Agricultural Journal 2 (1): 140-148, 2007

Physico-Chemical Properties of Egg Plant (*Solanum melongena* L.) Fruit in Response to Nitrogen Fertilizer and Fruit Size

[1]W.B. Akanbi, [2]A.O. Togun,[1]O.A. Olaniran, [3]J.O. Akinfasoye and [3]F.M. Tairu
[1]Department of Agronomy, Ladoke Akintola University of Technology, Ogbomoso, Nigeria
[2]Department of Crop Protection and Environmental Biology, University of Ibadan, Nigeria
[3]National Horticultural Research Institute, Idi-isin, Ibadan, Nigeria

Abstract: Variation in soil Nitrogen (N) content affect growth and development of egg plant (*Solanum melongena* L.) and may lead to changes in crop physiological conditions at flowering and the physio-chemical qualities of fruit and seeds produced. Two experiments with a 'long purple' variety of eggplant were carried out under field conditions to establish the relationship between N availability and fruit qualitiesand between the fruit size and q ualities of the seeds produced. The treatments consisted of four N levels (0, 40, 60 and 80 kg N ha^{-1}) combined factorially with three fruit sizes: small (0-2.5 cm in diameter, S_1), medium (2.6-5cm, S_2) and big (>5cm, S_3). Fresh fruit physio-chemical qualities such as fruit weight and diameter, per fruit number of seeds and seed weight, fruit pH, % juice, Crude Protein (CP), total solid, Fe and ascorbic acid contents were assessed. Data collected were statistically analyzed for determination of treatment effects. Nitrogen deficiencies reduced both physical and chemical properties of egg plant fruit. For most of the parameters assessed 80 kg N ha^{-1} treatment proved to be the best. However, crop performance under 60 kg N ha^{-1} fertilizer regime were, in most cases, were not statistically siginificant when compared to application 80 kg N ha^{-1}. The biggest fruit (S_3) consistently had the best physio-chemical qualities irrespective of N level. The exceptions to this are CP where there was no responseand seed weight/fruit and Fe content where S_2 and S_3 fruit sizes gave similar results. It was concluded that for production of high quality fruits and seeds in eggplant, application of 60 kg N ha^{-1} in combination with selection of big fruit (= 5cm in diameter) seems to be the best agronomic practices.

Key words: Egg plant, nitrogen, fruit size, physical parameters, chemical properties

INTRODUCTION

Egg plant is a long duration crop, with high yield which removes large quantities of nutrients form soil An egg plant crop yielding about 60 t ha^{-1} of fruit removes 190 kg N, 10.9kg P and 128kg K from soil[1] Nutrient uptake in egg plant partly depends on the source and availability of nutrients[2]. The quantity of nutrients which the farmer needs to apply depends on the yield potential of the cultivar, the level of available plant nutrients already in the soil and growth conditions. For a high yielding 'long purple' variety of egg plant it is necessary to adopt appropriate nutrient management practices which help to supply nutrients in quantities adequate to meet crop demand and minimize losses, thereby increasing the nutrient use efficiency. Such practices will be environmentally friendly and lead to sustainability in crop production.

The effect of fertilizers on the chemical composition of plants resides in that the nutrients taken up by plants from fertilizers are constituents of major organic compounds and increases the content of the latter in crops[3,4] Numerous agrochemical and biochemical studies indicate that one of the most effective and fast acting factors of variations in the chemical composition of plants and higher crop quality is fertilizer. By improving the supply of plants with particular nutrient the biochemical processes that make use of the nutrient are favoured.

Nitrogen is a major constituent of several of the most important substances, which occur in plants. It is of outstanding importance among the essential elements in that nitrogen compounds comprise from 40 to 50% of the dry matter of protoplasm, the living substance of plant cells[5,6]. For this, reason nitrogen is required in relatively large quantities for growth processes in plants. It follows directly from this that without an adequate supply of nitrogen appreciable growth cannot take place and that plants must remain stunted and relatively underdeveloped when nitrogen is deficient. Nitrogen is known to promote production, partitioning and accumulation of dry matter in

Corresponding Author: W.B. Akanbi, Department of Agronomy, Ladoke Akintola University of Technology, Ogbomoso, Nigeria

crop plants. The nitrogen taken up by plants are converted into amino acids which are involved in the biosynthesis of proteins substances, nucleic acid, alkaloids and other components[7]. Apparently, when nitrogen is deficient leaves will contain relatively little chlorophyll and thus reduced photosynthetic capacity.

Fruit size and composition are major criteria of quality for fresh fruit vegetables. These are genetically and environmentally controlled through the successive phases of fruit development and have been reported to be positively correlated with the amount of N-element available for plant use during fertilization, cell mitotic activity and cell enlargement[8]. More so, N-availability could affect the sink function of fruit and this has been discovered to play a role in the control of carbohydrate accumulation in tomato[9]. This latter activity could determine the number, size and chemical components of fruit vegetable fruits[10] Indeed both cell numbers and size contribute to the control of fruit size[11] and in many species small fruit can be related to low cel[8,12]. The number of cells, the size of individual cells and the nuclei DNA content are pertinent variables in the analysis of the genetic and phenotypic variations in fruit size and composition. As demonstrated by many research works the amount of fruit cell DNA depends to some extent on the available nitrogen. Hence, in fruit with sufficient amount of N, the numbers and size of cells are bound to be high.

