



Influence of Cattle Manure, Phosphorein, Potassein and Joker Fertilizer on Growth, Flowering and Fruit Quality of Cucumber (*Cucumis sativus* L.)

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Abstract

Two field experiments were conducted in sandy soil during the successive summer seasons of 2020/2021 and 2021/2022 at a private farm, Abu Hammad Center, Sharkia Governorate, Egypt. The experiment with the objective of studying the effects of bio-fertilizer used (phosphorein and potassein) and foliar spray with (potassium and phosphors within Joker fertilizer) and their combined between them on the growth, yield and fruits quality and flowering of cucumber. This study included 10 treatments as follows: control, Cattle 5m³/ fed .+0 Pk, Cattle 5m³/ fed .+2 ml/ 1 Pk, Cattle 5m³/ fed .+4 ml / 1 Pk, Phosphorein+0 Pk, Phosphorein+2ml / 1 Pk, Phosphorein+4ml / 1 Pk, potassein+0 Pk, potassein+2ml/ 1 Pk ,and potassein+4 ml/ 1 Pk. The experiments were laid out in complete block design with three replications. Results indicated that cattle manure with the level of Joker fertilizer at 4 ml/L significantly increased on vegetative growth characters and fruit quality of cucumber plants, followed by cattle manure with 2 ml/L foliar spray of Joker, bio fertilizer of phosphorein with 4 ml/L, potassein with 4 ml/L, respectively, in both growing seasons. Conclusively: it can be concluded that of application cattle manure, phosphorein and potassein with the highest values of Joker fertilizer (4 ml/ l), being the most effective treatments on vegetative growth characters and fruit quality and flowering of cucumber plant.

Keywords: Cattle manure – bio fertilizer –Joker fertilizer- cucumber.

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1. Introduction

Cucumber (*Cucumis sativus* L.) is a popular vegetable belongs to the family cucurbitaceae. Cucumber is native to the tropics and is one of the oldest cultivated vegetable crops [1]. Cucumber (*Cucumis sativus* L.) is an ancient vegetable and one of the most important members of the Cucurbitaceae family [2], which is cultivated for its fruits which are a rich source of minerals and vitamins. They added that fruit is eaten fresh in salads in accompaniment with other vegetables. It is considered as quality dietary food due to its excellent digestibility and rich water content (96.3 g/100 g). Cucumber is a dependable laxative for those who suffer constipation. The juice of cucumber is a valuable food in the treatment of hyper acidity, gastric and duodenal ulcers. High nutrient treatment during the past part of the century has significantly improved crop yields [3]. Cucumber requires large amounts of both macro and micro nutrients for economic yields of cucumber. Nitrogen, phosphorus and potassium are important nutrients for cultivation of cucumber. Cucumber plants should be fertilized with adequate dose of nitrogen, phosphorus and

potassium which are the main elements and they have significant effect on growth of plants. Nitrogen (N) is perceived as one of the principal macronutrients which is necessary for plants [4]. Nitrogen is a component of chlorophyll, the green pigment of plants that stimulates photosynthesis. Deficiency of nitrogen significantly reduces growth and yield of cucumber. The element phosphorus (P) is a must for photosynthesis. High level of available phosphorus throughout the root zone is essential for root development and good utilization of water and other nutrients by the plants [5]. Potassium is absorbed in greater amounts by plants than any other mineral element with the exception of nitrogen and, in some cases, calcium as well. Potassium helps in some essential functions in plants like protein building, photosynthesis, maintaining fruit quality and diseases reduction [6]. The organic matter benefit the soil through; binding the soil particles together to form aggregates, improving the moisture – holding capacity of soil (especially in sandy and loamy soils), improving soil permeability to water, increasing the cation exchange capacity of soils, buttering the soil against excessive or

abrupt pH change when soil amendments are added, favoring the formation of metal-organic matter complexes (e.g. with the Fe, Mn, Cu, Zn) which enhances the stable availability of these micronutrients throughout the growing period. Organic nutrients are important source of the micronutrients and also some secondary nutrients (S, Mg, Fe, and Cu) such as cattle manure and chicken manure [7].

