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Evaluation of growth and yield of twenty accessions of pumpkin (*Cucurbita pepo* Linn.) under four rates of nitrogen fertilizer in Unwana, South Eastern Nigeria

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Abstract

Pumpkin (*Cucurbita pepo* L.) is a vegetable crop often grown by peasant farmers in Nigeria without fertilizer application. With an increase pressure on land for other uses, farmers have adopted the use of fertilizers to boost crop productivity. This experiment was carried out to determine the effect of three rates of nitrogen fertilizer (urea) and a control, on 20 Accessions of pumpkin (*Cucurbita pepo* L.). The experiment was carried out in 2023 planting season at the Teaching and Research Farm, Department of Horticulture and Landscape Technology, Akanu Ibiam Federal Polytechnic, Unwana, Ebonyi State, Nigeria. The farm is located on latitude $06^0$05N and longitude $08^0$03E at an altitude of 300m above sea level. The experiment was conducted as a 4 x 20 factorial laid out in randomized complete block design (RCBD) with three blocks. Treatment used were twenty Accessions and four rates of nitrogen fertilizer (0. 60, 120 and 180kg/ha). Each plot size was 5m x 2m and the plants were spaced 0.9m x 0.9m. Data were taken on growth and yield parameters such as vine length, n of leaves, leaf area, days to 50% flowering, number of fruits, average weight of fruits, fruit girth and fruit yield. Amokwe accession produced the longest vines and heaviest fruits of approximately 318cm and 2.038kg, respectively. 120kg/ha of urea fertilizer recorded the longest vines (267.3cm), heaviest fruits (1.353kg) and highest fruit girth (15.92cm). However, control plots recorded the least values in all the parameters accessed. The highest fruit yield of the pumpkin of 11t/ha was recorded from Omasi accession. On the other hand Umulolo accession gave the least fruit yield of 8t/ha. The productivity of the twenty accessions of pumpkin could be maximized by the application of 60kg/ha of urea fertilizer, which gave population mean fruit yield of 10t/ha.

Keywords: Accessions, Evaluation, Nitrogen fertilizer and Pumpkin

Introduction

Pumpkin (*Cucurbita pepo* L.) belongs to the family *Cucurbitaceae*. The family consists of two well defined sub-families, eight tribes, about one hundred and eighteen genera and eight hundred and twenty five species (Jeffrey, 1990).The center of origin of *Cucurbita pepo* is Mexico, where it was domesticated at least 8,000 to 10,000 years (Decker, 1988). Pumpkin (*Cucurbita pepo*) is less heat resistant than *Cucurbita moschata* and for that reason less appropriate for tropical Africa, yet it is grown on a limited scale in all countries. The biggest international producers of pumpkins include the United States, Canada, Mexico, India and China (World Healthiest Foods, 2013).

Optimum growth occurs between 24^0C to 29^0C. Pumpkin is adapted to a wide variety of soil types which have good drainage and slight acidity. It is a typical vegetable of warm temperate and cool tropical areas. Most species are monoecious with male and female flowers borne separately on the same plant (Omafra, 2000). Most pumpkin seeds are covered by a white husk, although, some pumpkin varieties produce seeds without the white husk. Traditionally, *Cucurbita pepo* generally weighs between 2.7 to 8.2kg, though the largest cultivars of specie *Cucurbita maxima*, regularly weighs over 34kg (Gong et al., 2012).

It is an important traditional food that can be consumed mature and immature (Montes-Hernandez & Equiarte, 2002). It is consumed either by boiling (leaves and fruits) or by roasting or baking (seeds). Pumpkin leaves, fruits, flowers and seeds are all protective and health giving food, rich in vitamin A and in dietary fiber (VHS, 2007). Extensive research works have been carried out on this crop by great researchers in America and Europe. Paris et al.(2002) reported that cultivated *Cucurbita* have many things in common and are extremely diverse in fruit character. Some are large fruited, others are small fruited and every gradation between these extremes does exist.

Soil fertilization is one of the main factors increasing yield of plants (Kolodziej, 2006).Nitrogen is an essential nutrient which is a determining factor in crop production and absorbed primarily in the form of nitrate. It is the nutrient that most often restricts biological productivity (Power &Prasad, 2010).Nitrogen also plays a role in chlorophyll synthesis and hastens the process of photosynthesis and carbon dioxide assimilation (Jasso-chaverria et al., 2005). Fertilizer application is important in the production of pumpkin. Urea fertilizer is one of the essential elements required by plants in large amount but it is often susceptible to losses through leaching and volatility (Singh et al., 2003). Hence, most tropical soils are deficient in essential nutrients particularly nitrogen and phosphorus (Obalum et al., 2012).

