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Variation in seed yield of two cucumber (*Cucumis sativus*) cultivars as affected by poultry manurein Awka Rain forest zone of Nigeria

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Abstract

A Field experiment was conducted at the Teaching and Research Farm of Nnamdi Azikiwe University, Awka to evaluate the influence of three (3) poultry manure levels 0t/ha,5t/ha and 10t/ha and two (2) Cucumber cultivars, Darina and cucumber 999 on Cucumber seed number and weight production. The experiment was laid out in a 2x3 factorial randomized complete block design and replicated three times. It was observed that on both number of seeds per fruit and seed weight per fruit, plots that received 5t/ha poultry manure out performed plots that received 10t/ha poultry manure with Darina cultivar leading (282 and 5.85g respectively).But on fruit number, fruit size and fruit yield per hectare, both cultivars performed better on 10t/ha than on 5t/ha poultry manure application rate. This showed that for cucumber seed production, the recommended poultry manure application rate is 5t/ha and the recommended cultivar is Darina. It was also observed that fruit yield is significantly affected by the number of branches and not the length of vines.

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Introduction

Seed is the product of fertilized ovule that consists of embryo, seed coat and cotyledon but in terms of seed technology, any part of the plant body which is used for commercial multiplication of crop is called seed (Setimela and Kosina,2006). The use of high quality seed plays a pivotal role in crop production. The use of poor quality seeds nullify the utility of all agronomic practices and every other input applied to the crop matter how plushy they are applied. Presently seeds for planting can be obtained from certified (formal) seed vendors and farmers/community based in formal seed producers. Community based in formal seed production has recently gained popularity as an alternative to the formal seed. Sector of disseminating new crop varieties including the common bean. This is because farmer produced seed is readily available and is more affordable by most farmers than certified seeds. Community based seed production and dissemination is being promoted as a means of accelerating his diffusion of new varieties for the self-pollinated crops like rice and beans (Rubyogo *et al.*, 2010). The informal sector distributes seed through many ways that range from seed-to-seed exchange, gifts, form of payment for laborer seed for cash sale. Recent literature indicates that farmer-to-farmer seed marketing has gained importance as a means of seed exchange in Sub-Saharan Africa as economies develop and farmers are increasingly using markets to meet their seed needs (Sperling and McGuire, 2010).). In a research that was carried out by Katungi *et al.*, (2011), they discovered that farmer based common bean seed production was a profitable enterprise and was less sensitive to price fluctuations. Compared to certified common bean seed production, netprofitmarginswerefivetimeshigherforcertifiedcom monbeanseedthanfor farmer based common bean seed production. On many Instances even government institute ion slack capacity to produce seed in sufficient quantities. It is estimated that by 2050 the world population will be 9 billion people and the main goal of Agriculture is to feed this teeming population (Delimini, 2012).Production of high quality seeds that are readily available and easily affordable is imperative. This write up focuses on the production of cucumber seeds. Cucumber is a well-known fruit vegetable. The dietry importance of vegetables is now recognized all over the world as evident from FAO/WHO comments that fruits and vegetables are potential source to tackle spreading menace of malnutrition globally. At present, more than 70 vegetable fruits are cultivated on 42.6 million hectares in the world (FAO, 2003). Production of cucumber in Nigeria has increased probably due to awareness being created by its market demand and economic returns, short duration in maturity or due to its nutritional and medicinal values (Okoli and Nweke, 2015). Cucumber is a crop grown for its edible fruits which are eaten while still immature, either fresh or cooked and supplies vitamins, minerals and anti-oxidant to the body (Jitendra*et al.*, 2013). Cucumber is a very good source of vitamins A, C, K, and B6, potassium, pantothenic acid, magnesium, phosphorus, copper and manganese. Cucumber also supplies thiamine, niacin, iron, calcium and other nutritional characters (Gopalan *et al.*, 2015).

In the last few decades, the rate of world population is increasing and more area covered with infrastructures, which decreased agriculture area and conventional agriculture shifted to modern agriculture like excess utilization of inorganic fertilizer, hybrid varieties, irrigation methods and pesticides etc. Modern agriculture produces high yield, but some problems are equally created such as infertility of soil, new pests and diseases and health problems (Tavakoli and Khoshkan, 2013).This why this work focused on organic farming. Organic manure improves soil colour, adds mineral nutrients, and increases water retention ability of soil and increases survival and activities of microorganisms. Poultry manure is not limiting to easy availability, but also provide all essential nutrients to the plants and maintaining the soil fertility and give superior growth and yield (Mangila *et al.*, 2007). Considering the present high cost and scarcity of certified Cucumber seeds ,there is need to develop an effective,handy and sustainable method of Producing these seeds while

maintaining soil fertility and structure naturally.Equally ,Cucumber seeds easily loose viability so there is need to have a handy and fresh seed supply.

