

INFLUENCE OF FERTILIZER TYPES AND RATES ON THE GROWTH AND FRUIT YIELD OF THREE CUCUMBER (*Cucumis sativus* L.) VARIETIES

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ABSTRACT

Since its introduction into the rainforest agroecology, cucumber production is reportedly very low partly owing to inadequate agronomic management practices especially fertilizer application. Experiment on the effects of different fertilizer applications on growth and fruit yield of three varieties of cucumber was carried out at the Teaching and Research Farm, Obafemi Awolowo University, Ile-Ife, Nigeria. The experiment was a 4×3×3 factorial experiment laid out using a randomized complete block design in three replications. The treatments include four nitrogen fertilizer sources (Organic fertilizer, Liquid fertilizer, Urea fertilizer and NPK fertilizer) applied at the rates of 0, 75 and 120 kg N/ha on three varieties of cucumber (Poinsett 78, Marketer and Marketmore). Data were collected on growth parameters, phenology and fruit yield components. The longest vine was recorded due to the application of 120 kg N/ha of NPK on Poinsett variety. While Poinsett had the highest vegetative growth, Marketmore had the highest number of fruit and fruit yield per hectare. There was interaction between the effect of variety and fertilizer type on vine length, vine diameter, number of leaves, dry matter accumulation, total chlorophyll content, number of days to flowering and fruit length. It could be concluded that application of 120kg N/ha of inorganic nitrogen fertilizer promotes the growth and yield of cucumber. Poinsett performed best as regards vegetative growth compared to others and with respect to fruit yield, Marketmore performed best compared to the other two.

Keywords: *Cucumber, Fertilizer, Fruit Yield, Growth*

INTRODUCTION

Cucumber is a fruit vegetable grown in the temperate and sub-tropical zones of the world (Aiyelaagbe *et al.*, 2007; Eifediyi and Remison, 2009). It is a thermophile plant that requires a stable warm temperature for rapid growth and good yield (Cobeil and Gosselin, 1990). Wehner and Guner (2004) noted that it is one of the oldest vegetables cultivated by man with historical records dating back 5,000 years. It is noted to be the fourth most cultivated vegetable worldwide (Wehner, 2007). In Nigeria however, its place has not

been ranked because of underutilization and lack of its knowledge (Eifediyi and Remison, 2009). Cucumber is a very good source of vitamins A, C, K, B6, potassium and also provides dietary fiber, pantothenic acid, magnesium and phosphorus, (Olaniyi *et al.*, 2009). According to Nweke *et al.* (2013), cucumber production in most part of Nigeria is fast becoming popular, probably because of its high nutritional and medicinal values, as well as being a useful component ingredient in pharmaceutical (Kumar *et al.*, 2010). In spite of the good attributes,

cucumber production is still mainly done by very few farmers in Nigeria especially in urban and peri-urban areas due to lack of its awareness and agronomic response to a number of factors involved in producing marketable fruits with good quality (Nweke *et al.*, 2013). Soil nutrient management has been a major component of cultural practices improvement for most crops since over 95 percent of most arable land of southwest Nigeria are under frequent cultivation. Production constraints including the problem of low to medium soil nutrients have caused poor yield (Adepetu, 1986; Adepetu *et al.*, 2014). According to Roberts and Andrew (1989), a good way of preventing soil from becoming poor is to put back into it what plant was taken out. The positive effect of the application of inorganic fertilizers on crop yields and yield improvements had been reported by Carsky and Iwuafor (1999). It has also been elucidated that inorganic fertilizer can affect the composition of individual microbial communities in the soil (Khonje *et al.*, 1989). While organic fertilizer has been found to stimulate the growth of microbial population as a whole by supplying nutrient (Taiwo *et al.*, 2007), the need for reduced cost of fertilizing crops and improvement in environmental conditions have revived the use of organic manures worldwide (Ojeniyi, 2000; Maritus and Vleic, 2001; Ayoola and Adeniran, 2006). Soils with high organic matter and water holding capacity are required for cucumber cultivation and unfertile soils result in bitter and misshaped fruits which are unmarketable (Eifediyi and Remison, 2010). Cucumber responds positively to moderate nitrogen and phosphorus levels for optimal growth and

productivity (Olaniyi *et al.*, 2009; Eifediyi and Remison, 2010). There is need to develop the appropriate agronomical technology required to produce marketable cucumber to meet the nutritional need of the ever-growing population. Hence, the objective of this study was to document the influence of some fertilizer sources and rate on growth and fruit yield performance of cucumber particularly in south western Nigeria.

