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# GENETIC PROGRESS IN EARLY HYBRID ($F_1 – F_4$) POPULATIONS ARISING FROM CROSSES AMONG FOUR SOLANUM (EGG PLANT) GENOTYPE

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## ABSTRACT

Assessment of genetic progress is a very important tool in plant breeding programs. The objective of this study was to ascertain the genetic progress made in early hybrid (1-4) generations to identify the outstanding hybrid(s) that would be advanced to higher generations. The research was carried out at the teaching and research farm of the Department of Crop Science University of Nigeria, Nsukka during 2014 to 2016. Parents and hybrid generations from $F_1$ to $F_4$ were evaluated for the major yield contributing traits (number of flowers and fruits per plant, Plant height (cm), fresh fruit weight (g) and average fruit weight (g) ). The materials used include the parents: Yalo (*solanum melongena*), Jos (*solanum gilo*), Nsukka Local (*Solanum macrocapon*) and Nsukka indigenous (*solanum aethiopicum*) and their $F_1$ to $F_4$ progenies obtained from crossing and subsequent selfing. Genetic progress made at difference generations were obtained using Relative Performance Differential Analogue to Single Parent Heterosis analytical tool. Among the cross combinations, Yalo × Jos with genetic gain of 442.10% and Nsukka Local × Yalo(139.27%) were endowed for prolific flowering and fruiting. Yalo × Jos exhibited the highest genetic for fresh fruit weight (838.71%). Exploitation of these traits in the subsequent generations will improve the yield of *solanum*.

**Key words:** Solanum, Genetic progress, Hybrids and Heterosis.

## INTRODUCTION

Eggplants (*Solanum melongena L*) is among the traditional fruit and leafy vegetables that are cultivated by many Nigeria communities. The vegetable has been domesticated in Africa for the last few centuries and is still regarded as a major vegetable by both producers and consumers in Nigeria and other African countries (Gockowski *et al.,* 2003; FAO, 2010). They are nutritionally rich especially in calcium, iron and vitamin A and C (Schippers *et al.,* 2000; Agorey *et al*., 2012; Nyadanu *et al.,* 2014). The African eggplant play central role in the tradition and culture of people in sub-Saharan Africa (Chinedu *et al*., 2011). It serve as kola in ceremonies and festivals such as marriage, child naming, kola for visitors and other social gathering (Chinedu *et al*., 2011).

Eggplant (*Solanum melongena* L) have medicinal uses which range from weight loss to treatment of several ailments including asthma, skin infections, constipation, diabetes, leprosy, gonorrhea, cholera, bronchitis, dysuria, dysentery, asthenia and hemorrhoids (Nwodo *et al*., 2011). Irrespective of the importance eggplant, in most African countries, the crop is neglected and underutilized .The reduction in interest in terms of crop research and improvement of egg plant include the belief that the bitter variety (*Solanum macrocarpon*)are poisonous (Nyadanu and Lowor, 2014). Diversity has been recorded in agronomic traits of eggplant genotypes (Chinedu *et al.*, 2011). Assessment of variability present in eggplant species is an essential pre-requisite for formulating an effective breeding programme. Genetic variability as manifested in morphological and molecular diversity can be utilized to develop local eggplant cultivar with improved agronomic traits (Daunay *et al*., 1991). Fruit yield in eggplant is a cumulative effect of the yield contributing traits (such as number of flowers, fruit number and fruit weight). It is highly influenced by both genetic and environmental factors and selection for yield is achieved with unalloyed emphasis on the yield contributing traits. Therefore, a successful selection would depend upon the information on the genetic variability and association of yield with its component traits. Genetic gain made over generation will help to check the progress of the breeding program and will serve as a prelude for subsequent selection to develop high yielding *Solanum* variety.

## MATERIALS AND METHODS

**Plant material and field procedure**
Planting materials

| Local Name | Technical Name |
|---|---|
| Yalo | *Solanum melongena* |
| Jos | *Solanum gilo* |
| Nsukka Local (Africanegg plant) | *Solanum macrocapon* |
| Nsukka Indeginous | *Solanum eathiopicum* |

The study was carried out in the Teaching and Research Farm of Department of Crop Science, University of Nigeria Nsukka located in the derived savannah Zone (Latitude 06° 51N, Longitude 07° 23E, on the altitude of about 400m above sea level).The four S*olanum* varieties were evaluated from September (2015) to February (2016) and April to August, 2016 under field condition in a randomized complete block design (RCBD) with three replications. Materials for this study comprised four cultivated eggplant varieties namely: Yalo variety (*Solanum melongena*), Nsukka indigenous (*Solanum aethiopicum*), Jos variety(*Solanum gilo*), and Nsukka local (African eggplant) (*Solanum macrocarpon)*. During evaluation crosses were made to generate the $F_1$. The $F_1$ hybrids were planted and allowed to self pollinate to generate $F_2$ populations. The $F_3$ and $F_4$ Populations were planted in progeny rows which measured 112 m ×150 m given fifty six rows (ridges) separated 1m apart. Each ridge measured 1.5 m x 150 m. Seedlings were planted at a space of 45cm on top given a total of 33plants per ridge. During field establishment well cured poultry manure was applied on each row at the rate of 0.1512ton/h. All the necessary agronomic practices were observed.