Materials and methods

Experimental site

The experiment was carried out at the Teaching and Research farm of the Department of Soil science and Land resource management, Nnamdi Azikiwe University Awka, Anambrastate, Nigeria. Awka is located in the tropical rainforest zone of Nigeria. The research farm lies on latitude 6.2497N and 7.1167E, with average temperatures of 27˚C, annual rainfall of 1828mm.

Materials used

Two varieties of cucumber: Cucumber 999 and Darina. The Darina hybrid cucumber seeds and the cucumber 999 were purchased from a vendor in Enugu state. The Darina cucumber hybrid seeds were produced by the Seminis Company located in the United States of America. Cucumber 999 was produced by Thai-agro allied industries. Three poultry manure rates: 0 tons, 5 tons, 10 tons.

The experiment was laid out in a 2×3 factorial experiment in Randomized Complete Block Design (RCBD) and replicated three times.

Factor A (Varieties)	Factor B (Poultry manure rates)
Cucumber 999	0 ton
Darina	5 tons
Treatment combinations	10 ton
V1+0 tons V2+0 tons	
V1+5 tons V2+5 tons	
V1 +10 tons V2+10 tons	

Cultural practices

A land area of 17m by 8m was cleared, the land has one year fallow period. Beds were made of 2m by 2m and the distance between each bed was 1m.

Poultry manure was incorporated into the bed at the rate of 5 tons, 10 tons and was left to cure for a week, which after a week cucumber seeds was planted at a spacing of 50cm by 50cm two seeds per hole. Sowing was done manually on the top of the beds and it was carried out on 17th of May 2018. The seed rate was 2 seeds per hole with a planting space of 50cm×50cm. Weeding was done thrice during the growing period as at when due by hand weeding. Harvesting of cucumber fruits commenced at (6) weeks after sowing when the fruits has turn deep green in colour. Harvesting was done by hand picking of the mature fruits.

Soil sampling and handling

Composite soil sample was collected with soil auger before planting. After harvesting the cucumber, soil samples were collected again using core samplers and bags. They were taken to the laboratory for physical and chemical analysis (Table 1).

Data collection and analysis

Data collected on growth include; Number of flowers per plants and vine length. Data collected on yield include; number of fresh fruits, fruit length, fruit diameter, number of branches, number of seeds per fruit, seed weight, weight of fresh fruits and weight of damaged fruits of the Darina hybrid cucumber and Cucumber 999.All the data collected were subjected to analysis of variance (ANOVA) following the procedures for the experiment in Randomized complete block design (RCBD) using GENSTAT (2011) statistical software package. Mean separation was done by using least significant difference (LSD) at 5% probability level.

Results

Effects of variety on growth parameters

The number of leaves and plant height of both Cucumber 999 and Darina at 14 DAS were significantly different ($p>0.05$) at 30 DAS after planting (Table 3). The number of branches of both Cucumber 999 and Darina were not significantly different ($p<0.05$) at 30 DAS after planting. The number of flowers, number of leaves and vine length of both cucumber 999 and Darina was significantly different ($p>0.05$) at 30 DAS after planting. The number of leaves and plant height of both Cucumber 999 and Darina at 14 DAS were significantly different ($p>0.05$) at 30 DAS after planting (Table 3).

Table 1. Analyzed composite sample.

Soil properties	Unit	Value
Ph in water		6.9
Ph in KCL		6.2
Ca	Cmol/kg	5.75
Mg	Cmol/kg	10.75
H	Cmol/kg	0.07
Al	Cmol/kg	0.94
Organic carbon	g/kg	6.96
Organic matter	g/kg	12
Soil moisture	%	9.6
Bulk density	g/cm^3	1.85
Sand	%	86.8
Silt	%	7.06
Clay	%	6.14

Table 2. Analyzed poultry manure.

Properties	Unit	Value
Ph in water		8.7
Ph in KCL		7.9
Ca	Cmol/kg	22.5
Mg	Cmol/kg	18.25
H	Cmol/kg	0.33
Al	Cmol/kg	0.46
Organic carbon	g/kg	7.8
Organic matter	g/kg	13.4

The number of branches of both Cucumber 999 and Darina were not significantly different ($p<0.05$) at 30 DAS after planting.

The number of flowers, number of leaves and vine length of both cucumber 999 and Darina was significantly different ($p>0.05$) at 30 DAS after planting.

