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Effect of Vermicompost and Nitrogen Levels Fertilization on Yield and Quality of Head Lettuce

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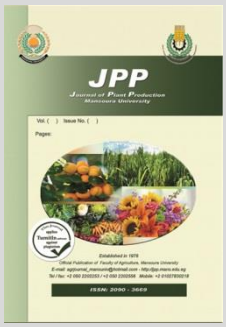

ABSTRACT

Two field experiments were conducted during the two successive winter seasons of 2019 and 2020. Faculty of Agriculture, Mansoura University, Egypt, to study the impact of organic fertilizers with vermicompost levels (1.5, 2.5 and 3.5 ton/fed) and mineral fertilizers with nitrogen levels (50, 75 and 100% N) from recommended dose and their interactions on growth, yield, chemical constituents and quality of head lettuce (*lactuca sativa* L.) cv Kharga. The results of this research showed that the highest values of fresh weight, dry matter percentage, yield/fed, chemical and quality parameters as well as the lowest values of nitrate (NO_3) and nitrite (NO_2) contents were obtained from fertilizing plants with vermicompost 3.5 t/fed. with N application at the rate of 75% followed by 100% from recommended dose in both seasons. In general, it could be recommended that fertilization plants with vermicompost 3.5 t/fed. with 75% N from the recommended dose in order to increasing head lettuce productivity and quality.

Keywords: head lettuce, vermicompost, nitrogen levels.

INTRODUCTION

Head lettuce (*Lactuca sativa* L.) belongs to the family Asteraceae, it's a rich source of vitamin A, E, C, antioxidants and phytochemicals which are anti-carcinogenic. It also provides a small amount of fat, some dietary fiber, protein, and carbohydrates, moreover some minerals. Head lettuce is commonly used as salad vegetables.

Supplementation of soil with organic matter increases aggregate formation, consequently get better soil aeration and water holding capacity, as well as, organic matter plays important role in regulation of soil pH which promote the nutrient uptake. However, the most important action of organic matter is the biological effects, so it increases the population of the microorganisms. Because of the aforementioned effects, organic matter has been paid attention in various new studies and vermicompost has taken its site in those research as one of the most essential supplementing agent for fertilization and soil properties improvement.

Vermicompost improves growth and development of plants when added even in little amounts, also it is effectively utilized in both floriculture and horticulture. Vermicompost makes plants qualified, healthy and productive, also organize plants development via supplying with humic acid and hormones. Also, it contributes in soil fertility and its quality by increment microbial activity and inhibits destruction of soil borne pests and diseases. (Arancon and Edwards, 2005). Durak *et al*. (2017) reported that growth parameters and yield were increased by vermicompost addition compared to control treatment and normal fertilization. It was concluded that application of 300 kg vermicompost per hectare is a promising in lettuce plants production for optimal yield as well as soil improvement.

Vermicompost have also positive influences on chemical, physical and biological properties for soil (Tejada *et al*., 2006). Application of organic and inorganic fertilizers increase growth and yield, furthermore it can improves the efficiency of the usage of organic and inorganic fertilizers to decrease production costs (Chatterjee, 2008). Vermicompost application combine with inorganic fertilization gave significant affection on yield and quality of tomato and cabbage plants moreover soil characteristies improvement (Goswami *et al* 2017). Frasetya *et al* (2019) reported that the addition of 5 t ha-1 vermicompost increased significantly lettuce plant growth.

There is a big need for more studies under Egyptian circumstances to recommendation for decreasing the amounts of nitrogen as mineral fertilizer, which is consumed in big quantities and thus causes reduction the product quality. It is well known that N has greater impact on growth parameters and yield of plants as other essential nutrients. Nitrogen plays necessary roles in many biochemical and physiological processes in plants. It is a constituent of the chlorophyll and many enzymes, who plays an essential role on the photosynthesis processes of plants. As well as it plays essential roles in many metabolic reactions and a structural constituent of cell walls (Marschner, 2012). Also, El- Bassyouni (2016) show that the vegetative growth, yield and a lot of chemical contents in lettuce plants were improving with increasing addition doses of N fertilizer from 60 to 100 kg N/fed. The highest values of dry matter and vitamin C and less nitrate content in lettuce heads were recorded from the moderate application (80 kg N/fed), compared to (100 kg N/fed) treatment. Gioia *et al.* (2017) reported that N rates (60,

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120, 180 kg N/ha) affected fresh and dry weights, dry matter of lettuce plants, N accumulation, N use efficiency and the estimated N losses at the end of the crop season comparing with control treatment (0 kg N/ha) . The commercial fresh matter and the number of leaves per plant were influenced by N fertilizer and increased with an increase in N dose. The superior responses observed when lettuce plants fertilized with the highest dose (171 kg N/ha) (Souza *et al.*, 2017).