Data recorded on flowers per plant and fruits per plant were obtained by counting, Fresh Fruit weight (g) was obtained by weighing all the harvested fruits from each plant using sensitive electric weighing balance, Sartorius B. 31005 and averaged to obtain the average fruit weight (g), plant height (cm) was obtained by measuring from the base of the plant to the tip of the longest branch using measuring tape. Statistical analyses were done to determine the means, standard deviation, variance and frequency distribution using the SPSS software computer package version 10.0. Inter-generation differences were estimated using a Relative Performance Differential Analogous to single parent heterosis (SPH). Thus, progress in $F_2$ relative to the $F_1$ generation ($RPD_{2,\ 1}$) and in $F_3$ relative to $F_1$ generation ($RPD_{3,\ 1}$) in that order up to $F_4$ generation was calculated according to Igili (2008) as outlined below:

$$RPD_{s,p} = 100\ (G_s - G_p/G_p)(\%)$$

Where: RPD = Relative Performance Difference in %

$G_S$ =Succeeding generation

$G_p$ = Preceding generation

The percentage performance of the genotypes for the traits was determined using the frequency distribution by calculating the difference of the deviation from the mean and the mean; then divide by the deviation and multiply by 100/1 = DI $- \bar{x}$ / DI × 100/1

Where: DI= Deviation from the mean

$\bar{x}$ = mean

# RESULTS

The result of genetic gain made over four generations ($F_1$ to$F_4$) in five traits ( flowers per plant, fruits per plant, fresh fruit weight, average fruit weight and plant height) are presented in table 1 to 5.Table 1 presented the genetic gain made from generation to generation for number of flowers per plant for the five crosses Yalow× Jos, Yalo× Nsukka Indigenous, Nsukka Indigenous ×Jos, Nsukka Local × Nsukka Indigenous and Nsukka Local× Yalo. Consistent genetic progress was observed in $F_2$, $F_3$ and $F_4$ over $F_1$ for Yalo× Jos. Retrogression was observed in second filial generation and third filial generation over first filial generation in the five cross combinations (yalo × Nsukka Indigenous, Nsukka Indigenous × Jos,Nsukka Local × Yalo, Nsukka Local× Nsukka Indigenous) which showed high genetic gain in $F_4$ generation over the preceding generations. The highest genetic gain (442. 10%) was recorded in Yalo × Jos for number of flowers. Table 2 presents the results of genetic gain of the early generations $F_1$ to $F_4$ for fruits per plant for the five crosses. In case of Yalo × Jos genetic progress was exhibited for fruits per plant as in flowers per plant. Table 3 shows the genetic gain made for fresh fruit weight in the five crosses. There was genetic progress at every generation in all the crosses except $F_4$ over $F_3$ for the cross Yalo × Nsukka Indigenous. Yalo × Jos recorded the highest genetic gain (838.11%) for fresh fruit weight. Table 4 presents the result of genetic gain for average fruit weight for the five crosses. Genetic progress in average fruit weight followed the same trend as fresh fruit weight. The cross Nsukka Local × Yalo made the highest genetic gain (354.13%). Table 5 presents the genetic progress made for plant height for the five crosses. There was continuous genetic progress for all the generation over the preceding generation. Decline was observed at $F_3$ generation over $F_1$ generation for Yalo × Nsukka Indigenous, Nsukka × Jos, Nsukka Local × Yalo. Decline was observed also for most of the crosses at generation three over two.

Figure1a, b, c and d represented frequency distribution of Yalo and Jos parents. Yalo × Jos hybrid at $F_3$ and $F_4$ generations with respect to number of flowers. The distributions were fitted into the normal distribution curves. The mean number of flowers for the two parents Yalo and Jos were 20 and 14 respectively with standard deviation of 5.367 and 8.083. Most of the plants produced more than 25 flowers. the distribution revealed that Jos parents produced flower range of 3-26 numbers. The hybrid Yalo ×Jos at $F_3$ had the mean flower number of 23.61 and at $F_4$ recorded 71.82. The distribution of $F_3$ and $F_4$ indicated that 82% and 74% of the plant population produced flowers that ranged from 15 to 35 and 60 to 85 respectively.

Figures 2a,b, c and d showed frequency distributions for Yalo and Nsukka indigenous parents., $F_3$

and $F_4$ generations of the Cross Yalo × Nsukka Indigenous (Y × N I) with respect to number of Flowers. Nsukka Indigenous produced up to 100 flowers with a mean of 93 flowers. The two hybrids $F_3$ and $F_4$produced mean flower number of 35 and 145 respectively. Fig:3 a, b, c and d represented distributions of number of flowers per plant for Nsukka indigenous and Jos parents with their hybrid Nsukka Indigenous × Jos. Wide variation existed in the number of flowers of the two parents. The mean flower numbers were 92.64 and 14 respectively. The flower number of the hybrids in the two generations was higher than that of the two parents; at $F_3$ the hybrid produced a mean of 130.46 and 94.16 flowers respectively at $F_4$. The distribution of Nsukka Local and Nsukka Indigenous parents with their hybrids at $F_3$ and $F_4$ generations are as presented in Figure 4. The hybrids showed high levels of endowment for prolific flowering. A significant increase in number of flowers was observed in $F_4$ generation.