MATERIALS AND METHODS

Location and Description of Experimental Site

The field experiments were carried out in the early and late cropping seasons of 2014 at the Teaching and Research Farm (T&RF), Obafemi Awolowo University (OAU), Ile-Ife, situated within the forest zone (latitude 07°28'N and longitude 04°33'E at 244m above sea level). The soil is a low base status forest soil derived from coarse-grained gneiss and granite parent rocks and is classified as an ultisol (Harpstead, 1973).

Materials Used in the Experiment

Three commercially grown cucumber namely: Marketer, Marketmore and Poinsett were obtained from a commercial seed company at Ibadan. The varieties were of market value and adapted to the tropical rain forest agroecology (Eifediyi and Remison, 2010).

The nitrogen fertilizer sources include: Organic fertilizer (OF) (N- 2%, P- 1.2%, K- 1.5%), Urea fertilizer (UF) (N- 46%, P- 0%, K- 0%), Compound N fertilizer (CNF) (N- 15%, P- 15%, K- 15%) and Liquid Organic fertilizer (LOF). SUPER GRO Liquid Organic fertilizer is a 100% organic liquid fertilizer, which is made from poultry

droppings. The laboratory analysis indicated that its nutrient composition is made of macro and micro elements shown in Table 11.

Field Layout and Experimental design

The land was conventionally prepared using disc plough twice and after which the plot was harrowed once using disc harrow. Each plot was 2.5m by 2.0m and the seeds were sown at 2 seeds per hole in 0.5m × 0.5m inter and intra row spacing to give a population density of 80,000 plants /ha. The experiment was a 4×3×3 factorial experiment arranged in a randomized complete block design in three replicates. The treatments included three varieties of cucumber (Poinsett, Marketer and Marketmore) and four types of fertilizers: Organic fertilizer (OF), Liquid Organic fertilizer (LOF), Urea fertilizer (UF), Compound N fertilizer (CNF) which were applied at three levels: 0, 75 and 120 kg N/ha. Fertilizer treatments were applied as split application at 3 and 6 weeks after planting (WAP) using the ring method around the plant. Data were collected on five (5) randomly tagged plants on rows three and five in a plot of seven rows for the following measured parameters: vine length (cm), vine diameter (cm), number of branches, number of leaves, total chlorophyll content (SPAD-502, Minolta Co. Japan), dry matter accumulation, number of days to flowering, fruit length, fruit diameter, number of fruits, and fruit yield/hectare.

Vine length (cm): determined by measuring the vine with a flexible tape rule from the root to the tip of the primary vine. This was collected before flowering and at harvest

Vine diameter (cm): determined by measuring the vine girth with flexible string,

which was later measured out on a ruler. This was collected before flowering and at harvest
Number of Branches: numbers of branches were determined by manually counting lateral branches growing across the vine axis. This was collected before flowering and at harvest

Number of Leaves: numbers of leaves were determined by counting leaves borne on the plant. This was collected before flowering and at harvest

Days to first flowering: taken as the day the first flower was observed on 50% of plants per plot.

Number of fruits per plot: manually counted as number of harvested fruits on each plant per plot. This was collected at harvest

Fruit length (cm): determined by measuring five randomly selected harvested fruits.

Fruit diameter (cm): determined with the help of a flexible tape rule which was then converted to diameter using the formula $2\pi r$ (circumference of a circle).

Fruit yield per hectare (kg/ha): Fruit yield per hectare was calculated using the formula of Oloyede *et al.* 2013.

$$\text{Fruit yield (tons/ha)} = \frac{\text{fruit weight/plot (kg)} \times 10,000\text{m}^2}{\text{Area of plot (m}^2\text{)} \times 1,000\text{kg}}$$

Chlorophyll Content: Chlorophyll contents was determined using chlorophyll meter (SPAD-502, Minolta Co. Japan), which is presented by SPAD value.

Dry matter accumulation (g): Five random plants from the inner rows of each plot were oven dried at 75°C till constant weight. This was collected at 4 WAP.

The data collected were subjected to analysis of variance (ANOVA) using the general linear models (GLM) procedure of Statistical Analysis Systems (SAS, 2003). Means of

significant treatments were separated using the Least Significant Difference at 0.01 and 0.05 probability level. (Steel and Torrie, 1987).

