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EFFECT OF MULCHING AND DIFFERENT RATES OF COMPOST ON GROWTH AND PRODUCTION OF THREE CUCUMBER HYBRIDS

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ABSTRACT

To evaluate the growth and productivity of three cucumber hybrids i.e “Hakim”, “Ghazeer” and “Hayel” under mulching , and four level of composting i.e zero, 4.67, 7 and 9.33 Ton/Fed ., a field study were carried out in two seasons 2021 and 2022 at Experimental Farm Faculty of Agriculture , Minia University, Egypt . The results showed that the three hybrids differed significantly under our experiment conditions which “Ghazeer” followed by “Hakim” hybrids were superior in it’s early and total yield in compared with “Hayel” Using mulching technique improved cucumber parameters such as plant height , leaf area and both fresh and dry weight. Also early and total yield growth and their components were increased with mulching compared with bare soil. Thus, using mulching could be used to grow cucumber plant in open field under El-Minia Egypt condition in the low night temperature of September . Regarding to the composting effect, data of our experiment showed that the rate 4.67 and 7 Ton/fed were the best treatment in compare with zero and 9.33 ton/fed . Those treatments gave the best growth and yield of the three cucumber hybrids .

Keywords: *Cucumber, Hybrids, Mulching, Composting, Organic fertilizer .*

1- INTRODUCTION

Cucumber plant "*Cucumis Sativus L*" is one of the most popular and important vegetables that belongs to the family **Cucurbitaceae**. In Egypt, cucumbers are cultivated under varied conditions including open fields, tunnels,

and greenhouse conditions. It is known that the growth and productivity of cucumber hybrids differ under various temperature and humidity and conditions. Therefore, this study was conducted to evaluate the response of

three hybrids to mulching and different rates of compost .

Compost (organic fertilizer) is a key building block of organic farming; (Biernbaum and Fogiel 2004). It is produced due to an aerobic process that enriches the decomposition of matter under controlled temperature, moisture, and oxygen conditions, without phytotoxicity or pathogens (Vigroso, et al. 2021). Compost production and usage in agriculture have increased yearly. It can be used as new material such as soil fertilizer and substrates for microbial inoculants (Hussein, et al. 2022). Compost and farm yards manure are organic sources of nutrients which enrich soil organic matter was enriched (Inoko 1984). Moreover, it benefits agriculture by substituting the more costly mineral fertilizer and reducing the costs of crop production (Vigroso, et al. 2021). It also producing highly cucumber yield , highly fruit quality and enhancing amino acid and carbohydrate metabolism processes compared to bare soil (Zheng, et al. 2022).

Mulch is a material used to cover the soil surface to control the weed's growth and increase warmth (Parsottambhai and Rawat 2020). Mulching type that farmers can use depends on the type of topography, cultivated crop, and prevailing weather conditions of the sowing area (Chopra and Koul 2020). There are two main types of mulching i.e. plastic or organic

mulches (Bark, grass clipping, dry leaves, sawdust, alfalfa, ash, and stubble). Using mulching can manage soil water content, soil properties, and microbial diversity as well as reduce salinity effect (Tang 2022). Moreover, using black plastic in mulching (which was used in this experiment) keeps soil moisture and provides many other positive advantages such as higher crop quality, earlier harvesting and increasing yield than bare soil (Meo 2017) .

Based on the importance of using organic matter and mulching techniques to improve crop quality, this investigation aimed to study the response of three commercial cucumber hybrids to four rates of organic fertilizer with and without black plastic mulch.

2.MATERIAL AND METHODS

Two field experiments were conducted in two seasons in September of 2021 and 2022 at Agricultural Experimental Farm , Minia university , Egypt, to study the response of three commercial cucumber hybrids to four doses of organic fertilizer with and without black plastic mulching.

Preparation of experimental soil:

The soil is a clay loam texture soil. However Soil sample was collected from the surface layer (0-30) of the experimental field and analyzed for some physical and chemical properties as shown in table 1.

Table 1 : Analytical data of the studied soil before cultivation .

SEASON	Particle size distribution %				PH value	EC mmhos / cm	Total CACO3 %	Organic matter %	Total Carbon	Available		Total N %
	Sand %	Clay %	Slit %	Texture %						P Ppm	K %	
First	13.1	52.4	34.5	Clay	8.45	1.38	6.50	2.00	1.16	4.00	310.0	0.10
Second	13.3	52.3	34.4	Clay	8.38	1.30	7.00	1.93	1.12	5.00	290.0	0.10
Samble No	Water soluble salts (1:5) me/ 100g soil					Micro-nutrients elements ppm						
	Na	K	Ca	Mg	Co3	Hco3	Cl	Fe	Mn	Zn	Cu	
First	2.53	0.05	2.60	1.15	0.00	2.10	2.38	60.3	2.65	1.20	6.10	
Second	2.44	0.05	2.55	1.30	0.00	2.00	2.45	61.8	2.57	1.37	5.52	

Before planting the soil was ploughed twice in two opposite direction and superphosphate (15.5 % P₂O₅) was added during field preparation at the rate of 200 Kg / Fed , Also 25 kg ammonium nitrate and 15 kg Sulphate were added . Polyethylene sheets (1.4 meter wide and 60 mm thick) were hand-laid on moist beds . The polyethylene was kept to the end of growing season .

2.1 Experimental materials .

Three hybrid cultivars of cucumber (*cucumis sativus*) “Hakim”, “Ghazeer”

and “Hayel” were used in main plots. “Hakim” hybrid imported by the Egyption company for seeds,oil,and chemicals and produced by Volo Agri Groub companies inUSA. “Hayel” imported by Satrade and produced by Monsanto Holland BV, and “Ghazeer” imported by Al-sanabel for trade and produced by sunrise , Mishigan , USA .

Four levels of plant compost i.e 0 , 12 , 18, and 24 kg / plot which equal to 0 , 4.67 , 7 and 9.33 ton / fed were distributed at sub plots .

