Role Of Compound Fertilizer and Planting Dates on Yield Characteristics of Two Varieties Snake Cucumber (Cucumis milo var. flexuosus Naud)

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The experiment was conducted in the vegetable field of the Department of Horticulture and Landscape Engineering/College of Agriculture and Forestry University of Mosul during the spring season 2023. The study included three factors. The first factor: - Two local cucumber varieties: (gennxt and Mosli). The second factor was compound fertilizer (NPK) at four levels (270, 180, 90.0 kg/ha!) and the third factor: planting dates. Two planting dates were chosen: (4/1/2023) and (4/20/2023). Compound fertilizer (NPK) was added to the soil in three stages, the first three weeks after planting and after the plants reached the appropriate size (four true leaves), and the second and third at an interval of 20 days between one stage and the next. Thus, the experiment included 18 treatments (2 x 2 x 4 = 16). With three replications, the experiment was carried out in the field using a factorial experiment according to a randomized complete block design (RCBD), where the treatments were randomly distributed according to the design used in the experiment. The results were analyzed statistically according to the design used, and the means were compared according to Duncan's multinomial test at the probability level of 0.05.

Keywords: NPK fertilizer; planting dates; varieties.

1. Introduction

Snake cucumber (Cucumis melo var. flexuosus L.) belongs to the Cucurbitaceae family and it is believed that the Mediterranean basin is the original homeland of this plant (Chakravarty, 1966; Walters and Thieret, 1993 and Pandey et al., 2010), and it is grown in Iraq in Open fields in two seasons (spring and fall) and it can also be grown under plastic tunnels and warm greenhouses (AL-Rikabi and AL-Zubaidy, 2021).

The fruits are eaten fresh and come in three colors: yellow-green, light green (golden), and dark green, and the fruits have wrinkled outer surfaces. The small fruits are eaten fresh and in salads (Pandey et al., 2010), and it is almost similar to the watermelon plant, except for the

difference in the nature of its flowers. It is monoecious and monoecious.

Studies show that increased consumption of cucumber fruits is directly associated with a lower risk of several common human infections and diseases, including cardiovascular, prostate, lung, stomach, cancer, osteoporosis, and UV-related skin disorders (Erdman et al., 2009 ; Fernández,. 2014 and Gayatri et al., 2014).

There is a good response by many vegetable crops to these NPK compound fertilizers, which led to increased vegetative growth and increased fruit yield, and this is agreed upon by many studies on cucumber crops (Eifediyi and Remison, 2010), rose (Kacha et al., 2017), and pumpkin (Oloyede). et al., 2013), squash (Jan et al., 2000) and watermelon (Olaniyi, 2008).

Choosing varieties is necessary to know their suitability to the environmental conditions in the region to obtain the best production. In a study by Lemos et al. (2022), when he tested two hybrids of roses, NUN 21613 and NUN 21901, under three different planting distances, he noticed that NUN 21613 was superior in the length of the main branch of the plant after 62 days. From seedlings over the other hybrid, this hybrid also excelled in the characteristics of fresh fruit weight, number of fruits per plant, and plant yield with the highest values compared to the NUN 21901 variety.

The addition of chemical fertilizers is very important in enhancing the productivity of cultivated crops, and their optimal and timely application significantly improves the quantity, productivity and quality of fruits (Bartolo and Schweissing, 1998).

During his study of three levels of NPK complex fertilizer (20:10:22 / 25 : 15 : 27 / 30 : 20 : 32) kg/1000 m2 on cucumber plants in India, Singh et al. (2019) found that fertilizing with a high level of complex fertilizer (30: 20: 32) (kg/1000 m2) recorded the highest rate in the number of fruits per plant, average weight of fruit (g), productivity per plant (kg), and productivity per square meter (kg) compared to other levels of fertilization.

It was found that plant height increases with an increase in the photoperiod from 12-14 hours, in addition to an increase in temperature (Goyne and Schneither, 1987 and 1988). These results also agreed with the results of Johnson and Jellum (1972) and Robertson and Green (1981).

Oloyede (2014) found in an experiment on squash plants in Nigeria under different planting dates (April 1, April 15, May 1, May 15) that plants planted on April 1 were superior in the number of marketable fruits and the total yield per unit area, with values reaching (14.11) fruits per plant and (53.56) t h-1, respectively, at a time when these characteristics decreased under the last planting date, with values reaching (1.38) fruits per plant and (4.17) t h-1, respectively.

