EFFECT OF VARIETY, SEEDLING AGE AND POULTRY MANURE ON GROWTH AND YIELD OF GARDEN EGG (SOLANUM GILO, L.)

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Abstract

Field experiments were conducted during the wet seasons of 2001 and 2002 at the research farm of the Institute for Agricultural Research, Samaru to evaluate the effects of three seedling age (4,6,8 week old seedlings) three poultry manure rates (0, 15, and 30t/ha) on the growth and yield of two varieties of garden egg (Samaru stripped and Anara). The treatments were replicated three times and laid out in a randomized complete block design.

The results showed that Anara significantly performed better in most of the growth and yield characters than Samaru stripped. However, fresh fruit weight per plant, fresh fruit weight/ha are higher in Samaru stripped. Six and eight week seedlings were significantly comparable in most of the growth and yield parameters. Poultry manure application increased growth, and yield characters over the control. Total fresh fruit yield per hectare was significantly increased from 17.04 tons in the control to 30.17 and 39.71 tons in 2001 and from 29.26 to 40.34 and 44.75 tons in 2002 by the application of 15 and 30t/ha poultry manure. Regression analysis indicated that maximum yield was obtained with seedling age of 7 weeks old and manure rates of 28t/ha for the two years combined data.

Introduction

Garden egg (Solatium Gilo L.) belongs to the family Solanaceae. The cropsupplements starchy foods being a cheap source of minerals and vitamins (Oyenuga and Fetuga, 1975). It is also valuable as a roughage as it promotes digestion and helps to prevent constipation (Aliyu, 1998). Garden egg is grown during both dry and wet seasons and because of their relatively high yield, is important commodity in the local trade and source of income to the farmer (Aliyu et al, 1992).

The yield of garden egg in Nigeria is generally low due to the use of varieties that are of low genetic base and over grown seedlings on soils that are of inherent low fertility. It has been reported that young pepper seedlings grew faster (Norman, 1977) and gave the greatest yield (Usman, 1990) than older seedlings. Garden egg has been reported to respond positively to manure and fertilizer application (Doikowa, 1976; Vadivel et al, 1988). In Nigeria, garden egg growth, yield component and yield have been observed to increase with mineral fertilizer and farmyard manure rates (Aliyu, 1992; 1998; Asiegbu and Uzo, 1984). In view of the fact that there is inadequate information on the response of garden egg to varying ages of transplanting and poultry manure rates; the present study was conducted with the aim of finding the best seedling age and poultry manure rates to use in garden egg production.

Materials and Methods

Field experiments were conducted during the wet seasons of 2001 and 2002 at the research farm of the Institute for Agricultural Research, Samaru ($11° 11^1$ N, $07° 38^1$ E, 686 altitude). The treatments consisted of two garden egg varieties (Anara and Samaru Stripped) three ages of seedlings (4,6 and 8 weeks) and three poultry manure rates (0,15 and 30t/ha). These were factorially combined and laid out in a randomized complete block design with three replications. Seedlings were initially raised in the nursery and transplanted to the field after attaining the ages of 4,6 and 8 weeks. Land preparation consisted of ploughing, harrowing and ridging before the site was then marked out into $12m^3$ and $9m^2$ gross and net plot respectively. Row spacing of 75cm and plant spacings of 40cm were used. Manure was applied and incorporated to the ridges as per the treatment one week before transplanting of crop.

The field was kept weed free throughout the period of experiment. Soil samples were taken before ridging and analysed for physical and chemical properties in accordance with Black (1965). A sample of the poultry manure was also taken each year and analysed. Data were taken on plant height, number of branches and leaves on plant basis. Two-plants were

also removed from each plot at two

weeks interval and dried to a constant weight in an oven kept at 70°C. The dried weight was used to calculate leaf area Index (LAI), Relative Growth Rate (RGR) and Net Assimilation Rate (NAR) in accordance with Evans (1972). Fresh fruit yield were recorded both on plant and hectare basis. The data collected were analysed statistically as described by Snedecor and Cocharan (1967). Treatment means were compared using Duncan's Multiple Range Test (Duncan, 1955).

Results

Table 1 shows the result of soil analysis for 2001 and 2002. the soil of the site in 2001 was generally more fertile than that of 2002, as it had higher nitrogen, phosphorous and Ca. C.E.C. was also higher in 2001 while the PH was lower. The manure applied in 2001 also contained more nutrients than that applied in 2002 (Table 2).