TABLE (2) : Chemical analysis of the used compost

	EC	Ph	Moisture %	organic C %	Total N%	Organic matter%	C/N %	Total k %	Total P %	M Dry weight	M fresh weight
Average	4.25	8	27.5	13.5	1	27.5	1:16	0.7	0.5	600 kg	800 kg

Black plastic mulch width (140) cm and thickness (60) mm was used in this experiment . Two treatment of mulching i.e bare soil “without mulching” and with mulching were distributed in sub_sub plots.

2.2 Experimental design and treatments applied :

The experimental was split_split plots in complete randomized blocks design with three replicates . Each experimental unit consisted of three beds . The bed was 3 m in length , 120 cm in width and 0.2m in height and experimental unit area was 10.8m²

Plant compost were added into the beds sides and buried in planting- both sides of the beds after making the plots. The beds were well covered with mulch by two men they buried about 10 cm from each side of the line and it was left 20 cm from each end and it was fixed with soil .

Three cucumber hybrids “Hakim” , “Ghazeer” and “Hayel” were occupied the main plots. Their seeds were sowed after adding compost and covering the soil with mulch. Seeds were sown directly on double rows per bed, in the row hill spaced of 25cm with two seeds per hill .

All the experimental units were fertilized with nitrogen as NH₄SO₄ (20.6 % N) at the rate of 150 kg N/fed . and potassium sulphate (48 % K₂O) at the rate of 50 kg K₂O/fed . these fertilizers were divided into 2 equal doses and applied at 25 days after sowing and after two weeks from the first dose .

All plants were similarly treated with the commercially practices for growing cucumber plants . farrow irrigation was applied .

Fruit picking was started on 19 October in both seasons at the marketable immature stage. Nine pickings at the first season and eight pickings at the second season at three days intervals were recorded . three plants were randomly taken from each experimental unit and the following data were recorded

2.3 Plant growth parameter

Three competitive plants were randomly taken from each experimental unit after 62 days from sowing and data for the following characters were recorded :

- 1- Average plant length in (cm)
- 2- Leaf surface area (cm²)

After 62 days of planting the sixth & seventh leaf of each plant were taken , and then we measured the weight of each 4cm² for each leaf individually and by this area and weight we measured the whole surface area of both sides as follow ;

$$\text{Leaf area} = \frac{\text{the whole leaf weight} \times 4(\text{the surface of 4cm area})}{\text{The weight of 4 cm}^2 \text{ area}}$$

3- Plant Fresh weight

In the end of season a plant from each experimental unit were taken and it's fresh weight were calculated in grams.

4- Plant Dry weight

After measuring the fresh weight a random sample of each plant 200 gm in weight were taken and were left in the room conditions to dry , then the sample were put in a drying oven for 48 h at a

temperature of 72 c and then they weighed and the dry weight of the plant was calculated as follow ; =

Dry weight =

$$\frac{\text{the plant fresh weight} \times \text{the sample weight after drying}}{200}$$

2.4 Yield and it's components :

After 60 days from sowing the data were taken for the following characters:

8- Early yield

Weight (gm/plant) and number of the fruits 9 number/plant) collected in first four pickings in both season from each treatment were considered to be an early yield .

9-Total yield :

Total weight and number of fruits per plot in both season were recorded .

At the Fourth and fifth picking of the plants , three fruits of each plant in the experimental unit were taken randomly to determine the following fruit characters :

11- Average fruit diameter (mm) .

12-Average fruit length (cm)

Statistical analysis

All data were statistically analyzed according to the technique of analysis of variance (ANOVA) and the least significant difference (L.S.D) method was used to compare the deference between the means of the treatment value according to the methods described by **Gomez and Gomez , (1984)** . All statistical analyses were performed using **CoSTATE** computer software .

3. RESULTS AND DISCUSSION

3.1 Effect of mulching and different rates of compost on Plant growth parameters of some cucumber hybrids

3.1.1 Plant height (cm) Data presented in table 3 shows that cucumber hybrids were differed significantly in both seasons . Whereas , “Hayel” hybrid showed the tallest plant (141.85 and 124 cm/plant) in the first and second season, respectively. While, the lowest one was Ghazeer hybrid which gave (125.12 and 93.62 cm/plant) in the first and second season respectively . These results are agree with those obtained by **Yoon et al (2022)**, who found that ‘Nagene’ cucumber cultivar had the longest plant height compared to other hybrids .

Mulching process has positive and significant effect of cucumber plant height compare with bare soil, where the plant height was (136.34 cm) in the first season and (113.33 cm/plant) in the second one in compare with bare soil which shown less values . These results are agree with those obtained by **Torres-Oliver , et al., (2018)**, **Awasthi, et al., (2022)**, and **joshi, et al .,(2022)**. they found that cucumber plant height was increased with using mulching technique .

Also, results in the same table shown that differences among rates of composting were significant in the first season only which the third rate of compost (7ton/fed) was the best treatment and giving the tallest plant (140.83cm/plant)in the first season . these results in harmony with those reported by **Hanadyani , et al., (2023)** , and **Ristiyana , at al.,(2023)** who said that compost and organic matters gave the highest plant height in cucumber plant .

Table 3 : Effect of mulching and different rates of compost on plant height (cm/plant) of some cucumber hybrids .

