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EVALUATION OF ORGANIC FERTILIZATION WITH DATE PALM WASTE AND SPRAYING WITH EXTRACT OF DECOMPOSING DATE PALM SEEDS ON CUCUMBER YIELD UNDER OPEN FIELD CONDITIONS

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Abstract

This field experiment was carried out during the spring season of 2017 in the fields of the Horticulture Department and Garden Engineering, College of Agriculture, Baghdad University (Abu-Ghraib), alternative site for Anbar University, to study the effect of organic fertilization with date palm leaves wastes added to the soil by weight : weight ratio without or with foliar spray by extract of decomposed grindery Date palm seedson cucumber yield under open field conditions according to RCBD design. The study included seven treatments: T0 fertilization of chemical fertilizers (NPK) recommended for cucumber using (260 kg urea / e with 340 kg super phosphate / e with the addition of 100 kg K / e using potassium sulfate), T_1, T_2 and T_3 Addition of organic fertilizer, consisting of 2.5%, 5% and 7.5% date palm leaves wastes, respectively, T4, T5 and T6 Addition of organic fertilizer of 2.5%, 5% and 7.5% date palm leaves wastes, respectively, with spraying plants leaves with decomposed grindery date palm seeds extract. A half of the recommendation of chemical fertilizers has been added to the soil of all organic fertilization treatments. The data were analyzed using Gen Stat program and the results were tested according to LSD test at 0.05 probability level.

Key words : Organic fertilization , date palm leaves wastes, foliar spraying extract, yield, cucumber.

Introduction

Organic fertilization has environmental, economic, dietary and nutritional effects. As it may contribute to solving the must global environmental problems that was climate change and food security (Te pasand Rees, 2014). Its performance is better than traditional agriculture under extreme weather conditions such us drought. It also maintains soil fertility, improves its structure for long term , production of healthy value food and higher export value and thus improving food security (Jouzi *et al.*, 2017 and Morshedi *et al.*, 2017). Te pasand Rees (2014) found that the addition of plant and animal residues to the soil led to increased soil organic matter , improve chemical ,physical and fertility properties, and resistance to disease thus increasing productivity. Funsho *et al*. (2015) and Singh and Singh (2016) and Ratna *et al.* (2016) and Pradeepkumar *et al*. (2017) and Singh *et al*. (2017) and Shree *et al*. (2018) found increase the number of fruits, fruits weight, total yield, and marketable yield of cucumber, potatoes and bitter pumpkin when adding organic fertilizer with half of chemical recommendation compared to chemical fertilization. On the other hand, there are large quantities of plant wastes cause health and environmental damage , either by untapped or burning it, including date palm (*Phoenix dactylifera* L.) wastes which is primary material of organic fertilizers. As the number of date palms in Iraq was 15.381.450 million and the average of wastes production from it about 20 kg dry material annually (Zafar, 2015). These wastes can be converted into organic fertilization and achieving environmentally and economically benefit.

Cucumis sativus L is belongs to Cucurbitaceae family. It was one of the most important vegetable crops in the world. It is believed to be native to Southeast Asia, particularly in northern India and the Himalayas (Sebastian, 2010). Cucumber cultivated in Iraq in the open

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field in spring and autumn, and in the protected environment, the area planted with cucumber in Iraq in 2015 was (822 dunums) and the total yield was (1902.6 kg per dunum) (Iraqi Ministry of Planning, 2016). Cucumber is a crop that have high nutrient requirements and its field performance is weak in the case of nutrient deficiencies in the soil, resulting in reduced yield, deformation and poor taste (Hassan, 2015). In order to get the best productivity, the nutritional status of the soil requires the addition of organic fertilizers or chemical fertilizers. However, the addition of long-term chemical fertilizers led to healthy and environmental risks that are known in this time. So the purpose of this research is to study the fertilization with decomposed date palm leaves and spraing with extract of decomposing date palm seeds as organic fertilizers and their effect on cucumber yield under open field conditions and compared with the effect of chemical fertilizer.