The effect of seedling age and Poultry Manure on the growth parameters of garden egg varieties is presented on Table 3. Anara is significantly taller than Samaru Stripped and had more leaves and branches. Seedling ages of 6 and 8 weeks statistically comparable and higher than 4 week old seedling in number of branches and plant height, in both years and number of leaves in 2001. Each manure rate significantly increased plant height in 2002 and number of leaves and branches in 2001. 'flic difference in these parameters between 15 and 3Ot/ha in the other year was not significant. The effect of the factors tested on growth indices is shown on Table 4. In both years, Anara had significantly higher LAI than Samaru stripped. The difference between the varieties in RGR and NAR was not significant in both years of study. Each increase in age significantly increased LAI in 2001 and RGR in 2002. The difference in between 6 and 8 week old seedlings in LAI in 2002 and RGR in 2001 was not significant. The effect of seedling age on NAR in 2001 was not significant in both years. Application of 15t/ha increased LAI compared with the control in both years and also LAI and RGR compared with 30t/ha in 2001. However, the control resulted in significantly higher RGR than 15 and 3Ot/ha in 2002 and NAR compared with 15t/ha in 2002. Data on fresh fruit weight per plant and per hectare as by affected by the seedling age and poultry manure in garden egg varieties is shown on Table 5. Samaru stripped out yielded Anara in both years. Six and 8 week old seedlings were comparable and significantly out yielded 4 week old plants in both years of trial. Each level of manure significantly increased fresh weight/plant in 2001. The difference between 15 and 3Ot/ha in fresh fruit weight/ha in both years, fresh fruit weight/plant in 2002 was not significant but the two levels were higher than the control.

A significant interaction was recorded between seedling age and poultry manure on fresh fruit weight/plant (Table 6). When the response to manure was compared across seedling ages, it was observed that fresh fruit weight increased with each manure rate when 8 week old seedlings were used with 4 week old, there was no significant difference in fruit weight with manure application.

Discussion

The crop performance from the result in both years showed that Anara had a significant edge over Samaru Stripped in growth parameters. According to Epenhuijsen (1974) and Schippers (2000), Samaru stripped reaches a height of 90-120cm whereas Anara is much branched and can reach a height of 180cm. Since, Anara had more leaves, more assimilates will be manufactured and used in the production of more dry matter. Consequently Anara had more total dry matter and increased growth indices. However, NAR was not affected which would seem to agree with the reports of Heath and Gregory (1938) that NAR was relatively constant for a wide range of species. Although Anara had more growth, fresh yield was higher in Samaru Stripped. This could be attributed to the bigger fruits of Samaru Stripped. Asiegbu and Uzo (1984) have held that increase in yield in most varieties of garden egg came essentially from greater fruit size.

The data on growth and yield parameters showed that older seedlings, were better than 4 week old. This could be attributed to the fact that older seedlings had already accumulated more biomass and dry matter before transplanting and will therefore grow' faster. Blackman (1919) described plant growth as an example of the operation of compound interest. The growth increment in any period adds to the capital available for subsequent growth. This increased growth in older seedlings was positively translated into higher yield. This is due to the fact that the presence of more leaves in older seedlings had resulted in greater photosynthetic area and ensured greater light interception and subsequently carbon dioxide

assimilation. Combined regression analysis for the two years indicated

that a quadratic model (Y—30.874+18.82x-l ,33x^2) gave the best fit to the data with maximum yield obtained at the age of 7 week.

Poultry manure application improved both crop growth and yield. This could be attributed to the fact that poultry manure improved both the physical and chemical properties of the soil. Aliyu (2000); Aliyu and Kuchinda (2002) have reported that both crop growth and final yield in pepper were increased with manure rates. However, the higher rate (30t/ha) depresses same growth parameters. This could be explained on the basis of the fact poultry manure releases certain quantities of ammonia and nitrate salts which at high rate may become phytotoxic and could adversely affect the plant directly and could also affect the soil micro-organisms responsible for mineralization of plant nutrients (Wiel and Kroonje, 1979). T wo year combined regression analysis revealed that the
quadratic made (Y=23.1 5+1,36x-0.024x^2) is adequately fit to the data with maximum yield obtained at 28t/ha.

Conclusion/Recommendations

From the results of this study it is recommended that garden egg production could be increased by the use of 7 week old seedlings and poultry manure rate of 28t/ha. Samaru stripped is the best variety for fresh fruits.

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Table 1: Physical and Chemical Properties of Experimental Soil at 0-15, 15-30cm Depth for 2001 and 2002

	2001		2002	
Soil Compositions	**0-15**	**15-30**	**0-15**	**15-30**
Mechanical composition				
Clay g/kg	16	34	22	30
Silt	42	30	44	44
Sand	42	36	34	26
Textural class (USDA)	loam	clay loam	loam	clay loam
Chemical composition				
pH(H_20)	5.50	5.30	5.70	5.90
pH(0.01 m $Cacl_2$)	4.90	5.00	5.10	5.40
% organic carbon (gkg'^{1})	0.17	0.13	0.54	0.48
Total nitrogen (gkg'^{1})	0.098	0.056	0.07	0.084
ppm Available phosphorus	7.00	1.75	3.50	1.75
Exchangeable bases ($cmolkg^{1}$)				
Ca				
Mg	3.80	2.50	1.80	2.20
Na	0.29	0.59	0.43	0.77
K	0.42	0.44	0.43	0.36
H+AI	0.16	0.19	0.23	0.15
C.E.C	0.20	0.40	0.10	0.10
	7.30	6.60	5.40	6.40

