Middle East Journal of Agriculture Research, 1(1): 13-18, 2012
ISSN 2077-4605

Effect of adding Compost at Different Depths on The Growth of Some Vegetable Crops under Net Plastic Houses

Manal M.H. Gad El-Mola., S.M. Saleh., Dina.A. ShafiK and A.A.M. Esmail.

Central Laboratory for Agricultural Climate (CLAC), Agricultural. Research Center,(ARC)

ABSTRACT

Lettuce (*Lactuca sativa L.)* cv. PP 400 cultivar, cucumber (*Cucumis sativus L*.) cv. Hesham cultivar and sweet corn (*Zea Mays var. regusa L.*) cv. Merit cultivar. Seedlings were transplanted in a net plastic house, Central laboratory for agricultural climate, Agricultural research center during two successive seasons 2009/2010 and 2010/2011 to investigate the best depth of application of organic matter to some vegetable crops. The compost is added to the greenhouse on three levels of depth, surface application (control), 15 centimeter and 30 centimeter. compost were added at the rate of 1.8 m3 per greenhouse two weeks before from transplanting. All treatments were irrigated using the drip irrigation system and fertilized by a balanced nutrient solution as Recommended dose for each crop. Some vegetative parameters were measured for the three crops. Firstly:- : Lettuce (Total leaves number/head, head size, head fresh weight and head dry weight. Secondly: cucumber (plant height, total leaf area, number of leaves, total chlorophyll, fresh weight, and dry weight. Thirdly. sweet corn (stem diameter, plant fresh weight, plant dry weight, number of kernels /row, un – husked ear weight, husked ear weight, fresh and dry weight of 1000 kernels, and total yield. Also, some chemical parameters were determined : NPK contents. The results showed that application of the organic matter on depth of 15 cm gave the best results for the leafy crops, while application of the organic matter on depth of 30 cm gave the best results for the fruity crops. The aim of the experiment is to find the most suitable depth of addition of compost to the different crops.

Key work: Lettuce, cucumber, sweet corn, depth of compost

Introduction

Organic agriculture dramatically reduces external inputs by refraining from the use of chemo-synthetic fertilizers, pesticides and pharmaceuticals. Instead, it allows the powerful laws of nature to increase both agricultural yields and disease resistance. Aidy (1993) reported that the best results were obtained with the half-buried treatment during winter cultivation and with the fully buried treatment during the spring. In winter and spring the best treatments gave increases in cucumber yield of 0.7 and 0.33 kg/plant, respectively, over controls (planted in soil).. Ricci *et al*. (1995) used two compost types in cultivation of lettuce and found that neither of the organic composts increased leaf nutrient contents except for K. The P, Ca, Mg and S content were not statistically different from those of plant received mineral fertilizers. A significant reduction in nitrate content was observed in plants received either type of compost, rather than mineral fertilizers. Vidigal *et al*. (1995) used farm yard manure at different levels, in cultivation of lettuce and reported that leaf N,P and K concentration increased with rising compost rates but the Ca concentration decreased. Siddiqui and Alam (1999) found that the growth of plants was better in beds receiving deep ploughing treatment. It was further promoted when deep ploughing was combined with the soil application of oil seed cakes/nematicides. The residual effect of oil-seed cakes and nematicides persisted even after a lapse of 6 months, as they remained effective against plant parasitic nematodes in the subsequent crop, tomato cv. Rooster (1999) used three types of compost showed higher lettuce yields after the use of compost. Bahman Eghball (2001) Soil properties in the 15- to 30-cm increment were unaffected by the applied treatments except soil electrical conductivity (EC). Residual soil NO3 to a depth of 1.2 m was greater for inorganic fertilizer than manure and compost treatments in drier years. Soil property changes were greater for the annual or biennial N-based than P-based manure or compost applications, reflecting the differences in application amounts.Jackson *et al*. (2001). indicated that over a period of several years, deep minimum tillage increased lettuce yield and decreased symptoms of lettuce drop disease, compared with shallow minimum tillage. Continuous shallow minimum tillage, despite a trend toward higher active and total organic matter in the surface layer of soil, is best used with intermittent deeper tillage to avoid disease and yield losses.El-Messery *et al* (2003) studied the effect of different levels of organic fertilization on spinach. They observed that fresh weight per plant and plant length were significantly increased by addition of chicken manure at 150kg N/fed.Grazia *et al*. (2003) indicated that increasing nitrogen fertilization rates (0-100-and 150 kg N/ha.) caused significant differences in yield with and without husk.Oraby *et al*. (2003) reported that ear lenghth and number of grains /row were significantly increased by increasing nitrogen fertilizer levels up to 120 kg/N/fed.Tuzel *et al*. (2003) found that the highest cucumber total yield was recorded with chicken manure and