Materials and Methods

The experiment was conducted on the field of vegetable crops of the Department of Horticulture and Garden Engineering, Collage of Agriculture, Abu Ghraib, alternative site of Anbar University during spring 2017. Seeds of hybrid cucumber (RANI) suitable for open field cultivation were directly planted in the field. Randomized Complete Block Design (RCBD) was divided into a simple experiment (Mohammadi and Mohammadi, 2012) with eleven experimental units and three replicates per experimental unit between each repeater distance of 1 m. A sample of soil was taken for analysis in the laboratories of the Ministry of Science and Technology / Soil and Water department (table 1). Date palm leaves waste and the dates palm seeds that were decomposed as Flegg and Randle (1980). That were mixed with field soil at a depth of 20 cm according to the experimental units, each contained 20 plants with a distance of 40 cm between plants. The experimental unit length is 8 m and width 0.3 m and the distance of 1.5 m between experimental unit . Table 2 shows some of the physical and chemical components of decomposed date palm leaves and date palm seeds before and after decomposition. Treatments included T_0 fertilization of the recommended chemical fertilizers (NPK) by using (260 kg urea/ha, 340 kg super phosphate/ha, 100 kg K/ha using potassium sulphate) (Al Sahaf *et al*., 2011) and treatments of organic waste addition were T_1 decomposed date Palm leaves wastes 5%, T2 5% decomposed date palm leaves wastes, T_3 decomposed date palm leaves wastes 7.5%, T_4 decomposed date palm leaves wastes 2.5% sprayed with decomposed grindery date palm seeds extract, T_5 decomposed date Palm leaves wastes 5% sprayed with decomposed grindery date palm seeds extract, T_6 decomposed date palm leaves wastes 7.5% sprayed with decomposed grindery date palm seeds extract. A half of the fertilizer recommendation was added for all organic fertilization treatments. After that soil and organic fertilizers was mixed, a drip irrigation system was installed to ensure that the irrigation water was distributed equally on the experimental plants. Tables 3 and 4 shows some physical and chemical properties of the soil of the study treatment at cultivation and at end of crop season.

Table 1 : Some of chemical and physical soil properties before planting.

Property		Value	Unit
Soil texture		Clay Loam	
Soil separators	Sand	220	g/Kg
	Silt	410	
	Clay	370	
pH	7.36	----	
Electrical conductivity (Ec)		1.58	ds/m
Total dissolved solids	1010	mg/L	
Total cations and anions dissolved	Ca^{++}	145	mg/L
	Mg^{++}	85	
	Na^{+}	215	
	K^{+}	10	
	$SO_4^{=}$	153	
	Cl^{-}	212	
	HCO_3^{-}	89	
	NO_3^{-}	2.5	
	$PO_4^{=}$	0.31	
Organic matter		11.4	g/Kg
Available N		48	Ppm
Available P		11.6	
Available K		168	
Total Fe		2125	
Available Fe		10.8	
Total Mg		911	
Available Mg		131	

Agricultural service operations were carried out in a symmetrical manner for all treatments , as the case with cucumber production in open field condition. Exposed water extract 1 : 7 of 1 kilo of decomposed grindery date palm seeds and 7 liters of water in a container was

Table 2 : Some of physical and chemical properties of decomposed date palm leaves and grindery Date palm seeds before and after decomposition.

Property	Decomposed date palm leaves waste	Grindery date palm seeds	
		Before deco-mposition	After deco-mposition
Organic matter %	71.03	97.4	74.99
Total N%	1.72	1.86	2.10
Total P%	0.62	0.53	0.58
Total K%	1.20	0.60	0.62
Organic C%	41.2	56.5	43.5
C/N%	23.95	30.4	20.71
Total Fe ppm	0.0516	121	0.0163
Total Mg ppm	0.0470	110	0.0096
Ec ds/m	5.20	3.77	2.57
pH	7.80	8.15	7.86
Cellulose%	26.4	41	33.0

to the end of season divided on the number of plants of experimental unit, the average of fruit weight gm fruit $^{-1}$ that was calculated by dividing the yield of experimental unit (kg) on the fruits number of plants experimental unit multiplied by 1000. Total yield per Plant (kg plant^{-1}) which calculated as the cumulative yield of the experimental unit plants was recorded from the beginning of the harvest until the end of the season and divided by the number of plants of the experimental unit, total yield and marketable yield.

Results and Discussion

Average number of fruits per plant (fruit day^{-1}) : The statistical analysis in table 6 showed that T_6 was the highest number of fruits per plant (22.78) with an increase of 47.63% compared with T_0, which gave a fruit yield rate of 15.43 fruits per plant, flowed by T_5(20.83) and T_3 (18.93), which the differences between them and T_6 were

Table 3 : Some of physical and chemical properties of the study treatments soil at cultivation.