Hybrid	Mulch treatment	First season					Second season				
		Compost rates					Compost rates				
		C1 zero	C2 4.67	C3 7	C4 9.33	Mean of AB	C1 Zero	C2 4.67	C3 7	C4 9.33	Mean of AB
A1 Hakim	B1 with mulch	151.33	128	141	133	138.41	127	131.66	119	118	123.91
	B2 without mulch	120	137	147	126	132.75	107.33	117.50	94	83	100.45
Mean of A1		135.58					112.18				
Mean of AC		135.66	132.83	144	129.83		117.16	124.58	106.50	100.50	
A2 Ghazeer	B1 with mulch	108	127.33	123.66	126.33	121.33	82.33	76	107.50	105	92.70
	B2 without mulch	120	124.33	140.33	131	128.91	84	97.50	88.33	108.33	94.54
Mean of A2		125.12					93.62				
Mean of AC		114	125.83	132	128.66		83.16	86.75	97.91	106.66	
A3 Hayel	B1 with mulch	142	164.66	151	139.50	149.29	122	129	117	125.50	123.37
	B2 without mulch	132.33	108.33	142	155	134.41	134.83	111	126.33	126.33	124.62
Mean of A3		141.85					124				
Mean of AC		137.16	136.50	146.50	147.25		128.41	120	121.66	125.91	
Mean of C		128.94	131.72	140.83	135.250		109.58	110.44	108.69	111.02	
Mean of B1		136.34	B2		132.02		Mean of b1		113.33	B2	106.54
LSD at 0.05 level of significance											
A					3.61						4.51
B					3.72						3.03
C					4.46						4.93
AxB					6.45						5.25
AxC					7.74						8.55
BxC					6.31						6.98
AxBxC					10.94						12.09

The interaction effect between different experiment treatments were significant in both seasons. The best treatment was(164.66 cm/plant) when sowing “Hayel” hybrid under mulching conditions and added compost with rate (4.67 ton/fed)only in the first season .

3.1.2 Plant Fresh weight (gm)/ plant

Data presented in table 4 showed that, different hybrids of cucumber had a significant effect on plant fresh weight in both seasons . where the hybrid “Hayel” showed the highest values of plant fresh weight(508.33 and 504.16 gm/plant) in first and second season respectively

.while “Ghazeer” hybrid showed the lowest values (361.25 and 383.32 gm/plant) in first and second season respectively .

Regarding the effect of mulching treatment on plant fresh weight data in the same table showed that, there was significant increase in plant fresh weight with mulching in comparison with bare soil in both season which the values were (460.27 and 458.33 gm/plant) with mulch and (440 and 441.66 gm/plant) without mulch the in first and second season respectively . these results are agree with those which obtained by

Shehata *etal* (2019) , who demonstrated that mulch gave the highest vegetative growth weight in cucumber like fresh weight .

Data in the same table showed that , the second rate of compost (4.67ton/fed) was the best treatment for obtained the highest values of cucumber plant fresh weight (508.88 and 566.66 gm/plant) in the first and second season, respectively. These results are in harmony with those obtained by **El-Afifi *et al* (2009)** , who demonstrated that compost manures increased values of fresh weight in summer squash .

Table 4 : Effect of mulching and different rates of compost on plant fresh weight (gm/plant) of some cucumber hybrids .

Hybrid	Mulch treatment	First season					Second season				
		Compost rates					Compost rates				
		C1 Zero	C2 4.67	C3 7	C4 9.33	Mean of AB	C1 Zero	C2 4.67	C3 7	C4 9.33	Mean of AB
A1 Hakim	B1 with mulch	700	433.33	450	533.33	529.16	566.66	383.33	400	633.33	512.50
	B2 without mulch	366.66	746.66	266.66	350	432.50	366.66	633.33	316.66	400	437.50
Mean of A1		480.83					462.50				
Mean of AC		533.33	590	358.33	441.66		466.66	525	358.33	550	
A2 Ghazeer	B1 with mulch	233.33	443.33	416.66	290	345.83	250	416.66	433.33	316.66	354.16
	B2 without mulch	366.66	360	413.33	366.66	376.66	416.66	383.33	500	350	450
Mean of A2		361.25					383.33				
Mean of AC		300	401.66	415	328.33		383.33	400	491.66	333.33	
A3 Hayel	B1 with mulch	500	450	623.33	450	505.83	483.33	500	616.66	500	525
	B2 without mulch	583.33	620	400	440	510.83	466.66	633.33	383.33	450	500
Mean of A3		508.33					504.16				
Mean of AC		541.66	535	511.66	445		508.33	566.66	500	475	
Mean of c		458.33	508.88	428.33	405		425	491.66	441.66	441.66	
Mean of B1		460.27	B2		440		Mean of b1		458.33	B2	441.66
LSD at 0.05 level of significance											
A						68.48					
B						15.30					
C						28.8					
AxB						26.16					
AxC						49.88					
BxC						40.72					
AxBxC						70.53					

Regarding to the interaction between experiment treatments data showed that, the interaction effects were significant in both seasons , and the heaviest plant fresh weight in the first season was (746.66 gm/plant) and obtained with growing “Hakim” hybrid without mulch and added the compost with the second rate (4.67 ton/fed) , Also in the second season “Hakim” was among the best values (600.33 gm/plant) with mulch plus the fourth rate of compost (9.33 ton/fed).

3.1.3. Plant Dry weight (gm)/plant

Data presented in table 5, showed that the three hybrids of cucumber had significant effect on plant dry weight in both seasons. The “Hayel “ hybrid showed the heaviest plant dry weight (54.22and 53.47 gm/plant) in first and second season respectively. On the other hand, “Ghazeer” hybrid showed the lowest values(40.82 and 41.98 gm/plant) of plant dry weight in first and second season . these results are agree with those obtained by **Zhu et al (2008)**, who demonstrated that shoot dry weights differed in the tested genotype and were superior in “Zaoduojia” than in “Jinchun No. 2” cucumber cultivar .

According to the data in the same table, the mulching treatment had no effect on plant dry weight compared with no mulching. These results were observed in both season and agree with those obtained by **Zhuang, et al (2023)**.

On the same time, data showed that , second rate of compost (4.67 ton/fed) was the best rate among the studied four rates to obtained the highest values of cucumber vegetative dry weight (53.79 and 54.53 gm/plant) in first and second season, respectively .