The distribution of number of fruits per plant for Yalo and Jos parents as well as their hybrids were as presented in Figure 5 a ,b, c, and d. The mean number of fruits for the two parents was 4.86 and 11.82 respectively. The mean fruit number for the hybrids was 8.21 at $F_3$ and 15 at $F_4$. Few plants produced up to 15 fruits at $F_3$ ,and at $F_4$ 30 fruits were recorded. Figure 6 a, b, c and d presented the frequency distribution for $F_3$ and $F_4$ hybrids (Yalo × Nsukka Indigenous) of Yalo and Nsukka Indigenous parents with respect to fruit number per plant. It was revealed that the hybrids at $F_3$ and $F_4$ generations produced more fruit than the female parent (Yalo) but less than the male parent(Nsukka Indigenous) which produced up to 92.64 fruits. The frequency distribution of Nsukka Indigenous and Jos with their $F_3$ and $F_4$ hybrids with respect to fruit number was as shown in Figure 7 a, b, c and d. The dispersion of the hybrids at $F_3$ and $F_4$ indicated that 70% of the plant produced 13 to 23 fruits. At $F_4$ some plant were outliers which produced 25 to 30 Fruits. Although they are lesser than the Nsukka Indigenous parents, they produce more than the Jos parents. Figure 8 a, b, c and d presented the Frequency distributions of number of fruits produced by Nsukka Local and Nsukka Indigenous parents, and their hybrids, Nsukka Local × Nsukka Indigenous at $F_3$ and $F_4$ generations. The distributions fitted into normal distribution curve. The distribution of Nsukka Local revealed an outlier since some plants exhibited an outstanding fruit production that fall outside the range. At $F_3$ and $F_4$ the mean fruit numbers per plant were lower than that of the two parents. Figure 9 a, b, c and d represented the frequency distribution of Yalo and Jos parents as well as their hybrid (Yalo × Jos) at $F_4$and $F_3$ with respect to Fresh Fruit weight. The parents had the mean Fresh Fruit weight per plant as 529.86g and 216.27g respectively. The hybrid weighed 303.65g at $F_3$ and 264.42g at $F_4$. The frequency distribution of Yalo and Nsukka Indigenous as well as their hybrid at $F_3$ and $F_4$ was presented in Figure 10a, b, c and d. The distributions of the two parents revealed that Yalo parents produced fruits with mean of 529.86g per plant, while Nsukka Indigenous had 223.20g per plant. The distribution of $F_3$ revealed that fruits that weighed from 200g to 500g were produced. The population of plant that produced fruits that weighed from 300g to 350g were highest. At $F_4$ the dispersion revealed that 86% of the population weighed 100 to 500g. The distribution of Nsukka Indigenous and Jos parents and their $F_3$ and $F_4$ hybrids for fresh Fruit weight were as shown in Figure11 a,b,c and d. The distribution revealed that Nsukka Indigenous parent had plant population that produced fruits that weigh**ed** from 100 to 400g. Jos variety produced fruits that weighed up to 800g. Most of the plants at $F_3$ produce fruits with 300g. The mean Fruit weight produced in $F_4$ was 184.91g. Figure 12a, b, c and d presented the distribution of Nsukka Local and Nsukka Indigenous parents and their $F_3$ and $F_4$ hybrids, Nsukka Local × Nsukka Indigenous. The Nsukka Local had mean Fresh Fruit weight of 169.55g while Nsukka Indigenous had 223.20g mean fruits weight. At $F_3$ the distribution revealed that 75% of the plant produced fruits that weighed 400 to 600g. At $F_4$ a mean fresh fruit weight of 158.32g was recorded. The distribution showed that 84% of the population produced 100g to 250g fruit weight.

**Table 1. Genetic gain (%) from generation to generation for number of flowers per plant.**

| Generation | RPD Over generation | Yalo× Jos | Yalo×Nsukka Indigenous | Nsukka Indigenous × Jos | Nsukka Local ×Yalo | Nsukka Local × Nsukka Indigenous |
|---|---|---|---|---|---|---|
| $F_1$ | $RPD_{2,1}$ | 48.8 | -39.25 | -5.41 | -27.41 | -23.42 |
| | $RPD_{3,1}$ | 20.95 | -53.67 | -55.55 | -71.96 | -65.48 |
| | $RPD_{4,1}$ | 7.92 | 86.62 | 21.76 | -8.03 | 37.16 |
| $F_2$ | $RPD_{3,2}$ | 52.59 | -23.73 | -53.01 | -61.37 | -54.92 |
| | $RPD_{4,2}$ | 442.10 | 207.20 | 28.72 | 71.46 | 79.11 |
| $F_3$ | $RPD_{4,3}$ | 302.78 | 302.78 | 173.91 | 22.79 | 297.35 |

RPD= Relation Performance Difference

**Table 2.Genetic gain (%) from generation to generation for number of fruits per plant.**

| Generation | RPD Over generation | Yalo× Jos | Yalo× Nsukka Indigenous | Nsukka Indigenous × Jos | Nsukka Local ×Yalo | Nsukka Local × Nsukka Indigenous |
|---|---|---|---|---|---|---|
| $F_1$ | $RPD_{2,1}$ | 23 | -27.21 | -34.16 | 139.27 | 32.79 |
| | $RPD_{3,1}$ | 37.25 | -43.51 | -65.61 | 41.72 | 53.84 |
| | $RPD_{4,1}$ | 55.23 | -31.08 | -72.37 | 74.06 | -57.28 |
| $F_2$ | $RPD_{3,2}$ | 74.78 | -22.39 | 47.76 | -40.69 | -31.31 |
| | $RPD_{4,2}$ | 58.61 | -5.31 | -58.03 | 19.06 | -36.44 |
| $F_3$ | $RPD_{4,3}$ | 64.08 | 22. | -19.66 | 39.56 | -7.46 |

RPD= Relation Performance Difference

**Table 3.Genetic gain (%) from generation to generation for fresh fruit weight (g) per plant.**

| Generation | RPD Over generation | Yalo× Jos | Yalo×Nsukka Indigenous | Nsukka Indigenous × Jos | Nsukka Local ×Yalo | Nsukka Local × Nsukka Indigenous |
|---|---|---|---|---|---|---|
| $F_1$ | $RPD_{2,1}$ | 838.71 | 80.61 | 293.74 | 261.82 | 161.02 |
| | $RPD_{3,1}$ | 412.58 | 39.96 | 177.85 | 129.45 | 109.25 |
| | $RPD_{4,1}$ | 417.90 | 27.01 | 187.85 | 119.94 | 100.94 |
| $F_2$ | $RPD_{3,2}$ | 45.39 | 29.82 | 29.43 | 36.58 | 46.53 |
| | $RPD_{4,2}$ | 44.83 | -33.79 | 32.47 | 39.29 | 59.09 |
| $F_3$ | $RPD_{4,3}$ | 1.04 | -8.29 | 525.45 | 156.81 | 206.31 |

RPD= Relation Performance Difference

**Table 4.Genetic gain (%) from generation to generation for average fruit weight (g) per plant.**

| Generation | RPD Over generation | Yalo× Jos | Yalo× Nsukka Indigenous | Nsukka Indigenous × Jos | Nsukka Local ×Yalo | Nsukka Local × Nsukka Indigenous |
|---|---|---|---|---|---|---|
| $F_1$ | $RPD_{2,1}$ | 209.00 | 7.92 | 25.87 | 12.94 | 14.43 |
| | $RPD_{3,1}$ | 189.12 | 62.52 | 46.88 | 27.39 | 144.30 |
| | $RPD_{4,1}$ | 112.04 | 43.84 | 55.05 | 354.13 | 21.23 |
| $F_2$ | $RPD_{3,2}$ | 65.07 | 50.59 | 16.69 | 67.09 | 113.5 |
| | $RPD_{4,2}$ | 12.04 | 33.28 | 48.80 | 83.56 | 301.68 |
| $F_3$ | $RPD_{4,3}$ | 13.67 | -11.49 | 56 | 39.56 | 67.82 |

