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INFLUENCE OF FOUR DIFFERENT GROUNDED SEEDS ON CONTROLLING *Meloidogyne incognita* INFECTING TOMATO PLANT UNDER GREENHOUSE CONDITIONS

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ABSTRACT

A pot trial was carried out to verify the impact of four grounded seeds i.e. caster, garlic, maize and sesame separately added as pre or post planting applications to tomato plants under the stress of *Meloidogyne incognita* infection in comparison with oxamyl in the greenhouse. Noticeably, data indicated that all tested organic materials as grounded seeds improved plant growth criteria and reduced nematode parameters as well. Using sesame grounded seeds as pre or post applications showed the maximum values of plant length (82.4 and 70.8%),total plant fresh weight (104.0 and 80.2%),shoot dry weight(65.5 and 65.5%),respectively. In the meantime, sesame grounded seeds accomplished the highest reduction percentage in numbers of eggmasses and galls / root system in this study. Caster application ranked second in this respect, whereas plant receiving the maize grounded seeds as pre-planting application gave the lowest amount values in enhancing plant growth parameters. It is evident that N, P, K, OM and O.C concentrations were obviously reduced by nematode infection with various degrees. All tested components showed remarkable increase in N, P, K, OM and O.C concentrations exceeding those of nematode alone.

Keywords: Grounded seeds, caster, garlic, maize, sesame, *Meloidogyne incognita,* nematode control, tomato.

INTRODUCTION

The root-knot nematode, *Meloidogyne incognita* is the important nematode species which parasitize economical vegetation within Egypt (Ibrahim and El-Saedy, 1976). Tomato plants are generally one of the most widespread vegetable fresh fruits in Egypt. Phytonemtodes in particular the root- knot nematode is recognized to be the most prevalent tomato pests. Additionally, the nematicides usually are high priced along with potentially unhealthy for the earth. Using botanical pesticides has become promising primary methods to defend crops. Commonly, botanicals break faster as compared to almost all traditional synthetic pesticides, also deemed to be fairly ecologically harmless. In addition, unlikely help to eliminate beneficial insects, mites as well as nematodes in comparison with chemical pesticides which having extended residue. Since most of them commonly degrade within a few days, and sometimes within a few hours, these biopesticides are being repeatedly used for the management of phytoparasitic nematodes. Many plants and plant products when applied in soil are known to cause decrease in the nematode population below damaging level. In few cases

plants have been found to be truly aggressive towards nematodes and some have revealed to generate lethal materials inhibitory to nematodes (Archana and Prasad, 2014). Therefore, the present investigation was carried out to study the influence of four different grounded seeds i.e. caster, garlic, maize, sesame comparing to oxamyl at the recommended dose against *M. incognita* infecting tomato plant cv. Castle Rock under greenhouse conditions(25±3c^{o})

MATERIALS AND METHODS

1. Nematode stock culture, propagations and preparing nematode inoculum:

To collect and determine the inocula of *Meloidogyne incognita* eggs; *M. incognita* was previously identified according to Taylor *et al.* (1955). Infected root systems with heavy eggmasses of *M. incognita* of various growing coleus, *Coleus blumei* plants, grown in 25 cm-diam plastic pots filled with sterilized clay sand soil, at the Nematology Research unit (NERU). Unit, Agricultural Zoology Department, Faculty of Agriculture, Mansoura University, Egypt, were well washed and cleaned by running tap water, then placed in a plastic container with enough solution of 1.0% NaOCl for 60 seconds, shaked vigorously (manually) then quickly passed through nested sieves and thoroughly washed the collected eggs with tap water to remove the bleach(Hussey and Barker, 1973) . Eventually, the number of eggs per unit volume of water was counted and then plants were inoculated directly with eggs according to the design of this experiment which was carried at the greenhouse of Nematological Research Unit (NERU).

2-Pesticide

Oxamyl (Vydate 24% L) Methyle-N-N-dimethyl-(N-(methyl) carbomycocyl)-1-Thioxamidate.

3-Prepration of plant seeds used:

A lot of seeds of caster, garlic, maize, and sesame were separately grounded by grinder and kept in a close container until use, where the dose was 5g/plant/pot added according to the design of the experiment.

4-Impact of Four Different grounded Seeds on Controlling *Meloidogyne incognita* Infecting Tomato Plant under Greenhouse Conditions (25±3^{o}c).