RESULTS

Soil properties of the experimental site

The results of general chemical and physical properties of the soil in the experimental area before cropping and after cropping are

presented in Table 1. The soil was slightly acidic with a pH of 6.5. The chemical properties of the soil were very low especially for nutrients like Ca²⁺ and K⁺, when compared with their critical values of 2.5 and 0.16 – 0.25 cmol/kg respectively while available P was considered high (Adepetu *et al.*, 2014). The soil textural classification of the plots was sandy loamy.

TABLE 1: SOIL CHEMICAL AND PHYSICAL PROPERTIES AT 0 – 15 CM DEPTH IN THE EXPERIMENTAL SITE

Chemical Property	O.A.U., Ile Ife, 2014
pH (H ₂ O) (1:2)	6.5
pH (CaCl ₂)	6.1
Organic Carbon (%)	0.52
Total N (%)	0.06
Available P (mg kg ⁻¹)	31.16
Exchangeable cations (cmol kg⁻¹)	
K ⁺	0.02
Ca ²⁺	0.22
Mg ⁺	0.11
Na ⁺	0.009
Physical Property	
Sand g kg ⁻¹	626.8
Silt g kg ⁻¹	120.0
Clay g kg ⁻¹	253.2
Textural class	Sandy loam

TABLE 2: MEAN SQUARES FOR MORPHOLOGICAL PARAMETERS AS INFLUENCED BY VARIETY, FERTILIZER TYPE AND LEVELS

Source of Variation	Df	Vine Length (cm)	Vine Diameter (cm)	No of Branches/plant	No of Leaves/plant	Dry matter/plant (g)	Chlorophyll content (SPAD)
Rep	2	45.86	0.0012	0.676	18.06	20.95*	18.94*
Variety	2	2419.64**	0.0172	0.565	135.81**	182.55**	24.05*
Fertilizer Type	3	1857.89**	0.1479**	0.157	92.68*	12.40	11.12
Fertilizer Levels	2	1273.51**	0.4736**	0.731	368.25**	224.93**	24.80**
Variety*Fertilizer Type	6	868.07**	0.0326*	0.491	213.67**	42.26**	17.08**
Variety*Fertilizer Levels	4	643.86**	0.0139	0.481	102.09**	8.30	3.53
Fertilizer Type*Fertilizer Levels	6	349.40*	0.0181	0.509	67.74*	24.29**	16.91**
Variety*Fertilizer Type*Fertilizer Levels	12	110.25	0.0278*	0.204	62.93**	7.50	7.19
Error	70	141.56	0.0137	0.352	24.53	6.22	4.94
CV		10.14	17.036	21.87	9.83	20.66	4.92

*, ** Significantly different at 0.05 and 0.01 levels of probability respectively

GROWTH PARAMETERS

The mean square values of the effect of treatments on morphology of the cucumber varieties are shown in Table 2. The varieties showed significant ($P \leq 0.01$) difference on some growth performance like: vine length, number of leaves, dry matter but had slight significant ($P \leq 0.05$) difference for chlorophyll content. Fertilizer types nested with levels had a significant ($P \leq 0.01$) response of the parameters measured except for number of branches. Similar results were also obtained for the interactions between fertilizer types and varieties. Table 3 showed that Poinsett had longer vines, more leaves and a higher total chlorophyll content which indicated a more condensed canopy while Marketmore and Marketer had greater dry matter which indicated that they may be more biomass and fibre than Poinsett. This can be due to the inability of the former to convert photosynthates into higher fruit yield. Table 4 showed that application of inorganic N.P.K (15:15:15) fertilizer resulted in an outstanding performance in canopy development such as vine length, vine diameter and number of leaves while the effects of other sources of fertilizer on the vine were not significantly different from each other. While the effects of Urea and Organic Fertilizer were not significantly different from each other for vine length, Urea effects were more noticeable on vine diameter and number of leaves. This may be due to the absorption rate of the fertilizers and