Effect of poultry manure rates on growth parameters

Poultry manure rate at 0/ton significantly influenced the number of leaves and plant height at 14 DAS($p>0.05$) but was not significantly influenced at poultry manure rate at 5tons and 10 tons respectively($p<0.05$)(Table 4). Poultry manure rates did not significantly influence the number of branches ,number of flowers and number of leaves at 30DAS($p<0.05$),but poultry manure rate at 0/ton significantly influenced vine length at 30DAS($p>0.05$) but was not significantly influenced at poultry manure rate at 5tons and 10 tons respectively($p<0.05$)(Table 4).

Cucumber 999 had the highest length of vine (122.1cm),number of branches(2.67) and number of leaves (24.54) all at 30 DAS and on 10t/ha poultry manure plots.

Table 3. Effect of poultry manure on growth parameters.

Poultry manure rates (tons)	Number of leaves (14DAS)	Plant height(cm) (14DAS)	Number of branches (30DAS)	Number of flowers (30DAS)	Number of leaves (30DAS)	Vine length (cm) (30DAS)
0 ton	4.450	5.679	2.23	4.34	20.79	95.5
5tons	5.083	7.142	2.23	4.60	20.75	107.4
10tons	5.144	7.574	2.46	4.51	21.84	109.1
LSD0.05	0.4229	0.4757	0.788	0.763	1.911	13.04

Table 4. Interaction effect of variety and Poultry manure rates on growth parameters.

Variety	Poultry manure rates(tons)	Number of leaves(14 DAS)	Vine length (cm) (14 DAS)	Number of branches(30 DAS)	Number of flowers (30 DAS)	Number of leaves (30 DAS)	Vine length(cm) (30 DAS)
V1	0tons	4.6	6.07	2.25	3.58	21.63	105.0
	5tons	5.22	7.394	1.94	4.42	22.31	116.4
	10tons	5.42	8.641	2.67	4.51	24.54	122.1
V2	0tons	4.3	5.292	2.20	5.11	19.94	86.0
	5tons	4.94	6.889	2.51	4.78	19.19	98.5
	10tons	4.87	6.507	2.25	4.52	19.13	96.2
LSD0.05		0.598	0.673	1.114	1.08	2.703	18.44

The least figures were obtained from plots on control (0/ton/ha).Poultry manure rate at 0/ton/ha significantly influenced the number of leaves and plant height at 14 DAS ($p>0.05$) but was not significantly influenced at poultry manure rate at 5tons and 10 tons respectively ($p<0.05$) (Table 5). Poultry manure rates did not significantly influence the number of branches ,number of flowers and number of leaves at 30 DAS($p<0.05$)(Table 5),but poultry manure rate at 0/ton significantly influenced vine length at 30 DAS($p>0.05$) but was not significantly influenced at poultry manure rate at 5tons and 10 tons respectively($p<0.05$) (Table 5).

Table 5. Effect of variety on yield parameters.

Variety	Fruit girth(cm)	Fruit weight(kg)	Number of fruits/plant	Fruit Length (cm)	Number of seeds/fruit	Weight of seed/fruit(g)
V1	18.5	2.04	3.20	20.20	185.4	3.81
V2	20.2	2.40	4.34	21.30	234.6	4.8
LSD0.05	0.28	0.21	0.46	2.73	14.73	0.52

Table 6. Effect of poultry manure rates on yield parameters.

Poultry manure rates (tons)	Fruit diameter(cm)	Fruit weight(kg)	Number of fruits	Fruit Length (cm)	Number of seeds/fruit	Weight of seed/fruit(g)
0 ton	14.567	0.26	1.64	15.3	193	4.14
5tons	16.758	1.262	2.48	17.8	236.4	4.90
10tons	17.717	1.58	3.03	18.8	200.4	3.80
LSD 0.05	0.3481	0.256	0.256	0.563	10.50	18.05

Yield parameters

Poultry manure rates significantly influenced fruit weight, fruit girth, average fruit weight and lenght at harvest ($p>0.05$)(Table 6). Darina had the highest fruit size and seed parameters. Tables 7 and 8 showed that Darina cultivar was significantly higher than Cucumber 999 on yield parameters like fruit size and seed number and weight on both 5t/ha and 10t/ha application rates.

Darina cultivar had the highest figures on yield parameters fruit girt (20.20cm), fruit length (21.30cm),fruit yield per plant (2.40kg) and fruit yield per hectare (21.40ton/ha) (Table 9).

Table 7. Interaction effect of variety and poultry manure rates on yield parameters.