Treat.	pH	Ecds/mF or saturated dough	Available nutrients mg/kg					Organic matter %	Total N %	Total C %	C/N %
			N	P	K	Fe	Mg				
T0	7.43	2.69	43	10.4	142	6.2	110	0.96	0.0230	0.5570	24.22
T1	7.36	5.18	47	13.0	153	16.8	145	1.49	0.0256	0.8643	33.76
T2	7.31	6.53	50	14.1	169	20.0	163	1.71	0.0270	0.9919	36.74
T3	7.25	8.05	55	14.7	182	24.3	172	1.90	0.0276	1.1021	39.93
T4	7.61	6.00	50	14.0	158	19.5	170	1.23	0.0259	0.7135	27.55
T5	7.69	7.91	56	14.8	176	22.0	173	1.34	0.0275	0.7773	28.27
T6	7.67	8.65	61	16.7	189	27.1	188	1.32	0.0287	0.7657	26.68

Table 4 : Some of physical and chemical properties of the study treatments soil at the end of the season.

Treat.	pH	Ecds/mF or saturated dough	Available nutrients mg/kg					Organic matter %	Total N %	Total C %	C/N %
			N	P	K	Fe	Mg				
T0	7.51	2.53	52	15.8	178	9.5	123	1.15	0.0339	0.6680	19.7
T1	7.29	4.41	46	12.9	149	15.3	136	1.46	0.0330	0.8488	25.72
T2	7.23	5.76	51	13.5	165	18.6	150	1.82	0.0337	1.0581	31.39
T3	7.19	7.62	54	15.0	179	22.5	158	2.25	0.0346	1.3081	37.81
T7	7.59	3.91	49	13.7	155	17.5	156	1.18	0.0338	0.6861	20.30
T8	7.66	9.63	53	15.2	171	20.0	165	1.22	0.0345	0.7093	20.56
T9	7.63	7.96	57	16.9	186	24.8	185	1.19	0.0389	0.6879	17.68

covered and left for a week with stirring once to twice a day. The extracts were sprayed on the leaves of the treated plants (4, 5 and 6) at a rate of once every week. Table 5 shows some chemical properties and the content of the elements of the spray extract. Measured traits included : number of fruits per plant fruit plant^{-1}, that calculated as in the following equation : The number of fruits in the experimental unit from the beginning of harvest

not statistically significant. The increase in the number of fruits and then in the yield may be due to the role of compost in improving the physical and biological properties of the soil, which leads to the better preparation of plant nutrients (Omidire, 2015). Thus, better vegetative growth represented by increasing leaves area and plant height, increased carbohydrate production thus giving the greatest number of fruits (Bayati *et al*., 2012). This is agreed

Table 5 : Some of chemical properties and content of some nutrients of extract 7: 1.

Grindery date palm seeds extract	pH	Ec ds/m	Available nutrients %			Available nutrients ppm	
			N	P	K	Fe	Mg
7/1	5.35	2.43	0.91	0.20	0.32	61	58

Table 6 : Effect of organic fertilization with date palm wastes on the percentage of vegetative growth dry matter and plant yield kg^{-1} and the total yield and marketable yield ton ha^{-1}.

Treat.	Number of plant fruits	Fruit weight	Yield kg $plant^{-1}$	Total yield ton ha^{-1}	Marketable yield ton ha^{-1}
T0	15.43	80.2	1.187	96.1	92.7
T1	17.00	99.2	1.690	134.7	131.6
T2	15.09	84.2	1.211	96.2	92.5
T3	18.93	79.4	1.498	118.7	115.1
T4	17.58	84.9	1.494	124.5	120.9
T5	20.83	80.6	1.671	139.2	136.1
T6	22.78	83.7	1.874	156.2	153.0
L.S.D.	5.660	16.95	0.2830	28.17	27.38

with Kahlel (2015) and Muslat and Saleh (2017).

Fruit weight (g) : The results of the statistical analysis in table 6 indicate that there is no significant difference among all the treatments. T_1 gave the highest value of the fruit weight of 99.2 g while Treatment of comparison T_0 ranked sixth when it achieved a fruit weight of 80.2 g. The increase in fruit weight in many treatments may be due to the effect of organic matter on increase in total soluble solids and dry matter of fruits, this is confirmed by the data in table 6, although the effect was not statistically significant. The effect of organic fertilization on increasing fruits weight may be due to the positive active role in which organic fertilizers diversity their sources in regulating and increasing plant absorption of the different nutrients from the soil solution, because they contain nutrients in balanced quantities and their release is relatively slow and continued longer time if compared to chemical fertilizers. As well as their role in improving the physical, chemical and biochemical parameters of soil (Wittner, 1999).