The main objective of this study was to evaluate the impact of vermicompost and nitrogen fertilizers doses on yield and quality of head lettuce plants.

MATERIALS AND METHODS

Analysis of soil:

Soil samples in both seasons of study, were taken at random from soil surface at a depth of (0 – 30 cm) before soil preparation to estimate the mechanical and chemical soil properties as shown in Table 1.

Table 1. Some physical and chemical properties of experimental soil during 2019 and 2020 seasons:

Seasons	Mechanical analysis (%)				Texture class	OM (%)	SP	Total $CaCO_3$ g/kg	EC dS.m^{-1} 1:5	pH (1:2.5)	Available (mg/kg soil)		
	Coarse Sand	Fine Sand	silt	clay							N	P	K
1st	2.8	22.1	40.3	34.8	Loamy	1.93	51.7	2.45	1.27	7.88	49.8	6.72	312
2nd	3.4	24.3	42.1	30.2	Loamy	2.03	53.9	2.64	1.43	7.76	51.1	7.12	319

SP: saturation percentage OM: Organic matter EC: Electrical conductivity

The experimental design and treatments:

This experiment was carried out in strip –plots design with 3 replicates in both seasons of study. The experiment contained 9 treatments including 3 levels of vermicompost (1.5, 2.5 and 3.5 ton/fed) and 3 levels of nitrogen fertilizers (50, 75 and 100% from recommended dose "65 kg N/fed"). Each experimental basic unit included 3 ridges, each of 5 m length and 0.7m width resulted an area of 10.5 m^2.

Vermicompost properties:

Vermicompost was applied during soil preparation. Chemical analysis of vermicompost are shown in Table 2

Table 2. Chemical analysis of vermicompost:

%			C/N	%			PH	EC
OM	OC	N		P	K	SP	(1:10)	dS-m^{-1}
34.62	20.08	1.68	1:16	2.11	1.31	105	7.53	2.24

OM: Organic matter OC: Organic carbon SP: Saturation percent

Nitrogen fertilizers:

Nitrogen fertilizers in the form of ammonium sulphate 20.5 % N were added to the soil in two equal doses, first one were added after 3 weeks from transplanting date, and the second was added after three weeks from the first addition.

Agricultural practices:

The field of experimental fertilized with calcium super phosphate (15.5 % P_2O_5) at the rate of 300 kg/fed was added during soil preparation. Seedlings of lettuce were immediately planted in the soil on 2 and 5 January in the 1st and 2nd seasons, respectively. K fertilizer in the form of potassium sulphate (100 kg/fed) was added with N fertilizer in two equal doses. In the both seasons of this study, all other agricultural practices were done according to the recommendations of Ministry of Agriculture and Land Reclamation.

Studies characters:

1. Vegetative growth parameters and yield:

After 90 days from transplanting, samples of 10 plants were randomly taken from each experimental unit to determine the following parameters:

1. Weight of edible head.
2. Dry matter: Samples from lettuce leaves (100g fresh weight) were dried in the oven at 70 °C until constant weigh was reached then dry matter was estimated.
3. Total yield.
4. Chlorophylls concentration: Chlorophyll a, b and total chlorophyll were determined in the leaves of lettuce plants at harvest according to the methods described by Wettstein (1957).

2. Chemical constituents

N and P percentage were determined in dried plant materials according to the methods described by Jackson (1967). While, K percentage was determined in lettuce plants using a flame photometer according to Black (1965).

3. Quality parameters:

1- **Crude protein percentage**: Was calculated by multiplying the total nitrogen by the factor 6.25.

2- **Total soluble solids percentage (TSS %):** Was estimated in leaves of lettuce plants by using Gali 110 Refractometer according to **AOAC (1990).**

3- **Vitamin C (Ascorbic acid) concentration:** It was determined according to the method reported in AOAC (1990).

4- **Vitamin E concentration**: It was estimated by reversed phase high performance liquid chromatography according to Gimeno *et al.* (2000).

5- **Nitrate (NO_3) and nitrite (NO_2) concentrations**: were determined in dry leaves as described by Singh (1988).