the immediate response of the plant to the fertilizers. Though the NPK 15:15:15 was easily available to the plants at steady level, the organic fertilizer took longer time before the available nutrients for plant growth and development could be assess by the plant. The organic liquid fertilizer was readily dissolved with the soil water and may not be easily available to the plant due to run off by rain and leaching by soil water. Table 5 indicated that only Poinsett responded to NPK 15:15:15 fertilizer with the best performance at 120 kgN/ha which was not significantly different from the application of 75 kgN/ha. The plant varieties were found to respond differently to Urea as Poinsett had better vine diameter at 120 kgN/ha, Marketer had better vine diameter and numbers of leaves while Marketmore had better vine length without urea but the vine diameter was promoted at 75 kgN/ha. All the growth parameters of Marketer and Marketmore responded positively to Organic fertilizer especially at 120 kgN/ha except for vine length in Marketmore. Table 6 also indicated that Marketer and Marketmore responded positively to NPK 15:15:15 fertilizer for biomass and total chlorophyll, Poinsett had improved biomass all at 120 kgN/ha but not significantly different from 75 KgN/ha. Urea and Organic fertilizer only improved the biomass of Poinsett and Marketer and had no effect on their chlorophyll, organic liquid was found not to have any effect.

TABLE 3: MEAN VALUES OF GROWTH PARAMETERS OF THE THREE CUCUMBER VARIETIES

Varieties	Vine Length (cm)	Number of Leaves	Dry Matter (g)	Total Chlorophyll content
Poinsett	124.29	52.58	9.64	46.99
Marketer	108,29	48.92	14.08	44.39
Marketmore	119.38	49.64	12.50	44.92
LSD 0.05	5.54	2.71	1.19	0.65

TABLE 4: MEAN VALUES OF FERTILIZER TYPES ON GROWTH PARAMETER OF CUCUMBER

Fertilizer Type	Vine Length (cm)	Vine Diameter (cm)	Number of Leaves
N.P.K (15:15:15)	129.17	0.73	52.48
Urea	115.30	0.68	49.07
Organic Fertilizer	115.00	0.74	51.37
Liquid Organic	109.80	0.58	48.59
LSD 0.05	6.86	0.07	3.13

TABLE 5: MEAN VALUES FOR GROWTH PERFORMANCE OF CUCUMBER TYPES TO FERTILIZER TYPES AND RATES

Treatments	Poinsett			Marketer			Marketmore		
	Vine length (cm)	Vine Diameter (cm)	Number of leaves	Vine length (cm)	Vine Diameter (cm)	Number of leaves	Vine length (cm)	Vine Diameter (cm)	Number of leaves
NPK									
0 kg N/ha	118.10	0.59	44.00	107.67	0.54	45.00	116.83	0.68	50.00
75 kg N/ha	160.23	0.89	68.33	108.20	0.73	46.00	140.20	0.63	48.33
120 kg N/ha	166.20	0.92	70.33	112.98	0.78	47.33	132.13	0.82	53.00
LSD 0.05	17.26	0.22	9.10	NS	NS	NS	NS	0.10	NS
Urea									
0 kg N/ha	106.60	0.63	46.33	116.00	0.51	46.67	120.67	0.58	50.33
75 kg N/ha	111.33	0.63	44.33	110.97	0.71	51.67	117.07	0.83	47.00
120 kg N/ha	126.50	0.58	46.67	115.57	0.90	58.66	113.00	0.80	50.00
LSD 0.05	10.18	NS	NS	NS	0.22	8.48	5.59	0.19	NS
Organic Fertilizer									
0 kg N/ha	110.52	0.58	48.33	104.00	0.58	44.67	108.67	0.53	47.00
75 kg N/ha	131.23	0.90	54.67	93.00	0.70	45.00	118.13	0.70	52.67
120 kg N/ha	139.97	0.95	59.00	107.17	0.93	52.00	122.50	0.82	59.00
LSD 0.05	NS	NS	NS	5.94	0.34	7.15	NS	0.13	11.25
Liquid Fertilizer									
0 kg N/ha	99.00	0.44	53.67	110.13	0.53	52.33	115.00	0.54	50.00
75 kg N/ha	108.20	0.65	50.33	104.03	0.60	47.67	107.00	0.55	42.33
120 kg N/ha	113.80	0.75	45.00	109.73	0.58	50.00	121.33	0.58	46.00
LSD 0.05	NS	NS	NS	NS	NS	NS	NS	NS	NS

NS – not significant

TABLE 6: MEAN VALUES FOR DRY MATTER AND CHLOROPHYLL CONTENT OF THE THREE CUCUMBER VARIETIES AS INFLUENCED BY FERTILIZER LEVELS