RPD= Relation Performance Difference

**Table 5.Genetic gain (%) from generation to generation for plant height (cm).**

| Generation | RPD Over generation | Yalo× Jos | Yalo× Nsukka Indigenous | Nsukka Indigenous × Jos | Nsukka Local ×Yalo | Nsukka Local × Nsukka Indigenous |
|---|---|---|---|---|---|---|
| $F_1$ | $RPD_{2,1}$ | 261.82 | 34.62 | 37.68 | 32.22 | 2.34 |
| | $RPD_{3,1}$ | 129.45 | -25.42 | -46.16 | -22.13 | 21.11 |
| | $RPD_{4,1}$ | 119.94 | 85.03 | 132.12 | 110.34 | 76.78 |
| $F_2$ | $RPD_{3,2}$ | 36.58 | -44.59 | -60.89 | -44.89 | -22.90 |
| | $RPD_{4,2}$ | 39.29 | 37.45 | 68.60 | 88.27 | 72.74 |
| $F_3$ | $RPD_{4,3}$ | 119.94 | 148.09 | 56.19 | 188.66 | 124.07 |

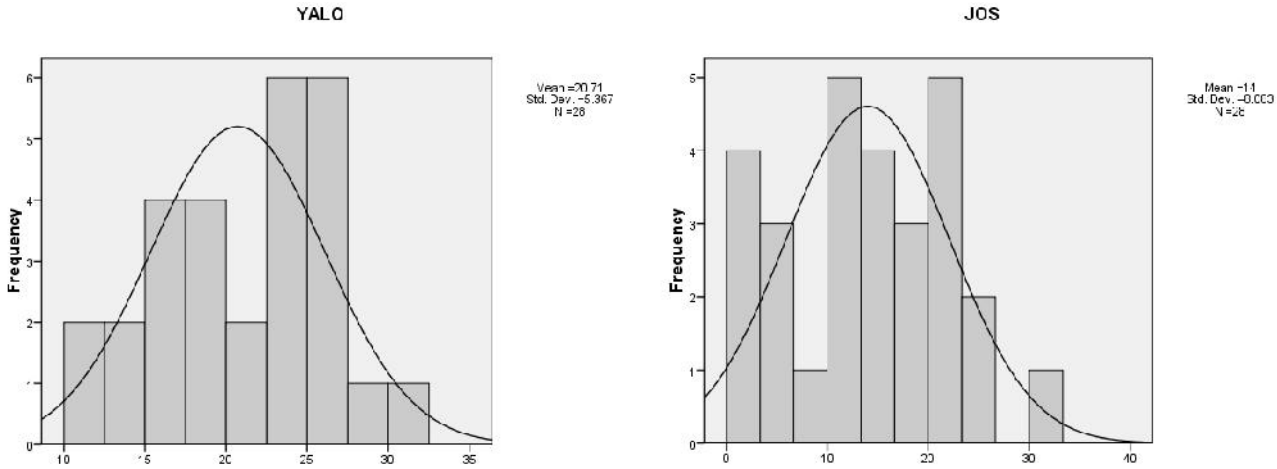
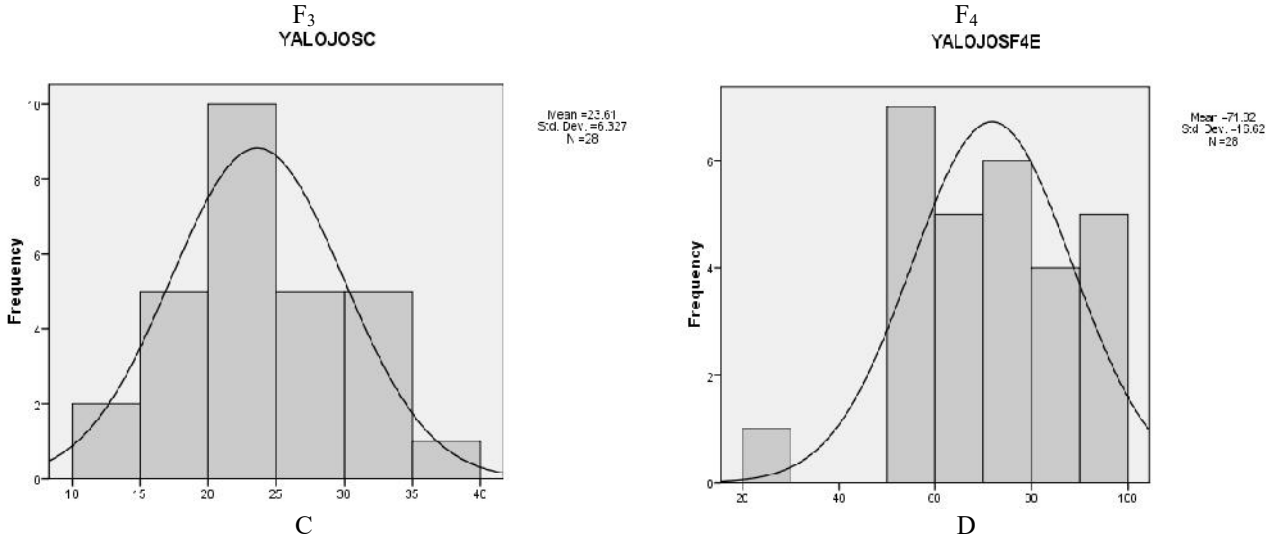
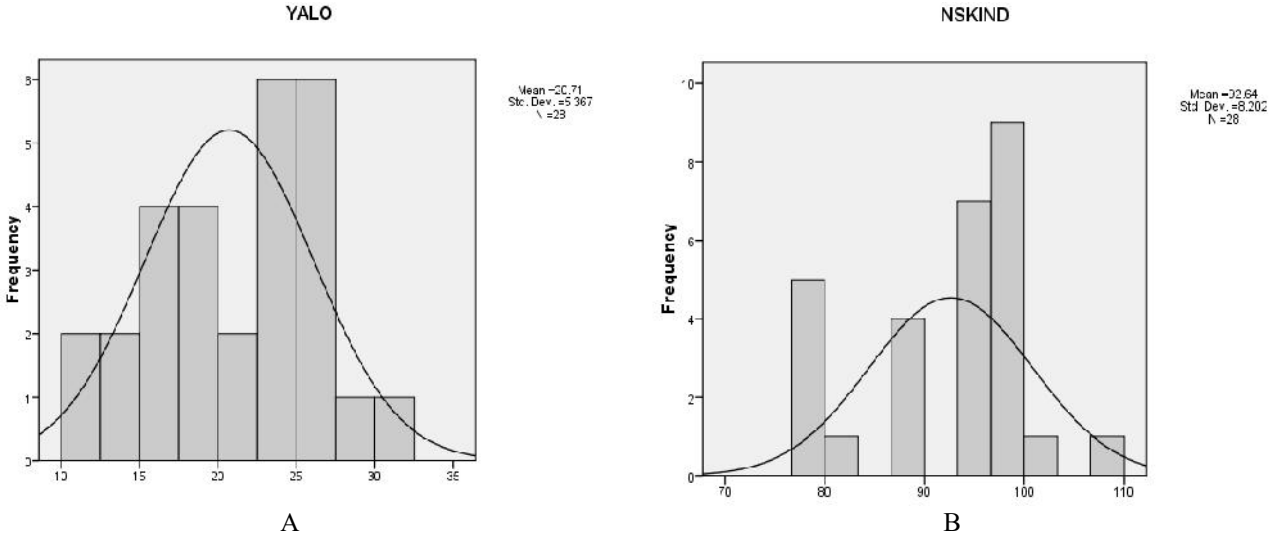