Statistical analysis:

Data were statistically analyzed according to the technique of analysis of variance (ANOVA) for the strip – plot design as published by Gomez and Gomez (1984) by means of "MSTAT-C" Computer software package. Least significant difference (LSD) method was used to test the differences between treatment means at 5 % level of probability as described by Snedecor and Cochran (1980).

RESULTS AND DISCUSSION

1. Vegetative growth parameters and yield.

Effect of vermicompost levels:

Results in Tables 3 and 4 reveal that significant effects of vermicompost levels *i.e.* 1.5, 2.5 and 3.5 t/fed. on fresh weight, dry matter %, total yield, chlorophyll a, b and total of head lettuce plants. Adding 3.5 t/fed. gave the highest significant values of all aforementioned parameters during both seasons except dry matter % in the second season where adding 2.5 t/fed. occupied the first place.

These results may be due to the positive influences of vermicompost that contains 34.62 % OM (Table 2) on physical, chemical and biological properties of the soil which is considered poor in organic matter as shown in Table 1. Also it may be reduce the alkalinity of the soil (pH 7.88 and 7.76 in both seasons respectively), which facilitates

the absorption of many nutrients. Moreover, the increase in the level of organic matter increases the biological activity in the soil which caused the increase in concentration of available nutrients for absorption by plant roots, hence reflected on positive effects on chlorophyll formation, vegetative growth and yield quantity. These results are in agreement with those obtained by (Arancon and Edwards, 2005; Tejada *et al*., 2006 and. Frasetya *et al* .,2019)

Table 3. Fresh weight of plant, dry matter percentage and total yield t/fed of lettuce as affected by vermicompost and nitrogen fertilizer levels as well as their interaction during 2019 and 2020 seasons.

Characters / Treatments		Fresh weight (g/plant)		Dry matter (%)		Total yield (t/fed)	
		1st	2nd	1st	2nd	1st	2nd
A- Vermicompost levels:							
1.5 t/fed		638.1	733.6	9.85	11.19	12.811	14.656
2.5 t/fed		659.0	755.7	10.02	11.72	13.222	15.067
3.5 t/fed		674.8	768.6	10.33	11.60	13.533	15.356
LSD at 5 %		9.0	9.2	0.15	0.13	0.195	0.194
B- Nitrogen fertilizer levels (ratio of the recommended dose):							
50 %		623.7	720.2	9.53	11.01	12.556	14.400
75 %		671.2	765.6	10.28	11.70	13.444	15.256
100 %		677.0	772.0	10.39	11.80	13.567	15.422
LSD at 5 %		8.9	8.8	0.14	0.13	0.183	0.171
C- Interaction:							
1.5 t/fed	50 %	612.8	707.4	9.34	10.79	12.333	14.133
	75 %	644.5	737.4	10.00	11.25	12.900	14.700
	100 %	657.0	756.0	10.22	11.53	13.200	15.133
2.5 t/fed	50 %	624.8	721.1	9.50	11.19	12.600	14.400
	75 %	671.0	764.8	10.19	11.87	13.433	15.267
	100 %	681.3	781.1	10.37	12.11	13.633	15.533
3.5 t/fed	50 %	633.4	732.2	9.75	11.05	12.733	14.667
	75 %	698.2	794.5	10.67	11.99	14.000	15.800
	100 %	692.8	779.0	10.58	11.76	13.867	15.600
LSD at 5 %		9.7	9.3	0.13	0.14	0.210	0.226

Table 4. Chlorophyll a, b and total chlorophylls concentrations in lettuce leaves as affected by vermicompost and nitrogen fertilizer levels as well as their interaction during 2019 and 2020 seasons.

