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EFFECT OF TIME OF PLANTING AND POULTRY MANURE APPLICATION ON GROWTH AND YIELD OF EGUSI MELON *(Colocynthis citrullus L.)* IN A DERIVED SAVANNAH AGRO-ECOLOGY

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ABSTRACT

A study was carried out to identify the effects of time of planting and poultry manure application on the growth and yield of Egusi melon. Five planting dates were chosen in 1995, viz April 2, 16 and 30 and May 14 and 28 in factorial combination with three poultry manure rates of 0, 5 and 10t/ha. In 1996, the planting dates of March 5 and 19, and April 2 were evaluated. The 1995 experiment was laid out in a 5x 3 factorial experiment in a Randomised Complete Block Design (RCBD) to test the two factors together while the 1996 experiment was laid out in RCBD. Nsukka local Egusi cultivar was used in both years. The result showed that early planting by April 2 depressed early plant development. However the fruit and seed yields were increased as planting was done early in the season. Seed yield/ha decreased by 350% and 1117% as planting was delayed from April 2 to April 16 and to April 30, respectively. No seed yield was obtained in May 14 and 28 plantings. In 1996, seed yield increased by 2.4% and decreased by 23.2% as planting was delayed from March 5 to March 19 and to April 2, respectively. Poultry manure application enhanced growth and development of egusi melon. Seed yield/ha increased by 58.7% and 62% as poultry manure was increased from 0 t/ha to 5t/ha and to 10t/ha, respectively. Response to poultry manure application was higher at the late planting dates.

Keyword: Egusi melon, Manure, Colocynthis citrullus

INTRODUCTION

The egusi melon, *Colocynthis citrullus L* is a member of the cucurbitaceae family. It has been referred to in some texts as *Citrullus vulgaris* (Okoli, 1984) and *Citrullus lanatus* (Ogunremi, 1978). It is an important food crop in many sub saharan African countries. It is grown for its seed, which is used in preparing assorted foods, especially soup and stew. The seed is also roasted and eaten as snacks. The seed is rich in oil and protein and contains good quantities of most of the essential amino acids (Oyolu and Macfarlene, 1982; Nwokolo and Sim, 1987; Oyenuga and Fetuga, 1974, and Okigbo, 1975).

Egusi melon has however not received much attention from researchers. There is a need to carry out investigation on methods of optimizing the production of the crop. Manuring and time of planting are important management options to be considered.

The optimum yield potential of a crop can only be achieved if environmental conditions suitable for its growth and development are provided. Time of planting is important as it relates changes to various environmental factors. Presently there is no report on the time of planting Egusi melon. The present study was carried out to determine the best date for planting egusi melon to achieve optimum growth and seed yield. It is also part of the aim to evaluate the effect of poultry manure application on the growth and yield of the crop.

MATERIALS AND METHODS

The study was carried out at the Department of Crop Science, University of Nigeria, Nsukka, experimental farm. Nsukka is located at latitude 06°52' North and longitude 07°24' East, and at the attitude of 447 metres above sea level. Two experiments were performed, one in 1995 and the other in 1996.

The seed of Nsukka Local cultivar of Egusi melon was purchased from a long standing Egusi melon farmer at Nsukka. Poultry manure was obtained from a deep litter system and was in dry condition.

1995 Experiment

The experiment was laid out in a 3 x 5 factorial in a randomized complete block design (RCBD) with four replications. Three rates of poultry manure, 0, 5 and 10t/ha ,were combined with five planting dates of April 2, 16, 30 and May 14 and 28, to give 15 treatment combinations. Each block was divided into 15 plots, measuring 6m x 3m. Soil samples to the depth of 15cm were collected from the plots before treatment application. These were bulked together and a sub-sample taken to the laboratory for chemical and physical analysis. The treatments were randomly assigned to the plots in each block. Seed was planted at 1.0 x 1.0 metre spacing at two seeds per hole. Weed control was done twice manually. The first was done three weeks after seedling emergence by hoeing. The second was done at the 5th week after seedling emergence by hand pulling. Plant growth and development records taken included; days to 50% seedling emergence, days to 50% flowering, vine length at 30days after emergence (DAE), number of branches 30DAE. The yield records included; number of fruits/ha, fruit yield (t/ha), average fruit weight (kg), 1000–seed weight (g), seed to fruit ratio, kernel to seed ratio and seed yield (kg/ha).

Statistical Analysis: Analysis of variance (ANOVA) was done according to the procedure described by Steel and Torrie (1980) for factorial experiments. The square root transformation method was used to transform the data where zero values were obtained. Separation of treatment means for statistical significance was by the F–LSD procedures according to Obi (1986). The F-LSD test was done at 5% probability level.

