

The effect of three types of organic fertilizer on some yield characteristics of two varieties of cucumber plants

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Abstract

The experiment was conducted at the research station of Horticulture and Landscape Department, College of Agriculture, Tikrit University, during the season 2024, to study the effect of three types of organic fertilizers (cow manure, sheep manure, and poultry manure) on two cultivars of cucumber plants. The experiment was implemented according to a Randomized Complete Block Design (RCBD) in a Split-Plot design, fertilization was in the main plots and cultivars in the sub-plots. The results were as follows: Fertilization with cow manure outperformed in the trait fruit number was gave 1.15 fruits plant⁻¹. As for the characteristics of plant yield, experimental unit yield, and total yield, fertilization with sheep manure was superior, recording values of (1.38 kg plant⁻¹, 6.92 kg and 57,639 tons ha⁻¹), respectively. Regarding the effect of cultivars, V2 outperformed V1 in the fruit length trait, which gave 32.67 cm plant⁻¹. The interaction effect was superior between sheep manure and V2 compare with some of the other treatment in terms of fruit length, plant yield, experimental unit yield, and total yield.

Keywords: cucumber, cultivars, organic fertilizer.

Introduction

Snake cucumber (*Cucumis melo* var. *flexuosus* Naud) is a summer vegetable belonging to the Cucurbitaceae family. The original habitat of the snake cucumber plant is India (Hedrick, 1919). In Iraq, snake cucumber is cultivated in open fields in two seasons (spring and autumn), or under protected environments such as tunnels, plastic houses, and glasshouses (FAO, 2013). It is a consumable vegetable grown for its fruits, which are used fresh or cooked and are utilized in pickle production. The fruits of the snake cucumber crop contain vitamin C, water, and other substances (Mutlu et al., 2005).

The productivity of snake cucumber in the country is relatively low. Increasing the production level can be achieved by studying the environmental conditions that affect plant growth and yield, particularly the fertilization factor, which is one of the important factors due to its evident impact on improving plant

growth and yield. Organic fertilization is one of the factors affecting vegetative growth and yield components (Grimstad, 1995). Mohammed (2013) conducted a study on snake cucumber showing that farmyard manure and compost improved the flower set rate and total fruit number. Similarly, Almrani et al. (2016) showed that the use of 2.5% and 5% poultry waste gave the highest values in fruit yield and In a study by Abdulkareem (2018) on the effect of cattle manure compost its addition to the soil led to a significant increase in fruit number and length and weight.

Genetic differences among cultivars is a primary determinant of agricultural performance which shows the existence of wide genetic diversity that provides an opportunity to select superior individuals carrying high production traits and greater ability to resist environmental or biological stresses. Recent studies showed that low genetic diversity leads to reduced flexibility of the

agricultural system and its responsiveness to changing challenges. meanwhile genetic diversity especially through strategies like evolutionary agriculture and cultivar mixtures can improve production stability and strengthen cultivars capacity for future environmental diversity (Joshi, 2023). Kumar et al. (2019) found that studying seven cucumber cultivars grown in a greenhouse showed superior results in the fruit yield per plant trait for the Akron and Terminator cultivars. In another study by Saeed et al. (2025) on local gynocious cucumber plants using five other hybrids, the fourth and fifth hybrids (B4 and B5) outperformed in providing the highest yield per plant.

Based on the above, this study aims to determine the best types of animal fertilizers used that provide the best indicators of vegetative growth and yield, in addition to the highest productivity, and to identify which of the two cultivars is better in terms of productivity, and to determine the best interaction treatment between cultivars and organic fertilization in providing the highest yield.

Materials and Methods

The experiment was conducted at the Agricultural Research Station /Department of Horticulture and Landscape / College of Agriculture / Tikrit University during the autumn agricultural season 2024. The aim was to study the effect of three cultivars of organic fertilization using cow, sheep, and poultry manure on the yield characteristics of two varieties of snake cucumber (*Cucumis melo* var. *flexuosus*). Soil samples were collected from different locations in the field at a depth of 0–30 cm and analyzed to determine the physical and chemical properties of the field soil. (Table 1)

The field soil was prepared by plowing with a disc plow in crosswise passes then smoothed and leveled. It was divided into three blocks with every block serving as a replicate. The distance between blocks was 3.5 m and every block was 19.5 m long with every block contained eight experimental units and every experimental unit

was 2 m long and 0.6 m wide with a distance of 0.5 m between experimental units and each experimental unit contained eight hills with a distance of 0.5 m between hills then planting was carried out on both sides of the blocks on August 10, 2024.