2. Materials and Methods.

The experiment was conducted in the vegetable field of the Department of Horticulture and Landscape Engineering, College of Agriculture and Forestry, University of Mosul, for the spring agricultural season 2023. A sample of the field's soil was taken to examine it beforehand to determine the physical and chemical characteristics of the soil. The maximum and minimum temperatures and the average rainfall were also recorded during the period of

implementation of the research.

The land was plowed using a flip disc plow, two perpendicular plows, then the process of leveling and smoothing the soil was carried out using a rake tool. The land was divided into three replicates, where planting terraces were created in each replicate. Each replicate included 16 terraces, 4 m long and 1250 cm wide, and drip irrigation pipes were placed. Next to the plants along the terrace. The seeds were planted directly in the field by making holes on the sides of the terraces and near the drip irrigation lines, at a rate of three to four seeds per hole, and the distance between one hole and another was 50 cm. Seeds for both the Mosul and Hindi (GENNXT) varieties were purchased from the local market, and the seeds were planted for the first date. On (1/4/2023), the second date was planting on (4/20/2023). The operations of hoeing and spraying with the insecticide (Alpha Zain) were carried out whenever necessary, and the weeds and bushes growing in the field were removed, and the field was made sure of the brushes. As for adding compound fertilizer (NPK) to the surface of the soil, it was done in three stages, three weeks after planting and the plants reaching the appropriate size (four true leaves), where the first batch of fertilizer was added, while the second batch was given 15 days after the first batch .

3. Results and discussion

1 - Number of fruits (fruits.plant^{-1}).

Table (1) shows that the Indian variety is significantly superior in the number of fruits (49.0) fruits plant^{-1} compared to the lowest value for the Mosul variety (40.6) fruits plant^{-1}. While the second planting date significantly exceeded the first planting date in the number of fruits of the plant (46.7, 42.9) fruits plant $^{-1}$ for each, respectively. As for fertilization levels, the fertilization level exceeded (270) kg/ha, with a value of (53.9) fruits. Plant^{-1} did not differ significantly from the fertilization level of 180 kg/ha, while the comparison treatment recorded the lowest number of fruits per plant, with a value of (53.8). Plant^{-1}.

Under the second planting date, the Indian variety gave the highest number of fruits while the Mosul variety, at the first planting date, gave the lowest values in the number of fruits.

The second planting date with the fertilization level of 270 kg/ha recorded the best number of fruits, and it did not differ significantly from the fertilization level of 180 kg/ha, thus superior to the comparison treatment for the first planting date.

The Indian variety significantly outperformed under the fertilization level of 270 kg/ha, recording the largest number of fruits per plant, amounting to (57.5) fruits plant^{-1}, and it did not differ significantly from the fertilization level of 180 kg per plant, compared to the lowest values of the Mosul variety under comparison, with a value of (27.0) fruits plant^{-1}.

Among the triple intervention, the Indian variety planted on the second date under the fertilization level of 270 kg/ha had the highest values in the number of female flowers with a value of (61,0) fruits plant^{-1}, which did not differ significantly with the fertilization level of 180 kg/ha, thus outperforming the Mosul variety grown under The first date of planting, for comparison, recorded the lowest number of fruits, amounting to (25.7) fruits plant^{-1}.

Table (1): effect of varieties, planting dates, compound fertilizer, and their interactions on number of fruits.

Planting Date	cultivars	Fertilization k g / h				Date × cultivars	Impact Date	Impact cultivars
		control	90	180	270			
First Date	Mosulli	25.7 h	33.0 g	47.3 e	48.0 de	38.5 d		
	Hindi	34.3 g	44.3 e	57.0 b	54.0 bc	47.4 b		
Second Date	Mosulli	28.3 h	36.0 f	53.7 bc	52.7 bc	42.7 c		
	Hindi	33.0 fg	48.3 cd	60.0 a	61.0 a	50.6 a		
Date × Fertilization	First Date	30.0 e	38.7 d	52.2 b	51.0 b		42.9 b	
	Second Date	31.2 e	43.2 c	55.4 a	56.9 a		46.7 a	
Cultivars × Fertilization	Mosulli	27.0 e	34.5 d	50.5 b	50.4 b			40.6 b
	Hindi	34.2 d	47.3 c	57.0 a	57.5 a			49.0 a
Impact Fertilization		30.6 c	40.9 b	53.8 a	53.9 a			

2 - Average weight of the fruit (g).