1996 Experiment

The 1996 expe riment was carried out to determine the effect of earlier planting dates on egusi crop development and seed yield. The treatments comprised three planting dates *viz*; March 5 and 19 and April 2. The experiment was laid out in a randomized complete block design with four replications. A basal application of 5t/ha of poultry manure was given to the plots. Weeding, harvesting, processing and statistical analysis were done as in the 1995 experiment. Rainfall, temperature and relative humidity records were collected from the Faculty of Agriculture meteorological station situated about 400 metres from the experimental site.

RESULT

The result of the soil analysis showed that the soil of the experimental site was texturally sandy clay loam (Table 1).The soil pH was low and its content of the major nutrient elements was also low. The weather records indicated that rainfall started earlier in 1996 (January) than in 1995 (February), however, higher amount of rain was recorded in 1995 than in 1996 (Table 2). Humidity was, on the average higher in 1995 than in 1996.There was little variation in temperature between the two years Significant effect of time of planting was recorded in all the attributes measured in the 1995 experiment (Table 3). Days to 50% seedling emergence was significantly higher in April 2, 1995 than in the other planting dates. Later plantings made on May 14 and 30 took higher number of days to attain 50% seedling emergence than earlier plantings made on April 16 and 30. Days to 50% flowering was largest in May 28 planting. The least number of days to 50% flowering was recorded in April 16 planting. Vine length at 30DAE decreased significantly as planting was delayed. There was no statistically significant difference between May 14 and 28 plantings in vine length at 30DAE. Number of branches/plant at 30DAE was statistically similar for plantings made on April 2nd, 16th and 30th. Later plantings made on May 14th and 28th were significantly lower than for those of the earlier planting dates.

The result also showed consistent significant decrease in number of fruit/plant, fruit yield/plant, average fruit weight, 1000-seed weight, percentage seed to fruit, percentage kernel to seed and seed yield/ha as planting was delayed. It was also noted that planting in May 28 produced no fruit while May 14 planting produced no seeds.

Table 1: Soil physical and chemical properties of the experimental site

Physical properties	
Coarse sand (%)	36
Fine sand (%)	24
Clay (%)	38
Silt (%)	2
Textural class: sandy clay loam	
Chemical Properties	
pH in water	3.9
pH in KCl	3.8
Organic carbon (%)	1.4
Organic matter (%)	2.3
Total N (%)	0.06
P (ppm)	18.0
K (meq/100g soil)	0.15
Mg (meq/100g soil)	0.90
Ca (meq/100g soil)	0.80
Na (meq/100g soil)	0.24
CEC (meq/100g soil)	10.50
E. C (mmho/cm)	0.26

Table 2: Weather Records

	January		February		March		April		May		June		July		August	
	1995	1996	1995	1996	1995	1996	1995	1996	1995	1996	1995	1996	1995	1996	1995	1996
Rainfall (mm)	0.0	34.5	0.3	14.2	121.7	26.7	128.6	104.3	172.8	135.1	324.5	140.5	255.7	137.8	414.0	219.60
Rain days	0.0	1.0	1.0	5.0	4	4	7	8	11	14	15	13	18	15	24	22
Relative Humidity																
(%) 0600Hr	62.5	78.0	62.5	74.5	79.5	74.5	80.0	74.5	79.5	74.0	81.0	74.5	80.5	75.0	80.5	77.5
1800Hr	51.0	57.0	50.00	61.50	65.5	66.0	69.0	67.0	73.0	70.00	78.0	72.0	76.5	72.0	76.0	75.0
Temperature (^{o}C)																
Minimum	13.50	19.0	18.0	21.5	22.0	22.6	22.0	22.5	21.0	21.0	20.5	21.0	20.5	19.5	20.5	20.5
Maximum	13.0	31.5	32.5	33.0	33.0	31.5	31.0	31.0	29.5	30.5	28.5	29.0	26.5	28.0	26.0	26.0

Table 3: Effect of time of planting on growth and yield attributes of Egusi melons 1995

Planting Date(1995)	Days to 50% seedling emergence	Days to 50% flowering	Vine length 30 DAP	No of branches/plant 30DAP	No of fruits/ hectare	Fruit yield/hectare (tlha)	Average fruit weight (kg)	1000 seed weight (g)	Percentage seed to fruit	Percentage kernel to seed	Seed yield / hectare (kg/ha)
April 2	10.00	37.08	163.40	4.75	67130	51.91	0.77	116.94	1.22	79.45	601.20
April 16	4.92	34.83	119.66	5.54	26759	18.17	0.68	108.44	0.74	76.48	134.98
April 30	4.16	36.50	94.31	5.12	15046	8.12	0.55	97.55	0.59	71.97	49.95
May 14	6.33	38.42	61.04	3.98	2917	0.47	0.16	0.00	0.00	0.00	0.00
May 28	5.00	46.75	64.77	3.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
F-LSD (p=0.05)	0.25	0.83	10.93	0.88	2390.	0.23	0.05	2.16	0.061	1.20	30.61