In eggplant, N source and level had a significant effect on the activity of the fruit sink[13,14]. Sonneveld *et al.*,[13] reported that fruit harvested from eggplant exposed to high N nutrient has a stronger sink for assimilate. This invariably has positive influence on dry matter partitioning into the fruit, fruit total solid contents and other proximate parameters[13-15]. In tomato [16,17] indicated reduction in fruit yield and quality with N deficiency. This was attributed to low meristematic cell activitiesand hence, lower number of cell observed in plant nourished with low N levels.

The contribution of eggplant, like many other fruit vegetables, to mineral and vitamins in human nutrition may be limited due to poor soil nutrients which reduce uptake of essential nutrients required for production of these food components. It could therefore be concluded that adequate nutrients application is required for high fruit and seed yields and qualities in fruit vegetable plants. In this paper, the above hypothesis is tested by nourishing the eggplant with different levels of N fertilizers. The resulting fruits from plants that received different doses of N fertilizers were assessed for both physical and chemical properties.

MATERIALS AND METHODS

Experimental site: The experiment was conducted on the Teaching and Research Farm at Ladoke Akintola University of Technolgy, Ogbomoso (Long. 4° 10'E; Lat. 8° 10' N), Nigeria. The soil at the experimental site was sand loam and low in organic matter. The experimental site has been under guinea grass fallow for two years prior to cultivation. Soil samples were collected and subjected to chemical analysis. The results indicated 0.17% N; 2.94% P and 1.06% organic matter. The experiment was conducted for two years (2003 and 2004). Newly released 'long pupple' variety of eggplant was used. The seeds were colleted from National Horticultural Research Institute (NIHORT), Ibadan, Nigeria.

TREATMENTS AND EXPERIMENTAL DESIGN

Experiment 1: In this experiment, nitrogen was applied at the rates of 0, 40, 60 and 80kg N ha^{-1}. Since the rate for N that the local farmers use is 60 kg N ha^{-1}[18] 40 kg was included as a treatment to see the possibility of reducing the amount of N being loaded into the soil. Phosphorous and K were applied to each plot at a basic rate of 60kg $P_2 0_5$ ha^{-1} (as single super phosphate) and 100 kg $K_2 0$/ha (as muriate of potash). Phosphorus, K and 50% of the N were applied a week after transplanting and the other 50% of the N was applied 3 and 4 weeks later for 2003 and 2004 experiment, respectively. The experiment was a randomized complete block design with 3 replication in each year.

High quality seeds were sown in the nursery in June 14th and 21st for 2003 and 2004 experiment, respectively. For both years, the seedlings were transplanted six weeks later. Prior to transplanting, the field was cleared and ploughed twice in 2003, while in 2004 trial the experimental field was ploughed and harrowed once. The field was divided into 3 blocks and a block measured 15×4.2 m and contained 4 plots of 4.2×3.0 m each. The seedlings spacing was 60×60 cm. This gave 35 and 27,778 plants per plot and per hectare, respectively. Plots were weeded three times. Karate and Benlate (Benomyl) were applied at the rate of 40 mL 20 L water to control insect-pests and foliar diseases. Staking was done to support the crop stemand improve interception of solar radiation and prevent incidence of fruit rot disease.

Fruit harvest started October 11 and continued at bi-weekly interval till November 22 in 2003 and November 29 in 2004. Ripening fruits were harvested twice weekly, counted and weighed. Apart from the total yield, the mean weights of the fruits picked at each harvesting date and treatment were estimated. At the peak of fruiting, 14 Weeks After Transplanting (WAT) in 2003, or 16 WAT in 2004, six mature fruits per treatment were harvested to determine fruit and seed parameters such as mean fruit weight, fruit diameter, per fruit number of seeds and seed weight,% seed germination and seedling vigour. Also the following fruit chemical properties namely fruit pH,% juice, Crude Protein (CP), total solid, Fe and ascorbic acid contents were taken in relation to applied N doses. Mean fruit weight was determined for each treatment by weighing 6 samples taken and average their weight. Fruit diameter was taken with veiner calliper, while number of seeds per fruit was taken as an average of number of seeds counted in any 4 fruits randomly selected from the original 6 fruits samples. To estimate the nutritional status of the fruits at the date of the first harvest, after 8 weeks of exposing the crop to different N fertilizers in each year, six mature fruit samples per treatment were collected, dried, ground and weighed for dry matter contents. Also, the obtained material was then used to determine total N content[19,20] and used in the crude fruit protein by multiplying it with a factor of 6.25. Other fruit chemical properties (pH, % juice, total solid, Fe and ascorbic acid) were determined following the methods of A.O.A.C.[21].

Data analysis: The data were subjected to analysis of varianceand when a significant F-test was obtained, means were separated using Least Significant Different ($p \leq 0.05$).

Experiment 2: This was carried out with the objective of assessing the effect of fruit size on physico-chemical properties of eggplant fruit. At the peak of fruiting in both years, 14 mature fruit samples per N-fertilizer treatment were randomly harvested. Then each fruit group were sorted out into three sizes as follows: small fruit (0-2.5 cm, S_1), medium fruit (2.6-5.0 cm, S_2) and big fruit (> 5 cm, S_3). Sorting out was done in such a way as to have at least 4 fruit in each fruit grade. Parameters taken for each fruit sizes were mean fruit weight, diameter, number of seeds/ fruit, per fruit seed weight,% seed germination, seedling vigour, fruit pH,% juice, crude protien, total solid, Fe and ascorbic acid contents. These parameters determined as in experiment 1. For determination of % seed germination, 300 seeds were counted from selected fruit samples. They were germinated in plug trays under moist. One week after sowing, number of seedlings per treatment were counted and expressed as percent of the total number of seeds planted. This gave information on% seed germination. The seedlings were allowed to grow for an additional four weeks before the seedling vigour which was based on rating scores of 1-5 was determined.