Corresponding Author: Manal M.H. Gad El-Mola.,Central Laboratory for Agricultural Climate (CLAC), Agricultural. Research Center,(ARC)

farmyard manure treatments. It was added that the differences can be attributed to the effect of fertilizers on soil microbial activity. *Jackson et al.*, (2004) reported that economic analysis of the three lettuce crops showed that net financial returns were highest with minimum tillage -OM inputs, despite lower yields. Various tradeoffs suggest that farmers should alternate between conventional and minimum tillage, with frequent additions of OM, to enhance several aspects of soil quality, and reduce disease and yield problems that can occur with continuous minimum tillage. Pandeyand Shukla (2006) found that the addition of compost can help in maintaining the same level of soil moisture with a lower water table compared to the noncompost field. A lower water table in the compost field can result in higher retention of rainfall in the soil compared to the noncompost field, which in turn can reduce runoff, deep percolation, and seepage losses and achieve water conservation.

Material and Methods

The study was conducted at the experimental site of Central Laboratory for Agricultural Climate (CLAC), Agricultural Research Centre (ARC), Dokki, Giza governorate, in a net plastic house, during two successive seasons 2009/2010 and 2010/2011.The compost is added to the net plastic house on three levels of depth, surface application (control), 15 centimeter and 30 centimeter . compst were added at the rate of 1.8 m3 per greenhouse two weeks before form transplanting Lettuce (*Lactuca sativa L.)* cv., cucumber (*Cucumis sativus L.*) cv. Hesham cultivar and sweet corn (*Zea Mays var. regusa L.*) cv. Merit cultivar. Seedlings were transplanted on the three levels of depth in the greenhouse .Lettuce seeds were sown in the nursery on September 15 th and the transplants were set up in net plastic house on October 1 st in the previous seasons respectively, Cucumber seeds were sown in nursery on 1st of September and then transplanting were done on 25th of september and sweet corn seeds were sown in the net plastic house on 15 th of September in the two seasons of 2009/2010 and 2010/2011. The treatments of the experiment were arranged in a complete randomized blocks design with three replicates for each treatment. All treatments were irrigated using the drip irrigation system and fertilized by a balanced nutrient solution as Recommended dose for each crop. Vegetative and chemical parameters were measured for each crop. The physical and chemical properties of the experimental soil are shown in Table (1). The chemical properties of compost are shown in Table (2).

Table 1: The physical and chemical properties of the experimental soil.

Particle size distribution			Texture	PH	EC	$CaCo_3$	OM	Soluble cations and anions (soil paste ext),(meq/l)					
Sand	Silt	Clay	Sandy Clay loam	1:2.5	ds/m	%	%	Ca	Mg	Na	K	Cl	HCO_3
57.3	16.7	26		8.2	2.4	16.0	0.35	6.0	3.0	20.1	1.2	13.0	2.6

Table 2: Some chemical and physical properties of the compost.

Ec ds/m	pH 1:10	O.M %	Total N %	C/N ratio	N %	P %	K %
1.91	8.06	26.2	1.68	15.6	1.51	1.11	1.06

Daily climatic data were collected by fixed sensors of air and soil temperatures, solar radiation, relative humidity and Precipitation installed in the middle of net plastic house .Climatic data are tabulated in Table (3,4).

Table 3: Climatic recorded data in the net plastic house during first season (2009/2010) in Dokki site .

Date	Soil temperature			Solar Radiation	Precipitation	Air temperature			Relative humidity
	[°C]			[mJ/m²]	[mm]	[°C]			[%]
	Aver.	Mini.	Maxi.	average	sum	Aver.	Mini.	maxi	average
September	28.96	26.6	31.2	396.65	0	27.94	20.76	36.35	58
October	24.67	19	27.7	273.83	0	23.83	14.66	39.17	56
November	19.63	14.8	25.1	229.21	6.4	17.86	10.29	26.92	65
December	16.39	4.4	23.9	196.47	0.2	15.02	7.85	23.65	69
January	15.16	8.7	22.4	260.62	1.2	15.25	7.31	24.13	66
February	16.45	9.8	24.3	290.06	2.6	16.4	7.17	26.39	56

Table 4: Climatic recorded data in the net plastic house during first season (2010/2011) in Dokki site.