Treatments	Poinsett		Marketer		Marketmore	
	Dry matter (g)	Chlorophyll	Dry Matter (g)	Chlorophyll	Dry Matter (g)	Chlorophyll
NPK						
0 kg N/ha	5.61	47.23	10.29	42.33	8.57	44.47
75 kg N/ha	12.15	46.27	15.00	40.67	15.29	45.00
120 kg N/ha	16.28	47.73	16.66	44.43	16.11	46.63
LSD _{0.05}	1.01	NS	4.25	3.31	3.13	1.33
Urea						
0 kg N/ha	6.65	47.07	13.58	45.48	10.87	48.31
75 kg N/ha	5.93	48.50	18.51	48.40	11.76	42.60
120 kg N/ha	10.02	45.20	20.78	45.57	13.29	42.67
LSD _{0.05}	2.28	NS	6.25	NS	NS	3.49
Organic Fertilizer						
0 kg N/ha	6.39	43.87	11.26	43.97	13.09	45.33
75 kg N/ha	9.77	42.63	8.65	43.07	11.98	44.50
120 kg N/ha	12.64	45.10	14.64	46.57	16.45	44.87
LSD _{0.05}	5.76	NS	NS	NS	NS	NS
Liquid Fertilizer						
0 kg N/ha	8.18	45.57	12.29	45.75	12.02	44.83
75 kg N/ha	7.76	44.20	13.15	40.70	8.37	43.57
120 kg N/ha	14.25	48.57	14.33	45.77	12.18	46.23
LSD _{0.05}	NS	NS	NS	NS	NS	NS

NS – not significant

TABLE 7: MEAN SQUARES FOR DAYS TO FIRST FLOWERING, FRUIT LENGTH, FRUIT DIAMETER, NUMBER OF FRUITS AND FRUIT YIELD/HECTARE AS INFLUENCED BY VARIETY, DIFFERENT FERTILIZER TYPE AND LEVELS.

Source of Variation	Df	Days to flowering	Fruit length (cm)	Fruit diameter (cm)	Number of fruits	Fruit yield/hectare (kg/ha)
Rep	2	1.69*	4.79	0.27	487.12**	112.70**
Variety	2	1.75*	40.75**	0.69	227.62*	96.42*
Fertilizer Type	3	1.25*	22.89**	1.62*	433.155**	105.88**
Fertilizer Levels	2	26.86**	16.67**	0.35	836.17**	73.28*
Variety*Fertilizer Type	6	1.18*	6.12*	0.71	97.09	17.61
Variety*Fertilizer Levels	4	0.9	5.34	0.25	213.34**	21.15
Fertilizer Type*Fertilizer Levels	6	3.03**	2.89	0.44	185.09**	21.29
Variety*Fertilizer Type*Fertilizer Levels	12	1.09**	10.44**	0.7	96.86	23.74
Error	70	0.42	2.53	0.52	57.55	19.77
CV		1.82	9.69	14.56	40.06	61.95

*, ** Significantly different at 0.05 and 0.01 levels of probability respectively

DAYS TO FLOWERING AND YIELD PARAMETERS

The mean square values of the effect of treatments on days to first flowering and some yield parameters of the cucumber varieties are shown in Table 7. The results showed that varieties had significant effect on all parameters except fruit diameter however, days to flowering, number of fruits and fruit yield/hectare were significant at ($P \leq 0.05$). This indicated that the differences in fruit length, days to flowering, number of fruits and fruit yield/hectare were due to varietal effect. Similarly, fertilizer type significantly ($P \leq 0.01$) influenced fruit length, number of fruits and fruit yield/hectare except days to flowering which

was only significant at ($P \leq 0.05$). However, fertilizer level nested in fertilizer type had significant ($P \leq 0.01$) effect on all parameters except fruit diameter and fruit yield per hectare. The interactions between the variety and fertilizer type also had significant ($P \leq 0.05$) effects for days to flowering and fruit length.

Table 8 showed that Marketmore had the longest length of fruit and was earliest to flowering which was significantly followed by Poinsett which is not different from Marketer as regards days to flowering. Marketmore produced the highest number of fruits and fruit yield/hectare among the three varieties. However, it was not significantly different from Poinsett variety.