Data analyses: One-way ANOVA was carried out to compare physicochemical parameters of the fruits from different size grades, while two-way ANOVA was carried out to compare qualities of fruits from different size grades and nourished with different doses of nitrogen fertilizer using software SAS (SAS Inc.). And when a significant F-test was obtained, means were separated using Least Significant Different (p = 0.05).

RESULTS AND DISCUSSION

The eggplant fresh fruit physico-chemical qualities were assessed in both years. Year effects were significant on eggplant fruit physical parameters taken except% seed germination Fig. 1. The mean fruit weight varied significantly (($p \leq 0.05$) between 21.7 in 2003 to 28.03 g in 2004. The fruit diameter, number of seeds/fruit and seed weight/fruit were all significantly better in year 2004 compared to what were observed in 2003. However, percent seed germination and seedling vigour were better in 2003.

Nitrogen level significantly increased all fruit physical parameters. Mean fruit weight increased with increasing N level up to the highest N (80 kg N ha^{-1}). Number of seeds/fruit had similar values for 0 and 60 kg N ha^{-1} but increased from 299.9 at 60 kg N ha^{-1} treatment to 533 at 80 kg N ha^{-1}. This reflects a reduction of 46, 44 and 42% when application rate was reduced from 80 to 60, 40 and 0 kg ha^{-1}, respectively. The seed weight/fruit obtained for 60 and 80 kg N ha^{-1} treatments were statistically insignificant, but the values were significantly higher than what was observed with application of either 0 or 40 kg N ha^{-1}. Despite the fact that plant nourished with 80 kg N ha^{-1} had the highest number of seeds, this does not reflected in seed weight/fruit. From the two results, irrespective of the N level, the more the number of seeds/fruit, the less the mean seed weight. The trend of the% seed germination in response to applied N level was similar to what was observed with seed weight per fruit. Application of 60 kg N ha^{-1} gave seed with highest% germination. The %germination of the seeds with this treatment was 2.2, 9.0 and 14.3 unit higher than what was obtained with 80, 40 and 0 kg N ha^{-1} treatments. In study of seedling vigour, the higher the applied N, the better the vigour. The best seedling vigour was from 80 kg N ha^{-1} application rate while the least was from non-fertilized plants se Fig. 2.

Main effects of fruit size as it affects fruit physical properties are presented in Fig. 3 All the parameters taken were significantly influenced by fruit size. Mean fruit weight, fruit diameter and number of seeds per fruit increased with increasing in fruit size reaching peak (in all