Date	Soil temperature			Solar Radiation	Precipitation	Air temperature			Relative humidity
	[°C]			[mJ/m²]	[mm]	[°C]			[%]
	Aver.	Mini.	Maxi.	average	sum	Aver.	Mini.	maxi	average
September	30.48	28.5	34.5	219.3	2	28.72	20.74	38.07	56
October	26.97	22.1	31.9	143.92	0	24.53	13.52	42.07	57
November	20.57	16.5	24.1	89.83	0	17.91	9.12	30.35	68
December	16.31	13.8	19.1	105.48	0	14.88	7.25	28	73
January	14.27	11.9	17.8	113.34	1.6	12.92	3.55	30.42	67
February	14.38	10.8	18.4	136.41	0.4	14.4	3.17	32.22	63

Middle East j. agric. res., 1(1): 13-18, 2012

Vegetative measurements:

Three plants were randomly chosen at harvest from each plot to record the vegetative parameters as follows:

Firstly:- Lettuce (total leaves number/head, number of leaf per head averaged from 10 plants of each treatment, head size, averaged from 8 head lettuce of each treatment and calculated using a measuring cylinder, head fresh weight, was expressed as the average weight of 12 plants, head dry weight .Secondly: Cucumber (plant height, total leaf area, number of leaves, total chlorophyll, fresh weight, and dry weight).

Thirdly: Sweet corn (stem diameter, plant fresh weight, plant dry weight, number of kernels /row, unhusked ear weight, husked ear weight, fresh and dry weight of 1000 kernels, and total yield. All ears harvested from each plot were weighed to give the total yield per plot and per Fadden.

Chemical analyses:

Samples of leaves of lettuce and cucumber and kernels of sweet corn were oven dried at 70^0C then ground in a blender and stored in glass vials for chemical analysis. The samples were digested by the wet digestion method using sulfuric acid and hydrogen peroxide as described by Chapman and Pratt (1961).

-Nitrogen, phosphorous and potassium in the acid digested solution were determined by using Micro kjeldahle for N, using spectrophotometer for P (colorimetric method) and flame photometer for K (Chapman and Pratt, 1961).

-Total chlorophyll reading it was measured in leaves by using digital chlorophyII meter (model Minolta chlorophyll meter SPAD-501).

Statistical analysis:

Data of the experiment was subjected to proper statistical analysis of variance according to Snedecor and Cochran (1980).

Results and Discussion

Data in Table (5) shows the effect of compost depth on vegetative parameters and total yield of lettuce plants, there were significant differences in all vegetative parameters; head fresh weight, head dry weight , number of leaves per plant ,head size and total yield of heads. The highest head fresh weight was found in 15cm depth, however the lowest value was found in the control treatment. The same performance was found in head dry weight and number of leaves per plant. The same was found in the second season. The highest head size was found in 15cm depth, however the lowest value was found in the control treatment. Also, there were significant differences in the total yield, the highest total yield was found in 15cm depth, however the lowest value was found in the control treatment. The same was found in the second season. Data in Table (6) shows the effect of compost depth on NPK contents of lettuce plants and chlorophyll content in outer leaves of head. There were significance differences in NPK contents of lettuce head and chlorophyll content in outer leaves of head. The highest NPK contents of lettuce plants and chlorophyll was found in 15 cm however the lowest value was found in the control treatment .The same was found in the second season. The results were agreement with those of Bahman Eghball (2001) Soil properties in the 15- to 30-cm increment were unaffected by the applied treatments except soil electrical conductivity (EC). Residual soil NO3 to a depth of 1.2 m was greater for inorganic fertilizer than manure and compost treatments in drier years. Soil property changes were greater for the annual or biennial N-based than P-based manure or compost applications, reflecting the differences in application amounts. Lora *et al*. (2006), used different levels of organic and mineral fertilization with lettuce, found that mineral fertilizer and its combination with organic fertilizer was better than organic fertilizer alone for total yields, Sakara and Zhiltsov (2007) used organic and mineral fertilization with vegetables, showed that organic fertilizer generally gave higher yields than mineral fertilizer but highest yields were obtained in case of application of both of them and Porto *et al*. (2008), used different levels of organic fertilization with lettuce, reported that lettuce yield was significantly higher when organic fertilizer was used, compared to the mineral nutrient supply.