In order to evaluate the influence of four different grounded seeds i.e. caster, garlic, maize, sesame comparing to oxamyl at the recommended dose against *M. incognita* infecting tomato plant cv. Castle Rock under greenhouse conditions(25±3c^{o}), forty four plastic pots (15cm-diam) containing 1600g.steam-sterilized clay sand soil(1:1,v:v) with one tomato seedling 30 days old each were used in this study, where two trials with sixteen pots each, one as pre-planting and the other as post planting applications were tested. Pots of the pre-planting trial received the dose of tested materials separately at the level of 5g/pot, mixed with soil and irrigated with tap water and left for decomposition one week before tomato transplanting .Moreover, in the case of post-planting trial 5g/pot/seedling from such materials was separately added one week after tomato transplanting for four replicates

each.One week later,1000 *M. incognita* eggs introduced to forty pots(seedlings)where four seedlings received 0.3ml/pot oxamyl, four seedling (pots)for nematode only , and another four seedlings (pots)without nematode and any treatments.

Each treatment was replicated four times. Treatments were as followed:

A. Pre-planting trial:

1.N+grounded caster seeds(5g/pot).
2- N+ grounded garlic seeds (5g/pot),
3- N+ grounded maize seeds(5g/pot),
4- N+grounded sesame seeds(5g/pot),

B-Post –Planting trial :

5- N+ grounded caster seeds (5g/pot),
6-N+ grounded garlic seeds (5g/pot),
7-N+ grounded maize seeds (5g/pot),
8-N+ grounded sesame seeds (5g/pot),
C-N+ oxamyl (0.3ml/pot),
D-N+ alone ,and

E-Plant free of nematode and any treatment.

Plastic pots were then arranged in randomized complete block design in the greenhouse and treated horticulturally, protected against mites and insects by conventional pesticide and irrigated with water as needed. Plants were harvested after 45 days from nematode inoculation and plant growth criteria i.e .shoot and root lengths and fresh wight as well as shoot dry weights, number of branches, flowers and fruits/plant were determined and recorded. Infected roots of each plant /treatment were washed with tap water ,fixed in 4% formalin for 24 h and examined for the number of galls and eggmasses per root system, and recorded.

Statistical analysis:

Statistically, the obtained data were subjected to analysis of variance (ANOVA) (Gomez and Gomez, 1984), followed by Duncan's multiple range Tested (DMRT) to compare means (Duncan, 1955).

Chemical analysis:

Nitrogen(N), phosphorus(P), potassium(K), organic matter(OM) and carbon(O.C) were determined according to Kjeldahl methods (A.O.A.C., 1980).

RESULTS AND DISCUSSION

Data presented in Tables (1&2) verify the impact of four grounded seeds i.e. caster ,garlic ,maize and sesame separately added as pre-planting applications to tomato plants under the stress of *Meloidogyne incognita* infection in comparison with oxamyl in the greenhouse conditions(25±3^{o}c)

Obviously ,results indicated that all tested organic materials as grounded seeds improved plant growth criteria and reduced nematode parameters as well. Among the tested materials , sesame grounded seeds showed the maximum values of plant length (82.4%),total plant fresh weight (104%),shoot dry weight(65.5%),number of flowers(100%),branches (200%) fruits(200%)/plant, whereas plant receiving the maize grounded seeds as pre-planting application gave the minimum percentages increase values of plant length (70.3%), total plant fresh weight (33.6%),shoot dry weight (51.7%),number of flowers (0.0%), branches (175%)and fruits (0.0%)per plant, respectively when compared to nematode alone (Table1).In the meantime, caster treatment ranked second to sesame application in percentage increase values of such plant growth parameters , whereas garlic treatment showed the intermediate percentage increase values of such tested plant growth criteria comparing to nematode alone .It is interesting to note that oxamyl as a systemic nematicide ranked first in this respect ,since its values amounted to 90.3, 82.8, 68.9% for plant length , total plant fresh weight and shoot dry weight ,in addition to its values of number of flowers(150%),branches (292.5%) and fruits (300%) per plant, comparing to nematode alone (Table1),

Regarding to plant free of nematode and any treatment ,it has percentage increase values of 16.6 ,8.6 and 10.3 % for plant length ,total plant fresh weight and shoot dry weight plus zero %, 25% and 2% for number of flowers , branches and fruits/ plant when compared to nematode alone (Table1).