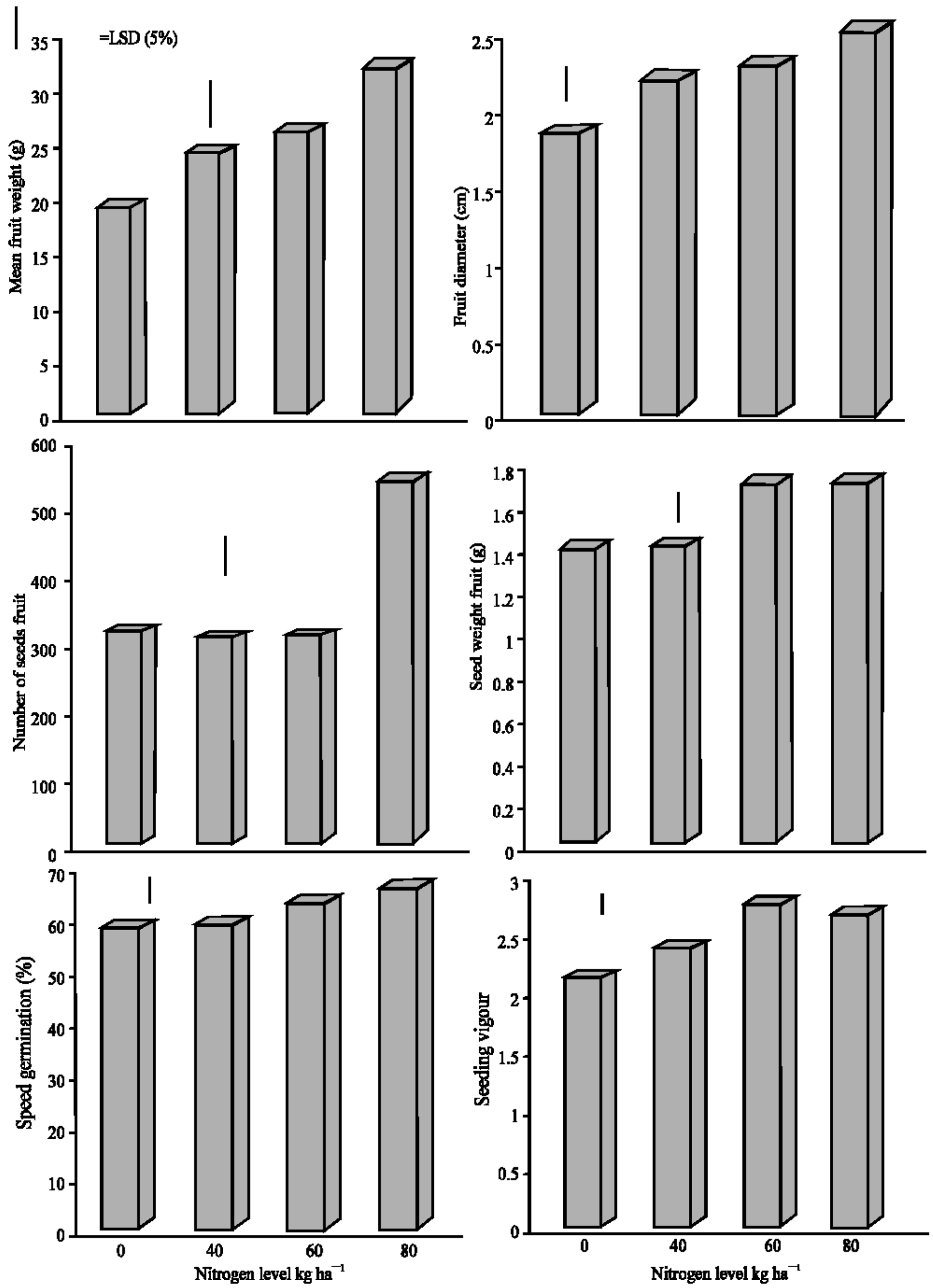

Fig. 1: Year effects on selected physical fruit qualities of *Solanum melongena*
* Seedling vigour obtained by rating score of 1 to 5; 1 = poor vigour; and 5 = Excellent vigour

cases) with the biggest fruit. The mean fruit weight obtained from the biggest fruit size (S3) was 12.6 and 21.0 g significantly higher than those of medium and small fruit sizes, respectively. Number of seeds/fruit ranged from 149.8 in small fruit to 602.2 in big fruit. This shows a change of 34 and 56% in number of seeds/fruit as the fruit size changes from small to medium and from medium to big, respectively. Similarly, seed weight/fruit increased gradually and varied from 0.99 in small fruit to 1.88 g/fruit in big fruit. However, seed weight/fruit obtained with medium and big size fruits were not significantly different. The %seed germination and seedling vigour followed the