The production of pumpkin is largely in the hands of peasant farmers, who are constrained by a number of factors such as lack of knowledge on the quantities of fertilizers to apply. Many farmers have resorted to the use of subsidized inorganic fertilizers such as urea since nitrogen fertilizer is an important factor for vigorous growth due to its immediate availability to the plant roots and increased plant yield (Mohamed et al., 2012). Urea fertilizer enriches the soil and excessive application increases nitrate accumulation in plants, low yield of crops, production of unmarketable fruits and, also, detrimental to human health (Musa et al., 2010).However, our research therefore, is aimed at investigating the effect of four rates of urea fertilizer on twenty Accessions of pumpkin in Unwana, South-eastern Nigeria.

Materials and Methods

Field experiment was conducted at the teaching and research farm, Department of Horticulture and Landscape Technology, Akanu Ibiam Federal Polytechnic, Unwana, Ebonyi State during the long rain season, 2023. Unwana is located on latitude $06^0$05'N and longitude $08^0$03'E with an elevation of 300m sea level (NIMET, 2014).

The study area is located in a humid tropical climate with annual rainfall greater than 2500mm and temperature ranging from 32^0C to 38^0C (Njoku et al.,2006).

Collection of Accessions of Pumpkin

Accessions of pumpkin were collected from twenty different areas of five south eastern State of Nigeria (Abia, Anambra, Ebonyi, Enugu and Imo States). After the collection, the accessions were first characterized according to source/place of collection, State, local government area and size of seeds (Table 1).

Field Work

The research field was measured, 199.5m long and 19m wide, giving an area of 3790.5m^2 (0.37905ha). The marked area of land was cleared, ploughed and harrowed using a tractor. Plots measuring 5m x 2m (10m^2) were marked out, beds were made manually using hoes and was raised 30cm high.

Table 1: Description of 20 Accessions of Pumpkin collected from South-Eastern States of Nigeria by Source/place, State, Local Government Area and Size of Seeds

S/No	Source/Place	State	L.G.A.	Size of Seeds
1	Abba	Anambra	Njikoka	Small
2	Agbaja	Enugu	Udi	Big
3	Amokwe	Enugu	Nsukka	Big
4	Amachi	Ebonyi	Afikpo North	Small
5	Amechi	Imo	Ideato South	Small
6	Ehime	Imo	Mbano	Big
7	Inyi	Enugu	Oji River	Small
8	Isiagu	Ebonyi	Ivo	Small
9	Isuochi	Abia	Umunneochi	Small
10	Lilu	Anambra	Ihiala	Small
11	Mgbom	Ebonyi	Afikpo North	Small
12	Ndioru	Abia	Ikwuano	Small
13	Omasi	Anambra	Anyamelum	Small
14	Omege	Ebonyi	Abakaliki	Small
15	Opi	Enugu	Nsukka	Big
16	Orlu	Imo	Orlu	Big
17	Oror	Abia	Arochukwu	Small
18	Ugwuoba	Enugu	Oji River	Big
19	Umudioka	Anambra	Dunukoka	Small
20	Umulolo	Imo	Okigwe	Small

Pre-planting Soils Analysis

Soil samples was collected at random from twelve representative locations of the experimental plots with soil auger at a depth of 20cm and samples was bulked into a composite sample from which sub-samples were taken for laboratory analyses for chemical and physical properties of the soil.

Experimental Design

The research was conducted as a 4 x 20 factorial laid out in randomized complete block design (RCBD). Each treatment was replicated three times and the treatment was comprise of four rates of urea fertilizer (0, 60, 120 and 180kg/ha) and twenty accessions of pumpkin. The research field was divided into three equal blocks and each

block consists of eighty plots, giving a total of two hundred and forty plots.

Cultural Practices

Pumpkin seeds were extracted from healthy pods collected from different areas in five south eastern states of Nigeria. The twenty accessions of pumpkin were sown in six rows per plot at spacing of 0.9m x 0.9m. Urea fertilizer was applied at four rates of 0, 60, 120 and 180kg/ha. It wasapplied three weeks after planting. Weeding was controlled manually using hoe about three times to minimize the effect of weeds on the plant. Zap insecticide was used to control insects and pests attack. Harvesting of pumpkin was commenced at 13^{th} to 17^{th} week after planting (WAP) and was done by hand plucking.