Data in Table (7) shows the effect of compost depth on vegetative growth of cucumber plants. There were significant differences in all vegetative growth parameters: plant height, number of leaves, leaf area per plant. The highest plant height was found in 30cm depth, however the lowest value was found in the control treatment. The same was found in number of leaves and leaf area per plant. The same was found in the second season. Data in Table (8) shows the effect of compost depth on plant fresh weight ,plant dry weight and total yield. There were significant differences in all parameters. The highest fresh weight and dry weight of plant was found in 30 cm depth ,however the lowest fresh and dry weights were found in the control treatment. The highest total yield was found in 30cm depth, however the lowest value was found in the control treatment. The same trend was found in the second season. Data in Table (9) shows the effect of compost depth on NPK contents and chlorophyll content in cucumber plants. There were significant differences in all parameters. The highest chlorophyll was found in 30cm depth, however the lowest value was found in the control treatment. The same was found in NPK contents. The same trend was found in the second season. These results were in line with those obtained by Abou-El-Hassan *et al* (1993). They showed that on 2 successive winter seasons (1989-90 and 1990-91) cucumber cv. Katia seedlings were grown in 50-cm-deep trenches filled with either faba straw or rice straw covered with a 10-cm layer of clay or sand. Other seedlings were grown in trenches filled with sand or clay only. The straw media gave higher yields than sand or clay only. Rice straw covered with sand gave the plant fresh weight and dry matter content. Fresh weight, dry matter content and yield were generally lower in the second year on the same substrate. All the substrates investigated increased the organic matter content of the soil.

Table 5: Effect of different compost depths on physical characteristics of lettuce plant leaves grown under net plastic house.

	2009/2010					2010/2011				
Treatment	fresh weight g/plant	dry weight (g/100g head fresh weight)	number of leaves / plant of head	head size (cm3) of lettuce	Total yield g/plant	fresh weight g/plant	dry weight (g/100g head fresh weight)	number of leaves / plant of head	head size (cm3) of lettuce	Total yeild
0	454.7	5.7	31.0	1264.3	454.7	451.9	6.0	32.0	1264.3	451.9
15	549.7	6.4	33.0	1682.7	549.7	548.2	6.9	34.0	1679.7	548.2
30	491.4	6.5	31.7	1641.3	491.4	484.2	6.7	32.7	1637.3	484.2
L.S.D	7.68	0.033	0.074	4.07	7.68	10.88	0.045	0.074	5.41	10.88

Table 6: Nitrogen, Phosphorus, Potassium and chlorophyll content in lettuce plants as affected by different compost depths.

	2009/2010				2010/2011			
Treatment	%N	%P	%K	chlorophyll SPAD	%N	%P	%K	Chlorophyll SPAD
0	3.5	0.5	5.5	5.8	3.6	0.5	5.9	6.0
15	4.2	0.8	6.8	7.6	4.4	0.8	7.3	7.8
30	3.7	0.7	6.2	6.3	3.6	0.7	6.5	6.4
L.S.D	0.006	0.001	0.034	0.06	0.014	0.003	0.027	0.04

Table 7: Effect of different compost depths on physical characteristics of cucumber plant grown under net plastic house.

	2009/2010			2010/2011		
Treatment	plant height/cm	Number of leaves	Leaf area /plant cm2	plant height/cm	Number of leaves	Leaf area /plant cm2
0	240.8	28.6	8481.0	242.8	29.0	8480.3
15	265.0	30.6	9976.0	266.3	30.9	9975.0
30	271.3	32.5	10176.7	272.3	33.1	10175.3
L.S.D	1.87	0.078	2.962	4.645	0.231	4.740

Table 8: Effect of different compost depths on vegetative growth of cucumber plant grown under net plastic house.

	2009/2010			2010/2011		
Treatment	Total yield/g/plant	fresh weight g/plant	dry weight g/plant	Total yield/g/plant	fresh weight g/plant	dry weight g/plant
0	2528.7	189.2	32.4	2529.7	189.4	32.9
15	2821.7	262.6	43.7	2822.3	259.4	44.5
30	2995.0	280.5	54.3	2997.0	276.9	55.0
L.S.D	6.85	0.067	0.065	2.88	0.167407	0.438

Table 9: chlorophyll, Nitrogen, Phosphorus, and Potassium uptake of content in cucumber plants as affected with different compost depths.