Table (2) shows that the Mosul variety was significantly superior in average fruit weight, reaching (153.84) g, compared to the lowest value for the Indian variety, recording (130.83) g. While the second planting date was superior to the first planting date in terms of average fruit weight per plant, with a value of (132.93, 151.74) g for each, respectively. The fertilization level exceeded (180) kg/ha, recording the highest values in average fruit weight, with a value of (158.21) g, and it did not differ significantly from the fertilization level of 270 kg/ha, while the comparison recorded the lowest values in that characteristic, with a value of (122.21) g.

As for the interaction between planting dates and varieties, the Indian variety, under the second planting date, recorded the highest values in average fruit weight per plant, with a value of (135.85) g, while the Mosul variety, under the first planting date, gave the lowest values in average fruit weight per plant, with a value of (140.06) g.

As for the interaction between planting dates and fertilization levels, the second planting date with the fertilization level of 180 kg/ha recorded the best values in terms of average fruit weight, with a value of (166.48) g, superior to the comparison for the first planting date, which gave the lowest values in terms of average fruit weight (105.02).) g. As for the interaction between varieties and fertilization levels, the Mosuli variety excelled under the fertilization level of 180 kg/ha in terms of average fruit weight, with a value of (194.77) g, compared to the lowest values for the Indian variety under comparison, which recorded (119.47) g.

The triple interaction shows the superiority of the Mosul variety grown in the second date under the fertilization level of 180 kg/ha with the highest values in the fruit weight rate, with a value of (200.00) g, outperforming the Indian variety grown under the first date. For

comparison, it recorded the lowest values in that characteristic, which amounted to (96.63) g.

Table (2): The effect of varieties, planting dates, compound fertilizer, and their interactions on weight of fruits.

Planting Date	cultivars	Fertilization k g / h				Date × cultivars	Impact Date	Impact cultivars
		control	90	180	270			
First Date	Mosulli	96.63 f	117.73 def	189.53 ab	156.33 bcd	140.058 b		
	Hindi	113.40 def	135.57 cdef	110.33 ef	143.93 cde	125.808 b		
Second Date	Mosulli	153.27 bcde	162.53 abc	200.00 a	154.70 bcd	167.625 b		
	Hindi	125.53 cdef	142.83 cde	132.97 cdef	142.83 cde	135.850 a		
Date × Fertilization	First Date	105.02 c	126.65 bc	149.93 ab	150.13 ab		132.933 b	
	Second Date	139.40 ab	152.68 ab	166.48 a	148.34 ab		151.737 a	
Cultivars × Fertilization	Mosulli	124.95 c	140.13 bc	194.77 a	155.52 b			153.842 a
	Hindi	119.47 c	139.20 bc	121.65 c	143.00 bc			130.829 b
Impact Fertilization		122.208 b	139.667 ab	158.208 a	149.258 a			

3 - Yield per plant (kg plant^{-1}).

The results of Table (3) show that the Indian variety was significantly superior in yield per plant, with the highest values reaching (3.99) kg plant^{-1}. Compared with the Mosul variety, which recorded the lowest values (3.66) kg plant^{-1}. While the second planting date outperformed the first planting date in terms of yield per plant, with values reaching (4.59, 3.59) kg plant^{-1} for each, respectively. The level of fertilization exceeded (180) and (270) kg/ha, which did not differ significantly between them, as the highest values were recorded in the yield per plant, with a value of (4.62, 4.56) kg plant^{-1} for each of them, respectively, while the comparison recorded the lowest values in the yield characteristic. One plant with a value of (2.20) kg plant^{-1}.

The interaction between planting dates and varieties, as the Indian variety, under the second planting date, recorded the highest values in yield per plant, with a value of (4.20) kg plant-1, while the Mosul variety, under the first planting date, gave the lowest values in yield per plant, with a value of (3.38) kg plant^{-1}.

As for the interaction between planting dates and fertilization levels, the second planting date with the fertilization level of 180 and 270 kg/ha recorded the best values in yield per plant, with a value of (4.85, 4.78) kg plant^{-1}, superior to the comparison for the first planting date, which gave the lowest values in the trait. The yield of one plant is (2.09) kg plant^{-1}.

The bilateral interaction between varieties and fertilization levels was superior to the Indian variety for the fertilization level of 180 kg/ha in terms of yield per plant, with a value of (4.79) kg plant^{-1}, and it did not differ significantly from the fertilization level of 270 kg/ha compared to the lowest values for the Mosul and Indian varieties under comparison, which were recorded. (2.07, 2.34) kg plant^{-1} for each, respectively.