Vegetative Characteristics Measured

Growth parameters data were taken four inner pants from each experimental plot leaving out the guard rows. Vine length was measured in centimeter using measuring tape from the base of the plant to the apex at eleventh week after planting (WAP). Number of leaves was assessed by visual count of the green leaves at 11^{th} WAP. Leaf Area (cm^2) was calculated by measuring the length and width of tagged plant using graduated centimeter ruler and mean leaf area recorded. Days to 50% flowering was determined by taking the average days from the date of planting to the day first flower bud emerge on half of the plant stand per plot was recorded.

Yield and yield related Parameters Measured

The number of fruits was counted and recorded at each harvest. Fruits weight (kg) was determined by weighing the number of fruits at each harvest and mean fruit weight was recorded. Fruit girth (cm) was measured using veneer caliper at successive harvesting intervals.Fruit yield (t/ha) was determined by summing up the successive harvesting intervals and expressed in tons/ha.

Data Analysis

Data collected was subjected to analysis of variance (ANOVA) for Randomized Complete Block Designusing Genstat 2014 software (GENSTAT, 2014). The accessions of pumpkin means, urea fertilizer means and accessions x urea fertilizer interactions were compared using Fishers Least Significant Difference as outlined by Obi (2012).

Results and Discussion

The low soil pH 5.80 showed that the soil was acidity. This is in line with the report of Azu et al. (2017) who reported high acidity in most soils of Ebonyi State. According to Azu et al. (2018), the high concentration of oxides of iron and aluminum coupled with the presence of 1:2 clay minerals in the clay fraction of most hydromorphic soils of Ebonyi State is responsible for high exchangeable acidity and pH as observed in the study. Total nitrogen and available phosphorus were low and below the critical level of 0.15% and 12mg/kg as proposed by Osodeke & Ubah (2005). The organic carbon and organic matter were low indicating low soil fertility. Generally, the basic cations, except Calcium were low which might be responsible for the high pH (Table 2).

Table 2: Pre-planting Soil Chemical and Physical Properties of the Experimental Plots

Constituents	Quantities
pH	5.80
Total N (g/kg)	1.50
Available P (mg/kg)	7.80
Organic Carbon (g/kg)	14.3
Organic Matter (g/kg)	24.9
Ca^{2+} ($Cmolkg^{-1}$)	3.00
Mg^{2+} ($Cmolkg^{-1}$)	1.00
K^{+} ($Cmolkg^{-1}$)	0.32
Na^{+} ($Cmolkg^{-1}$)	0.02
ECEC ($Cmolkg^{-1}$)	7.16
Exchangeable Acidity ($Cmolkg^{-1}$)	2.82
BS (%)	60.11
Sand (g/kg)	380
Silt (g/kg)	140
Clay (g/kg)	480
Textural Class	Clay Loam

Vine Length (cm)

The accession, Amokwe, from Enugu State, had the mean longest vine length of approximately 318cm, which differed significantly (P = 0.05) from the other 19 accessions used in the study. Apparently, the accession, Ehime, from Imo State had the shortest vine length of approximately 234cm, and differed from all other accessions, except Abba (237cm) (from Anambra State), Agbaja (249cm) (from Enugu State),Amechi (242cm) (from Imo state), Lilu (248cm) (from Anambra State),Opi (250cm), Ugwuoba (242cm) (from Enugu State), Isuochi, (238cm), Ndioru (250cm) and Oror (242cm) (from Abia State) and Orlu (245cm) (from Imo State). The results of N-fertilizer and the accession x N-fertilizer interaction was not significant from the preliminary F-test. Therefore, the effects of N-fertilizer rates were not different from the control. The reduction on vine length on plots subjected to 0kgN/ha (control) can be attributed to deficiency of nitrogen in the soil and hence, produced stunted plants. The vine length in the experiment increased as Urea (nitrogen fertilizer) increased from control (0kgN/ha) to 120kgN/ha beyond which there was a decrease on the vine length. This is in agreement with Abdel-Mawgoudet al. (2005) who reported an increase in vine length of cucumber with an increase in urea application. Singh et al. (1998) noted that an increase in nitrogen fertilizer increased plant height when compared to control.See Table 3.