	2009/2010				2010/2011			
Treatment	chlorophyll SPAD	%N	%P	%K	chlorophyll SPAD	%N	%P	%K
0	25.3	2.9	0.4	3.1	26.0	3.0	0.4	3.1
15	26.1	3.5	0.5	3.5	27.0	3.7	0.5	3.5
30	36.2	4.0	0.6	3.6	26.8	4.2	0.6	4.1
L.S.D	0.024	0.04	0.002	0.046	0.004	0.078	0.002	0.069

Data in Table (10) shows the effect of compost depth on stem thickness, plant fresh weight and plant dry weight. There were significant differences in all parameters. The highest stem thickness was found in 30cm depth, however the lowest value was found in the control treatment. The same was found in plant fresh weight and plant dry weight. The same trend was found in the second season. Data in Table (11) shows the effect of compost depth on ear weight with husked ear weight without husked and ear length. There were significant differences in all parameters. The highest ear weight with husked was found in 30cm depth; however the lowest value was found in the control treatment. The same was found in ear weight without husked and ear length. The same trend was found in the second season. Data in Table (12) shows the effect of compost depth on number of grains per row, fresh weight of 1000 grains and dry weight of 1000 grains and total yield,. There were significant differences in all parameters. The highest number of grains per row was found in 30cm depth, however the lowest value was found in the control treatment. The same was found in fresh weight of 1000 grains and dry weight of 1000 grain. The same trend was found in the second season. Data in Table (13) shows the effect of compost depth on NPK contents. There were significant differences in all parameters. The highest total yield was found in 30cm depth, however the lowest value was found in the control treatment. The same was found in NPK contents. The same trend was found in the second season. Similar results were obtained by Hassan (2004). who showed that increasing nitrogen fertilization levels led to significant increase in P%, K%, 100-grain weight, ear lenghth,ear diameter and number of grains / row in both growing both seasons.

Table 10: Effect of different compost depths on vegetative growth of sweet corn plant grown under net plastic house.

	2009/2010			2010/2011		
Treatment	Stem thinck/mm	Fresh weight/g	Dry weight/g	Stem thinck/mm	Fresh weight/g	Dry weight/g
0	94.3	166.7	13.3	95.8	168.1	13.4
15	115.7	196.0	14.7	114.9	195.3	15.3
30	125.3	220.7	20.3	124.5	219.8	20.1
L.S.D	8.74	12.18	0.296	9.04	13.2	0.115

Table 11: Effect of different compost depths on physical characteristics of sweet corn plant grown under net plastic house.

	2009/2010			2010/2011		
Treatment	husked ear weight/g	Unhusked ear weight/g	Ear length /cm	husked ear weight/g	Unhusked ear weight/g	Ear length/cm
0	245.6	174.3	15.9	244.0	171.7	15.6
15	275.9	194.5	17.9	278.7	191.1	17.5
30	335.3	216.4	21.0	334.0	218.7	21.4
L.S.D	10.07	10.23	0.19	10.29	10.01	0.37

Table 12: Effect of different compost depths on vegetative growth of sweet corn plant grown under net plastic house.

	2009/2010				2010/2011			
Treatment	Number of grains /row	Fresh weight of 1000 grain	Dry weight of 1000 grain	Total yield(kg/plant)	Number of grains /row	Fresh weight of 1000 grain	Dry weight of 1000 grain	Total yield (kg/plant)
0	23.0	302.9	102.8	1.03	24.2	304.5	101.3	1.2
15	24.7	308.3	110.8	1.5	26.2	309.2	108.3	1.6
30	30.0	314.9	117.0	1.1	31.5	315.9	116.0	1.3
L.S.D	0.185	1.206	0.232	0.18	0.147	1.44	0.629	0.2

Table 13: Nitrogen, Phosphorus, and Potassium uptake of content in Sweet corn plants as affected bydifferent compost depths.

	2009/2010			2010/2011		
Treatment	%N	%P	%K	%N	%P	%K
0	2.9	0.4	3.1	3.0	0.4	3.1
15	3.5	0.5	3.5	3.7	0.5	3.5
30	4.0	0.6	3.6	4.2	0.6	4.1
L.S.D	0.04	0.002	.046	0.078	00.2	0.69

References

Abou-El-Hassan, E.A., A.H. Khereba, M.S. Youssef, M.H. Zaki and H. Khalifa, 1993. Studies on using some local media for two successive years without sterilization on plant growth, yield and nutrient uptake of cucumber grown under unheated greenhouses in Egypt. Acta Ho.rticulturae., 323: 451-460.