This resulted in 24 experimental units derived from the interaction between the cultivar and fertilization factors, using two cultivars of snake cucumber and three types of organic (animal) fertilizers, in addition to a control treatment. The treatments was arranged according to a split plot design with cultivars added to the main plots and organic fertilization to the sub plots. Fertilization was applied at a rate of 10 tons per hectare based on fertilizer recommendations (Mutlu et al., 2005). Drip irrigation was used and the treatments were randomly arranged in the field as follows:

The following traits were studied:

1. Fruit Length (cm): Measured by using a measuring tape for five fruits from each experimental unit.

2. Number of Fruits (fruit plant⁻¹): Measured by calculating all the numbers of the fruit in the experimental unit from the beginning of harvesting to the end of the growing season and then divided by the number of plants in the experimental unit.

3. Yield per Plant (kg plant⁻¹): Calculated using the following method:

$$\text{Yield per Plant (kg)} = \frac{\text{Yield per Experimental Unit (kg)}}{\text{Number of Plants in the Experimental Unit}}$$

4. Yield per Experimental Unit (kg): Calculated as the sum of the yield from the first and second harvest

5. Total Yield (ton ha⁻¹): Calculated from the beginning to the end of harvesting using the following formula:

$$\text{Total Yield (ton/ha)} = \left[\frac{\text{Yield per Experimental Unit (ton)}}{\text{Area of Experimental Unit (m}^2\text{)}} \right] \times 10,000.$$

Table 1: Some physical and chemical properties of the field soil

Trait	Unit of Measurement	con
Sand	%	33
Silt	%	29
Clay	%	38
Texture		Sandy Loam
Soil Acidity (pH)		7.09
Electrical Conductivity	millimole	3.24
Organic Matter	mg/kg	1.32
Nitrate	mg/kg	11.3
Ammonium	mg/kg	12.11
Available Phosphorus	mg/kg	16.7
Potassium	mg/kg	3.37

Results and discussion

1. Fruit Length

Table 2 shows no significant differences in fruit length among all organic fertilization treatments. Regarding cultivars, cultivar V2 outperformed cultivar V1, giving the highest fruit length of 32.67 cm, compared to cultivar V1, which gave a maximum fruit length of 27.17 cm.

As for the interaction effect the treatment combining cultivar V2 with poultry manure outperformed

other interaction treatments achieving a fruit length of 35.00 cm. The shortest fruit length was recorded for cultivar V1 fertilized with sheep manure at 24.00 cm.

2. Number of Fruits per Plant

From **Table 3**, which shows the effect of adding organic fertilizers on the number of fruits per plant for two cultivars of snake cucumber, it is observed that there is no significant difference regarding the effect of cultivars.

However, regarding the effect of fertilization, the treatments with cattle manure outperformed, achieving 1.10 fruits per plant, compared to the treatments with sheep and poultry manure, which yielded 1.01 and 1.04 fruits per plant, respectively.

As for the interaction treatments, a significant effect was observed with the treatment combining cultivar V2 and cattle manure, where the number of fruits reached 1.12 fruits per plant. This treatment outperformed some other interaction treatments, namely the treatment combining cultivar V1 with sheep and poultry manure, which yielded 0.98 and 1.02 fruits per plant, respectively, as well as the control treatment for cultivar V2, which yielded 1.03 fruits per plant.

3. Yield per Plant

From **Table 4**, significant differences are observed among the organic fertilization treatments. The treatment with sheep manure outperformed the treatment with cattle manure, with yields per plant of 1.38 kg and 1.08 kg, respectively.

Regarding the cultivar effect, no significant differences were found.

As for the interaction effect, the interaction treatment combining cultivar V2 with sheep manure was superior, achieving a value of 1.47 kg, compared to other interaction treatments. These include the treatment combining the same cultivar (V2) with cattle manure and the control treatment for cultivar V1 with cattle manure, which recorded values of 1.03 kg and 1.07 kg, respectively.

4. Yield per Experimental Unit

From **Table 5**, which shows the effect of adding organic fertilizers on the yield per experimental unit there was significant differences observed due to the fertilization factor. The treatment with sheep manure outperformed reaching 6.92 kg compared to the treatment with cattle manure and the control treatment where the yield per experimental unit was 5.83 kg and 5.38 kg respectively. Regarding cultivars no significant differences were found.