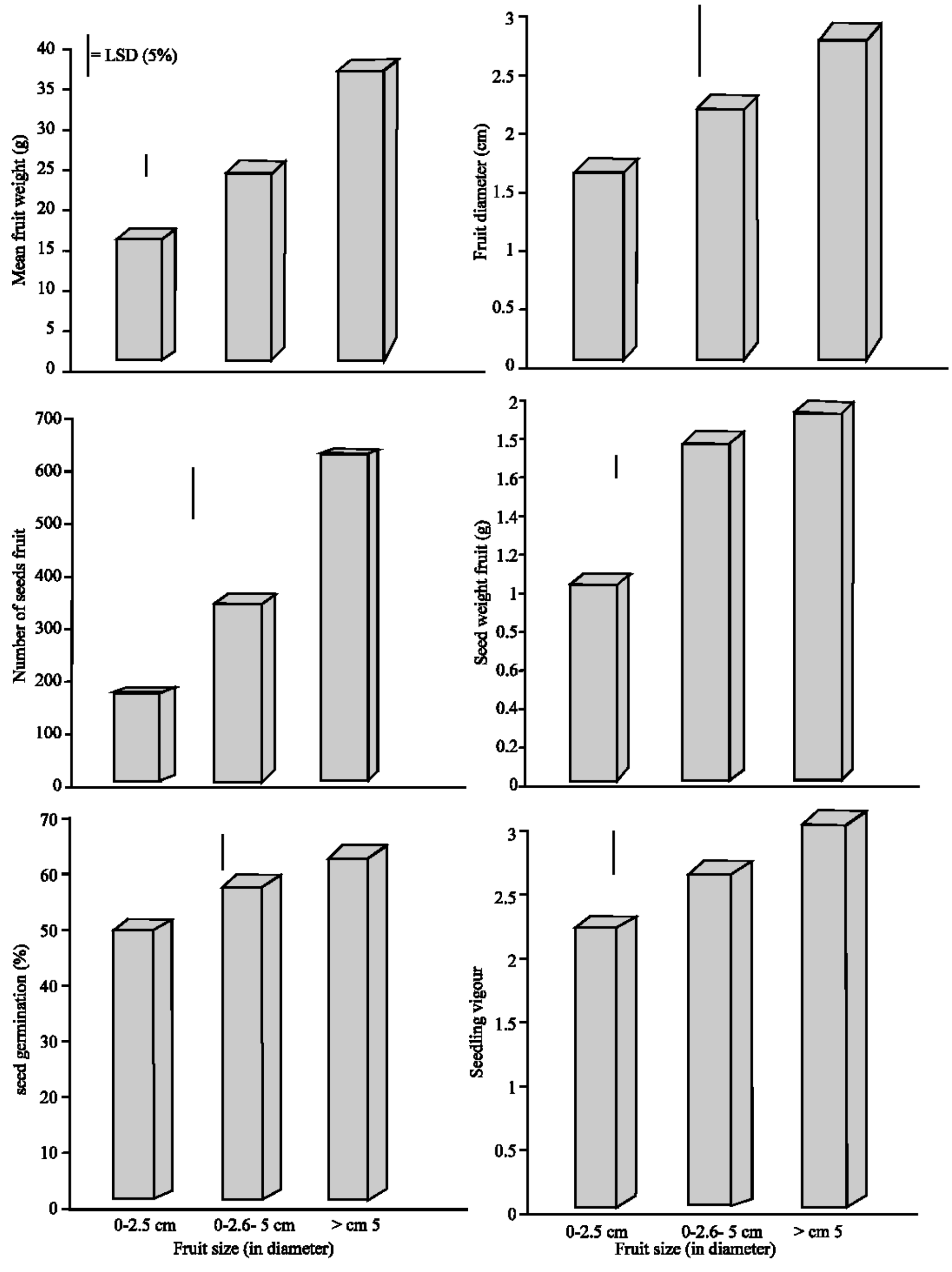

Fig. 2: Effects of Nitrogen level on selected physical fruit qualities of *Solanum melongena*
* Sedling vigour obtained by rating score of 1 to 5; 1 = poor vigour; and 5 = Excellent vigour

same pattern. The two parameters had their highest values with big fruit and least with small fruit.

The interactive effects of fruit size and N fertilizer rate on physical quality of fruit and seed of *S. melongena* are highly significant ($p \leq 0.01$) Table 1. The highest mean fruit weight (47.50 g fruit^{-1}), fruit diameter (3.25 cm) and number of seed/fruit were observed with big fruit harvested from plant that received 80 kg N ha^{-1}. In most cases, small fruit from non fertilized plants gave the least values. In study of seed weight/fruit big fruit from plants

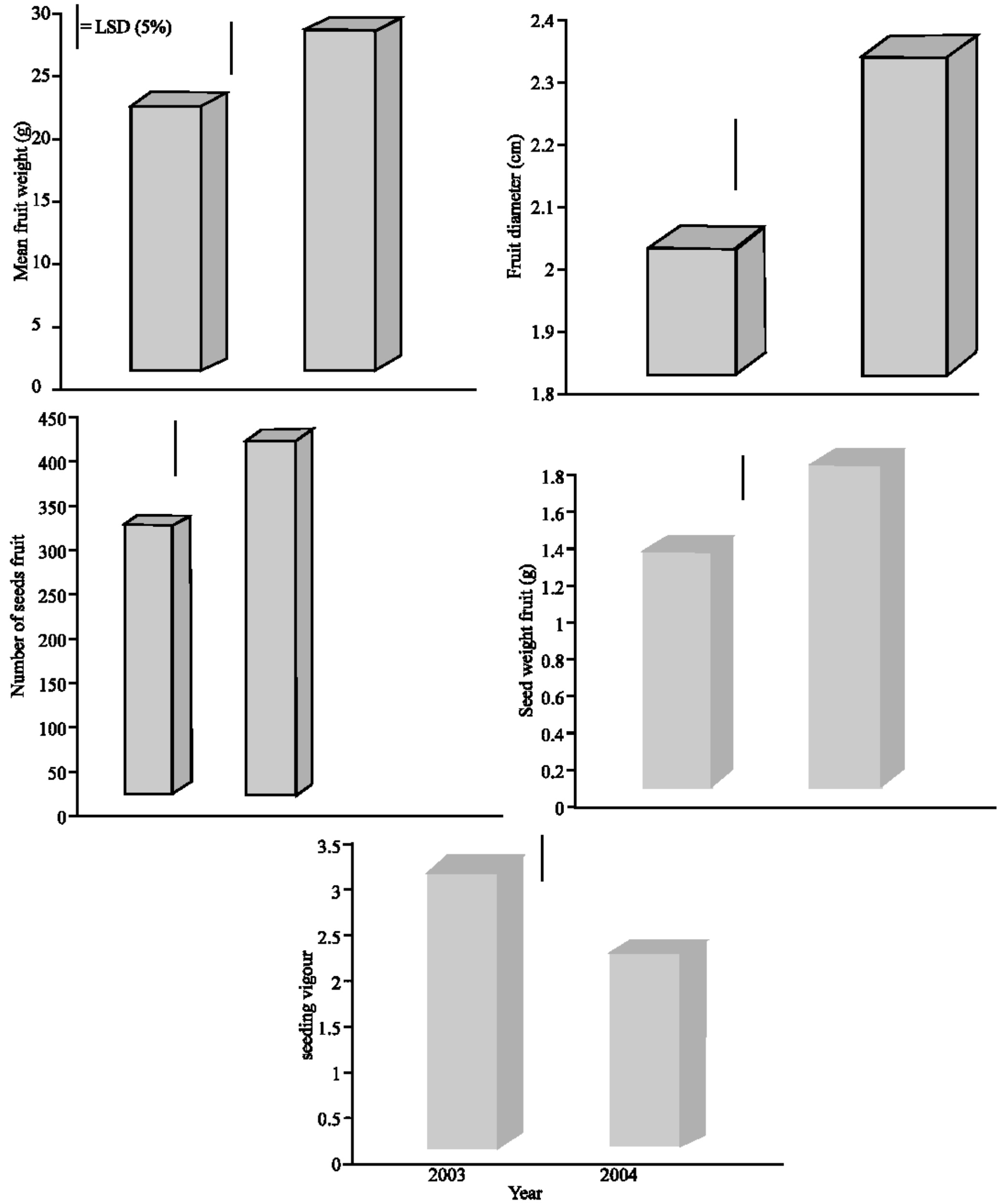

Fig. 3: Fruit size as affected selected physical fruit qualities of *Solanum melongena*

* Sedling vigour obtained by rating score of 1 to 5; 1 = poor vigour; and 5 = Excellent vigour

fertilized with 80 kg N ha^{-1} produced the best, but this was not significantly different ($p \leq 0.05$) from the observed values in big fruits when fertilized with either 40 or 60 kg N/ha. The% seed germination and seedling vigour gave similar response to interaction of fruit size and N level.