Data presented in Table (2) show number of galls and eggasses on tomato plant infected with *M. incognita* as affected by the tested four grounded seeds in comparison with oxamyl under greenhouse conditions ($25\pm3c^{o}$).It is evident that the two nematode criteria were obviously influenced by all tested organic materials, comparing to nematode alone (Table2).Plant receiving sesame grounded seeds accomplished the highest reduction percentage in numbers of eggmasses (95%)and galls / root system(90%)followed by that of garlic treatment with values of 90 and 88.2%, respectively. The relative lowest reduction percentage of these nematode parameters were recorded by caster treatment with values of 85 and 85.5% as compared with nematode alone.

Concerning root galling indices , a significant reduction in its values was also achieved by all tested organic materials comparing to nematode alone, since their values were on par(3)each vs 5 for nematode alone (Table2).Similar trend was noticed for eggmasses indices, since their values were also on par(2) except that of caster (3)vs 4 for nematode alone .

Moreover, oxamyl as a systemic nematicide ranked first over such tested grounded seeds in suppressing number of galls and eggmasses with values of 90.9 and 99.5%, respectively. It was also noted that oxamyl treatment achieved the lowest values of galls or eggmasses indices that were amounted to 2 or zero VS 5 or 4 respectively, for nematode alone (Table2).

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Table(2): Impact of four grounded seeds added as pre planting application in comparison with with oxamyl on root galls 889

and number of eggmasses of *Meloidogyne incognita* infecting tomato plants cv. Castel Rock under greenhouse conditions(25±3°c).

Treatments	* Nematode Parameters					
	No. of galls /root system	Red%	RGI	No .of Eggmasses /root system	Red.%	EI
Caster	16.0 b	85.5	3	15.0 b	85.0	3
Garlic	13.0 c	88.2	3	10.0 c	90.0	2
Maize	15.5 b	85.9	3	10.0 c	90.0	2
Sesame	11.0 d	90.0	3	5.0 d	95.0	2
Oxamyl	10.0 d	90.9	2	5.5 d	99.5	0
N alone	110.0 a	_	5	100.0 a	_	4
L.S.D	1.62			1.62		

N=1000 eggs of *Meloidogyne incognita* .
Each figure is the mean of four replicates.
Means in each column followed by the same letter(s) did not differ at P<0.05 according to Duncan's multiple-range test.

Data in Tables(3&4) illustrate the influence of four grounded seeds i.e. caster ,garlic ,maize and sesame in comparison with oxamyl on plant growth response of tomato plants cv.Castle Rock added as post-planting applications under the stress of *M. incognita* infection in the greenhouse conditions (25±3°c). Results indicated that all tested grounded seeds ameliorated plant growth parameters and diminished nematode criteria as well. Obviously , grounded seeds of sesame ranked first in the increment values of plant growth characters that were amounted to 70.8%, 80.2%, 65.5%,200% and 175% for plant length , total plant fresh weight , shoot dry weight number of flowers and number of branches/plant , respectively ,(Table3). Similar trend was obviously recorded concerning nematode parameters by sesame treatment where its percentage of reduction values were 89.5 and 94% for number of galls and eggmasses comparing to nematode alone , respectively (Table 4). Moreover ,plant receiving garlic grounded seeds followed values of sesame either in plant growth characters (49.7 ,73.3 , 44.8 ,0.0 and 106.25%) or nematode criteria(85.2 & 88.8%) respectively for all tested parameters, comparing to nematode alone (Tables3&4). In the meantime caster grounded seeds showed the intermediate percentage increase values of plant length (44.7%) total plant fresh weight (66.4%), shoot dry weight (37.9%) and number of branches /plant (100%), whereas maize grounded seeds showed the lowest percentage increase values of plant growth criteria which were amounted to 44.5, 37.1 10,3 and 81.3% for the same plant growth characters , comparing to nematode alone , respectively (Table3).