These results agree are with **Li and Mattson (2019)**, who said that organic fertilizer gave highest dry weight compare to control in cucumber plant .

Regarding to the interaction between experiment treatments data showed that , the interactions effect were significant in both seasons, which the highest values of plant dry weight (80.62 gm/plant) in the first season was obtained with growing “Hakim” hybrid without mulch plus compost with the second rate. Whereas, in the second season, the highest value was (76.96 gm/plant) was giving by “Hayel” hybrid grown without mulch and treated with compost with rate (4.67 ton/fed) .

3.1.4 Leaf area cm²/leaf

The results in table 6, demonstrated that “Hakim” Hybrid had the highest significant value of leaf area in both seasons compared with “Ghazeer” and “Hayel” , its values were (161.33 and 144.78 cm²/leaf) in the first and second season respectively . These results were comparable to those reported by **Pakash at al (2021)**, who confirmed that cucumber cultivars differed and “Marketmore 76” cucumber cultivar had higher leaf area than “Poinsett 76” cultivar .

The data in the same table showed that , mulching technique had a clear significant impact on leaf area only in the first season compared to bare soil . The estimated values were (123.51 and 107.99 cm²) in the first and second season respectively season. These results were comparable to those reported by **Joshi, et al (2022)** who confirmed that leaf area trait was superior with black mulch in cucumber plant .

Table 5 : Effect of mulching and different rates of compost on plant dry weight (gm/ plant) of some cucumber hybrids .

Hybrid	Mulch treatment	First season					Second season				
		Compost rates					Compost rates				
		C1 Zero	C2 4.67	C3 7	C4 9.33	Mean of AB	C1 Zero	C2 4.67	C3 7	C4 9.33	Mean of AB
A1 Hakim	B1 with mulch	68.33	32.75	45.91	44.74	47.93	68.45	32.73	44.89	44.82	47.72
	B2 without mulch	41.46	80.62	35.14	52.79	52.50	57.34	72.69	34.64	53.82	54.62
	Mean of A1	50.22					51.17				
Mean of AC		54.89	56.69	40.52	48.76		62.89	52.71	39.76	49.32	
A2 Ghazeer	B1 with mulch	31.18	41.61	47.21	33.79	38.45	29.16	48.29	47.08	33.82	39.59
	B2 without mulch	56.90	39.51	37.84	38.52	43.19	56.86	43.49	37.99	39.18	44.38
	Mean of A2	40.82					41.98				
Mean of AC		44.04	40.56	42.52	36.15		43.01	45.89	42.54	36.50	
A3 Hayel	B1 with mulch	46.43	51.34	60.51	50.42	52.17	44.80	53	60.49	55.45	53.44
	B2 without mulch	58.89	76.91	46.41	42.87	56.27	49.52	76.96	46.02	41.54	53.51
	Mean of A3	54.22					53.47				
Mean of AC		52.66	64.12	53.46	46.64		47.16	64.98	53.26	48.49	
Mean of c		50.53	53.79	45.50	43.85		51.02	54.53	45.18	44.77	
Mean of B1		46.18	B2		50.65		Mean of b1		46.91	B2	50.84
LSD at 0.05 level of significance											
A					2.53						4.31
B					2.21						3.60
C					2.62						3.42
AxB					3.83						6.24
AxC					4.54						5.94
BxC					3.71						4.84
AxBxC					6.43						8.4

Table 6 : Effect of mulching and different rates of compost on the leaf area of some cucumber hybrids .

Hybrid	Mulch treatment	First season					Second season					
		Compost rates					Compost rates					
		C1 Zero	C2 4.67	C3 7	C4 9.33	Mean of AB	C1 Zero	C2 4.67	C3 7	C4 9.33	Mean of AB	
A1 Hakim	B1 with mulch	224.67	259.13	155	132.90	184.92	107.97	175.21	165.60	133.45	145.55	
	B2 without mulch	145.84	142.39	141.43	89.27	132.06	193.99	179.62	67.55	134.84	144	
Mean of A1		161.33					144.78					
Mean of AC		187.76	186.93	148.21	111.08		150.98	177.41	116.57	134.14		
A2 Ghazeer	B1 with mulch	67.74	61.74	99.28	67.21	70.46	70.37	66.02	76.20	82.31	73.72	
	B2 without mulch	45.40	70.22	97.94	102.03	78.89	64.36	172.19	81.50	97.94	103.99	
Mean of A2		76.38					88.86					
Mean of AC		56.57	65.71	91.81	84.62		67.37	119.10	78.85	90.12		
A3 Hayel	B1 with mulch	96.31	101.60	108.30	108.75	103.74	73.16	163.46	106.91	75.24	104.69	
	B2 without mulch	57.89	130.86	139	65.01	98.19	57.97	95.16	71.90	72.93	74.49	
Mean of A3		100.96					89.59					
Mean of AC		77.10	116.23	123.65	86.88		65.57	129.31	89.40	74.09		
Mean of C		106.31	127.56	123.49	94.19		94.64	141.94	94.94	99.45		
Mean of B1		123.51	B2		102.27		Mean of b1		107.99	B2		107.49
LSD at 0.05 level of significance												
A					10.84						4.90	
B					3.83						4.34	
C					5.70						6.19	
AxB					6.63						7.53	
AxC					9.89						10.73	
BxC					8.07						8.76	
AxBxC					13.98						15.18	

Also, the data in the same table surface demonstrated that, different rates of compost had a clear impact on leaf area compared to control (without compost) . The second rate (4.67 ton/fed) was the best in both seasons which gave (127.56 and 141.94 cm²) in first and second season respectively . These results were comparable to those reported by **Esmaipour, et al (2020)** who confirmed that the medium enriched with 10 % to 20% vermicompost gave the highest leaf area of cucumber plant .

Regarding to the interaction among experiment treatments data showed that ,

the interactions effect were significant in both seasons, the highest values of leaf area in the first season was (259.13 cm²) in “Hakim” hybrid with mulch and (4.67 ton/fed) compost treatment.