Cattle manure is a potential source of nutrients and also a potential benefit to soil amelioration especially for communal farmers who cannot afford fertilizers. However, getting the maximum value out of the manure requires applying it at proper rates and frequency in conjunction to a particular soil [8]. Cattle manure application rates in cucumber as a sole crop or as an intercrop since little work has been done on the effects of manure on cucumber growth and yield [9], and [10]. Bio fertilizers is a large population of a specific or a group of beneficial microorganisms for enhancing the productivity of soil. In recent decades the use of chemical fertilizers has been a common practice, whereas bio-fertilizers were neglected but nowadays by reason of irregular application of chemical fertilizers and their detrimental effects on human and soil health a lot of emphasis is being paid and organisms to provide nutrition requirement of plants [11]. Bio fertilizer is a substance which contains living microorganisms which, when applied to seed, plant surfaces, or soil, colonizes the rhizosphere or the interior of plant and promotes growth by increasing supply or availability of primary nutrients to host plant. Bio fertilizers add nutrients through natural processes of nitrogen fixation, solubilizing phosphorus and stimulating plant growth through the synthesis of growth promoting substances [12]. Bio fertilizers can be expected to reduce the use of chemical fertilizer and pesticides.

The microorganisms in bio fertilizers restore the soil's natural nutrient cycle and build soil organic matter. Bio fertilizers can symbiotically associate with plant root. Involved microorganisms could readily and safely convert complex organic material to simple compounds, so that plant could easily utilize them. The microorganism improves soil fertility. It maintains the natural habitat of the soil. It has been shown that it increases crop yield by 20-30%, replace chemical nitrogen and phosphorus by 25% in addition to stimulating plant growth [13]. Bio fertilizers in comparison with chemical fertilizers have enormous economic and environmental advantages. The biological fertilizers have been shown to have a special importance as appropriate replacement for chemical fertilizers, through to improving of soil fertility and providing nutrition requirement of plant [14]. Bio-fertilization is agricultural practices in sustainable agriculture that used to promote plant nutrient and production. Several bacterial strains are used as bio-fertilizers such as nitrogen fixing bacteria and phosphate and potassium solubilizing bacteria (PSB and KSB). Bio-fertilizers application makes major essential macronutrients available to absorption by plants and causes enhancement in plant growth and yield [15].

Moreover, bio-fertilizers contain a variety of beneficial microorganisms and enzymes which promote and improve plant growth and protect plants from pests and diseases that led to increase yield and quality of agriculture crops and reduce pollution of soil and water by chemical fertilizers [16-17]. Using bio-fertilizers significantly increased vegetative growth characteristics in cucumber *Salama et al., 2023*

plants i.e., plant height, number of leaves, leaf area, plant fresh and dry weight [18], shoot length, root length, number of branches, root fresh weight, shoot fresh weight, and dry weight of shoots and roots [13-15-19] as compared to non-treated control plants. Likewise inoculation soil or plants with bio-fertilizers cause a significant increment in early and total yield and fruit quality, such as fruit length, fruit diameter and fruit fresh weight [7-20-22]. The purpose of this study was to compare different levels of chemical and bio fertilizer and organic manure on growth and fruit quality and flowering of cucumber, also evaluate the relationship between quantitative traits of cucumber. One of goals was to examine morphological traits effects on fruit quality using multivariate analysis and to investigate the improvement of cucumber nutrition and improvement of produce of highest yield via application of bio fertilizers and organic manure so if possible to able to recommend this fertilizers as replacement to the chemical fertilizers.

2. Material and Methods

The two field experiments were conducted in sandy soil during the successive summer seasons of 2020/2021 and 2021/2022 at a private farm, Abu Hammad Center, Sharkia Governorate, Egypt. The experiment with the objective of studying the effects of bio-fertilizer used (phosphorein and potassein) and foliar spray with (potassium and phosphors within Joker fertilizer) and their combined between them on the growth, yield and fruits quality of cucumber. A soil sample was taken at a depth at 30 cm. Soil physical and chemical properties and chemical properties of cattle manure are presented in Tables (1 and 2). The treatments in the experiment received the recommended dose of cattle manure were applied one dose at (5 m³/fad) at the time of bed preparation of the soil for agriculture. The treatments in the this experiment received the recommended of bio-fertilizers of potassein and phosphorein and applied at sowing, and foliar spray with Joker (P 55 % and K 45 %) were applied three times at 25 days, 30 days and 35 days from sowing, respectively. The Seedlings sown at 1st of April in both growing seasons which included 3 lines each were 3 m length and 90 cm width. The distance between plants was 25 cm.