Delayed planting progressively decreased the number of days to 50% seedling emergence and number of days to 50% flowering in 1996 plantings (Table 4). Early planting made on March 5 gave the lowest vine length in which plants produced no branches at 30DAE. Planting made on March 19 produced the highest number of branches/plant while that made on April 2 produced the highest vine length. Number of fruits/ha, fruit yield/ha and average fruit weight decreased as planting was delayed from March 5 to April 2. The March 19 plants produced highest 1000seed weight, seed to fruit ratio, kernel to seed ratio and seed yield (t/ha) among the three planting dates in 1996.

The result indicated that application of poultry manure significantly affected all the attributes measured in 1995 with the exception of number of days to seedling emergence (Table 5). Number of days to 50% flowering decreased significantly with poultry manure application. On the contrary application of poultry manure significantly increased other growth and yield attributes, although there was no significant difference between the effect of applications of 5t/ha and 10t/ha poultry manure rates in all these attributes with the exception of number of branches/plant and average fruit weight where 10t/ha gave significantly higher values than the 5t/ha rate.

Table 4: Effect of time of planting on growth and yield attributes of Egusi melon in 1996

Planting Dates(1996)	Days to 50% seedling emergence	Days to 50% flowering	Vine length 30 DAP	No of branches/ plant 30DAP	No of fruits/ hectare	Fruit yield/hectare (tlha)	Average fruit weight (kg)	1000 seed weight (g)	Percentage seed to fruit	Percentage kernel to seed	Seed yield / hectare (kg/ha)
March 5	14.50	46.75	4.88	0.00	42222	45.39	1.12	111.99	1.67	74.84	787.68
March 19	13.25	40.00	55.19	3.98	41944	39.24	0.94	113.51	2.05	75.43	806.42
April 2	7.75	36.50	61.50	3.67	40000	31.97	0.81	109.99	2.04	75.95	654.64
F–LSD (p=0.05)	0.60	1.78	8.02	0.08	Ns	8.96	Ns	ns	0.23	Ns	145.37

Table 5: Effect of poultry manure application on growth and yield attributes of Egusi melon in 1995

Poultry manure rate/ha(t/ha)	Days to 50% seedling emergence	Days to 50% flowering	Vine length 30 DAP	No of branches/plant 30DAP	No of fruits/ hectare	Fruit yield/hectare (tlha)	Average fruit weight (kg)	1000 seed weight (g)	Percentage seed to fruit	Percentage kernel to seed	Seed yield / hectare (kg/ha)
0	6.42	36.92	94.35	3.80	30695	22.23	0.670	105.71	0.74	74.84	188.50
5	6.33	35.92	138.60	5.36	39815	26.98	0.62	106.52	0.90	76.16	299.19
10	6.33	35.58	144.42	6.25	38426	28.98	0.71	110.71	0.91	75.71	305.34
F – LSD (p=0.05)	0.25	0.83	10.93	0.08	2390	2.30	0.05	2.16	0.061	1.20	30.61

Table 6: Effect of time of planting by poultry manure interaction on growth and yield of Egusi melon in 1995

Planting dates	Manure rate (t/ha)	Days to 50% seedling emergence	Days to 50% flowering	Vine length 30 DAP	No of branches/ plant 30 DAP	No of fruits/ hectare	Fruit yield/ hectare (tlha)	Average fruit weight (kg)	1000 seed weight (g)	% seed to fruit	% kernel to seed	Seed yield/ hectare (kg/ha)
April 2	0	10.00	36.75	139.75	4.00	58472.22	44.32	0.76	113.18	1.18	78.47	444.92
	5	10.00	37.25	176.56	4.50	73750.00	54.89	0.74	117.43	1.28	78.44	696.77
	10	10.00	37.25	173.90	5.75	69166.67	56.51	0.82	120.23	1.19	80.44	677.92
April 16	0	5.25	35.75	86.93	3.90	28861.11	17.31	0.70	107.20	0.52	77.94	90.05
	5	4.75	34.50	132.11	6.38	27500.00	17.72	0.65	107.20	0.52	77.43	157.29
	10	4.75	34.25	139.44	6.33	27916.67	19.49	0.70	112.28	0.82	74.08	157.60
April 30	0	4.00	38.25	56.38	3.51	8750.00	5.06	0.55	96.75	0.52	71.08	25.54
	5	4.25	36.00	107.13	5.19	18194.45	8.35	0.47	96.28	0.53	73.78	43.53
	10	4.25	35.25	119.42	6.67	18194.45	10.95	0.62	99.63	0.72	71.06	80.79
May 14	0	6.50	40.75	42.23	2.60	1805.56	0.24	0.15	0.00	0.00	0.00	0.00
	5	6.00	37.75	64.10	4.12	3333.33	0.54	0.15	0.00	0.00	0.00	0.00
	10	6.50	36.75	76.79	5.22	3611.11	0.64	0.17	0.00	0.00	0.00	0.00
May 28	0	5.00	47.50	44.11	2.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5	5.00	46.50	64.03	2.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10	5.00	46.25	86.18	4.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
F-LSD (P= 0.05)		2.42	1.66	25.00	1.52	414012	3.51	0.09	-	0.11	2.08	53.02