The % seed germination was highest (71.33%) in big fruit from 60kg N ha^{-1} plots while the best seedling vigour (3.27) was measured from big fruit that received highest N level. The variability of fresh egg plant f ruit chemical properties in response to fruit size, N level and their combinations are significant Table 2 and 3. The fruit pH, %sjuice and total solid were significantly higher in 2003 than 2004. In contrary, crude protein, Fe and ascorbic acid contents were significantly better in fruits harvested in 2004 than those of 2003. The crud eprotein of 2004 grown plants was 0.13 g kg^{-1} better than that of year 20003. In study of Fe content, 2004 plants was 32% better than that of 2003. Similar trend was observed swith

Table 1: Interactive effects of N – fertilizer and fruit size on fruit and seed qualities of *Solanum melongena*

Fruit size (S) in diameter (cm)	Nitrogen (N) level (kg ha^{-1})	Fruit weight (g)	Fruit diameter (cm)	Number of seeds/fruit	Seed weight /fruit (g)	Seed germination (%)	Seedling vigour +
0-2.5 cm	0	11.50	1.30	99.17	1.05	34.83	1.48
	40	14.83	1.60	132.00	1.03	43.00	2.17
	60	16.50	1.70	118.67	0.95	55.17	2.50
	80	17.50	1.85	249.50	0.95	61.17	2.50
2.6-5 cm	0	18.67	1.85	312.50	2.00	54.00	2.75
	40	22.67	2.15	301.83	1.27	55.67	2.33
	60	23.00	2.20	405.17	2.12	59.17	2.50
	80	30.00	2.35	303.33	1.57	56.50	2.75
> 5 cm	0	26.00	2.25	512.83	1.10	53.67	2.50
	40	33.50	2.70	466.00	1.85	60.00	3.03
	60	37.17	2.85	383.00	2.00	71.33	3.08
	80	47.50	3.25	1047.00	2.55	61.17	3.27
F^{Test}	S	**	**	**	**	**	**
	N	**	**	**	**	**	**
	S X N	**	**	**	**	**	**

*, ** indicate the significance at 0.05 and 0.01 probability level, respectively. +Seedling vigour obtained by rating score of 1 to 5; 1 = poor vigour and 5 = excellent vigour

Table 2: Chemical properties of fresh *Solanum melongena* fruit in response to N fertilizer and fruit size in 2003 and 2004

Treatment	pH	%Juice	Crude protein (g kg^{-1})	Total solid (g kg^{-1})	Fe	Ascorbic acid
Year						
2003	6.2	27.88	1.01	7.11	1.41	7.71
2004	6.0	26.46	1.14	6.58	1.54	7.85
Fruit size (in diameter)						
0-2.5 cm	5.6	18.90	1.04	6.05	1.29	7.12
2.5-5.0 cm	6.2	31.11	1.13	6.98	1.54	8.28
>5.0 cm	6.4	31.55	1.06	7.50	1.59	7.95
N–level						
(kg ha^{-1})0	5.7	26.46	0.60	6.12	1.18	5.53
40	6.0	25.75	1.14	6.95	1.57	7.15
60	6.2	29.77	1.28	7.01	1.69	10.21
80	6.4	26.76	1.28	7.30	1.47	8.23
LSD (5%):						
Year	0.10	0.96	0.11	0.15	0.09	0.13
Fruit size	0.13	4.26	0.14	0.18	0.10	0.15
N-level	0.15	2.74	0.16	0.21	0.12	0.18

*,** and ns indicate the significance at 0.05, 0.01 probability level and not significant, respectively

Table 3: Chemical properties of fresh *Solanum melongena* fruit in response to N fertilizer and fruit size

Fruit size (S) in diameter (cm)	Nitrogen (N) level (kg ha^{-1})	pH	%Juice	Crude protein (kg ha^{-})	Total solid (kg ha^{-})	Fe	Ascorbic acid
0-2.5 cm	0	5.0	19.12	0.49	5.00	1.07	4.18
	40	5.25	19.23	1.16	6.00	1.26	7.71
	60	5.9	19.67	1.23	6.32	1.42	9.92
	80	6.1	18.08	1.26	6.90	1.41	6.66
2.6-5 cm	0	5.8	31.23	0.81	6.55	1.20	6.82
	40	6.2	28.97	1.25	7.05	1.68	7.08
	60	6.7	35.85	1.23	7.17	1.82	10.98
	80	6.2	28.40	1.33	7.17	1.47	8.25
>5 cm	0	6.2	29.02	0.49	6.80	1.27	5.61
	40	6.5	29.06	1.11	7.80	1.77	6.67
	60	6.6	34.30	1.39	7.55	1.82	9.72
	80	6.3	33.80	1.26	7.87	1.53	9.81
F^{Test}	S	**	**	ns	**	**	**
	N	**	**	**	**	**	**
	S*N	**	**	ns	**	ns	**

*, ** and ns indicate the significance at 0.05, 0.01 probability level and not significant, respectively

ascorbic acid content. The year differences in physicochemical properties could be due to the different weather conditions over the periods of experiment in both years. In most casesand irrespective of N level, the better result was achieved in 2004 when the amount and distribution of rainfall and other environmental conditions in the experimental site were more favourable.