TABLE 8: MEAN VALUES OF DAYS TO FLOWERING AND YIELD PARAMETERS OF THE VARIETIES

Varieties	Days to flowering	Fruit Length (cm)	Number of Fruits/plant	Fruit yield (t/ha)
Poinsett	35.47	15.65	20	6.97
Marketer	35.56	16.01	16	5.65
Marketmore	35.14	17.65	21	8.91
LSD 0.05	0.34	0.91	3.93	2.12

TABLE 9: MEAN VALUES OF DAYS TO FLOWERING AND YIELD PARAMETERS AS INFLUENCED BY FERTILIZER TYPE

Fertilizer Type	Days to Flowering	Fruit Length (cm)	Fruit Diameter (cm)	Number of Fruits/plant	Fruit yield (t/ha)
N.P.K	35.52	17.71	5.17	24	9.86
Urea	35.59	16.47	5.12	17	6.50
Organic Fertilizer	35.33	15.59	4.73	20	7.21
Liquid Organic	35.11	15.98	4.72	15	5.15
LSD 0.05	0.35	0.86	0.39	4	2.44

Also, Table 9 showed that Organic Fertilizer and Liquid Fertilizer were significantly early as both were not significantly different from each other. NPK Fertilizer significantly

increased the length of the fruit as well as considerable increase in the fruit yield/hectare while the effects of other sources of fertilizer on the fruit length and

fruit yield/hectare were not significantly different from each other. Effect of NPK Fertilizer and Urea on the fruit diameter was significantly higher followed by Organic Fertilizer and Liquid Fertilizer. NPK Fertilizer and Organic Fertilizer effect on the number of fruits were higher than when Liquid fertilizer was applied. This implied that NPK Fertilizer seems to favour the fruit length and the number of fruits produced. Though, it is expected that Urea should improve the growth of cucumber as reported on other nitrogen loving crop. However, the application of Urea fertilizer at 3 weeks after planting did not only result in high level of phyto-injury, but resulted in excessive foliage growth that delayed reproductive stage of cucumber. The slow release of N from the Organic Fertilizer source resulted in the slow pace of development but it did not have much negative effect on yield parameters compared to the growth parameters. In addition, according to Table

10, all the fertilizer type produced the same result as regards earliness in all the four fertilizer types. Nonetheless, Liquid Fertilizer positively influenced days to flowering in all the varieties by significantly reducing the days to flowering by 1 day.

This was followed by NPK fertilizer (120 kg N/ha) in Poinsett and Marketer. While Urea and Organic Fertilizer only influenced the Marketmore best in terms of earliness compared to other varietal interaction with Urea and Organic Fertilizer.

Furthermore, the effect of Urea at 75 kg N/ha on Poinsett produced the largest fruit compared to other variety – fertilizer interaction across the 3 varieties and 4 fertilizer types. This implies that Poinsett responded best to a lower rate of NPK Fertilizer in producing long fruits. (Table 10) From Table 10, the control plot of Marketmore produced the highest number of fruits across the 3 varieties and type of soil amendments.

TABLE 10: MEAN VALUES FOR DAYS TO FLOWERING AND YIELD PARAMETERS OF THE THREE CUCUMBER VARIETIES AS INFLUENCED BY FERTILIZER LEVELS

Treatments	Poinsett			Marketer			Marketmore		
	Days to flowering	Fruit length (cm)	Number of fruits	Days to flowering	Fruit length (cm)	Number of fruits	Days to flowering	Fruit length (cm)	Number of fruits
N.P.K									
0 kg N/ha	36.00	16.17	18.00	35.00	16.03	19.00	36.00	18.77	29.00
75 kg N/ha	35.00	20.67	36.00	37.00	18.00	19.00	36.00	17.80	20.00
120 kg N/ha	34.00	15.30	18.00	36.00	18.30	12.00	34.00	18.33	28.00
LSD 0.05	1.00	2.66	9.00	2.00	NS	NS	1.00	NS	NS
Urea									
0 kg N/ha	37.00	15.80	25.00	37.00	15.81	19.00	36.00	15.90	38.00
75 kg N/ha	35.00	13.43	11.00	36.00	15.30	14.00	34.00	20.97	9.00
120 kg N/ha	35.00	16.83	18.00	35.00	14.67	12.00	35.00	19.57	10.00
LSD 0.05	1.00	NS	NS	0.01	NS	NS	NS	1.59	18.00
Organic Fertilizer									
0 kg N/ha	37.00	14.30	27.00	36.00	15.45	20.00	37.00	14.70	33.00
75 kg N/ha	36.00	13.80	12.00	35.00	15.07	22.00	34.00	18.33	13.00
120 kg N/ha	35.00	14.30	14.00	35.00	16.93	16.00	34.00	17.43	23.00
LSD 0.05	1.00	NS	NS	NS	NS	NS	2.00	3.25	15.00
Liquid Fertilizer									
0 kg N/ha	36.00	14.20	24.00	37.00	14.61	19.00	37.00	16.11	23.00
75 kg N/ha	35.00	15.27	7.00	34.00	14.50	12.00	35.00	18.20	11.00
120 kg N/ha	34.00	17.77	12.00	34.00	17.47	9.00	34.00	15.67	15.00
LSD 0.05	1.00	NS	NS	2.00	NS	9.00	2.00	NS	NS