3.2 Effect of mulching and the different rates of compost on the Yield and it's components

3.2.1 Fruit diameter (mm/fruit)

According to the data presented in table 7, the results showed that , “Hakim” hybrid gave the highest fruit diameter (12.82 and 10.84 mm) in the first and second season, respectively. These results were comparable to those

reported by **Moradi et al (2020)**, who found that superior average diameter was affected by the genetics make up of growing genotype .

The data presented in the same table proved that mulch had an effect on fruit diameter only in the second season, which was (11.82 mm) compared to un mulched treatments. These results agree with those found by **Ajibola and Amujoycgb, (2019)** who reported that black mulch affect the fruit diameter in cucumber plant .

According to the data in the same table, the differences among compost rates were significant only in the first seasons . where the third rate (7 ton/fed) gave the highest fruit diameter (12.34 mm) compared with the control. These results were comparable to those found by **Ristiyana, et al (2023)**, and **Omara and Farrag (2022)** who said that compost increased fruit diameter in cucumber plant.

The interaction effect among different treatments were significant in both seasons. The best treatment in the first season was “Hayel” hybrid without mulch and addition compost with the fourth rate (9.33 ton/fed). This

interaction treatment gave (18.17 mm). On the other hand, in the second season the best value was (14.56 mm) in the treatment of “Ghazeer” hybrid under mulching and second rate of compost (4.67 to/fed).

3.2.2 Fruit length (Cm)

Results shown in table 8, indicated that , “Hayel” hybrid gave the highest value of fruit length in both season compared to ‘Ghazeer” and “Hakim” hybrids . Its fruit length (13.74 and 13.79 cm) in first and second season respectively. **Manggoel et al (2022)**, found similar findings which found that the tested hybrids differed under the same growing conditions, and “Odukpani” cucumber hybrid produced taller fruit .

The data presented in the same table shown that the differences between mulching and bare soil were not significant in both seasons compared to un mulched treatments. These results disagree with those obtained by **Ekwa, et al (2017)** and **Ajibola and Amujoycgb, (2019)** which they said that black mulch increased the fruit length in cucumber plant .

Table 7 : Effect of mulching and different rates of compost on the fruit diameter of some cucumber hybrids .

Hybrid	Mulch treatment	First season					Second season					
		Compost rates					Compost rates					
		C1 Zero	C2 4.67	C3 7	C4 9.33	Mean of AB	C1 Zero	C2 4.67	C3 7	C4 9.33	Mean of AB	
A1 Hakim	B1 with mulch	9.56	9.16	13.17	8.07	9.99	11.43	13.81	11.96	11.47	12.17	
	B2 without mulch	8.80	12.57	11.39	13.88	11.66	12.35	8.36	8.77	8.59	9.52	
Mean of A1		12.82					10.84					
Mean of AC		9.18	10.86	12.28	10.97		11.89	11.09	10.36	10.03		
A2 Ghazeer	B1 with mulch	15.27	9.97	14.74	8.60	12.14	8.33	14.56	12.42	12.51	11.96	
	B2 without mulch	11.81	12.19	13.49	15.49	13.24	11.02	7.52	8.35	8.30	8.80	
Mean of A2		12.69					10.38					
Mean of AC		13.54	11.08	14.11	12.04		9.67	11.04	10.39	10.40		
A3 Hayel	B1 with mulch	9.62	11.24	10.32	6.64	9.46	11.62	13.14	10.38	10.18	11.33	
	B2 without mulch	11.19	15.28	10.96	18.17	13.90	6.58	6.43	7.66	8.63	7.32	
Mean of A3		11.68					9.33					
Mean of AC		10.40	13.26	10.64	12.41		9.10	9.79	9.02	9.40		
Mean of C		11.04	11.73	12.34	11.81		10.22	10.64	9.92	9.94		
Mean of B1		10.53	B2		12.93		Mean of B1		11.82	B2	8.55	
LSD at 0.05 level of significance												
A						0.81						0.34
B						0.6						0.19
C						0.72						0.69
AxB						1.03						0.33
AxC						1.26						1.20
BxC						1.03						0.99
AxBxC						1.79						1.71

Table 8 : Effect of mulching and different rates of compost on the fruit length of some cucumber hybrids .

Hybrid	Mulch treatment	First season					Second season					
		Compost rates					Compost rates					
		C1 Zero	C2 4.67	C3 7	C4 9.33	Mean of AB	C1 Zero	C2 4.67	C3 7	C4 9.33	Mean of AB	
A1 Hakim	B1 with mulch	12.06	13.43	13.19	13.10	12.94	12.66	13.17	13.42	13.15	13.10	
	B2 without mulch	12.70	13.92	13.30	13.29	13.30	12.48	13.34	12.96	14.72	13.37	
	Mean of A1	13.12						13.24				
Mean of AC		12.38	13.67	13.24	13.19		12.57	13.25	13.19	13.93		
A2 Ghazeer	B1 with mulch	13.19	11.90	10.59	11.39	11.77	12.18	11.90	11.98	12.04	12.02	
	B2 without mulch	12.83	12.39	12.79	12.95	12.74	13.61	12.62	13.92	13.30	13.36	
	Mean of A2	12.52						12.69				
Mean of AC		13.01	12.14	11.69	12.17		12.90	12.26	12.95	12.67		
A3 Hayel	B1 with mulch	13.67	15.15	13.79	13.84	14.11	13.61	15.20	13.92	14.08	14.20	
	B2 without mulch	13.32	12.58	13.51	14.08	13.27	13.11	13.40	13	14.04	13.39	
	Mean of A3	13.74						13.79				
Mean of AC		13.50	13.86	13.65	13.96		13.36	14.30	13.46	14.06		
Mean of c		12.96	13.23	12.86	13.11		12.94	13.27	13.20	13.55		
Mean of B1		12.94	B2		13.14		Mean of b1		13.11	B2	13.37	
LSD at 0.05 level of significance												
A						0.69						0.68
B						0.39						0.39
C						0.48						0.51
AxB						0.69						0.68
AxC						0.84						0.88
BxC						0.68						0.72
AxBxC						1.19						1.25

