015). Potential of compost for suppressing plant diseases. In: Ganesan S., Vadivel K., Jayaraman J., editors. Sustainable Crop Disease Management Using Natural Products. CABI Publishing, CAB International; Wallingford, UK: 2015. pp. 345–388.

Stirling, G. R. (2018) Chapter 5 Biological control of plant-parasitic nematodes, In George O Poinar Jr., & Hans-Börje Jansson (ed) Diseases of nematodes Vol 11 CRC Press pp160.

Tabarant, P. (2011). Effetsd'apport de matières organiques sur le contrôlebiologique des nématodes parasites du bananieren Guadeloupe. Thèse de doctorat, L'Institut des Sciences et Industries du Vivant et de l'Environnement, 176p.

Tamer, C.E., Ncedayi, B., Parseker, A.S. and Çopur, Y.S. (2010). Evaluation of several quality criteria of low-calorie pumpkin dessert. Nat. Bot. Hort. Agrobot., 38: 76-80.

Tariq, M., Khan, A., Asif, M., Khan, F., Ansari, T. and Siddiqui, M.A. (2018). Nematode suppressive effect of botanicals against the root-knot nematode *Meloidogyne Incognita* infesting *Solanum melongena* L. Trends in Biosciences, p. 2570.

Taylor, A.L. and Sasser, J.N. (1978). Biology, identification and control of root-knot Nematodes (*Meloidogyne* spp.) Coop. Pub. Dept. Plant Pathol., North Carolina State Univ. and U.S. Agency Int. Dev. Raleigh, N.C. 111 pp.

Zhang, M., Malhi, S.S., Panasuik, R. and Henriquez, B. (2011). 'Response of turfgrass growth in a black chernozemic soil amended with municipal solid/biosolid waste compost. Journal of PlantNutrition,34(2):183-205.

Zuhair, R., Moustafa, Y.T.A., Mustafa, N.S.A., El-Dahshouri, M. F., Zhang, L. and Ageba, M. F. (2022). Efficacy of amended vermicompost for bio-control of root knot nematode (RKN) *Meloidogyneincognita* infesting tomato in Egypt. Environmental Technology & Innovation 27 (2022) 102397.

تأثير استخدام التسميد بالكمبوست لمكافحة نيماتودا تعقد الجذور المصاحبه لنبات الكنتالوب في مصر

مروه محمود الدريني وايمان السيد حماد

قسم بحوث الأمراض النيماتودية ـ معهد بحوث أمراض النباتات – مركز البحوث الزراعية – الجيزه – مصر

تعتبر النيماتودا المتطفلة نباتيا مصدر قلق في المجال الزراعي. تهاجم نيماتودا *Meloidogyne* عدد كبير من النباتات حيث أن لها مدى عوائلي واسع مما يستلزم وجود بدائل متنوعة من طرق المكافحة لتقليل أعدادها. في هذه الدراسة تم مقارنة أنواع مختلفة من الكمبوست وهي VERMI compost في شكل صلب وسائل،COMPOSTIVE compost، AGRN compost بالمقارنة مع المبيد الكيماوي Oxamyl على نباتات الكنتالوب المصابة بنيماتودا تعقد الجذور وتقييم فعاليتها على نمو النباتات تحت ظروف الصوبة الزجاجية والصوبة الانتاجية. أظهرت النتائج ان كل المعاملات باستخدام الكمبوست أدت الى تحسن معنوي في القياسات الخضرية لنباتات الكنتالوب تحت ظروف الصوبة الزجاجية. كما انها أدت الى تقليل التعداد النهائي ومعدل التكاثر لنيماتودا تعقد الجذور *Meloidogyne incognita* سواء في التربة او على الجذور. حققت المعاملة بالكمبوست السائل COMPOSTIVE compostوالكمبوست السائل VERMI compostأفضل النتائج في خفض اعداد اليرقات في التربة وكذلك عدد العقد وكتل البيض على جذور نباتات الكنتالوب في الصوبة الإنتاجية. حققت كذلك كل المعاملات زيادة في وزن المحصول وتحسين جودة الثمار حيث أعطت المعاملة COMPOSTIVE compost نسبة مواد صلبه ذائبة ١٢,٧% ونسبة بروتين 3.90 mg/100ml ونسبة سكريات 15.31 mg/100ml وذلك عند مقارنتها بالنباتات الغير معاملة (الكنترول).