**Fig.1a and b: Frequency distribution of number of flowers for Yalo (a) and Jos (b).**



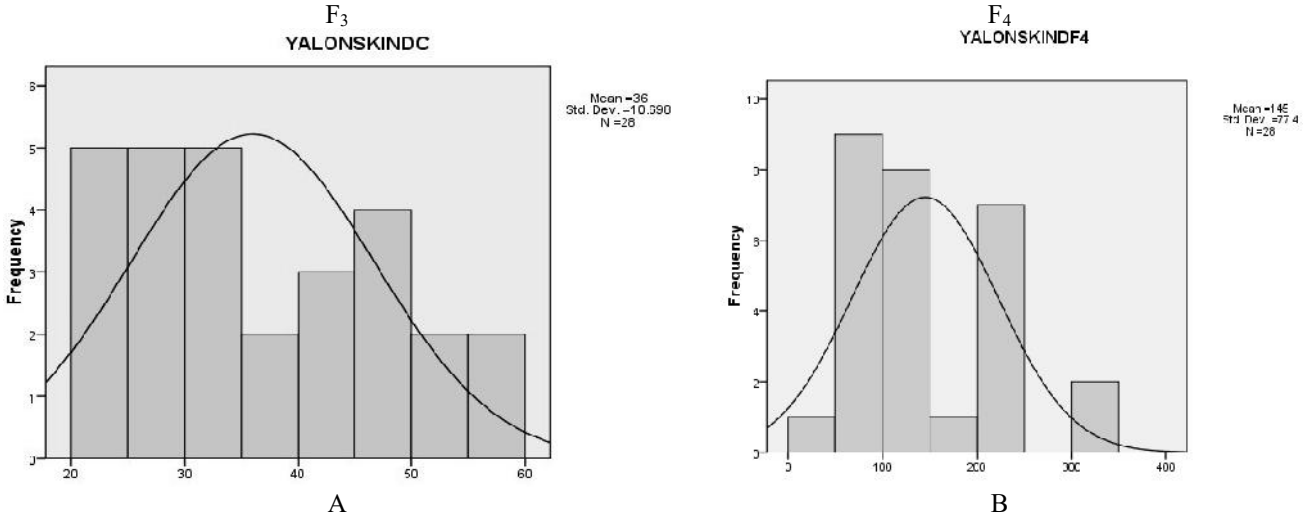

C D

**Fig.1c and d: Frequency Distribution of number of flowers at $F_3$ (c) and $F_4$ (d) for the Cross Yalo× Jos (Y × J).**