2.1. The recorded data

• The growth traits

- A. Number of leaves / plant: 5 plants were randomly selected/plot and their number of leaves counted and their mean taken at three weeks after planting (3WAP) and six weeks after planting (6WAP). This was achieved by counting.
- B. Number of branches / plant: 5 plants were randomly selected/plot and their number of branches counted and their mean taken at three weeks after planting (3WAP) and six weeks after planting (6WAP). This was achieved by counting.
- C. Plant Fresh weight/plot:- 5 plants were randomly selected per plot and there tape was used to measure the weight of the plant at harvests.
- D. Plant height: - This was determined using measuring tape. The tape was used to measure the height of the plant from the level of the soil to the top of the shoot apex.

- E. Plant Dry weight/plant: - 5 plants were randomly selected per plot and there tape was used to measure the weight of the plant at harvests.
- G. Number of male inflorescences: was calculated the average male inflorescences for five plants in the plot.
- H. Number of female inflorescences: was calculated the average female inflorescences for five plants in the plot.

- **Fruit quality**

- A- Fruit length: Mean of ten Fruits length was measured at harvests using meter ruler.
- B- Fruit diameter: The measurement was taken as an average of five fruits using Vernier.

2.2. Statistical Analysis

The experiments were laid out in complete block design with three replications. The obtained data were subjected to statistical analysis of variance using SAS program [23] and means were compared by using least significant difference (LSD) test at 5% level of significance according to the method described by [24].

3. Results and Discussion

3.1. Vegetative growth characters

Data in Table (3 and 4) investigated the effect of cattle manure, phosphorein and potassein as soil application, and Joker fertilizer as foliar spray on vegetative growth characters of cucumber plants, i.e. plant height, number of leaves, number of branches, plant fresh weight and plant dry weight. Results indicated that cattle manure with the level of Joker fertilizer at 4 ml/L significantly increased on vegetative growth characters of cucumber plants, followed by cattle manure with 2 ml/L foliar spray of Joker, bio fertilizer of phosphorein with 4 ml/L, potassein with 4 ml/L, respectively, in both growing seasons. The lowest values were obtained as response of the control treatment. Respecting the role of cattle manure, potassium, phosphorein and Joker fertilizer, [8] and [10] demonstrated that cattle manure is a potential source of nutrients and also a potential benefit to soil amelioration, especially for communal farmers who cannot afford fertilizers.

However, getting the maximum value out of the manure requires applying it at proper rates and frequency in conjunction to a particular soil. In addition, bio fertilizer is a substance which contains living microorganisms which

- F. Number of days to flowering: - was calculated the mean of days after sowing at flowering.

when applied to seed, plant surfaces, or soil can be promotes growth by increasing the supply or availability of primary nutrients to the host plant. Bio fertilizer (phosphorein and potassium) add nutrients through the natural processes of solubilizing phosphorus, solubilizing potassium and stimulating plant growth through the synthesis of growth promoting substances [12]. Moreover, Joker fertilizer is contains P and K nutrients, which promote growth and activate the biological and physiological processes in plant [25]. These results are in accordance with those reported by [26-27] and [28] who worked with cattle manure, bio fertilizers and P K. fertilizer, respectively.

3.2. Flowering and Fruit quality

Data of fruit quality and flowering of cucumber, i.e. early flowering, number of male and female, fruit length, fruit diameter as affected by cattle manure, bio fertilizer (phosphorein and potassein) and Joker fertilizer (P and K nutrients) are given in Table (5). Results indicated that cattle manure with the highest of Joker fertilizer (4 ml/L) foliar spray significantly increased fruit quality of cucumber and its components. These treatment followed by cattle manure with the lowest value of Joker (2 ml/L), phosphorein with Joker at 4 ml/L, and potassium with 4 ml/L of Joker fertilizer, foliar spray ,respectively. The important role of cattle manure, bio fertilizer and Joker fertilizer in increasing fruit quality and its components, [8] demonstrated that cattle manure as an organic manure promotes micro-organisms in the soil in release the nutrients to plant and activate the biochemical, biological and physiological processes in plant to formation protein, translocate carbohydrates and many compounds for increasing the yield of plant Moreover, [28] concluded that bio fertilizer had an important role in increasing fruit quality and flowering of cucumber that it had contain micro-organisms for promote bio-processes in plant. In addition, Joker fertilizer which contains P and K nutrient that improved the fruit of cucumber and increased the yield [20]. These results are agreement with those reported by [5-9-11], and [6-29], who working with cattle manure; bio fertilizer and phosphorus and potassium fertilizers on cucumber.