The efficiency of N uptake was higher with adequate soil moisture content. This is in line with the report of Akanbi [21] on okra and Togun[6] on tomato fruit.

Fruit size had significant effect ($p \leq 0.05$) on fruit pH, %juice, total solid, Fe and ascorbic acid contents. The small fruit had highest acidity while the least was determined from the big fruit. Percent juice varied form 18.90 in small to 31. 55 in big fruit. However% juices of medium and big fruits are not statistically significant. Crude protein was not significant across the fruit sizes. Nevertheless, crude protien of medium sized fruits was the highest while small fruit had the least. The fruit total solid increased significantly with increasing fruit size. The order of increase in total solid in relation to fruit size is small< medium<big fruit. The observed relationship between fruit size and fruit total solid was repeated for Fe and ascorbic acid. The Fe content of 1.2 mg kg^{-1} fruit obtained from small fruit was significantly lower than 1.54 and 1.59 obtained for medium and big fruit size, respectively. The Fe content of small and big fruits were similar. As for ascorbic acid, medium sized fruit had best with value of 8.28 mg kg^{-1} fruit and this was 1.16 and 0.33 unit higher than what was observed from small and big fruit, respectively.

Application of nitrogen had significant affect on all eggplant fruit chemical properties measured. Fruit pH reduced significantly with increasing N level from 0 to 80 kg N ha^{-1} in both years. On the other hand, there was an increase in %fruit juice with increasing in N level up to 60 kg N ha^{-1} treatment beyond which it fell. The 60 kg N ha^{-1} treatment gave the highest %juice and this was 11.5, 4.5 and 11.2 higher than the observed values from 0, 40 and 80kg N ha^{-1} treatments. The CP of the three N levels (40, 60 and 80 kg ha^{-1}) were not significantly different. However, there values were significantly higher than what was observed on non-fertilized control plants. The fruit total solid was highest (7.3) under 80 kg N ha^{-1} fertilizer regime. This was closely followed by 7.01, 6.95 and 6.12 g kg^{-1} fruit total solid taken from plants that received 60, 40 and 0 kg N ha^{-1}, respectively. The total solid of fruit from fertilized with 40 kg N ha^{-1} was not significantly different from that of 60 kg N ha^{-1} treatment. The fruit Fe and ascorbic acid contents in response to N-level differed significantly. For both traits, there values increased with increasing N-level. Ascorbic acid content was affected by N-stress. There were significant differences among N levels in the ascorbic acid content with reductions of as much as 46% for the N-stress treatments. The higher qualities in 60 kg N ha^{-1} treatment was probably due to enhancement in the uptake and assimilation of nutrients which are known to positively affect eggplant fruits[5,11]. In this, experiment, 60 kg N ha^{-1} made adequate N available and increased its uptake for plant use. The fact that 60 kg N ha^{-1} was more efficient than 80 kg N ha^{-1} treatment indicates that the former could be regarded as optimum for production of high quality fruit and seeds in this crop.

The observed better fruit physicochemical properties with 60 and 80 kg N ha^{-1} treatments indicate that N stress has adverse effect on egg plant fruit physicochemical properties. When fertilizer is applied in adequate amount, mobilization of nutrients into the fruits is enhanced. Also, the rate of N uptake is dependent on the rate of photosynthate supply to the root system. The assimilate supply in turn is dependent on photosynthate production and its use by shoot processes. All these are influenced by the nutrient availability. In this study, poor fruit qualities associated with low N fertilizer rates could be attributed to insufficient supply of N required for fruiting. This is in line with the report of Pan[4] and Russo[5]. In both reports, proximate and elemental composition of plant fruits and seeds were discovered to be low with poor nutrition. Moreso, eggplant fruits harvested from eggplant exposed to high nutrients has been documented to have a stronger sink for assimilate. This invariability has positive influence on dry matter partitioning into the fruits[11,14].

The interactive effects of fruit size and N-level on eggplant fruit chemical properties were highly significant ($p = 0.01$) with the exception of crude protein and Fe contents. The lowest pH range was observed on small fruit irrespective of fertilizer level. The highest fruit crude protein was determined from big fruit fertilized with 60 kg N ha^{-1}. This was not significantly differed from crude protein of other big fruit across other N-levels. The Fe and ascorbic acid contents of medium and big fruit that received 60 kg N ha^{-1} were similar and significantly higher than other treatment combinations.

Fruit size affected the qualities of eggplant fruits and seeds. The better qualities of medium and big sized fruits in this experiment agrees with that of Bergervoet *et al.*, Joubes and Chevalier[10] on tomato crop. Big fruits were reported to have higher efficient sink functionand this facilitate partitioning and accumulation of more photosynthetic products. With this, nutritional templates are not limiting and hence productions of constituents like proteins, are enhanced[8,12]. The protein, Feand ascorbic acid contents of S2 and S3 fruits are better than S1 ones. This could be explained from the fact that the S2 and S3 fruits have more numbers of cellsand the sizes of individual cells in them are bigger than S1. This favoured accumulation of more organic substances in them, this culminate in better quality.