According to the results , the different rates of compost have a significant effect on fruit length in both seasons compared to control . Where the second rate (4.67 ton/fed) gave the highest fruit length (13.23 cm) in the first season . whereas, the forth rate (9.33 ton/fed) had the highest fruit length (13.55 cm) in the second season . **Ristiyana, et al (2023)** found similar findings, who said that compost treatments enhanced fruit length of cucumber plant

The interaction effect among different treatments were significant in both seasons . the best treatment in the first season was given by “Hayel” hybrid transplanted on mulch and added compost with the second rate (4.67 ton/fed) which were (15.15 and 15.20 cm) in first and second season respectively .

3.2.3 Early yield (gm/plant)

Results in table 9, indicated that , “Ghazeer” hybrid had the highest f early yield in both season , compare with “Hakim” and “Hayel” hybrid, and gave (724.53 and 727.42 gm/plant) in first and second season respectively.

The data in the same table demonstrated that, covering soil with mulch had a significant effect on the average early yield. It had the highest weight (707.06 and 715.98 gm) in the first and second season, respectively in compare with bare soil which gave (685.8 and 670.23 gm) in the first and second season respectively These findings are consistent with those found by **Soleymani, et al., (2015)** who demonstrated that early yield were higher in cucumber plant grown on black and clear mulch conditions.

According to the same table, the differences among the effect of the compost rates were significant , where the third rate (7 ton/fed) gave the heaviest early yield per plant (810.45 and 804.23 gm) in the first and the second season respectively. These findings are consistent with those found by **El-Affif et al (2009)** who demonstrated that compost manure increased the early yield in the summer squash plants .

The interaction effect among different treatments were significant in both seasons. The heaviest early weight per plant were (900.28 and 904.31 gm/plant) in first and second season, respectively which was observed in “Ghazeer “ hybrid when transplanted without mulch and added compost with the third rate (7 ton/fed) .

3.2.4 Numbers as early yield fruits/plant .

Results shown in table 10, indicated that , “Hakim” hybrid had the highest number of fruits that were produced per plant (8.49 and 8.45 fruit/plant) in the first and second season, respectively .

The data presented in the same table proved that , mulch had a significant and positive effect on the quantity of the cucumber fruits as number/plant which gave (8 and 8.65 fruits/plant) in first and second season respectively . Comparing with bare soil , which gave (7.49 and 7.93 fruit/plant) in first and second season respectively . These finding are in harmony with **Ajibola and Amujoycgb., (2019)** who said that white plastic mulch increased the number of cucumber fruits per plant.

Table 9 : Effect of mulching and different rates of compost on the Early yield (gm/plant) of some cucumber hybrids .

Hybrid	Mulch treatment	First season					Second season				
		Compost rates					Compost rates				
		C1 Zero	C2 4.67	C3 7	C4 9.33	Mean of AB	C1 Zero	C2 4.67	C3 7	C4 9.33	Mean of AB
A1 Hakim	B1 with mulch	546.69	657.75	834.15	664.05	675.66	561.87	675.02	843.55	675.43	688.97
	B2 without mulch	492.56	684.50	828	830.62	708.92	516.44	687.26	727.39	665.79	649.22
Mean of A1		692.29					669.09				
Mean of AC		519.62	671.12	831.07	747.34		539.16	681.14	785.47	670.61	
A2 Ghazeer	B1 with mulch	576	593.82	895.22	842.81	726.96	584.34	568.50	904.31	851.22	727.09
	B2 without mulch	451.13	658.96	900.28	878	722.09	458.50	664.41	904.28	883.81	727.75
Mean of A2		724.53					727.42				
Mean of AC		513.56	626.39	897.75	860.40		521.42	616.45	904.30	867.52	
A3 Hayel	B1 with mulch	762.66	811.43	711.19	589	718.57	804.35	815.43	714.46	593.31	731.88
	B2 without mulch	520.72	683.05	693.86	607.95	626.39	522.39	686.32	731.41	594.74	633.71
Mean of A3		672.48					682.80				
Mean of AC		641.69	747.24	702.52	598.47		663.37	750.87	722.93	594.02	
Mean of c		558.29	681.58	810.45	735.40		574.65	682.82	804.23	710.72	
Mean of B1		707.06	B2		685.80		Mean of b1		715.98	B2	670.23
LSD at 0.05 level of significance											
A					50.25						29.65
B					28.86						24.19
C					47.97						28.35
AxB					49.99						41.90
AxC					83.1						49.11
BxC					67.85						40.10
AxBxC					117.52						69.46

Table 10 : Effect of mulching and different rates of compost on Numbers as early yield fruits/plant of some cucumber hybrids .

Hybrid	Mulch treatment	First season					Second season				
		Compost rates					Compost rates				
		C1 Zero	C2 4.67	C3 7	C4 9.33	Mean of AB	C1 Zero	C2 4.67	C3 7	C4 9.33	Mean of AB
A1 Hakim	B1 with mulch	8.66	8.83	9.53	8.36	8.89	9	9.33	10	7.66	9
	B2 without mulch	7.26	8.53	8.46	8.30	8.14	7.33	9	8	7.33	7.91
Mean of A1		8.49					8.45				
Mean AC		7.96	8.68	9	8.33		8.16	9.16	9	7.50	
A2 Ghazeer	B1 with mulch	6.93	7.20	9	7.16	7.57	7.66	8.33	9.50	8.66	8.54
	B2 without mulch	6.86	8.20	7.76	6.70	7.38	7.83	8.66	8.66	8.33	8.37
Mean of A2		7.47					8.45				
Mean of AC		6.90	7.70	8.38	6.93		7.75	8.50	9.08	8.50	
A3 Hayel	B1 with mulch	7.40	8.86	6.90	7.20	7.59	9	9	7.66	8	8.41
	B2 without mulch	8.43	6.60	6.83	5.96	6.95	8	7.66	7.66	6.66	7.50
Mean of A3		7.27					7.93				
Mean of AC		7.91	7.73	6.86	6.58		8.50	8.33	7.66	7.33	
Mean of C		7.59	8.03	8.08	7.28		8.13	8.66	8.58	7.77	
Mean of B1		8	B2		7.49		Mean of b1		8.65	B2	7.93
LSD at 0.05 level of significance											
A						1.06					0.55
B						0.37					0.27
C						0.49					0.47
AxB						0.65					0.46
AxC						0.86					0.82
BxC						0.70					0.67
AxBxC						1.22					0.67