Characters / Treatments		Chlorophyll a (mg/g FW)		Chlorophyll b (mg/g FW)		Total chlorophylls (mg/g FW)	
		1st	2nd	1st	2nd	1st	2nd
A- Vermicompost levels:							
1.5 t/fed		0.646	0.693	0.456	0.505	1.102	1.198
2.5 t/fed		0.658	0.708	0.467	0.518	1.124	1.226
3.5 t/fed		0.668	0.717	0.478	0.529	1.146	1.246
LSD at 5 %		0.004	0.005	0.004	0.005	0.004	0.005
B- Nitrogen fertilizer levels (ratio of the recommended dose):							
50 %		0.637	0.686	0.445	0.494	1.082	1.181
75 %		0.666	0.714	0.476	0.527	1.142	1.241
100 %		0.669	0.717	0.479	0.530	1.148	1.248
LSD at 5 %		0.002	0.003	0.005	0.006	0.007	0.005
C- Interaction:							
1.5 t/fed	50 %	0.630	0.681	0.438	0.485	1.068	1.166
	75 %	0.651	0.693	0.462	0.514	1.114	1.206
	100 %	0.657	0.705	0.466	0.517	1.123	1.222
2.5 t/fed	50 %	0.636	0.685	0.444	0.494	1.080	1.179
	75 %	0.664	0.715	0.474	0.524	1.138	1.239
	100 %	0.673	0.723	0.482	0.537	1.154	1.260
3.5 t/fed	50 %	0.644	0.693	0.453	0.505	1.098	1.197
	75 %	0.682	0.735	0.492	0.544	1.173	1.279
	100 %	0.677	0.724	0.489	0.537	1.166	1.262
LSD at 5 %		0.008	0.007	0.007	0.006	0.010	0.010

Effect of nitrogen fertilizer levels:

Data presented in Tables 3 and 4 indicate that significant differences among the three levels of nitrogen (50, 75 and 100%) from recommended dose on fresh weight, dry matter % , total yield, chlorophyll a, b and total concentrations of head lettuce plants in both seasons. The highest values of all aforementioned parameters were recorded when head lettuce plants fertilized with 100% N followed by 75% N, and the differences between 100% and 75% N from recommended doses were insignificant in both seasons of study except, chlorophyll a in the first season and total chlorophylls in the second season.

These results may be due to a vital role of nitrogen in many biochemical and physiological processes in lettuce plants. It is a component of many important organic compounds ranging from proteins to nucleic acids. It is a constituent of the chlorophyll molecule and many enzymes, which play an important role in plant photosynthesis which reflected positively on the aforementioned parameters. These results are in harmony with those recorded by El-Bassyouni (2016), Gioia *et al*. (2017) and Souza *et al*. (2017).

Effect of interaction:-

Concerning the effect of interaction among vermicompost and nitrogen levels on fresh weight, dry matter % , total yield, chlorophyll a, b and total of head lettuce plants, data in the same Tables show significant effects in the 1st and 2nd season. The highest values were recorded from the interaction between vermicompost at 3.5 t/fed. and 75% N followed by vermicompost at 3.5 t/fed and 100% N from recommended dose and the differences were insignificant except, fresh weight in the first season, chlorophyll a, b, total in the second season and total yield in the first season. These results are due to the individual effects of the treatments mentioned previously, which showed significant superiority for the treatment of vermicompost at a rate of 3.5 t/fed for most of the estimates. On the other hand, the two treatments of N application at rates of 100 and 75% kg N/fed were significantly superior over treatment of 50 kg N/fed, without significant differences between them.

2-Chemical composition:

N, P , K and crude protein percentage in head lettuce

Effect of vermicompost levels:

It is clear from data presented in Table 5 that increasing vermicompost levels from 1.5 to 3.5 t/fed were significantly increased N, P , K and crude protein% in head lettuce plants during both seasons. The highest values were recorded when plants fertilized with vermicompost at 3.5 t/fed. followed by 2.5 t/fed. during both seasons.

These results may be attributed to the high content of vermicompost in the organic matter and the narrow deference between carbon and nitrogen (C/N) as shown in Table 2, as this leads to an increase in the mineralization process and the quantities of available elements in the soil for absorption by plant roots, in addition an increase in Co_2 in the soil solution which causes a decrease in the alkalinity of the soil and thus reflected on growth and increase roots ability to absorb an abundant amounts of nutrients and consequently increase N, P and K in the plant tissues, moreover increment in chlorophyll content which caused the increase in the efficiency of photosynthesis process,

which reflected positively on protein formation. These results confirm those obtained by Frasetya *et al* 2018 and 2019

Table 5. N, P, K and protein percentages in lettuce leaves as affected by vermicompost and nitrogen fertilizer levels as well as their interaction during 2019 and 2020 seasons.