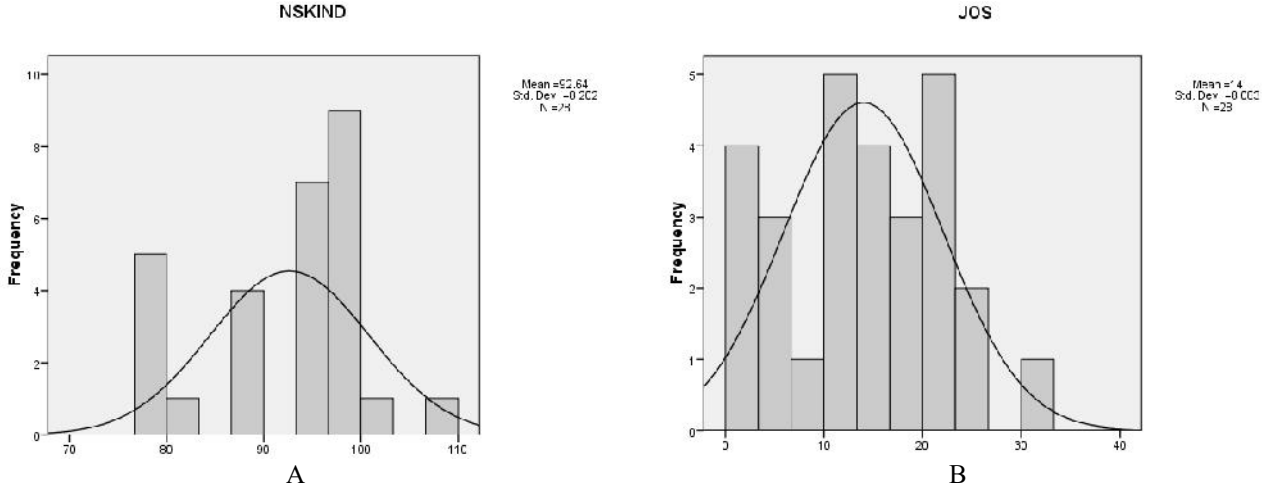

A B

**Fig.2a and b: Frequency Distribution of number of flowers for Yalo (a) and Nsukka Indigenous (b).**



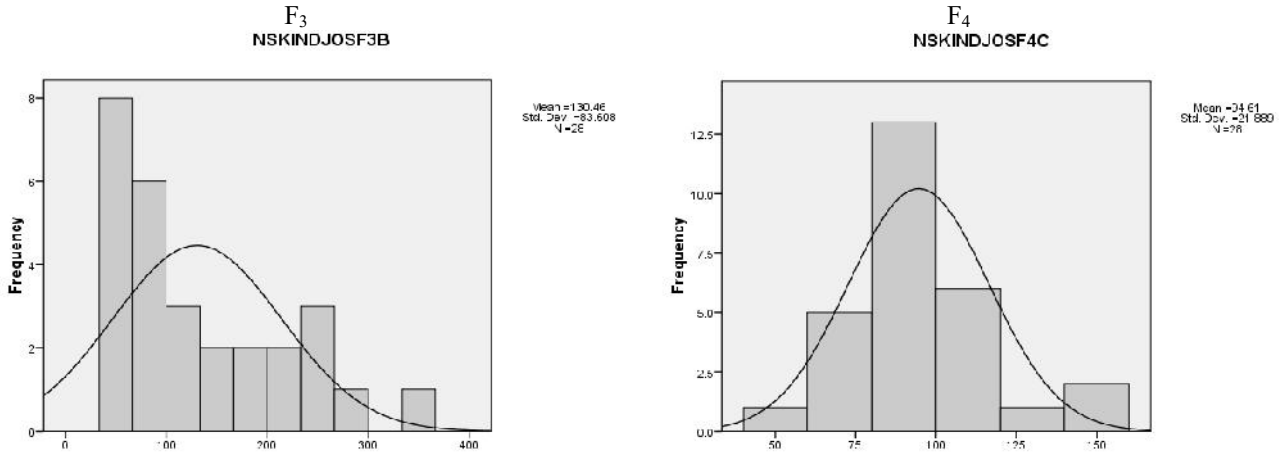

A B

**Fig.2c and d: Frequency Distribution of number of flowers at $F_3$(c) and $F_4$(d) for the Cross Yalo × Nsukka Indigenous (Y × N I)**



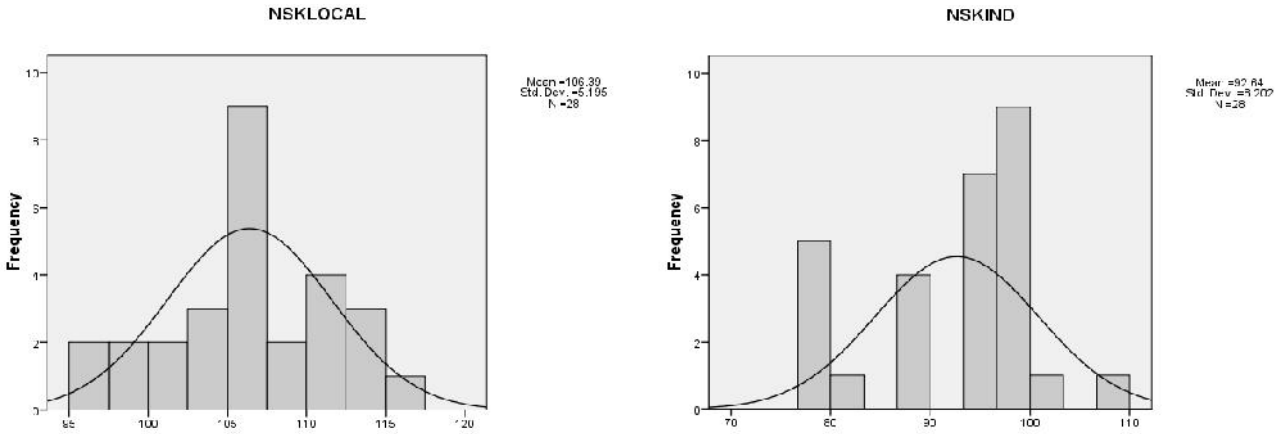

A B

**Fig.3a and b: Frequency Distribution of Number of Flowers for Nsukka Indigenous (a) and Jos (b).**




C D

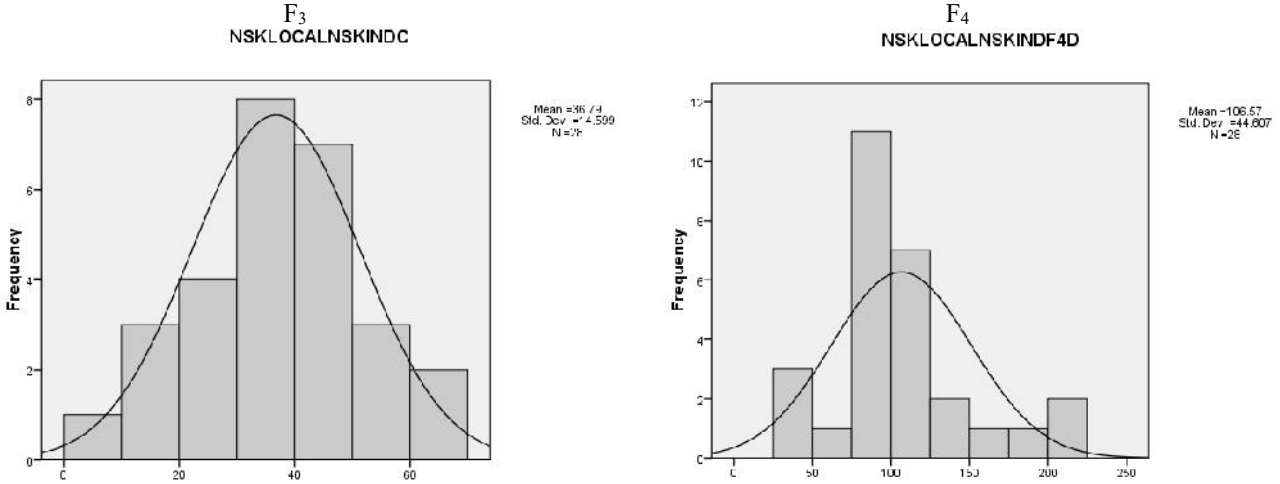
**Fig.3c and d: Frequency Distribution of Number of Flowers at $F_3$(c) and $F_4$ (d) for the cross Nsukka Indigenous × Jos (N In × J ).**