Table 3: Vine Length (cm) of Twenty Accessions of Pumpkin as affected by Four Rates of Urea Fertilizer (kg/ha)

Accessions of Pumpkin	Urea Fertilizer Rates (kg/ha)				
	0	60	120	180	Mean
Abba	233.4	233.4	260.7	221.0	237.1
Agbaja	255.4	228.9	244.6	272.2	248.8
Amachi	260.0	273.7	317.8	264.2	278.9
Amechi	230.2	241.7	238.2	256.2	241.6
Amokwe	315.0	369.6	280.2	305.7	317.6
Ehime	229.5	242.4	236.1	229.4	234.3
Inyi	282.3	303.5	281.0	268.6	283.9
Isiagu	260.0	272.4	315.2	260.2	277.0
Isuochi	232.9	234.1	223.3	259.7	237.5
Lilu	239.4	274.1	257.0	220.2	247.7
Mgbom	307.9	262.6	278.4	282.2	282.8
Ndioru	249.9	245.1	252.6	252.6	250.0
Omasi	278.9	308.7	244.2	297.2	282.3
Omege	305.0	248.1	268.7	303.5	281.3
Opi	239.6	275.2	260.0	223.2	249.5
Orlu	233.6	233.6	261.9	251.4	245.1
Oror	234.0	250.2	236.7	245.6	241.6
Ugwuoba	231.4	240.7	239.1	257.3	242.2
Umudioka	282.1	303.2	280.9	265.3	282.9
Umulolo	273.1	257.9	279.3	267.6	269.5
Mean	257.3	265.0	267.3	260.2	

$LSD_{0.05}$ For Comparing two Accessions of Pumpkin Means = 32.50

Number of Leaves/Plant

Accessions of Pumpkin, Urea fertilizer and Accessions x U-fertilizer interactions effects were not significant ($P > 0.05$) on number of leaves/plant from the preliminary F-tests. The accession, Mgbom, from Ebonyi State produced higher number of leaves/plant of approximately 29 leaves, which was statistically not different from the other 19 accessions. The smallest mean number of leaves of approximately 27 was produced by Ndioru from Abia State. The results showed, however, that the accessions and U-fertilizers belong to their respective population means of approximately 28 leaves/plant. Nitrogen fertilizer helps to stimulate vegetative growth in plant resulting to higher number of leaves considering that K and P were applied at recommended rates. It is possible that their uptake was enhanced by nitrogen fertilizers which have been reported by mediate uptake and utilization of potassium, phosphorus and other elements in plants (Brady, 1984). The result is summarized in Table 4.

Table 4: Number of Leaves of Twenty Accessions of Pumpkin as affected by Four Rates of Urea Fertilizer (kg/ha)

Accessions of Pumpkin	Urea Fertilizer Rates (kg/ha)				
	0	60	120	180	Mean
Abba	25.30	28.70	27.20	26.63	26.96
Agbaja	25.58	27.50	28.00	28.58	27.42
Amachi	25.67	28.33	28.50	27.50	27.50
Amechi	25.25	28.00	27.60	26.70	26.89
Amokwe	27.67	30.42	28.67	26.08	28.21
Ehime	27.92	27.33	27.92	25.67	27.21
Inyi	29.92	28.25	26.58	28.33	28.27
Isiagu	27.20	28.00	28.00	27.50	27.68
Isuochi	29.33	28.25	26.50	27.42	27.88
Lilu	26.15	28.18	26.00	27.50	26.95
Mgbom	28.50	28.42	26.67	32.50	29.02
Ndioru	26.17	25.83	27.67	26.75	26.60
Omasi	27.33	28.17	28.83	27.25	27.90
Omege	29.00	29.58	26.67	28.92	28.54
Opi	25.25	28.42	27.33	27.17	27.04
Orlu	25.50	28.92	30.33	28.67	28.35
Oror	25.33	27.00	28.33	26.75	26.85
Ugwuoba	27.50	26.92	26.67	26.83	26.98
Umudioka	27.10	29.00	28.33	27.00	27.86
Umulolo	28.33	26.67	30.08	26.00	27.77
Mean	27.00	28.09	27.80	27.49	

Accessions of Pumpkin, Urea Fertilizer, Accessions x Urea Fertilizer Interactions Means were not Significant from the F-test.