Characters		N(%)		P(%)		K(%)		Protein(%)	
Treatments		1st	2nd	1st	2nd	1st	2nd	1st	2nd
A- Vermicompost levels:									
1.5 t/fed		1.932	1.650	0.204	0.182	2.259	1.979	11.11	9.48
2.5 t/fed		2.089	1.823	0.218	0.199	2.381	2.076	12.01	10.48
3.5 t/fed		2.224	1.946	0.230	0.211	2.509	2.194	12.79	11.18
LSD at 5 %		0.030	0.025	0.004	0.004	0.040	0.035	0.22	0.26
B- Nitrogen fertilizer levels (ratio of the recommended dose):									
50 %		1.810	1.543	0.192	0.172	2.146	1.852	10.40	8.87
75 %		2.201	1.938	0.227	0.206	2.490	2.178	12.65	11.14
100 %		2.234	1.938	0.233	0.214	2.513	2.219	12.84	11.14
LSD at 5 %		0.031	0.022	0.003	0.002	0.038	0.030	0.28	0.20
C- Interaction:									
	50 %	1.727	1.417	0.183	0.160	2.053	1.757	9.93	8.14
1.5 t/fed	75 %	2.000	1.740	0.207	0.183	2.327	2.050	11.50	10.00
	100 %	2.070	1.793	0.220	0.203	2.397	2.130	11.90	10.31
	50 %	1.803	1.557	0.193	0.174	2.137	1.853	10.37	8.95
2.5 t/fed	75 %	2.197	1.933	0.227	0.207	2.483	2.143	12.63	11.11
	100 %	2.267	1.980	0.234	0.215	2.523	2.230	13.03	11.38
	50 %	1.900	1.657	0.200	0.183	2.247	1.947	10.92	9.52
3.5 t/fed	75 %	2.407	2.140	0.247	0.227	2.660	2.340	13.84	12.30
	100 %	2.367	2.040	0.244	0.223	2.620	2.297	13.61	11.73
LSD at 5 %		0.033	0.028	0.007	0.005	0.042	0.035	0.31	0.26

Effect of nitrogen fertilizer levels:

Data shown in Table 5 clarify that increasing nitrogen fertilizers levels from 50 to 100% from recommended doses significantly increased the amount of N, P , K and crude protein% in both seasons. The highest values were recorded when head lettuce plants fertilized with 100% N followed by 75% N and the differences between them had insignificant effects except, N% and P% in the first season and k% in the second season.

These results are logical, thus the relationship among nitrogen amounts addition and both vegetative growth vigor, photosynthesis process and carbohydrate formation in plant leaves is proportional and parallel, and consequently increment in growth, spread of roots in a wide area of the soil, and nutrients absorption including N,P and K . Similar result was reported by Gioia *et al.* (2017).

Effect of interaction:

From Table 5, data reveal that the interaction between vermicompost and N levels fertilizers gave significant positive effects on N, P , K and crude protein% in both seasons. The highest values were obtained when head lettuce plants fertilized with vermicompost 3.5 t/fed. and 75% N from recommended dose in both seasons followed by vermicompost 3.5 t/fed. plus 100% N from recommended dose and the differences were insignificant except, N% in both season , K% in the second season and crude protein% in the second season.

3- Quality parameters:

TSS, VC, VE, NO_3-N and NO_2-N in head lettuce

Effect of vermicompost levels:

Results in Table 6 indicate that the highest levels of vermicompost "3.5 t/fed". gave the highest significant values of TSS, VC and VE , it gave the lowest values of NO_3-N and NO_2-N during both seasons followed by fertilizing with vermicompost at the rate of "2.5 t/fed".

Table 6. TSS percentage, VC, VE, NO_3-N and NO_2-N concentrations in lettuce leaves as affected by vermicompost and nitrogen fertilizer levels as well as their interaction during 2019 and 2020 seasons.