The interaction effect was significant for the treatment combining cultivar V2 with sheep manure, which recorded a value of 7.33 kg. This treatment outperformed other interaction treatments, such as the treatment combining cultivar V1 with cattle manure and the control treatment, which recorded values of 5.08 kg and 5.33 kg, respectively, as well as the treatment combining cultivar V2 with cattle manure, which yielded 5.67 kg.

Table 2: Effect of Organic Fertilizers on Fruit Length in Two Cultivars of Snake Cucumber.

Fertilization Variety	Control	CM	SM	PM	Mean Effect of Variety
V1	33.00 a	25.67 bc	24.00 c	26.00 bc	27.17 b
V2	30.00 abc	32.00 ab	33.67 a	35.00 a	32.67 a
Mean effect of organic fertilizers	31.50 a	28.83 a	28.83 a	30.50 a	

Table 3: Effect of Organic Fertilizers on the Number of Fruits per Plant for Two Cultivars of Snake Cucumber.

Fertilizer Variety	Control	CM	SM	PM	Mean Effect of Variety
V1	1.08 ab	1.09 ab	0.98 c	1.02 bc	1.04 a
V2	1.03 bc	1.12 a	1.04 abc	1.07 ab	1.07 a
Mean effect of organic fertilizers	1.05 ab	1.10 a	1.01 b	1.04 b	

Table 4: Effect of Organic Fertilizers on Yield per Plant for Two Cultivars of Snake Cucumber.

Fertilizer Variety	Control	CM	SM	PM	Mean Effect of Variety
V1	1.07 cd	1.03 d	1.30 abcd	1.37 ab	1.19 a
V2	1.33 abc	1.13 bcd	1.47 a	1.33 abc	1.32 a
Mean effect of organic fertilizers	1.20 ab	1.08 b	1.38 a	1.35 a	

Table 5: Effect of Organic Fertilizers on Yield per Experimental Unit for Two Cultivars of Snake Cucumber.

Fertilizer Variety	Control	CM	SM	PM	Mean Effect of Variety
V1	5.33 bc	5.08 c	6.50 abc	6.75 ab	5.92 a
V2	6.33 abc	5.67 bc	7.33 a	6.63 ab	6.49 a
Mean effect of organic fertilizers	5.83 bc	5.38 c	6.92 a	6.69 ab	

Table 6: Effect of Organic Fertilizers on Total Yield for Two Cultivars of Snake Cucumber.

Fertilizer Variety	Control	CM	SM	PM	Mean Effect of Variety
V1	44444 bc	42361 c	54167 abc	56250 ab	49306 a
V2	52778 abc	47222 bc	61111 a	55278 ab	54097 a
Mean effect of organic fertilizers	48611 bc	44792 c	57639 a	55764 ab	

5. Total Yield

Table 6 indicates significant differences in total yield due to organic fertilization. The treatments with sheep manure and poultry manure outperformed the control treatment and cattle manure, with yields of (57639, 55764, 44792, and 48611) tons ha⁻¹, respectively.

Regarding cultivars, no significant differences were observed.

As for interaction factors, the table shows the superiority of the treatment combining cultivar V2 with sheep manure, which gave the highest total yield of 61,111 tons ha⁻¹. This treatment outperformed other interaction treatments, while the lowest yield was recorded for the treatment combining cultivar V1 with cattle manure, at 42,361 tons ha⁻¹.

Based on the above results the increase in the traits of fruit number and yield per plant and yield per experimental unit and total yield under fertilization with cattle manure and sheep manure can be given to the high content of macro and micronutrients in these fertilizers even though in varying proportions between the two specially nitrogen and phosphorus. These elements contribute to increased vegetative growth and stimulate photosynthetic processes positively reflecting on yield quantity also the organic matter in these fertilizers improves soil properties enhances the activity of soil microorganisms and improves aeration which results in increase of the efficiency of mineral nutrient absorption (Abogadallah et al., 2010).

As for the reason for the superiority of the treatment combining sheep manure with cultivar V2 (Mo et al., 2016), it may be attributed to one of two factors

Conclusions

From the above, it can be concluded that organic fertilizer treatments play a clear role in improving the yield characteristics of snake cucumber, with sheep manure being the most effective, followed by poultry manure, particularly for the second cultivar (V2) in terms of yield per plant, yield per experimental unit, and total yield. This demonstrates the efficiency of organic and animal fertilizers in meeting the plant's nutritional requirements. As for the cultivars, they did not show a significant effect on the studied traits, indicating their genetic similarity and comparable responsiveness to environmental conditions.

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Conflict of Interest Statement: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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