The interaction of time of planting and poultry manure on growth and yield attributes in the 1995 experiment is presented in Table 6. Poultry manure applications showed no effect on number of days to seedling emergence in all the planting dates. However application of 10t/ha poultry manure on April 16 planting showed the earliest attainment of 50% flowering. Application of 5t/ha poultry manure in April 2 plants produced the highest values among the other rates on vine length at 30DAE, number of fruits/ha, seed to fruit ratio and seed yield (t/ha). On the remaining attributes with the exception of number of branches/plant, the application of 10t/ha manure in April 2 plants produced the best performance. There was however no significant difference between the 5t/ha and 10t/ha rates of poultry manure in these dates.

DISCUSSION AND CONCLUSION

The analysis of the soil sample of the experimental site revealed that according to Ibedu *et al* (1980), the organic matter, P, N, K, Mg and Ca contents were all low. The soil was also acidic. The weather record indicated that rainfall started earlier in 1996 (January) than in 1995 (February), although the amount of rainfall was very much higher in 1995 than in 1996 during those periods. The relative humidity was also higher in 1995 than in 1996. The temperature regimes during those periods did not differed much in both years.

The delayed seedling emergence recorded in the early sown seeds was attributable to low soil moisture content early in the season. In March the quantity of rain received was very low and such rainfall could-easily be lost through evaporation. It was also noted that the seeds remained in the soil for about 14 days and only germinated when the environment became favourable for seed germination. Days to seedling emergence affected days to flowering. Early seedling emergence resulted to earlier flowering.

Vine length and number branches at 30DAE were other growth attribute that seemed to be adversely affected by low rainfall. Low rainfall at the early season tended to have caused retarded crop development, hence the March 5, 1996 plants did not produced any branch at 30DAE and vine length was also significantly low at that time. Similarly at later planting dates of May 14 and 28, both vine length and number of branches/plant were significantly low. That seem to suggest that high rainfall and humidity impeded the growth and development of egusi melon crop which agreed with the report by researchers with other crops. Jones (1976) attributed this trend to the leaching away of nutrient elements in the soil especially N and this tends to become more rapid with more frequent rainfalls. Other factors that must have

played a role in the declining growth and yield in the crop with delay in time of planting include solar radiation and humidity. Fakorede (1985) reported that planting later in the year characterized by heavy rainfalls, is subjected to high cloud, cover hence lower solar radiation than in early planting, which will bring about low rate of photosynthesis.
This, of course, will bring about low rate of photosynthesis.

Seed to fruit ratio and kernel to seed ratio, which .measure the proportions of edible part of the crop, were similarly affected by date of planting. It was also observed that Egusi melon that was planted in May 14 and 28 did not give any seed yield,apparently due to the fact that the crop has a sole insect pollinator the bees (*Apis spp*) (Cobley, 1957). The bees do not come out from their hives during period of heavy rains as it impedes their activities, leading to no pollination of flowers, which results to poor or even zero seed production.

Poultry manure largely improves the soil chemical properties, thereby enhancing crop growth and yield. This resulted to the significant increase in growth and yield recorded in this crop with poultry manure application. Tisdale and Nelson (1975) had earlier noted that plants tend to respond more in soils with very low nutrient status than in soils with high reserve. This idea was supported in this work by the fact that responses at the later planting dates of April 30, May 14 and 28 noted for low nutrient content due to increased leaching, were higher than at the early planting dates.

The seed yield obtained in the March 19, 1996 planting was the highest and compared well with what were obtained by other researchers (Ogunrenu, 1977, Denton *et al* 1989). Early planting in the year after the first rains is recommended for high seed yield. Application of poultry manure is also recommended for higher seed yield. Higher rates of poultry manure are however recommended for later planted crop.

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