Table 2: Chemical Composition of the Poultry Manure for 2001 and 2002 Seasons

% Chemical Composition	2001	2002
N	2.63	1.90
P	0.437	0.402
K	1.37	1.23
Ca	1.340	.1.160
Mg	0.204	0.225

Table 3: Effect of Seedling Age and Poultry Manure on Growth Parameters of Garden Egg at Saniaru Wet Season at 12 WAT

Treatment	Plant Height (cm)		Number of Leaves		Number of Branches	
	2001	2002	2001	2002	2001	2002
Variety						
Samaru stripped	47.27b	73.60b	52.10b	55.90b	8.45b	6.61b
Anara	63.03a	106.90a	89.30a	120.00a	13.56a	16.78a
SE±	1.282	1.584	5.608	5.283	0.430	0.640
Seedling age (weeks)						
4	28.26b	83.9b	26.30b	78.70b	3.68b	9.78b
6	66.62a	93.20a	93.70a	86.50ab	14.49a	12.48a
8	70.57a	93.60a	92.30a	98.70a	14.84a	12.83a
SE +	1.571	1.938	6.874	6.471	0.527	0.784
Poultry Manure Rates (t/lia)						
0	43.02b	78.30c	39.40c	64.00b	7.03c	9.64b
15	59.62a	93.20b	73.90b	90.70a	11.57b	11.98a
30	62.81a	99.20a	98.90a	109.20a	14.41a	13.46a
SE +	1.571	1.938	6.874	6.471	0.527	0.784

Means within a column of a set treatment followed by unlike letter(s) are signilicantly different using Duncan Multiple Range Test (DMRT) at 5% level of probability.

Table 4: Effect of Seedling Age and Poultry Manure on Growth Indices of Garden Egg Varieties at Samaru Wet Season at 8 WAT

Treatment	LAI		RGR (g/g/day)		NAR (g/cin²/Day)	
	2001	2002	2001	2002	2001	2002
Variety						
Samaru Stripped	0.199b	0.562b	0.487	0.533	0.0053	0.00767
Anara	0.300a	0.876a	0.590	0.578	0.0001	0.00678
SE +	0.0215	0.031	0.054	0.028	0.0026	0.00048
Seedling age (weeks)						
4	0.117c	0.434b	0.332b	0.489c	0.0039	0.00689
6	0.2646	0.625a	0.635a	0.528b	0.0121	0.00672
8	0.368a	1.098a	0.649a	0.649a	0.0071	0.00806
SE±	0.0264	0.037	0.066	0.034	0.0032	0.00059
Poultry Manure Rates (t/ha)						
0	0.193b	0.497b	0.512ab	0.602a	0.0061	0.008a
15	0.319a	0.857a	0.659a	0.489b	0.0072	0.0061b
30	0.237b	0.804a	0.445b	0.575b	0.0099	0.00756
SE±	0.0264	0.037	0.066	0.034	0.0032	0.00059

Means within a column of a set of treatment followed by unlike lettcr(s) are significantly different using Duncan Multiple Range Test (DMRT) at 5% level of probability.

Table 5: Effect of Seedling Age and Poultry Manure on Yield Parameter of Garden Egg Varieties at Samaru Wet Season

Treatment	Fresh Fruit Weight Per Plant (g)		Fresh Fruit Weight t/ha (g)	
	2001	2002	2001	2002
Variety				
Samaru Stripped	1010.00a	1505.00a	33.67a	50.16a
Anara	612.00b	782.00b	28.27b	26.05b
SE +	38.331	38.260	1.344	1.276
Seedling age (weeks)				
4	231.00b	903.00b	19.54b	30.1 lb
6	1072.00a	1208.00a	35.73a	40.25a
8	1130.00a	1319.00a	37.67a	43.97a
SE +	46.956	46.888	1646	1.562
Poultry Manure rates (t/ha)				
0	427.00c	878.00b	17.04b	29.26b
15	925.00b	1210.00a	36.17a	40.34a
30	1081.00a	1343.00a	39.71a	44.75a
SE±	46.959	46.888	1.646	1.562

Means within a column of a set of treatment followed by unlike letter(s) are significantly different using Duncan Multiple Range Test (DMRT) at 5% level of probability.

Table 6: Interaction Between Seedling Age and Poultry Manure on Fresh Fruit Weight/Plant(g) of Garden Egg Varieties at Samaru 2001 Wet Season

Treatment	Poultry Manure Rates (t/ha)		
	0	15	30
4 •	131.00c	272.00de	291.00de
6	458.00cd	1282.OOab	1475.00a
8	691.00c	1220.00b	1477.00a
SE +		81.259	

Means followed by different letter(s) are significant statistically using Duncan Multiple Range Test (DMRT) at 5% level of probability.