The results in the same table demonstrated that , differences among compost rates were significant only in the second season , The second rate (4.67 ton/fed) gave the highest fruit numbers in the second season (8.66 fruit/plant). **Ghasem, et al.**, (2014) found similar findings which said vermicomposte produced higher numbers of fruits per plant than chemical fertilizer.

The second order of interaction effect among different treatments were significant in both seasons . The highest quantity of cucumber's fruit were (9.53 and 10 fruit/plant) in the first and second seasons, respectively. These results were obtained by Hakim hybrid grown on mulch with the addition of compost at the third rate (7 ton/fed) .

3.2.5 Total yield (gm/plant)

Data in table 11, showed that , “Hakim” hybrid had the heaviest total fruit weight/plant in the first season which was (1327.18 gm/plant). Whereas , “Ghazeer” hybrid had the heaviest total fruit weight(1345.8 gm/plant) in the second season . **Pakash , at al (2021)** found similar findings which said that total yield was higher in cucumber cultivar “Poinsett 76” than “Marketmore 76” cultivar

Data presented in the same table shown that , mulch effect were not significant in both seasons on the total fruit weight/plant which gave (1333.29 and 1339.6 gm/plant) in first and second season respectively in compare with bare soil which gave (1296.34 and 1334.2 gm/plant). these findings disagree with those found by **Hernmwati (2023)**, who demonstrated that all mulch materials improve cucumber production in compare with bare soil .

The finding in the same table demonstrated that, differences between compost rates were significant in both seasons , where the third rate (7 ton /fed) gave the heaviest total fruit weight (1341.95 and 1352.12 gm/plant) in first and second season, respectively. **Mariah, et al. (2020)**, found similar findings and said that organic fertilizer (20 and 30 tons/ ha) increases the fruit weight in cucumber plant .

The interaction among the three studied factors were significant , where

the heaviest total fruit weight were (1693.74 and 1630.1 gm/plant) in first and second season respectively in “Hakim” hybrid without mulch and the third rate (7 ton/fed) of compost treatment.

3.2.6 Total yield (as fruit numbers per plant) .

The observations presented in table 12, indicated that , “Hayel” hybrid had the highest total numbers of cucumber fruits /plant in the first season which was (15.39 fruit/plant). On the other hand , “Hakim” hybrid had the highest values in the second season which gave (16.21 fruit/plant). These results were agree to those reported by **Alkwaz and Al-Hassani (2023)**, who demonstrated that Zucchini squash hybrid “Chamsa” was superior in the number of fruits in comparing with other hybrids .

The same data presented that , mulch had an impact on the total number of fruits/plant in both seasons , which gave (14.45 and 15.79 fruit/plant) in the first and second season, respectively, compare to bare soil which gave (14.39 and 15 fruit/plant) in first and second season respectively .these finding are in harmony with **Uddain, et al (2019)**, who said that white plastic mulch enhance the number of fruits per plant in zucchini plant .

Table 11: Effect of mulching and different rates of compost on the total yield (gm/plant) of some cucumber hybrids .

Hybrid	Mulch treatment	First season					Second season				
		Compost rates					Compost rates				
		C1 Zero	C2 4.67	C3 7	C4 9.33	Mean of AB	C1 Zero	C2 4.67	C3 7	C4 9.33	Mean of AB
A1 Hakim	B1 with mulch	1096	1232	1471.66	1257.81	1264.36	1072.4	1306.9	1476.9	1261.4	1279.43
	B2 without mulch	1139.07	1363.25	1693.74	1363.89	1389.99	1146.4	1365.3	1630.1	1401.2	1385.80
	Mean of A1	1327.18						1332.6			
Mean of AC		1117.53	1297.62	1582.70	1310.85		1109.46	1336.12	1553.53	1331.34	
A2 Ghazeer	B1 with mulch	1371.49	1366.29	1336.36	1367.61	1360.44	1380.4	1327.6	1342.2	1365.7	1353.80
	B2 without mulch	970.81	1085.66	1413.35	1550	1254.95	941.9	1442.1	1416.9	1549.7	1337.69
	Mean of A2	1307.70						1345.8			
Mean of AC		1171.15	1225.98	1374.86	1458.80		1161.15	1384.88	1379.59	1457.71	
A3 Hayel	B1 with mulch	1436.08	1319.63	1367	1377.61	1375.08	1458.4	1327.5	1373	1383	1385.51
	B2 without mulch	1033.77	1322.74	1316.90	1302.96	1244.09	1039.1	1286.9	1331.2	1459.5	1279.21
	Mean of A3	1309.58						1332.3			
Mean of AC		1234.92	1321.18	1341.95	1340.28		1248.78	1307.25	1352.12	1421.28	
Mean of c		1174.53	1281.59	1433.17	1369.98		1173.1	1342.7	1428.4	1403.4	
Mean of B1		1333.29	B2		1296.34		Mean of B1		1339.6	B2	1334.2
LSD at 0.05 level of significance											
A					42.28						32.60
B					43.21						32.22
C					47.36						55.71
AxB					74.85						55.80
AxC					82.05						96.52
BxC					66.98						78.82
AxBxC					116.02						136.5

Table 12 : Effect of mulching and different rates of compost on the total yield (as fruit numbers per plant) .of some cucumber hybrids .