Leaf Area (cm^2)

The accession, Orlu, from Imo State, had the highest leaf area of 199cm^2, while the accession, Umulolo, from Imo State had the least leaf area of 163cm^2. However, the differences among the accessions in leaf area were not statistically significant ($P > 0.05$). The 120kg N/ha had the highest leaf area of 196cm^2, which differed from the 60kg N/ha and the control (0kgN/ha), but equal to the mean leaf area produced using 180kg N/ha. It appears that 120kgN/ha should be chosen since 180kgN/ha would be a waste of fertilizer because both 120kgN/ha and 180kg N/ha statistically gave the same leaf area. The significant response of leaf area to higher rates of nitrogen fertilizer (Urea) at 120kg/ha may be an indication that nitrogen was taken up by the plant and subsequently utilized in cell multiplication, amino acid synthesis and energy formation that acts as structural compound of the chloroplast which carries out photosynthesis. Lawlor (2002) reported that nitrogen fertilizer is a constituent of chlorophyll. Leaf area increased as urea rates increased from 0kg N/ha to 120kg N/ha, beyond which there was a decrease on the leaf area produced. This is in agreement with Josiah et al. (2007) who reported that an increase in leaf area of Cucumber attributed to the use of nitrogen in the soil. However, nitrogen fertilizer insufficiencies reduces leaf area which results to reduction in surface light interception for photosynthesis as reported by Cechin and Fumis (2004).The accessions did not differ in their mean leaf area. Also, the accession x U-fertilizer interaction was not significant (Table 5).

Table 5: Leaf Area (cm^2) of Twenty Accessions of Pumpkin as affected by Four Rates of Urea Fertilizer (kg/ha)

Accessions of Pumpkin	Urea Fertilizer Rates (kg/ha)				
	0	60	120	180	Mean
Abba	172.0	184.0	175.0	169.2	175.1
Agbaja	168.9	196.8	166.5	158.6	172.7
Amachi	170.7	164.3	200.5	183.8	179.9
Amechi	168.8	186.0	172.4	171.4	174.7
Amokwe	171.0	194.5	175.3	198.9	184.9
Ehime	157.5	173.2	187.1	192.6	177.6
Inyi	148.4	186.8	216.0	213.5	191.1
Isiagu	170.1	195.0	172.1	170.1	176.8
Isuochi	144.2	186.9	185.8	216.8	183.4
Lilu	169.3	189.0	171.9	169.0	174.8
Mgbom	172.7	184.1	166.4	199.6	180.7
Ndioru	163.2	165.4	187.7	190.1	176.6
Omasi	151.0	162.7	189.2	186.8	172.4
Omege	149.9	180.0	233.0	162.1	181.3
Opi	176.2	181.4	182.7	206.3	186.7
Orlu	166.5	207.6	260.2	162.1	199.1
Oror	141.5	172.6	197.6	205.0	179.2
Ugwuoba	134.1	208.5	204.6	189.7	184.2
Umudioka	170.4	194.0	174.3	174.9	178.4
Umulolo	160.0	148.0	189.2	156.2	163.3
Mean	158.4	180.9	196.1	188.1	

$LSD_{0.05}$ For Comparing two Urea Fertilizer Means = 14.06

Days to 50% Flowering

The analysis of variance showed non-significant ($P > 0.05$) effects of accessions, U-fertilizer rates and accessions x U-fertilizer interaction on days to 50% flowering. This means that the accessions and the U-fertilizer rates, including the control, had the same mean number of days to 50% flowering, which is equal to the population of 48 days. Plot treated with nitrogen fertilizer at 180kg/ha took longer days to flower than other rates of Urea studied. This is not in accordance with work by Dosantos et al. (2009) who observed longer days to 50% flowering on control plots when compared with plots treated with nitrogen fertilizer. Gradual increase in nitrogen fertilizer on the twenty accessions of pumpkin to 120kg/ha or 180kg/ha of Urea, increases days to flowering. This is not in agreement with the result by Naeem et al. (2002) for Chili. (Table 6).

Table 6: Days to 50% Flowering of Twenty Accessions of Pumpkin as affected by Four Rates of Urea Fertilizer (kg/ha)

Accessions of Pumpkin	Urea Fertilizer Rates (kg/ha)				
	0	60	120	180	Mean
Abba	51.00	49.00	50.00	50.40	50.10
Agbaja	49.42	50.08	46.83	50.42	49.19
Amachi	48.50	34.25	49.58	51.67	46.00
Amechi	47.20	49.50	49.60	49.10	48.85
Amokwe	49.67	45.75	50.58	47.75	48.44
Ehime	46.50	48.67	46.58	49.92	47.92
Inyi	47.83	48.33	52.58	50.83	49.90
Isiagu	47.50	44.25	48.51	50.62	47.72
Isuochi	45.25	50.17	46.67	48.50	47.65
Lilu	47.53	47.20	49.67	50.10	48.63
Mgbom	51.17	49.11	51.83	50.50	50.65
Ndioru	48.17	49.25	44.58	44.92	46.73
Omasi	48.08	50.75	48.17	49.83	49.21
Omege	46.83	50.83	51.92	49.75	48.83
Opi	48.17	47.92	51.67	49.50	49.31
Orlu	48.75	43.92	46.17	45.58	46.10
Oror	48.25	49.08	44.83	44.50	46.67
Ugwuoba	47.25	49.50	49.67	49.75	49.04
Umudioka	47.80	47.22	46.58	49.70	47.83
Umulolo	47.58	35.08	49.67	50.50	45.71
Mean	48.09	46.85	48.76	48.93	