The triple interaction shows that the Indian variety planted on the second date under the fertilization level of 180 kg/ha was significantly superior to the highest values in yield per plant, with a value of (4.91) kg plant^{-1}, and it did not differ significantly with the fertilization level of 270 kg/ha, thus superior to the Mosul variety grown under The first date, for comparison, recorded the lowest values for that trait, which amounted to (1.98) kg plant^{-1}.

Table (3): The effect of varieties, planting dates, compound fertilizer, and their interactions on Plant yield kg .

Planting Date	cultivars	Fertilization k g / h				Date × cultivars	Impact Date	Impact cultivars
		control	90	180	270			
First Date	Mosulli	1.9770 g	3.3730 e	4.1127 c	4.0597 c	3.38058 d		
	Hindi	2.2067 g	3.6397 d	4.6793 ab	4.6460 ab	3.79292 c		
Second Date	Mosulli	2.1567 g	4.1127 c	4.7793 ab	4.7060 ab	3.93867 b		
	Hindi	2.4723 f	4.5793 b	4.9127 a	4.8460 ab	4.20258 a		
Date × Fertilization	First Date	2.09183 e	3.50633 c	4.39600 b	4.35283 b		3.58675 b	
	Second Date	2.31450 d	4.34600 b	4.84600 a	4.77600 a		4.58675 a	
Cultivars × Fertilization	Mosulli	2.06683 f	3.74283 d	4.44600 b	4.38283 b			3.65963 b
	Hindi	2.33950 e	4.10950 c	4.79600 a	4.74600 a			3.99775 a
Impact Fertilization		2.20317 c	3.92617 b	4.62100 a	4.56442 a			

4 - Early yield (kg ha^{-1})

Table (4) shows that the Indian variety excelled in early yield with the highest values, reaching (155.21) kg ha^{-1}, compared to the Mosul variety, which recorded the lowest early yield of the plant, giving (141.62) kg ha^{-1}. The table shows that there are no intestinal differences between the two dates for this trait. The fertilization level was (270) kg/ha with the highest values in early plant yield, reaching (215.92) kg ha^{-1}. While the comparison treatment recorded the lowest values and amounted to (96.50) kg ha^{-1}.

As for the interaction between planting dates and varieties, the Indian variety under the first planting date recorded the highest values in the early yield of the plant, reaching (155.50) kg ha^{-1}, outperforming the Mosul variety under the second planting date, which recorded the lowest early yield of the plant, reaching (139.50) kg ha^{-1}.

Interaction between planting dates and fertilization levels. The second planting date with the fertilization level of 270 kg/ha recorded the best values for the early yield of the plant, with a value of (217.33) kg ha^{-1}. This is superior to the comparison treatment for the first planting date, which gave the lowest values for the early yield of the plant, with a value of (100.17) kg ha^{-1}.

The bilateral interaction between varieties and fertilization levels showed the superiority of

the Indian variety under the fertilization level of 270 kg/ha in the early yield trait, with a yield of (241.00) kg ha^{-1}, compared to the lowest values for the Mosul and Hindi varieties under the comparison treatment, which recorded (91.17, 101.83) kg ha^{-1}. For each of them respectively.

The triple intervention showed the superiority of the Indian variety planted in the second date under the fertilization level of 270 kg/ha with the highest values in the early yield trait, with a yield of (241.00) kg ha^{-1}, superior to the Mosul variety grown under the first date of the comparison treatment, which amounted to (110.67) kg ha^{-1}. Which did not differ significantly with the fertilization level of 270 kg/ha for the Indian variety under the first cultivation level.

Table (4): The effect of varieties, planting dates, compound fertilizer, and their interactions on Early yield t h^{-1} .

Planting Date	cultivars	Fertilization k g / h				Date × cultivars	Impact Date	Impact cultivars
		control	90	180	270			
First Date	Mosulli	110.67 fg	129.67 def	146.67 cde	188.00 b	143.750 ab		
	Hindi	89.67 g	126.33 ef	165.00 bc	241.00 a	155.500 a		
Second Date	Mosulli	93.00 c	113.33 fg	158.00 cd	193.67 b	139.500 b		
	Hindi	92.67 g	128.67 def	157.33 cd	241.00 a	154.917 a		
Date × Fertilization	First Date	100.167 d	128.000 c	155.833 b	214.500 a		149.625 a	
	Second Date	92.833 d	121.000 c	157.667 b	217.333 a		147.208 a	
Cultivars × Fertilization	Mosulli	101.833 e	121.500 d	152.333 c	190.833 b			141.625 b
	Hindi	91.167 e	127.500 d	161.167 c	241.000 a			155.208 a
Impact Fertilization		96.500 d	124.500 c	156.750 b	215.917 a			