Hybrid	Mulch treatment	First season					Second season				
		Compost rates					Compost rates				
		C1 Zero	C2 4.67	C3 7	C4 9.33	Mean ofAB	C1 Zero	C2 4.67	C3 7	C4 9.33	Mean of AB
A1 Hakim	B1 with mulch	13.93	15.40	16.23	13.36	14.73	14.33	17.75	18	17.66	16.93
	B2 without mulch	13.13	14.86	14.10	12.93	13.75	15	17	15.66	14.33	15.50
Mean of A1		14.24					16.21				
Mean of AC		13.53	15.13	15.16	13.15		14.66	17.37	16.83	16	
A2 Ghazeer	B1 with mulch	13.76	13.33	14.50	14	13.90	15.33	14	16	14.50	14.95
	B2 without mulch	12.13	15	14.26	12.90	13.57	14	15	15	15	14.75
Mean of A2		13.73					14.85				
Mean of AC		12.95	14.16	14.38	13.45		14.66	14.50	15.50	14.75	
A3 Hayel	B1 with mulch	15.30	15.16	14.90	13.56	14.73	14.66	17.66	15.33	14.33	15.50
	B2 without mulch	15.23	15.60	17.33	15.26	15.85	14	14.66	15.66	14.66	14.75
Mean of A3		15.39					15				
Mean of AC		15.26	15.38	16.11	14.41		14.33	16.16	15.50	14.50	
Mean of C		13.91	14.89	15.22	13.67		14.55	16.01	15.94	15.08	
Mean of B1		14.45	B2		14.39		Mean of b1		15.79	B2	15
LSD at 0.05 level of significance											
A						0.90					0.42
B						0.51					0.6
C						0.68					0.78
AxB						0.88					1.04
AxC						1.19					0.82
BxC						0.97					1.10
AxBxC						1.68					1.91

At the same table, the results revealed that different rates of compost had effect on the numbers of cucumber per plant , which the third rate(9.33 ton/fed) was the best one in the first season which gave (15.22 fruit/plant) . Whereas , the second rate (4.67 ton/fed) gave the highest numbers (16.01 fruit/plant) on the second season. **Ghasem, et al** (2014) found similar findings that vermicomposte produced higher number of fruits than chemical fertilizer in cucumber plant .

The interaction among the three studied factors were significant , where the highest total quantity of cucumber was (17.33 fruit/plant) in “Hayel” hybrid grown without mulch with the addition of the third rate of compost (9.33 ton/fed). In the second season , “Hakim” hybrid with mulch and the second rate of compost (4.67 ton/fed) gave the highest numbers (18 fruit/plant) .

4.DISCUSSION.

All three cucumber hybrids in our experiment were differed significantly in both seasons in most growth characters and yield as early and total . these differences may be related to genetic differences among hybrids and their interaction with environmental conditions. In our experiment according to both mulching technique and rates of compost which added to the soil . where mulching technique has more advantage for the soil and plants which growing into such as controlling the weeds growth , give the highest soil temperature, and conserving moisture and that lead to a strong and earlier growth moreover enhance the soil properties and nutrient availability and this cause higher productivity of cucumber plant . addition to , adding compost for the soil improve the soil physical – chemical parameters for example , it delivering nutrients to soils without increasing nitrate leaching ,

increasing soil productivity , enrich the bacterial diversity and controlling the fusarium wilt in cucumber and that led to nutrient availability and concentration, growth parameters, and early and total yield were more significant .

CONCLUSION

“Hayel” hybrid followed by “Hakim” with mulch technique and the second rate of compost (4.67 ton/fed) gave the heaviest fresh weight , dry weight , the tallest cucumber plants and the highest leaf area in both seasons .further more, “Ghazeer” hybrid and “Hakim” gave the heaviest early , total weight and the highest numbers of fruit per plant . Moreover, the third rate of compost (7 ton/fed) was the best rate in yield parameters . Mulch technique and compost had an impact on the growth and enhancing the yield of cucumber.

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الملخص العربي:

تأثير تغطية التربة بالمالش و اضافة معدلات من السماد العضوي علي نمو و انتاجية ثلاث هجن من الخيار.

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لتقييم انتاج ثلاثة أنواع من هجن الخيار وهي "حكيم" و "غزير" و "هايل" تحت ظروف التربة المغطاة بشرايح البلاستيك "المالش" والتربة الغير مغطاة ، وأربعة مستويات من التسميد العضوي " الكمبوست " " صفر و 4.67 و 7 و 9.33 طن/ فدان " . تم إجراء الدراسة الحقلية في موسمين الخريف لعامي 2021 و 2022 في المزرعة التجريبية لكلية الزراعة ، جامعة المنيا ، مصر. أظهرت النتائج أن ثلاثة أنواع هجينة اختلفت معنويا في ظل ظروف تجربتنا حيث كان هجين "غزير" يليه هجين "حكيم" متفوقة في إنتاجيتها المبكرة والكلية مقارنة ب "هايل". باستخدام تقنية التغطية بالمالش ، تم تحسين معاملات الخيار مثل زيادة طول النبات ، ومساحة سطح الورقة ، والوزن الطازج والجاف للنبات ، كما تم زيادة صفات المحصول مع التغطية بالمالش مقارنة بالتربة الغير مغطاة . علاوة على ذلك ، أعطى القدرة على نمو نبات الخيار في ذلك الوقت من العام (تحت درجة حرارة منخفضة). أيضا كان معدل (4.67 و 7 طن / فدان) أفضل معدلات من الكمبوست للحصول على أفضل نمو وعائد لهجن الخيار الثلاث.