Accessions of Pumpkin, Urea Fertilizer and Accessions x U-Fertilizer Interactions Means were not Significant from the F-test.

Number of Fruits/Plant

The results showed that Omasi, from Anambra State, had the highest mean number of fruits/plant of approximately three (3) fruits than the remaining 19 accessions, which had a population mean number of fruits of approximately two (2). The variations observed on the number of fruits per plant could be attributed to genetic differences existing among the accessions. Nee (1990) reported that Cucurbita genotypes produce fruits of various sizes as dictated by the genetic constitution. Mondal et al. (1989) noted a wide range of variability in Watermelon for fruit length, fruit diameter and number of fruits per plant.

The 60kgN/ha produced the highest number of fruits of approximately two (3) fruits, which differed from the mean number of fruits/plant produced by the control (Table 7). This finding concurred with Andrade et al. (2006) and Dosantos et al. (2009) who observed significant increase in number of fruits in plots treated with nitrogen fertilizer when compared to control plots. Proper nutrients promote vigorous growth of Pumpkin plant which confirm the observation of Waseem et al. (2008) who reported that 60kgN/ha gave higher number of fruits and yield of Cucumber. Ahmad et al. (1999) and Kurup et al (1997) also reported that increase in nitrogen rates increases fruit number of Okra.

The significant accession x U-fertilizer interaction was due to the differential responses of the accessions across the U-fertilizer rates. For example, the accessions, Omasi, from Anambra State, produced the highest mean number of fruits of approximately five (5) at 60kgN/ha, which dropped to three (3) fruits at 120kgN/ha and 180kgN/ha. Also, the accession, Inyi, from Enugu State, had approximately the same number of fruits/plant of two (2) at all levels of N-fertilizer rates including the control. See the result in Table 7.

Table 7: Number of Fruits of Twenty Accessions of Pumpkin as affected by Four Rates of Urea Fertilizer (kg/ha)

Accessions of Pumpkin	Urea Fertilizer Rates (kg/ha)				
	0	60	120	180	Mean
Abba	2.000	2.667	2.000	2.333	2.250
Agbaja	2.000	2.000	2.000	2.333	2.083
Amachi	2.000	2.333	2.333	2.000	2.167
Amechi	2.333	2.333	2.667	2.000	2.333
Amokwe	2.000	2.333	2.333	2.667	2.333
Ehime	2.000	2.000	2.333	1.667	2.000
Inyi	2.333	2.333	2.000	2.333	2.250
Isiagu	2.000	2.000	2.333	2.000	2.083
Isuochi	2.667	2.000	2.333	2.333	2.333
Lilu	2.000	2.333	2.000	2.000	2.083
Mgbom	2.333	2.333	2.000	2.333	2.250
Ndioru	2.000	1.667	2.667	2.333	2.167
Omasi	2.000	5.333	3.333	2.667	3.333
Omege	2.333	2.000	2.333	2.333	2.250
Opi	2.000	2.667	2.333	2.000	2.250
Orlu	2.333	3.000	2.333	2.333	2.500
Oror	1.667	2.667	2.667	2.667	2.417
Ugwuoba	2.000	2.333	2.000	2.333	2.167
Umudioka	2.000	2.333	2.333	2.000	2.167
Umulolo	2.000	2.000	1.667	2.000	1.917
Mean	2.000	2.534	2.300	2.233	

$LSD_{0.05}$ For Comparing two Accessions of Pumpkin Means = 0.486
$LSD_{0.05}$ For Comparing two Urea Fertilizer Means = 0.251
$LSD_{0.05}$For Comparing two Accessions x U-Fertilizer Interaction Means = 0.971

Fruits Weight (kg)

The accession, Amokwe, from Enugu State, produced the heaviest fruit with a mean of approximately two (2) kg, while Omasi, from Anambra State, had the least fruit weight of 0.71kg. The variations observed on the fruit weight could be attributed to genetic differences existing among the accessions. .This is in agreement with work done by Nee (1990). The accessions, Amokwe, Inyi and Ehime from Imo State, Isuochi, from Abia State and Orlu, from Imo State, had the same mean fruit weight of approximately two (2) kg each (Table 8). The U-fertilizer rates and the accessions x fertilizer interaction were not significant (P >0.05) from the F-tests (Table 8).