Characters		TSS(%)		VC(mg/100 g FW)		VE(mg/100 g FW)		NO_3-N(ppm)		NO_2-N(ppm)	
Treatments		1st	2nd	1st	2nd	1st	2nd	1st	2nd	1st	2nd
A- Vermicompost levels:											
1.5 t/fed		4.066	4.439	16.81	12.52	0.206	0.308	139.2	118.5	2.280	1.876
2.5 t/fed		4.422	4.856	17.44	13.44	0.226	0.325	135.1	122.3	2.143	1.726
3.5 t/fed		4.711	5.144	17.96	13.91	0.241	0.342	130.6	111.0	2.032	1.632
LSD at 5 %		0.039	0.033	0.10	0.07	0.005	0.004	1.5	1.6	0.040	0.038
B- Nitrogen fertilizer levels (ratio of the recommended dose):											
50 %		3.802	4.246	16.29	12.07	0.192	0.295	130.2	111.8	2.020	1.603
75 %		4.661	5.020	17.90	13.87	0.238	0.338	132.0	116.0	2.071	1.658
100 %		4.736	5.173	18.03	13.95	0.243	0.341	142.8	124.0	2.364	1.972
LSD at 5 %		0.032	0.029	0.14	0.11	0.004	0.004	1.1	1.4	0.041	0.039
C- Interaction:											
	50 %	3.577	4.037	15.71	11.14	0.183	0.285	135.5	114.5	2.180	1.753
1.5 t/fed	75 %	4.247	4.453	17.35	13.08	0.213	0.314	137.6	117.5	2.227	1.843
	100 %	4.373	4.827	17.37	13.35	0.223	0.325	144.5	123.4	2.433	2.030
	50 %	3.833	4.253	16.40	12.38	0.192	0.294	129.5	114.7	1.993	1.570
2.5 t/fed	75 %	4.620	5.063	17.73	13.90	0.238	0.335	132.5	123.0	2.073	1.643
	100 %	4.813	5.250	18.20	14.06	0.248	0.345	143.4	129.2	2.363	1.963
	50 %	3.997	4.447	16.76	12.67	0.202	0.307	125.6	106.2	1.887	1.487
3.5 t/fed	75 %	5.117	5.543	18.62	14.64	0.264	0.366	125.8	107.6	1.913	1.487
	100 %	5.020	5.443	18.52	14.43	0.258	0.354	140.5	119.2	2.297	1.923
LSD at 5 %		0.054	0.048	0.20	0.17	0.008	0.007	2.3	2.2	0.052	0.048

Effect of nitrogen fertilizer levels:

Data shown in Table 6 clear that increasing nitrogen levels from 50 to 100% from recommended doses significantly effects on TSS, VC , VE , NO_3-N and NO_2-N during both seasons. The highest significant values were recorded when head lettuce plants fertilized with 100% N followed by 75% N from recommended dose in both seasons.

Effect of interaction:-

Data presented in the same Table reveal that the interaction among vermicompost and N levels fertilizers gave significant positive effects on TSS, VC, VE, NO_3-N

and NO_2-N during both seasons. The highest significant values of TSS, VC and VE were recorded when head lettuce plants fertilized with vermicompost "3.5 t/fed" and 75% N from recommended dose in both seasons followed by fertilized with vermicompost "3.5 t/fed" and 100% N from recommended dose except, VC in the first season. However, the highest values of NO_3-N and NO_2-N contents were recorded when head lettuce plants fertilized with vermicompost "1.5 t/fed" and 100% N. On other hand, the lowest significant vales of NO_3-N and NO_2-N contents were recorded when head lettuce fertilized with vermicompost "3.5 t/fed" plus 50% N or 75% N from recommended dose in both seasons.

CONCLUSION

In view of obtained and discussed results, it was found that fertilizing head lettuce plants with 3.5 t/fed vermicompost during soil preparation, in addition 75% N fertilizer from recommended quantity to get a good yield with high quality and minimizing the environmental pollution and production costs.

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تأثير التسميد بمستويات من الفيرمكمبوست والسماد النتروجيني علي المحصول والجودة لخس الرؤوس

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أجريت تجربتان حقليتان فى الموسمين الشتويين لعامى 2019- 2020 في المزرعة البحثية لكلية الزراعة جامعة المنصورة لدراسة تأثير التسميد العضوي بالفيرمكمبوست بمعدلات (1.5 و 2.5 و 3.5 طن/فدان) والتسميد النتروجيني بمعدل (50 و 75 و 100%) من الكمية الموصي بها علي النمو الخضري والمحصول وصفات الجوده لنباتات خس الرؤوس صنف خرج. وقد أظهرت النتائج ان اعلي قيم بدرجه معنوية لقياسات النمو الخضري المتمثلة في الوزن الخضري والنسبه المئوية للماده الجافه وكذلك المحصول ومحتوي النبات من الكلوروفيل أ و ب والكلي وصفات الجوده وتشمل المواد الصلبة الذائبة – فيتامين سي – فيتامين إي علاوة علي انخفاض تركيز كلا من النترات والنيتريت قد تم الحصول عليها نتيجة اضافه الفيرمكمبوست بمعدل 3.5 طن للفدان مع التسميد النتروجيني بمعدل 75% من الكمية الموصي بها . لذلك توصي الدراسة بتسميد نباتات الخس الرؤوس بالفيرمكمبوست بمعدل 3.5 طن للفدان مع التسميد النتروجيني بمعدل 75% من الكمية الموصي بها للحصول على اعلي محصول وافضل صفات جوده مع تقليل التلوث والتكاليف.