Bahman Eghball, 2001. Soil Properties as Influenced by Phosphorus- and Nitrogen-Based Manure and Compost Applications . USDA-ARS, Dep. of Agron. and Hortic., Univ. of Nebraska-Lincoln, Lincoln, NE 68583.

Chapman, H.D and P.F. Pratt, 1961. Methods of analysis for soil, plant and water. Calif,univ.U.S.A

El-Aidy, F., 1993. Preliminary results on the possibility of using straw as natural substrate for growing cucumber under plastic greenhouses. Acta Horticulturae. 323: 423-427.

El-Messery, M.M.A., S.M. Khalaf, R.M.E. Helal and M.M. Soliman, 2003. Effect of organic fertilization on yield and quality of some vegetable crops under saline condition. Research Bulletin, Ain Shams Univ.Cairo Egypt.

Grazia, J.D., P.A.Tittonell, D.Germinara, A.D. Chiesa and J. Grazia, 2003. Phosphorus and nitrogen fertilization in sweet corn (Zea mays L.var.saccharata bailey).Spanish .J.Agri. Res., 1(2): 103-107.

Hassan, M.M., 2004. Response yellow maize to mitrogen, potassium fertilization and plant density. Ph. D.Thesis, Fac. Agric., Al-Azhar, Univ., Egypt.

Jackson, L.E., I. Morales, I.R. Ramirez and S.T. Koike, 2004. Minimum tillage practices affect disease and yield of lettuce. California Agriculture. 2002. 56: 1, 35-38, 40. 3 ref.

Jackson, L.E., I. Ramirez, R. Yokota, S.A. Fennimore, S.T. Koike, D.M. Henderson, W.E. Chaney, F.J. Calderonand, K. Klonsky, 2001. On-farm assessment of organic matter and tillage management on vegetable yield, soil, weeds, pests, and economics in California. Agriculture, Ecosystems & Environment. 2004. 103(3): 443-463.

Lora, S.R., L.M. pulido, A.M. Mendez and F.B. Pena, 2006. Effect of mineral and organic fertilization on yield of lettuce in a typic Hapludalfs soil of medium fertility . Revista U.D.C.A. Actualidad & Divulgacion Centrifica

Oraby, F.T., A.A. Sarhan, M.F. Abdel-Maksoud and A.H. Bassiouny, 2003. Proper agronomic practices required to maximize productivity of some maize varieties in old and reclaimed soils. Effect of sowing dates on response of two maize hybrids to nitrogen fertilization. Egypt. J. Appl. Sci., 18(58): 597-618.

Pandey, C. and S. Shukla, 2006). Effects of composted yard waste on water movement in sandy soil. Compost Science & Utilization, 14(4): 252-259.

Porto, M.L.,C.J. Alves, P.A. Souza, C.R. Araujo and A.J. Arruda, 2008. Nitrate production and accumulation in lettuce as affected by mineral nitrogen supply and organic fertilization. Horticultura Brasileira. 26(2): 227-230.

Ricci, M.S.F., D.W.V. Casali, A.A. Cardoso and A.H. Ruiz, 1995. Nutrient contents in two lettuce cultivars fertilized with organic compost. Pesquisa Agropecuaria Brasileira, 30(8): 1035-1039.

Rooster, L., 1999. Use of compost in vegetable growing Proeftuinnieuws., 9(6): 29-32.

Sakara, N.A. and Y.A. Zhiltsov, 2007. Evaluating the adaptive potential of cabbage cultivars and hybrids in the primore territory . Kartofeli Ovoshchi., 7: 8-9.

Siddiqui, M.A. and M.M. Alam, 1999. Integrated control of plant parasitic nematodes with organic soil amendments/nematicides and ploughing on okra. Proceedings of the Indian National Science Academy. Part B, Reviews and Tracts - Biological Sciences. 1997. 63(6): 545-550. 26 ref.

Snedecor, G.W. and W.G. Cochran, 1980. Statistical methods Oxford and J.BH Publishing Com., 7th edition.

Tuzel, Y., A. Gul, I.H. Tuzel and A.R. ongun, 2003. Organic cucumber production under green house conditions. Acta Horticulturae., 608: 149-157.

Vidigal, S.M., C.A. Ribeiro, D.w.v.Casali and F.E.L. Fontes, 1995. Response of lettuce (Lactuca sativa L.) to the residual effect of organic compost. I. Field trial . Revista Ceres, 42(239): 80-88.