Variety	Poultry manure rates(ton)	Fruit girth(cm)	Fruit weight(kg)	Number of fruits	Fruit Length (cm)	Number of seeds/fruit	Weight of seed/fruit(g)
V1	0ton	10.483	0.54	1.63	16.20	186.6	4.2
	5tons	16.833	1.552	2.33	18.50	190.5	4.05
	10tons	18.567	2.27	3.20	20.20	179.1	3.21
V2	0ton	12.650	1.467	2.00	18.5	199.5	4.11
	5tons	17.33	1.750	3.23	19.0	282	5.85
	10tons	20.20	2.413	4.34	21.30	222	4.44
LSD0.05		0.4852	0.3632	0.797	15.53	25.52	0.40

At harvest the fruit girt ,average fruit weight, length of fruits and fruit yield per hectare of both cucumber 999 and Darina was significantly different($p<0.05$(Table 8).Poultry manure rates significantly influenced yield parameters at harvest ($p>0.05$) (Table 10).

Discussion

The data concerning plant height and vine length showed that both traits were highest in plants that received poultry manure at10 ton/ha, whereas the least plant height and vine length was noted in 0 ton/ha plots. The highest vine length in plants with a highest poultry manure level indicated that an increase in poultry manure level caused increase in the plant height and vine length of cucumber. As per varieties, maximum vine length was obtained in Cucumber 999 (122.1cm at 30 DAS) while the minimum vine length was noted in Darina (96.2cm at 30 DAS).

Table 8. Effect of variety on yield per plot.

Variety	Yield per plot (tons/ha)
V1	17110.84
V2	19231.23
LSD0.05	3500.957

The increase in plant height and vine length might be due to more organic matter in the soil, because it has more water holding capacity and releases nutrients gradually and continuous to the soil(Table 2). In such situation, the rate of plant metabolic processes is improved and in response, the growth is also increased (Ali*et al.,* 2011). According to results, the highest numbers of branches per plant were observed in those plants to which highest level ofpoultry manure was applied at 10 tons/ha and the lowest numbers of branches per plant were noted in control plant.

Table 9. Effect of poultry manure rate on yield per plot.

Poultry manure rate	Yield per plot (tons/ha)
0 ton	17331.08
5tons	16968.67
10 tons	19009.28
LSD0.05	4287.779

The increased amount of poultry manure increased the number leaves in cucumber plants. The number of leaves per plant in plots supplied with poultry manure at 10 tons/ha was more and the plants that received no poultry manure had lesser number of leaves per plant. In cultivars, Cucumber 999 had the largest number of leaves per plant (24.54 at 30 DAS) and branches (2.67). According Enujeke*et al.* (2013)who reported that poultry manure was contained more nutrients, which improved the physical condition of

soil for plant growth and development. Increased poultry manure level increased the numbers of branches per plant, because high concentrations of nutrients were present in poultry manure which encouraged the growth of the plant (Enujeke,2013).In case of cultivars, highest fruit weight per hectare at poultry manure rate of 10t/hectare was obtained in Darina (21.40ton/ha), while that of Cucumber 999 was(19.00ton/ha). The increase in average fruit weight and fruit yield per hectare might be due to the high concentration of nutrients in high poultry manure level which boost up the growth and yield.

Similar results were obtained by Nweke and Nsoanya (2015) who noted that high poultry manure level which is a rich source of nitrogen, phosphorus, magnesium and calcium increased the cucumber fruit weight.

Table 10. Interaction effect of variety and poultry manure rate on yield per plot.

Variety	Poultry manure rate	Yield per hectare
V1	0 ton	16.68733
	5 tons	15.63592
	10 tons	19.00928
V2	0 ton	17.97483
	5 tons	18.30142
	10 tons	21.41745
LSD0.05		60.63835

Maximum pod seed weight (5.85g) and number of seeds (282) were observed in Darina supplied with poultry manure at 5 tons/ha. Cucumber 999 also had its highest yields in the fore mentioned parameters on 5t/ha manure rate. This work clearly showed that although poultry manure rate of 10t/ha favored high fruit size and yield, it does not favor seed yield.

Conclusion

This study confirmed that Darina had the highest number of seeds (282) and highest average seed weight (5.85g per pod) at 5tons/ha poultry manure rate. Cucumber 999 also performed best in the above parameters on 5tons/ha poultry plots. Although for the both cultivars the highest fruit yield per hectare came from plots on 10t/ha poultry rates. For seed production, the recommended cucumber cultivar is Darina and poultry manure rate of 5ton/ha in Awka.South-east Nigeria.

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