However, maize treatment recorded considerable percentage reduction values of root galls (83.9%) and eggmasses number as well (87.5%)

followed by that of garlic treatment ,whereas caster grounded seeds achieved the least percentage reduction values of the same nematode parameters that were amounted to 80.5 and 84.5% for numbers of galls and eggmasses , respectively (Table 4). It is worthy to note that oxamyl as a systemic nematicide ranked first in this respect, since its values assigned 90.9 and 99.5% for numbers of galls and eggmasses /plant , respectively (Table4).Moreover, oxamyl treatment surpassed other tested ones in the increment values of plant growth parameters i.e. plant length (90.3%), total plant fresh weight (82,8%),shoot dry weight (68.9%) numbers of flowers (100%) , branches (217.5%) fruits / plant (300%), respectively, comparing to nematode alone (Table3). Concerning plant free of nematode and any treatments, it showed percentage increase values of 16.6 , 9.9, 10.8, 0.0 , 25 and 60% for plant length , total plant fresh weight ,shoot dry weight ,numbers of flowers , branches and fruits /plant , respectively comparing to nematode alone (Table3).

With respect to root galling indices, a significant reduction in its values was also recorded by the tested organic materials as compared to nematode alone (Table 4), since their values were on par (3) vs 5 for nematode alone. Similar trend was observed for eggmasses indices, since their values were also on par (3) except that of sesame (2) vs 5 for nematode alone (Table 4).It is worthy to observe that oxamyl as a systemic nematicide gave the lesser values of galls or eggmasses indices that were amounted to 2 or zero vs.4 for nematode alone, respectively.

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Table (4) Effect of four grounded seeds as post-planting treatments in comparison with oxamyl on number of galls and eggmasses

of *Meloidogyne incognita* infecting tomato plants cv. Castel Rock under greenhouse conditions (25±3C°).

Treatments	* Nematode Parameters					
	No. of root galls/root system	Red%	RGI	No. of Eggmasses /root system	Red %	EI
Caster	21.5 b	80.5	3	16.0 b	84	3
Garlic	16.25 d	85.2	3	11.25 c	88.8	3
Maize	17.75 c	83.9	3	12.5 c	87.5	3
Sesame	11.5 e	89.5	3	6.0 d	94.0	2
Oxamyl	10.0 f	95.9	2	0.5 e	99.5	0
N alone	110.0 a	_	5	100 a	_	4
L.S.D	1.032			1.262		

N=1000 eggs of *Meloidogyne incognita*
***Each figure is the mean of four replicates.**
Means in each column followed the same letter(s) did not differ at P<0.05 according to Duncan's multiple-range test.

Data presented in Table (5) show that percentage increase values of nitrogen (N), phosphorus (P), potassium(K), organic matter and organic carbon in leaves of tomato plant cv. Castel Rock infected with *M. incognita* treated by four grounded seeds, i.e. caster, garlic, maize and sesame, as pre-planting applications at level of 5g/pot in comparison with oxamyl at the recommended dose under greenhouse conditions(24±2°C).It is evident that N, P, K, OM and O.C concentrations were obviously reduced by nematode infection, All tested components showed remarkable increase in N, P, K, OM and O.C concentrations exceeding those of nematode alone. Among the tested grounded seeds as pre-planting treatments, sesame surpassed other ground seeds in percentage increase values of N (51.1%), P (34.9%), K (30.4%), and O.M (8.4%), as compared to nematode alone followed by caster grounded seeds with values of 43.41, 28.6, 26.8, and 7.2% respectively, whereas maize grounded seeds gave the lesser values of 5.9, 4.7, 3.9, and 1.2% for the same previous items (Table 5). However, when the same grounded seeds added to tomato plants as post-planting applications under the stress of *M. incognita* infection in the same greenhouse conditions, similar trend of the previous mentioned results was recorded as indicated that sesame grounded seeds also overwhelmed other tested organic materials but with lesser values which were amounted to 47.1, 31.4, 28.3, 7.9 and 7.7% for N, P, K, OM and O.C, followed by caster, in this respect, respectively, as compared to nematode alone(Table 6). In both cases of the addition of the four grounded seeds tested as pre-planting or post-planting, oxamyl treatment, clearly ranked first in increasing percentage values of N, P, K, OM and O.C, over all components tested and untreated uninoculated one, since

its values were amounted to 67.4, 46.0, 40.9, and 11.1% for N, P, K, and OM as compared to nematode alone, respectively (Tables 5 &6).

Table (5). Average percent of nitrogen(N), phosphorus(P), potassium(K), organic matter(OM) and carbon(O.C) in leaves of tomato plant cv. Castel Rock under the stress of *Meloidogyne incognita* infection treated with four different ground seeds as pre-planting applications comparing with oxamyl in greenhouse conditions (25±3°C).