Table (1): The experimental soil analysis showing the soil physical and chemical properties.

Properties	value
pH in H ₂ O	5.11
pH in KCL	4.77
Organic matter (%)	1.51
Organic carbon (%)	0.27
Nitrogen (%)	0.77
Phosphorus (mg/kg)	1.97
Magnesium (Cmol/kg)	0.95
Sodium (Cmol/kg)	0.55
Potassium (Cmol/kg)	1.33
Calcium (Cmol/kg)	0.71
Moisture content (%)	0.95
Silt (%)	1.51
Clay (%)	4.27
Sand (%)	94.22
Soil texture	Sandy

Table (2): Cattle manure

Properties	value
N %	0.95
P %	0.47
K %	0.63
Ca %	1.52
Zn %	4.70
pH (1:5)	6.7
E.C (1 : 10)	4.03
OM %	42.97
O C %	24.98
CN ratio	120.6
Fe ppm	61.27
Mn ppm	26.19
Zn ppm	18.03
Cu ppm	5.72

This study included 10 treatments as follows

1. Control
2. Cattle 5m3/ fed .+0 Pk
3. Cattle 5m3/ fed .+2ml /l Pk
4. Cattle 5m3/ fed .+4 ml/l Pk
5. Phosphorein+0 Pk
6. Phosphorein+2ml /l Pk
7. Phosphorein+4 ml/l Pk
8. Potassein +0 Pk
9. Potassein +2ml /l Pk
10. Potassein+4ml /l Pk

Table (3): Effect of cattle manure, phosphorein, potassein with joker fertilizer (P and K) on growth characters of cucumber during both growing seasons

Treatment	Plant height (cm)	Number of branches	Number of leaves
2021season			
Control	95.33f	1.03 f	41.66f
Cattle 5+0 Pk	102.00ed	1.33e	43.66 f
Cattle 5+2ml /l Pk	120.00b	4.00 a	67.00 b
Cattle 5+4 ml/l Pk	138.66a	4.33 a	72.33 a
Phosphorein+0 Pk	112.33bcd	2.00 ced	59.00c
Phosphorein+2ml /l Pk	115.00bc	2.33 cbd	58.66 bc
Phosphorein+4 ml/l Pk	104.33fed	3.00 b	66.00 b
Potassein +0 Pk	105.33ed	1.33e	43.00ef
Potassein +2ml /l Pk	118.66b	1.66ed	48.00de
Potassein+4ml /l Pk	119.66b	2.66bc	62.33c
2022season			
Control	96.23f	1.06 f	42.36g
Cattle 5+0 Pk	105.00ed	1.35e	44.06 f
Cattle 5+2ml /l Pk	123.66b	4.22 a	67.00 b
Cattle 5+4 ml/l Pk	138.66a	4.36 a	72.33 a
Phosphorein+0 Pk	114.33bcd	2.05 ced	59.15c
Phosphorein+2ml /l Pk	115.00bc	2.66bc	61.35c
Phosphorein+4 ml/l Pk	122.00b	3.02 b	66.00 b
Potassein +0 Pk	123.66b	2.33 cbd	61.66 bc
Potassein +2ml /l Pk	106.35fed	1.36e	45.02ef
Potassein+4ml /l Pk	107.37ed	1.67ed	48.06de

Similar letter(s) in the same column are non-significant statistically at 0.05 level of probability.