The results clearly show that it is possible to improve the physico-chemical properties of fresh eggplant fruits through appropriate nutrition and that selection of big fruits could resulted in production of high quality plants. The bigger the fruit the higher the quality in terms of physical properties and composition. This is in agreement with many previous findings for different crop species[21,22]. Moreover, as a report from a tomato cultivation experiment also indicate[6], the better quality in eggplant fruit physiochemical properties could primarily be attributed to the higher N utilization efficiency. From this study, it follows that the bigger the fruit and the more the available N-nutrient for plant use, the better the qualities of the seeds produced. It was concluded that for production of high quality fruits and seeds in eggplant, application of 60 kg N ha^{-1} in combination with selection of big fruit (≥5cm in diameter) seems to be the best agronomic practices.

REFERENCE

1. Hedge, D.M., 1997. Nutrient Requirement of Solanaceous vegetable crops. Food and Fertilizer Tech. Techni. Bull., pp: 9.
2. Jose, D., K.G. Shaimugarelu and S. Thamburaj, 1988. Studies on the efficiency of organic vs inorganic form of nitrogen in brinjal. Indian J. Plant Nutrition, 14: 175-185.
3. Yagodin, B.A., 1982. Effects of Fertilizers on Crop composition and Quality. In: Agricultural Chemistry. 2nd (Edn.) pp: 310-330.
4. Pan, W.L., J.J. Camberato, R.H. Moll., E.J. Kamprath and W.A. Jackson, 1995. Altering Source-Sink Relationships in Prolific Maize Hybrids; Consequences for Nitrogen Uptake and Remobilization. Crop Sci., 35: 836-845.
5. Russo, V., 1996. Cultural methods and mineral content of eggplant (*Solanum melongena*) fruit. J. Sci. Food and Agric., 71: 119-123.
6. Togun, A.O., W.B. Akanbi and R. Dris, 2003. Influence of compost and Nitrogen fertilizer on growth, nutrient uptake and fruit yield of tomato (*Lycopersicon esculentum*). Crop Res., 98: 40-56.
7. Sinclair, T.R. and T. Horie, 1989. Leaf nitrogen, photosynthesis and crop radiation use efficiency. A Review. Crop Sci., 29: 90-98.
8. Jullien, D., 2001. Fruit size and composition in fresh tomato fruits: Effects of fertilizer application. Htp.//www. Plant nutrition.org.
9. Gyllapsy, E., C.K. Bergervoel and D. Jullien, 1993. Sink-source relation in fruit vegetables as affected by N fertilizer. Scientia Hort. 58: 87-94.
10. Joubes, A.D. and L. Chevalier, 2000. Physiochemical components of fresh tomato fruits in relation to N fertilizer. J. Plant Nutr., 18: 29-37.
11. Asiegbu, J.E., 1991. Response of tomato and eggplant to mulching and nitrogen fertilization under tropical conditions. Sci. Hort., 46: 33-41.
12. Sweeny, D.M., D.A. Graetz, S.J. Locascio and K.L. Cambell, 1987. Tomato yield and nitrogen recovery as influenced by irrigation method, nitrogen source and mulch. Horticultural Sci., 22: 27-29.
13. Sonneveld, C., R. Baas, H.M.C. Nussen and J. De Hoog, 1999. Salt tolerance of flower crops grown in soiless culture. J. Plant Nutr., 22: 1033-48.
14. Savvas, B.D. and F. lenz, 2000. Response of eggplants grown in recirculating nutrient solution to salinity imposed prior to the start of harvesting. J Horticultural Sci. Biotechnol., 75: 262-267.
15. Albregts, E.E., C.M. Howard, 1975. Influence of mulch type and fertilizer rates on eggplant response. Proc. Soil Crop Sci. Soc. Fla., 36: 61-62.
16. Errebhi, M. and G.E. Wilcox, 1990. Tomato growth and nutrient patterns as influenced by nitrogen form ratio. J. Plant Nutr., 13: 1031-1043.
17. Hedge, D.M. and K. Srinivas, 1989. Growth & Yield analysis of tomato in relation to soil matric potential and nitrogen fertilization. Indian J. Agron., 34: 417-425.
18. National Horticultural Research Institute (NIHORT) (1986). Advancement in Production of Solanaceous Crops in Nigeria. In: NIHORT Annual Report, NIHORT, Ibadan, Nigeria, pp: 80.
19. Bremner, J.M., 1965. Total Nitrogen. In: C.A. Black (Ed.). Methods of soil analysis. Part 2. Amer. Soc. Agron., Madison, Wis., pp: 1149-1178.
20. AOAC., 1984. Official Method of Analysis (12th Ed.). Washington Dc. Association of Official Analytical Chemists.
21. Akanbi, W.B., 2002. Growth, Nutrient uptake and Yield of maize and okra as influenced by compost and Nitrogen fertilizer under different cropping systems. Thesis, University of Ibadan, Nigeria. pp: 228.
22. Ulger, A.C., H. Ibrikci, B. Cakir and N. Guzel, 1997. Influence of Nitrogen Rates and Row Spacing on Corn Yield, Protein contentand other plant Parameters. J. Plant Nutr., 20: 1697-1709.

SAS Institute, Inc. 1987. SAS/STAT. Guide for personal computers, 6th Ed. Cary. NC.