A B

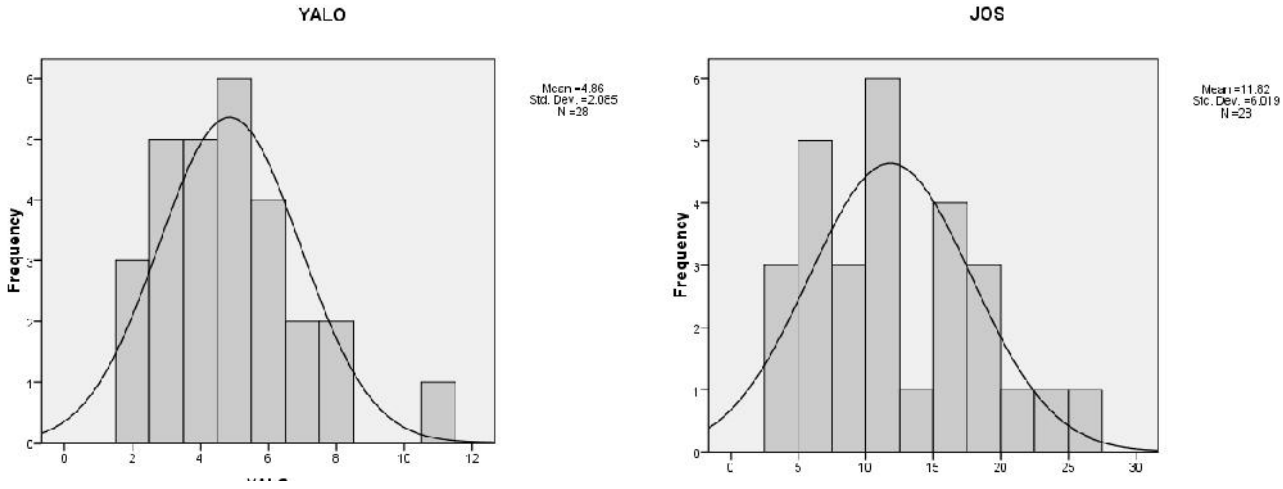
**Fig.4a and b: Frequency Distribution of Number of Flowers for Nsukka Local (a) and Nsukka Indigenous (b).**

$F_3$ $F_4$



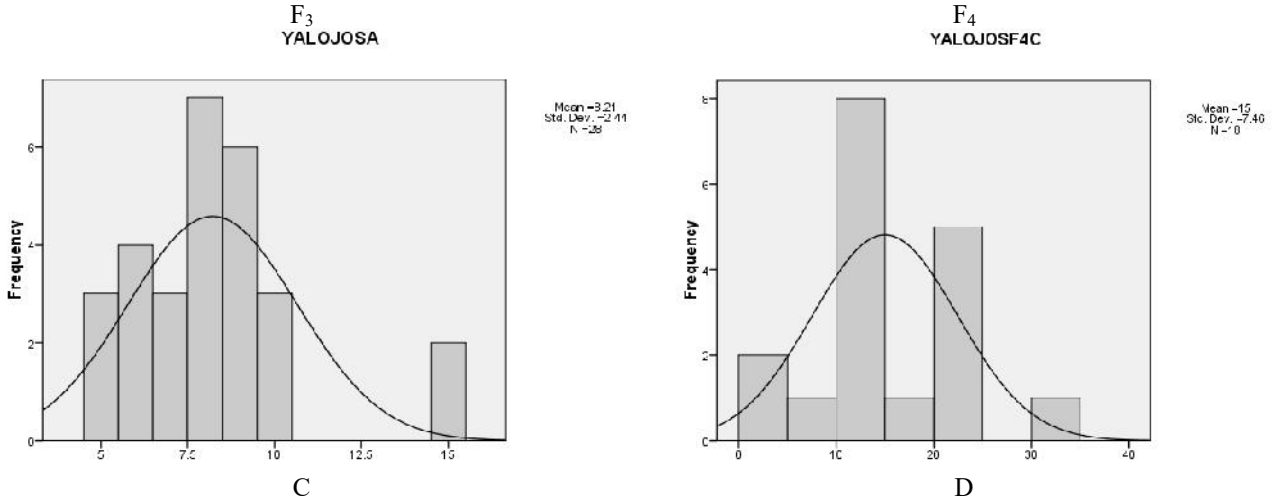

C B

**Fig.4c and d: Frequency Distribution of Number of Flowers at $F_3$(c) and $F_4$(d) for the cross Nsukka Local × Nsukka Indigenous (NL×NI).**