5 - Total yield (t h^{-1})

Table (5) shows that the Indian variety was significantly superior in terms of total yield, reaching (41.88) t h^{-1}, compared to the lowest value for the Mosul variety, recording (37.46) t h^{-1}. While the second planting date was superior to the first planting date in terms of total plant yield, with values reaching (42.65, 36.69) t $h^{-1}$for each of them, respectively. As for fertilization levels, the fertilization level exceeded (180) kg/ha, as the highest values were recorded in The total yield reached (48.06) t h^{-1}, while the comparison recorded the lowest values in the total plant yield, with a value amounted to (26.57) t h^{-1}.

The interaction between planting dates and varieties, as the Indian variety, under the second planting date, recorded the highest values in the total yield of the plant, with a value of (44.69) t h^{-1}, while the Mosul variety, under the first planting date, gave the lowest values in the total yield of the plant, with a value of (34.32) t h^{-1}.

As for the bilateral interaction between planting dates and fertilization levels, the second planting date with the fertilization level of 180 kg/ha recorded the best values for total yield,

with a value of (51.60) t h^{-1}, thus superior to the comparison for the first planting date, which gave the lowest values for total yield. (25.060) t h^{-1}.

The bilateral interaction between varieties and fertilization levels was clear, as the Indian variety under the fertilization level of 180 kg/ha was significantly superior in total yield with a value of (51.09) t h^{-1}compared to the lowest values for the Mosul and Hindi varieties under comparison, which recorded (26.00, 27.13) t h^{-1}each respectively.

The triple interaction shows the superiority of the Indian variety planted in the second appointment under the fertilization level of 180 kg/ha with the highest values in the total yield trait with a value of (54.81) t h^{-1}, thus outperforming the Mosul variety grown under the first appointment. For comparison, it recorded the lowest values in that trait, which It reached (23.90) t h^{-1}.

Table (5): The effect of varieties, planting dates, compound fertilizer, and their interactions on total yield t h^{-1} .

Planting Date	cultivars	Fertilization k g / h				Date × cultivars	Impact Date	Impact cultivars
		control	90	180	270			
First Date	Mosulli	23.900 h	31.733 f	41.657 cd	39.993 d	34.3208 d		
	Hindi	26.220 gh	36.557 e	47.377 b	53.047 b	39.0709 c		
Second Date	Mosulli	28.113 g	42.260 cd	48.393 b	46.130 c	40.6058 b		
	Hindi	28.050 g	42.850 c	54.813 a	53.047 a	44.6900 a		
Date × Fertilization	First Date	25.0600 g	34.1450 e	44.5167 c	43.0617 cd		36.6958 b	
	Second Date	28.0817 f	42.5550 d	51.6033 a	48.3517 b		42.6479 a	
Cultivars × Fertilization	Mosulli	26.0067 f	36.9967 e	45.0250 b	41.8250 c			37.4633 b
	Hindi	27.1350 f	39.7033 d	51.0950 a	49.5883 a			41.8804 a
Impact Fertilization		26.5708 d	38.3500 c	48.0600 a	45.7067 b			

6 - Marketing yield (t h^{-1})

The results of Table (6) indicated that the Indian variety was superior in terms of marketing yield, reaching (41.59) t h^{-1}, compared to the lowest value for the Mosul variety, recording (37.18) t h^{-1}. It indicates that the second planting date was superior to the first planting date in terms of the marketing yield of the plant, as it gave the highest values for the marketing yield, with values reaching (42.37, 36.40) t h^{-1} for each of them, respectively. Fertilization levels show that the fertilization level (180) kg/ha is superior to the rest of the levels, with a value of (45.47) t h^{-1}, while the comparison recorded the lowest values in the marketing yield of the plant, with a value of (26.18) t h^{-1}.

As for the interaction between planting dates and varieties, the Indian variety under the second planting date had the highest values in the marketing yield of the plant, with a value

reaching (44.40) t h^{-1}, while the Mosul variety, under the first planting date, showed the lowest values in the marketing yield of the plant, with a value reaching (34.03) t h^{-1}.

As a result of the bilateral interaction between planting dates and fertilization levels, the second planting date with the fertilization level of 180 kg/ha recorded the best values in the marketable yield characteristic, with a value of (51.36) t h^{-1}, superior to the comparison with the first planting date, which gave the lowest values in the marketable yield character. Which amounted to (24.66) t h^{-1}.