Table (4): Effect of cattle manure, phosphorein, and potassein with joker fertilizer (P and) K on fresh and dry weight on fresh and dry weight and fruit length of cucumber during both growing seasons

Treatment	Plant fresh weight (g)	Plant dry weight (g)	Fruit length (cm)
2021 season			
Control	232.00 g	60.33 f	6.33 g
Cattle 5+0 Pk	252.00feg	72.66 ed	8.66f
Cattle 5+2ml /1 Pk	530.66 ab	114.33b	17.66ba
Cattle 5+4 ml/1 Pk	564.00a	122.00a	21.66a
Phosphorein+0 Pk	379.66d	107.33 b	20.33c
Phosphorein+2ml /1 Pk	464.00c	107.00b	19.66c
Phosphorein+4 ml/1 Pk	472.66bc	111.66 b	19.00bc
Potassein +0 Pk	495.00ab	106.33b	17.66bac
Potassein +2ml /1 Pk	255.33fe	79.33 d	10.00 ef
Potassein+4ml /1 Pk	307.33fe	79.00d	12.00ed
2022 season			
Control	222.50 h	61.33 f	6.34 g
Cattle 5+0 Pk	253.15fe	72.76 ed	8.68f
Cattle 5+2ml /1 Pk	540.66 ab	114.33b	17.67ba
Cattle 5+4 ml/1 Pk	564.00a	122.00a	21.66a
Phosphorein+0 Pk	377.64d	107.34 b	20.33c
Phosphorein+2ml /1 Pk	460.66c	107.22b	19.68c
Phosphorein+4 ml/1 Pk	475.66bc	112.66 b	19.50bc
Potassein +0 Pk	496.07ab	113.33b	17.61bac
Potassein +2ml /1 Pk	256.36fe	79.32 d	10.00 ef
Potassein+4ml /1 Pk	307.34fe	79.15d	12.00ed

Similar letter(s) in the same column are non-significant statistically at 0.05 level of probability.

Table (5): Effect of cattle manure, phosphorein, potassein with joker fertilizer (P and K) on flowering and fruit quality of cucumber During both growing seasons

Treatment	Fruit diameter (cm)	Number of fruits	Early flowering (days)	Number of Male flowers	Number of female flowers
2021 season					
Control	2.00f	2.00e	33.33 c	4.00f	5.66d
Cattle 5+0 Pk	2.26e	2.66d	34.00bc	5.66e	8.33d
Cattle 5+2ml /1 Pk	3.16b	6.00b	40.66a	12.66ab	17.66a
Cattle 5+4 ml/1 Pk	4.13a	7.33a	41.66a	13.00a	18.66a
Phosphorein+0 Pk	2.36de	4.00bc	38.00bac	11.00c	14.00cb
Phosphorein+2ml /1 Pk	2.43dec	4.00c	38.33bac	10.66c	15.00b
Phosphorein+4 ml/1 Pk	2.60dc	4.00c	39.00bac	11.66bc	15.66b
Potassein +0 Pk	2.73dce	5.33b	40.66a	11.66bac	15.66b
Potassein +2ml /1 Pk	2.26e	2.33d	36.00bac	7.66d	9.00d
Potassein+4ml /1 Pk	2.30de	3.33d	37.33bac	8.00d	9.33c
2022 season					
Control	2.01f	1.58e	33.33 d	4.00f	5.66e
Cattle 5+0 Pk	2.25e	2.66d	34.00c	5.66e	8.33d
Cattle 5+2ml /1 Pk	3.18b	6.00b	40.66b	12.66b	17.66b
Cattle 5+4 ml/1 Pk	4.13a	7.33a	45.66a	15.00a	19.26a
Phosphorein+0 Pk	2.46de	4.00c	38.00b	11.00c	14.00cb
Phosphorein+2ml /1 Pk	2.47dec	4.00c	38.33b	10.66c	15.00b
Phosphorein+4 ml/1 Pk	2.63dc	5.00b	39.00b	11.66b	16.66b
Potassein +0 Pk	2.77dce	5.33b	40.66b	11.66b	16.66b
Potassein +2ml /1 Pk	2.36e	2.33d	36.00b	7.66d	9.00d
Potassein+4ml /1 Pk	2.34de	3.76c	37.33b	8.00d	9.33c

Similar letter(s) in the same column are non-significant statistically at 0.05 level of probability.

4. Conclusions

Conclusively: it can be concluded that used organic manure (cattle manure), bio fertilizers (phosphorein and potassium) and Joker fertilizer increased growth characters and fruit quality and flowering of cucumber.

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