Plant yield (kg $plant^{-1}$) : The results of this study showed that all the organic fertilization treatments with decomposed date palm leaves wastes exceeded on the treatment of chemical fertilization. T_6 gave the highest plant yield of 1,874 kg and an increase of 57.87% compared to T_0 which achieved of 1.187 kg. The second place was T_1 and T_5, which achieved of 1.690 and 1.671 kg per plant respectively, while T_3, T_4, T_2 gave a little more plant yield, which was 1.498, 1.494, 1.211 kg $plant^{-1}$ (table 6). This may be due to the fact that the increase in the number of fruits has been reflected positively on the increase of the plant value, and this is consistent with (Muslat and Saleh, 2017).

Total yield (tons ha^{-1}) : The treatment T_6 was exceed by giving highest value of the total yield of 156.2 tons ha^{-1}, with an increase of 62.53% about comparison treatment T_0, which gave a total yield of 96.1 tons. T_6 did not significantly differ with treatments T_5 and T_1, which giving a total yield of 139.2 and 134.7 tons, respectively (table 6). The total yield increase was results to increase fruits number and plant yield. Organic fertilizer gradually released nitrogen as available nitrate to be absorbed by the plant for long periods, allowing chlorophyll production at an advanced period of plant life and an increase in the leaves area, thus increasing the plant productivity (Eswaran and Mariselvi, 2016).

The marketable value (tons ha^{-1}) : The results in table 6 indicate the significant effect of adding decomposed date palm leaves wastes and leaves spray with extract of decomposed grindery date palm seeds on the marketable yield. T_6 achieved the highest value of 153 tons ha^{-1}, achieving an increase of 65.04% compared to the comparison treatment T_0, which gave marketable yield of 92.7 tons ha^{-1} . T_5 and T_1 achieved marketable value of 136.1 and 131.6 tons, respectively. The effect of T_6 was not significant with T_4 and T_3 in the marketable yield that amounted to 120.9 and 115.1 tons ha^{-1} respectively. Organic fertilizer contains low molecular weight compounds that give resistance to plants and stimulate growth in different conditions (Monda, 2017). Organic fertilizer also gives resistance to plants against diseases (Pane, 2012), which reflected positively on the amount of marketable yield.

Conclusion

The results showed that organic fertilization with date

palm leaves wastes with or without spraying with extract of decomposed grindery date palm seeds increased the yield. The treatment T_6 exceeded by giving the highest number of fruit per plant [(22.78, the highest yield per plant (1.874 kg], the highest total yield (156.2 ha^{-1}) and the highest marketable yield of 153.0 tons ha^{-1}. T_5 and T_1 were second by giving total yield (139.2 and 134.7 tons ha^{-1}) and a marketable yield (136.1 and 131.6 ha^{-1}), respectively.

References

AL-Bayati, H. J. M., M. T. A. Al-Habar and W. B. A. AL-Lelah (2012). Effect of different organic fertilizers on growth and yield of Cucumber cv. grass F_1 under unheated plastic house. *Kufa Journal of Agricultural Sciences*, **4(2)** : 336-327. ISSN: 20727798 23128186 .

Al-Mohammedi, Sh. M. and F. M. Al-Mohammadi (2012). Statistics and Experiments Design. Dar Osama for Publishing and Distribution. Amman - Jordan. P. 376. ISBN : 9789957224097.

Al-Sahaf, F. H., M. Z. K. Al-Mharib and F. M. Jawad (2011). Response of Cucumber hybrids to chemical and organic fertilizers. *The Iraqi Journal of Agricultural Sciences*, **42 (4)** : 52 - 62.ISSN: 00750530 24100862 .

Eswaran, N. and S. Mariselvi (2016). Efficacy of Vermicompost on growth and yield parameters of *Lycopersicum esculentum* (Tomato). *International Journal of Scientific and Research Publications*, **6(1)** : 95-108 . ISSN 2250-3153 .

Flegg, P. B. and Phylls E. Randle (1980). A new outlook on mushroom compost Preparation. *The Mushroom Journal*, **91** : 261-363.

Funsho, F. E., A. B. Oluwafemi and A. Joseph (2015). Comparative Evaluation of Organic and Inorganic Manure on Sweet Pepper Performance in two Ecological Zones of Nigeria. *American Journal of Experimental Agriculture*, **6(5)** : 305-309. ISSN: 2231-0606 .

Hassan, A. Abdel Moneim (2015). *Fertilization of vegetable production*. College of Agriculture. Cairo University .P693.ISBN : 9789779261371 .