Treatments	Chemical Component in Leaves									
	N %	Inc. %	P %	Inc. %	K %	Inc. %	O.M %	Inc. %	O.C %	C/N ratio
Garlic	2.51	13.6	0.34	7.9	3.61	8.7	67.02	2.4	38.96	15.5
Sesame	3.34	51.1	0.425	34.9	4.33	30.4	70.92	8.4	41.23	12.34
Maize	2.34	5	0.330	4.7	3.45	3.9	66.18	1.2	38.48	15.44
Caster	3.17	43.4	0.405	28.6	4.21	26.8	70.14	7.2	40.78	12.86
Oxamyl	3.70	67.4	0.460	46.0	4.68	40.9	72.70	11.1	42.27	11.42
N alone	2.21	_	0.315	_	3.32	_	65.42	_	38.03	17.21
Free of N and any treatments	2.3	4.1	0.356	3.0	3.4	2.4	66.30	1.3	39.0	

N= 1000 *Meloidogyne incognita* eggs.

Table(6) Average percent of nitrogen(N), phosphorus(P), Organic matter(O.M) and Carbon in leaves of tomato plant cv. Castel Rock under the stress of *Meloidogyne incognita* infection treated with four different grounded seeds as post-planting applications comparing with oxamyl in green house conditions (25±3c°).

Treatments	Chemical Components in leaves									
	N %	Inc. %	P %	Inc. %	K %	Inc. %	O.M %	Inc. %	O.C %	C/N ratio
Garlic	2.42	9.5	0.335	6.3	3.51	5.7	66.53	1.69	38.68	15.98
Sesame	3.25	47.1	0.414	31.4	4.26	28.3	70.57	7.9	41.03	12.62
Maize	2.26	2.3	0.321	1.9	3.39	2.1	65.79	0.565	38.25	16.92
Caster	3.09	39.8	0.395	25.4	4.12	24.4	69.71	6.55	40.53	13.12
Oxamyl	3.70	67.4	0.460	46.0	4.68	40.9	72.70	11.12	42.27	11.42
N alone	2.21	_	0.315	_	3.32	_	65.42	_	38.08	17.21
Free of N and any treatments	2.30	4.1	0.356	3.0	3.4	2.4	66.30	1.34	39.0	

N = 1000 *Meloidogyne incognita* eggs.

Data in Table (7) showed the nutrient constituents analysis of the tested four organic soil amendments i.e. caster, garlic, maize and sesame as grounded seeds which varied remarkably in amounts of ammonium (in form

of nitrogen), phosphorus, potassium, organic matter, organic carbon/nitrogen ratio.

Table (7): Approximate percentage of ammonium (nitrogen from), Potassium(K), Phosphorus(P), organic carbon(o.c) and Carbon / nitrogen (C/N ratio) of four grounded plant seeds.

Nutrient Constituent						
Materials of organic amendments	**N %**	**P %**	**K %**	**O.M %**	**O.C %**	**C/N**
Sesame	2.48	0.511	1.63	69.1	40.2	16.2
Caster	2.26	0.475	1.51	71.9	41.8	18.5
Garlic	1.65	0.347	1.20	61.6	35.8	21.7
Maize	1.44	0.307	1.09	59.2	34.4	23.9

Actually, the influence of four different grounded seeds i.e. caster, garlic, maize, sesame comparing to oxamyl at the recommended dose against *M. incognita* infecting tomato plant cv. Castle Rock under greenhouse conditions showed that all tested materials improving plant growth parameters and diminishing nematode criteria as well. These findings are in accordance with the observations of Ram and Baheti (2004) who stated that plant products i.e. neem, castor and karanj products (leaf and seed kernel) were effective in improving plant growth and reducing nematode population over the untreated control . Sesame grounded seeds ranked first in enhancing plant growth criteria and diminishing nematode gall and eggmass numbers as well. Sesame seeds contain the lignans pinoresinol and lariciresinol (Milder *et al*., 2005). Lariciresinol is a lignan, a type of phenylpropanoids which enhanced plant acclimatization at different levels of photosynthetic photon flux (Mohammad, *et al*., 2006). Phenylpropanoids belong to the largest group of secondary metabolites produced by plants, mainly, in response to biotic or abiotic stresses such as infections. It is thought that the molecular basis for the protective action of phenylpropanoids in plants is their antioxidant and free radical scavenging properties (Dixon *et al*., 2002). However, garlic extract demonstrated greater potential than neem leaf extract in the control of root-knot nematode infection of tomato (Agbenin *et al*., 2005)