Table 8: Fruits Weight (kg) of Twenty Accessions of Pumpkin as affected by Four Rates of Urea Fertilizer (kg/ha)

Accessions of Pumpkin	Urea Fertilizer Rates (kg/ha)				
	0	60	120	180	Mean
Abba	0.482	0.820	0.992	0.850	0.786
Agbaja	1.300	1.217	1.333	0.933	1.196
Amachi	1.017	0.800	1.017	1.083	0.979
Amechi	0.880	0.817	0.150	0.910	1.027
Amokwe	2.017	2.000	2.150	1.983	2.038
Ehime	1.150	0.900	0.750	1.117	0.979
Inyi	1.533	2.267	1.500	1.800	1.775
Isiagu	0.500	0.850	1.100	0.880	0.833
Isuochi	1.550	1.400	2.100	1.900	1.738
Lilu	0.823	0.710	1.630	0.912	1.019
Mgbom	1.117	0.817	1.100	0.883	0.979
Ndioru	0.933	0.717	1.217	0.850	0.929
Omasi	0.483	0.983	0.667	0.717	0.713
Omege	1.117	1.200	1.217	0.900	1.108
Opi	0.817	0.850	1.050	1.283	1.000
Orlu	1.300	1.550	1.967	1.833	1.633
Oror	0.883	1.950	1.633	1.183	1.413
Ugwuoba	0.917	0.700	1.217	1.150	0.996
Umudioka	0.495	0.800	0.967	0.883	0.786
Umulolo	1.450	1.717	1.950	1.100	1.554
Mean	1.038	1.153	1.353	1.158	

$LSD_{0.05}$ For Comparing two Accessions of Pumpkin Means = 0.399

Fruit Girth (cm)

The accessions, Orlu (Imo State), Amokwe and Umulolo (Imo State) and Isuochi (Abia State) produced the largest mean fruit girth of approximately 19cm each, while Mgbom, Omege and Amachi (Ebonyi State), Omasi (Anambra State) and Ndioru (Abia State) produced the least mean fruit girth of approximately 12cm each. Also, the accessions, Inyi and Agbaja (Enugu State) and Oror (Abia State), belong to the same population of fruit girth with a population mean of 16.0cm, which differed from the other two populations.

Mean fruit girths obtained with 120kgN/ha and 180kgN/ha were the highest of 16.0cm each, which differed from a mean fruit girth of 13.0cm obtained with the control (0kgN/ha).These results is in accordance with the work of Waseem et al. (2008) who noted that high dose of nitrogen fertilizer significantly maximizes Cucumber fruits girth.. Statistically, the mean fruit girth of approximately 15cm obtained with 60kgN/ha was equal to those obtained with 120kgN/ha and 180kgN/ha. The accessions x U-fertilizer rates interactions were not significant (P>0.05). The resultis presented in Table 9.

Table 9: Fruit Girth (cm) of Twenty Accessions of Pumpkin as affected by Four Rates of Urea Fertilizer (kg/ha)

Accessions of Pumpkin	Urea Fertilizer Rates (kg/ha)				
	0	60	120	180	Mean
Abba	11.05	14.20	18.20	16.53	15.00
Agbaja	15.67	10.20	19.44	18.80	16.03
Amachi	11.03	14.20	14.37	11.03	12.66
Amechi	11.20	14.20	19.00	16.57	15.24
Amokwe	16.63	22.07	19.07	16.93	18.67
Ehime	10.20	11.87	11.70	13.53	11.82
Inyi	13.73	15.00	16.60	19.72	16.26
Isiagu	13.00	13.50	16.50	15.00	14.38
Isuochi	17.90	19.07	15.00	22.40	18.59
Lilu	10.00	13.50	16.20	16.70	14.10
Mgbom	9.77	11.77	10.03	13.47	11.26
Ndioru	13.21	13.53	13.10	14.23	13.52
Omasi	13.77	11.73	12.83	14.73	13.27
Omege	14.03	10.6	12.73	10.80	12.04
Opi	13.67	15.00	15.77	13.83	14.57
Orlu	18.20	19.14	20.17	19.57	19.27
Oror	13.07	15.63	19.00	16.77	16.12
Ugwuoba	12.63	16.83	15.20	13.90	14.64
Umudioka	10.20	14.00	16.00	13.40	13.40
Umulolo	16.27	20.43	17.43	18.07	18.05
Mean	13.27	14.83	15.92	15.80	