NS – not significant

TABLE 11: NUTRIENT COMPOSITION OF SUPER GRO LIQUID ORGANIC FERTILIZER

Nutrient	Concentration
Nitrogen (N)	72g per litre (Macro)
Phosphorus (P)	45g per litre (Macro)
Potassium (K)	30g per litre (Macro)
Sulphur (S)	15g per litre (Macro)
Calcium (Ca)	9g per litre (Macro)
Magnesium (Mg)	7g per litre (Macro)
Iron (Fe)	5 mg per litre (Micro)
Iodine (I)	3 mg per litre (Micro)
Marine Salt	1 mg per litre (Micro)
Zinc (Zn)	1 mg per litre (Micro)

DISCUSSION

Productivity in fruit vegetable crops is determined by the nutrient status of the cultivated soil. The nutrient status is controlled by major nutrients reported to improve vegetative growth. From the results, Marketmore and Poinsett variety was highest in dry matter and vine length at 120 kg N/ha of Urea and 120 kg N/ha NPK treatments respectively. Poinsett had longer vines and more leaves which indicated a more condensed canopy while Marketmore and Marketmore had greater dry matter owing to thicker vines which indicated that they had more biomass and fibre than Poinsett. This can be due to the former's ability to convert photosynthates into higher fruit yield. It can be inferred that N.P.K fertilizer was particularly effective in increasing vine length in Poinsett variety and Marketmore. This corroborates results by Ahmed *et al.* (2004) and Enujeko (2013). Poinsett had significantly better number of leaves whereas N.P.K and Organic Fertilizer contributed significantly to the highest number of leaves.

In this study, Marketmore was significantly earlier than Marketmore and Poinsett as regards

days to flowering. This correlated with the findings of Utobo *et al.* (2010), which indicated that Marketmore was earlier to flower. Liquid Fertilizer influenced earliness significantly compared to the other four. Marketmore variety produced the highest number of fruits. Utobo *et al.*, (2010) supported this outcome which could be attributed to the fact that the Marketmore is more determinate and as such directed most of its nutrient flow to their reproductive growth unlike Poinsett which is less determinate whose nature is such that vegetative growth does not terminate at the onset of flowering and fruit setting and thus, has to share its nutrient flow both ways (Bodunde *et al.*, 1993).

In addition, Marketmore also produced the longest and widest fruit with Urea at 75 kg N/ha rate. Similar result supported this in the work done by Ahmed *et al.* (2004). It was observed that many of the treatments were close to each other thus indicating they were not significantly higher than each other. These disparities in growth and yield characters of cucumber have been documented by researchers across the world

(Widders and Price, 1989; Uruk, 1998). The differences in vegetative and yield characters can be attributed to genetic composition of the varieties used; the Marketmore variety which is a bred cultivar from Marketer may have been more active than the other varieties and therefore had a strong source to sink relationship which resulted in high yields experienced in the variety (Cavatorta *et al.*, 2007).

Moreover, Marketmore generated the highest fruit yield per hectare. This was not far fetched from results obtained by Ahmed *et al.* (2004). NPK accounted for the highest fruit yield came at 120 kg N/ha. This is in conformity with the findings of John *et al.* 2004 who attributed the vigorous growth and increased fruit yield of cucurbits to higher supply of nutrient elements.

CONCLUSION

Marketer variety produced the highest biomass while Poinsett variety was highest in terms of chlorophyll content and foliage production. As regards nutrient sources, N.P.K and Organic Fertilizer type accounted for increased leaf number. Organic Fertilizer influenced vine thickness and vine diameter compared to the other four. Marketmore and Liquid Fertilizer influenced significant earliness as regards days to flowering significantly while Marketmore performed best for number of fruits and fruit length out of the three varieties. N.P.K appeared to favour fruit yield and yield components while Marketmore generated the highest fruit yield per hectare.

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