Botanical parts possess properties including insecticidal activity, repellence to pests, antifeedancy, insect growth regulation, toxicity to nematodes, mites, snail and slugs, and other pests of agricultural importance (Siddiqui *et al.,* 2005). The use of botanical pesticides is now emerging as one of the prime means to protect crops. In addition, plant extracts have chemicals which are referred to collectively as “botanicals”. Generally, botanicals degrade more rapidly than most conventional (synthetic)

pesticides, and so are considered relatively environmentally benign and less likely to kill beneficial insects, mites and nematodes than pesticides with longer residual activity. Since most of them generally degrade within a few days, and sometimes within a few hours, these biopesticides are being frequently used for the management of phytoparasitic nematodes (Nageswari and Mishra, 2005).In few cases plants have been found to be actually antagonistic towards nematodes and some have shown to produce toxic materials inhibitory to nematodes The use of botanical products to manage phytonematodes population has a number of possible advantages over synthetic products viz. the botanical pesticides are available in bulk; they are easy to apply and are expected to be cheaper in comparison to synthetic chemicals; such compounds also being biodegradable are unlikely to cause environmental problems than conventional pesticides; and the farmers can easily prepare crude extracts of botanicals for their use in field (Archana and Prasad, 2014).

It is clear that N, P, K, OM and O.C concentrations were obviously showed incredible raise in N, P, K, OM and O.C concentrations exceeding those of nematode alone. Among the tested grounded seeds either pre or post planting treatments, sesame surpassed other ground seeds in this respect. These observations disagree with that of Oteifa (1953) who stated that root-gall nematode damage on cabbage increased with amounts of potassium available to the host plant because potassium increased the rate of reproduction of nematode. Huber (1980) also recorded that root gall nematode damage on lima bean decreased with increased ammonium supplied to the plant. The C:N ratio of this tested organic materials was very narrow either pre or post planting which ranged between 12.34:1 to 15.5 for pre-planting application and 12.6 to 16.9 for post planting application. In the meantime, These findings are agreed with the observations of Miller and Donahue (1990) who reported that organic residues with C:N ratio 20:1 or narrow have sufficient nitrogen to supply the decomposing microorganisma and also to release for plant use.

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تأثير مطحون أربعة انواع من البذور النباتية في مكافحة نيماتودا تعقد الجذور التي تصيب نباتات الطماطم تحت ظروف الصوبة الزراعية

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تم اجراء تجربة تحت ظروف الصوبة الزراعية (25 ± 3م°) لدراسة تأثير مطحون أربعة انواع من البذور النباتية هي الخروع والثوم والذرة والسمسم منفصلة قبل الزراعة وبعد الزراعة بمعدل 5 جم لكل اصيص علي نيماتودا تعقد الجذور *Meloidogyne incognita* التي تصيب نباتات الطماطم بالمقارنة بالمبيد النيماتودي الاوكساميل وقد اظهرت النتائج مايلي:

1. حققت جميع المعاملات تحسن واضح في المقاييس النباتية المختبرة وكذلك ادت الي خفض تعداد النيماتودا .
2. أظهرت المعاملة ببذورالسمسم قبل أو بعد الزراعة أعلي معدلات التحسن في المقاييس النباتية المختبرة لطول النبات (82.4 و 70.8٪)، ومجموع وزن النبات الرطب (104.0 و 80.2٪) والوزن الجاف للمجموع الخضري(65.5 و 65.5%)، على التوالي لكلا من المعاملة قبل وبعد الزراعة علي الترتيب.
3. كذلك حققت المعاملة ببذور السمسم أعلى نسبة انخفاض في أعداد كتل البيض والعقد النيماتودية علي المجموع الجذري النبات في حين احتلت المعاملة ببذور الخروع المرتبة الثانية في هذا الصدد.
4. سجلت المعاملة ببذور الذرة قبل الزراعة اقل القيم في تحسين المقاييس النباتية وخفض تعداد النيماتودا .
5. كان من الواضح أن تركيزات حدوث خفض في تركيزات النتروجين والفسفور والبوتاسيوم والمادة العضوية نتيجة الاصابة بالنيماتودا بدرجات متفاوتة وقد أظهرت جميع المعاملات زيادة ملحوظة تتجاوز المعاملة بالنيماتودا وحدها.