$LSD_{0.05}$ For Comparing two Accessions of Pumpkin Means = 2.653
$LSD_{0.05}$ For Comparing two Urea Fertilizer Means =1.370

Fruit Yield (t/ha)

The analysis of variance showed that the main effects of accessions and accessions x U-fertilizer interactions were not significant (P > 0.05). The accessions, under the conditions of the experiment, did not differ in their mean fruit yield, and therefore, belong to the same population with a mean fruit yield of 10t/ha.

On the other hand, the main effect of U-fertilizer on fruit yield was significant (P = 0.05), which was due to the fact that the fruit yield at 0kgN/ha of 8t/ha, differed significantly (P = 0.05), from the population mean fruit yield of approximately 10t/ha produced using 60kgN/ha. Martinet and Paganini (2006) reported that there was an increase on number of fruits in a study on Pumpkin in Lithuania due to an increased fertilizer. Although, due to different climatic condition and soil type, nitrogen recommendation for optimum fruit may be as high as 150kg/ha, but in this study 60kg/ha of nitrogen fertilizer was found to be adequate. The results are in agreement with the work done by Greef (1994) who observed that yield of vegetable increases with an increase in nitrogen fertilizer applied up to a point of stagnation and a decrease in yield. These reductions in yield at high nitrogen fertilizer rates could be as a result of high concentration of soluble nitrogen which increases the osmotic potential of the soil solution causing a reduction in water uptake by the plant roots (Onyango, 2002) (Table 10).

The interaction between accessions and nitrogen fertilizer had no significant influence on fruit yield of Pumpkin in both years. But the highest fruit yields were obtained at Omasi accession x 60kgN/ha treatment. Papadopoulos (2001) observed a significant relationship between nitrogen concentration and yield of Cucumber. Omasi accession x 60kgN/ha interaction produce gave the highest number of vines, number of flowers, number of fruits and fruit yield per plant.

Table 10: Fruit Yield (t/ha) of Twenty Accessions of Pumpkin as affected by Four Rates of Urea Fertilizer (kg/ha)

Accessions of Pumpkin	Urea Fertilizer Rates (kg/ha)				
	0	60	120	180	Mean
Abba	7.18	10.77	8.24	9.23	8.86
Agbaja	8.20	9.23	9.23	10.26	9.23
Amachi	7.69	12.31	8.20	8.20	9.10
Amechi	7.18	11.00	9.20	9.20	9.15
Amokwe	7.69	9.74	11.28	10.77	9.87
Ehime	8.20	10.26	9.74	8.72	9.23
Inyi	9.74	10.77	10.26	9.23	10.00
Isiagu	7.62	12.30	8.20	8.20	9.08
Isuochi	9.74	9.23	9.23	9.23	9.36
Lilu	7.60	10.62	7.18	7.18	8.15
Mgbom	9.23	9.23	8.20	11.28	9.49
Ndioru	8.72	10.26	9.74	10.26	9.74
Omasi	8.72	12.31	11.79	11.79	11.15
Omege	7.18	11.28	9.23	9.74	9.36
Opi	7.18	10.26	10.77	9.74	9.49
Orlu	7.18	10.26	9.74	10.77	9.49
Oror	8.72	10.77	10.77	8.72	9.74
Ugwuoba	10.77	8.72	9.74	10.26	9.87
Umudioka	9.23	10.26	9.23	8.24	9.24
Umulolo	7.69	10.26	8.20	7.18	8.33
Mean	8.25	10.49	9.41	9.41	

$LSD_{0.05}$ For Comparing two Urea Fertilizer Means = 0.833
Accessions of Pumpkin, Accessions x U-Fertilizer Interactions Means were not Significant from the F-test

Conclusion

The Accessions of pumpkins varied in the different agronomic attributes as influenced by the N-fertilizer (Urea) rates. The productivity of the Accessions, especially Omasi from Anambra State, could be maximized by the application of 60kg/ha of Urea fertilizer, which gave the highest fruit yield of 11t/ha, whereas the population means of all the Accessions was 10t/ha. From the results of this study, we recommend; Omasi accession from Anambra State which gave highest fruit yield of 11t/ha. 60kg/ha of urea fertilizer for production of accessions which gave population mean fruit yields of approximately 10t/ha.

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