Iraqi Ministry of Planning (2016). *Central Statistical Organization*. Annual Statistical Abstract.

Jouzi, Z., H. Azadi, F. Taheri, K. Zarafshani, K. Gebrehiwot, S. V. Passel and P. Lebailly (2017). Organic Farming and Small-Scale Farmers: Main Opportunities and Challenges. *Ecological Economics*, **132** : 144–154.

Kahlel, A. S. (2015). Effect of Organic Fertilizer and Dry Bread Yeast on Growth and Yield of Potato (*Solanum tuberosum* L.). *Turkish Journal of Agricultural and Natural Sciences,* Special Issue **2** : 1977- 1984 .

Morshedi, L., F. Lashgarara, S. J. Farajollah Hosseini and M. O. Najafabadi (2017). The Role of Organic Farming for Improving Food Security from the Perspective of Fars Farmers . *Sustainability,* **9**:(11) 2086. https://doi.org/10.3390/su9112086.

Musara, C. and J. Chitamba (2014). Evaluation of cattle manure application rate on the growth rate and fruit yield of cucumber (*Cucumis sativas* L.). *International Research Journal of Agricultural Science and Soil Science*, **4(9)** : 167-171 . (ISSN: 2251-0044).

Monda, H., V. Cozzolino, G. Vinci, R. Spaccini and A. Piccolo (2017). Molecular characteristics of water-extractable organic matter from different composted biomasses and their effects on seed germination and early growth of maize. *Sci. Total Environ*., **590** : 40-49.

Muslat, M. M. and S. A. Saleh (2017). Influence of date palm wastes fertilization on some growth and yield of cucumber parameters under protected cultivation.*Anbar Journal of Agricultural Sciences*, **15(1)** : 181-190 . ISSN: 1992-7479.

Omidire, N. S., R. Shange , V. Khan, R. Bean and J. Bean (2015). Assessing the Impacts of Inorganic and Organic Fertilizer on Crop Performance Under a Micro irrigation-Plastic Mulch Regime. *Professional Agricultural Workers Journal*, **3(1)** : 1-9

Pane, C., G. Celano, D. Villecco and M. Zaccardelli (2012). Control of *Botrytis cinerea*, *Alternaria alternata* and *Pyrenochaetaly copersici* on tomato with whey composttea applications. *Crop Protec.*, **38** : 80-86.

Pradeepkumar, T., B. P. Bonny, R. Midhila, J. John, M. R. Divya and C. V. Roch (2017). Effect of organic and inorganic nutrient sources on the yield of selected tropical vegetables. *Scientia Horticulturae*, **224** : 84–92.

Ratna, S. A., M. H. K. Howlader, M. M. Hasan, M. R. Mallick and U. K. Shanta (2016). Effect of integrated use of manure and fertilizer on the growth and yield of potato. *Progressive Agriculture*, **27 (4)** : 435-443 . ISSN: 1017 – 8139.

Shree, S., Ch. L. Regar, F. Ahmad, V. K. Singh, R. Kumari and A. Kumari (2018). Effect of Organic and Inorganic Fertilizers on Growth, Yield and Quality Attributes of Hybrid bitter gourd (*Momordica charantia* L.). *Int. J. Curr. Microbiol. App. Sci*., **7(4)** : 2256-2266 . ISSN: 2319-7706 .

Singh, L. and B. K. Singh (2016). Effect of integrated nutrient management on growth, yield and quality traits of cucumber (*Cucumis sativus* L.) cv. SwarnaAgeti under polyhouse condition. *Master Thesis*. Banaras Hindu University, India.

Singh, V. , V. M. Prasad, S. Kasera, B. P. Singh and S. Mishra (2017). Influence of different organic and inorganic fertilizer combinations on growth, yield and quality of cucumber (*Cucumis sativus* L.) under protected cultivation. *Journal of Pharmacognosy and Phytochemistry*, **6(4)** : 1079-1082 . P-ISSN: 2349-8234. E-ISSN: 2278-4136.

Te Pas C. M. and R. M. Rees (2014). Analysis of Differences in Productivity, Profitability and Soil Fertility Between Organic and Conventional Cropping Systems in the Tropics and Sub-tropics. *Journal of Integrative Agriculture*, **13(10)** : 2299-2310 .

Wittner, S. (1999). *Effect of foliar fertilizing*. Michigan State Univ , Michigan . USA.

Zafar, S. (2015). *Date Palm as Biomass Resource*. Paragraph. http://www.bioenergyconsult.com/date-palm-biomass/.