Table(1).Impact of four different grounded seeds in comparing with oxamyl on plant growth response of tomato plants cv. Castle Rock added as pre-planting applications under the stress of *Meloidogyne incognita* infection in the greenhouse conditions(25±3c^{o}).

Treatments	* Plant Growth Response												
	Length(cm)		Total	Inc.%	Fresh weight(g)				No. of flowers	No .of branches	No .of fruits	Shoot D.Wt(g)	Inc.%
	shoot	root			shoot	root	total	Inc.%					
Caster	15.5 g	15.6 b	31.1 f	76.6	12.9 c	5.0a	17.9bc	54.3	1.5a	11.5a	2 a	4.7ab	62.1
Garlic	50.0 c	15.5 b	65.5 c	72.4	11.5 d	5.5a	17.0cd	46.6	1.0 a	11.0a	1 a	4.5bc	55.2
Maize	48.3 d	16.4 a	64.7 c	70.3	11.2 d	4.6a	15.8d	33.6	1.0 a	11.6a	1 a	4.4 c	51.7
Sesame	52.5 b	16.8 a	69.3 b	82.4	14.5 b	4.6a	19.1b	64.7	2 a	12.0a	3 a	4.8 a	65.5
Oxamyl	55.8 a	16.5a	72.3 a	90.3	15.4 a	5.8a	21.2 a	82.8	2 a	12.7a	2 a	4.7ab	68.9
N alone	29.0 f	9.0 d	38.0 e	_	9.0 e	2.6b	11.6 e	_	1 a	4.0 b	1 a	2.9 e	_
Plant free of Nematode and any treatment	33.8 e	10.5 c	44.3 d	16.6	9.6 e	3.0b	12.6 e	8.6	1 a	5.0 b	0.8 a	3.2 d	10.3
L.S.D	0.946	0.681	1.537		0.681	0.947	1.200		1.364	1.367	1.622	63.44	

N=1000 eggs of *Meloidogyne incognita* ***Each figure is the mean of four replicates.**

Increase %=Treatment –N alone/N alone ×100.

Means in each column followed by the same letter(s) did not differ at P<0.05 according to Duncan's multiple-range test.

Table(3) Influence of four grounded seeds in comparison with oxamyl on plant growth response of tomato plants cv. Castel Rock added as post-planting applications under the stress of *Meloidogyne incognita* infection in the greenhouse Conditions(25±3c^{o}).

Treatments	*Plant Growth Response.												
	Length(cm)				Fresh weight of plant				No.of flowers	No. of branches per plant	No. of fruits	Shoot D.Wt.(g)	Inc%
	shoot	root	Total	Inc.%	shoot	root	Total	Inc.%					
Caster	40.0d	15.0b	55.0d	44.7	14.0b	5.3a	19.3b	66.4	1a	8.0c	1 a	4.0ab	37.9
Garlic	42.5c	14.9b	57.4c	49.7	14.2b	5.9a	20.1ab	73.3	1a	8.25c	1 a	4.2 a	44.8
Maize	40.4d	14.5b	54.9d	44.5	11.3c	4.6b	15.9c	37.1	1a	7.25c	1 a	3.2 bc	10.3
Sesame	47.3b	17.3a	64.6b	70.8	15.3a	5.6a	20.9a	80.2	2a	11.0b	1 a	4.8 a	65.5
Oxamyl	55.8a	16.5a	72.3a	90.3	15.4a	5.8a	21.2a	82.8	2a	12.7a	2 a	4.9 a	68.9
N alone	29.0f	9.0d	38.0f	_	9.0d	2.6c	11.6d	_	1a	4d	0.5 a	2.9 c	_
Plant free	33.8e	10.5c	44.3e	16.6	9.6d	3.0c	12.6d	9.9	1a	5d	0.8 a	3.2bc	10.3
L.S.D	0.947	0.947	1.891		0.947	0.681				1.325	1.150	0.681	

N=1000eggs of *Meloidogyne incognita* * Each figure is the mean of four replicates Increase%=Treatment – N alone/ N alone ×100.
Means in each column followed by the same letter(s) did not differ at P<0.05 according to Duncan's multiple-range test.