As for the bilateral interaction between varieties and fertilization levels, the Indian variety under the fertilization level of 180 kg/ha was significantly superior in marketing yield with a value of (50.85) t $h^{-1}$and did not differ significantly from the fertilization level of 270 kg/ha compared to the lowest values for the Mosul and Indian varieties under comparison. Which recorded (25.61, 26.76) t h^{-1} for each of them, respectively.

The triple intervention showed the superiority of the Indian variety grown in the second appointment under the fertilization level of 180 and 270 kg/ha with the highest values in the marketable yield characteristic with a value of (54.57, 52.80) t h^{-1}, thus outperforming the Mosul variety grown under the first appointment and for comparison, it recorded the lowest values. In that capacity, which amounted to (23.48) t h^{-1}.

Table (6): The effect of varieties, planting dates, compound fertilizer, and their interactions on marketable yield t h^{-1} .

Planting Date	cultivars	Fertilization k g / h				Date × cultivars	Impact Date	Impact cultivars
		control	90	180	270			
First Date	Mosulli	23.481 l	31.419 g	41.452 de	39.792 e	34.0358 d		
	Hindi	25.837 hl	36.257 f	47.132 b	45.872 bc	40.3295 b		
Second Date	Mosulli	27.731 h	36.257 f	48.161 b	43.424 dc	38.7743 c		
	Hindi	27.687 h	42.563 d	54.567 a	52.800 a	44.4045 a		
Date × Fertilization	First Date	24.6593 g	33.8377 e	44.2917 c	42.8317 cd		36.4051 b	
	Second Date	27.7088 f	422825 d	51.3643 a	48.1123 b		42.3670 a	
Cultivars × Fertilization	Mosulli	25.6060 f	36.7102 e	44.8065 b	41.6080 ڊ c			37.1827 b
	Hindi	26.7622 f	39.4100 e	50.8495 a	49.3360 a			41.5894 a
Impact Fertilization		26.1841 d	38.0601 c	47.8280 b	45.4720 a			

4. Discussion

Planting dates affected the leaf area of the plant and increased the number of branches, which contributed to increasing the results of the photosynthesis process of plants. At the same time, the root area improved, which increased the absorption of nutrients. This is consistent with the

findings of (Logjam and Devi 2017), and that increase in the characteristics of vegetative growth contributed to creating The best yield for plants is through improving the floral growth characteristics of the plants, as the percentage of female flowers increased compared to the decrease in male flowers, to obtain a good set ratio for the plants, and it agrees with what was found by (Sharma 2016) and (Kapuriya et al. 2017), which enhanced the increase in the number of fruits for the plants (Eifediyi and Revision (2009) and increased the size and weight of fruits (Sharma, 2016), which was reflected in an increase in plant yield and thus an increase in the total yield per unit area. This is consistent with (Khan et al. 2017)

Nitrogen is one of the important nutrients in growth and production, as it participates in the metabolic processes that affect the vital activity of the plant, which is reflected in an increase in yield and quality (Al-Ajili, 2005). Phosphorus is one of the nutrients most in demand by plants because of its participation in the plant metabolism, which It was reflected in an increase in vegetative growth characteristics and an improvement in plant yield of the cucumber cucumber studied in the experiment. This element plays a role in root growth (Filgueira, 2012, Prates et al., 2012) and metabolic processes such as formations of ATP, nucleic acids, and photosynthesis (Taiz, 2013, Oliveira et al., 2017), while potassium plays the role of a catalyst in many biological processes, including protein synthesis and photosynthesis (Taiz and Zeiger, 2003). It improves the characteristics of the yield and plays a role in increasing the size of fruits by increasing the efficiency of the photosynthesis process and increasing the transfer of synthetic materials to the fruits (Abu Dahi and Al-Younis, 1988 and Al-Naimi, 1999). It increases fruit weight and yield (Hanshal and Sadiq, 2010).

The superiority of the Indian variety in flower yield characteristics and quantitative and qualitative yield characteristics may be due to the variation in hybrid vigor, which is controlled by a set of genetic factors specific to the hybrid and the influence of environmental factors represented by the degree of response to climate and soil factors in the production area (Kazim and Hussein 2015) or due to the difference in the hybrids' ability to flower. Adaptation to different growing conditions, climate change and genetic composition and their response to rapid adaptation to existing conditions within the cultivation area (Eifediyi and Remison, 2009).

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