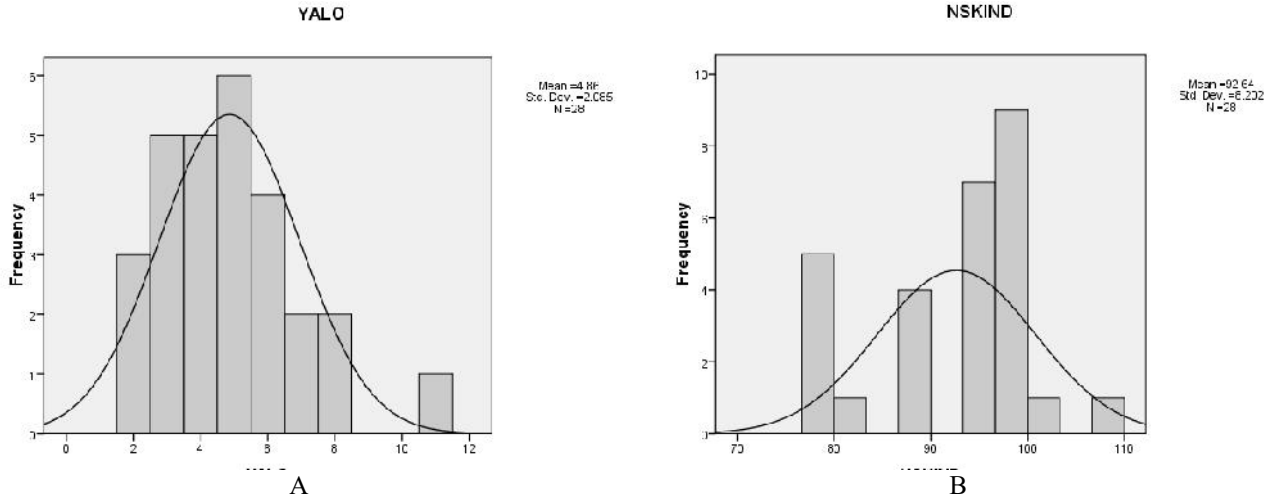

A B

**Fig.5a and b: Frequency Distribution of Number of Fruits at for Yalo (a) and Jos (b).**



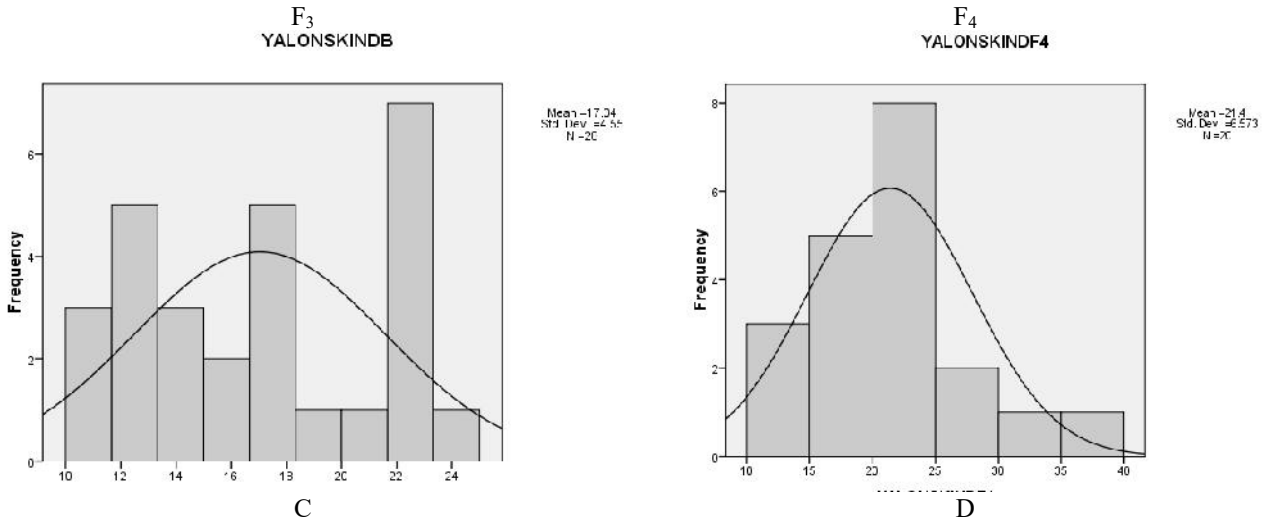

C D

**Fig.5c and d: Frequency Distribution of Number of Fruits at $F_3$(c) and $F_4$(d) for the cross Yalo × Jos (Y × J).**



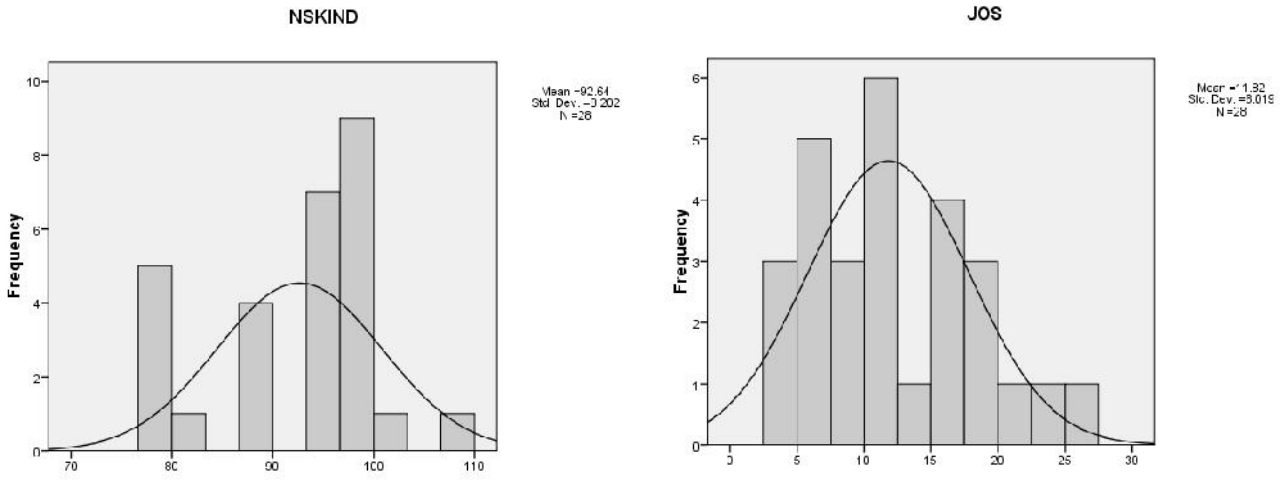

A B

**Fig.6a and b: Frequency Distribution of Number of Fruits for Yalo (a) and Nsukka Indigenous (b).**




C D

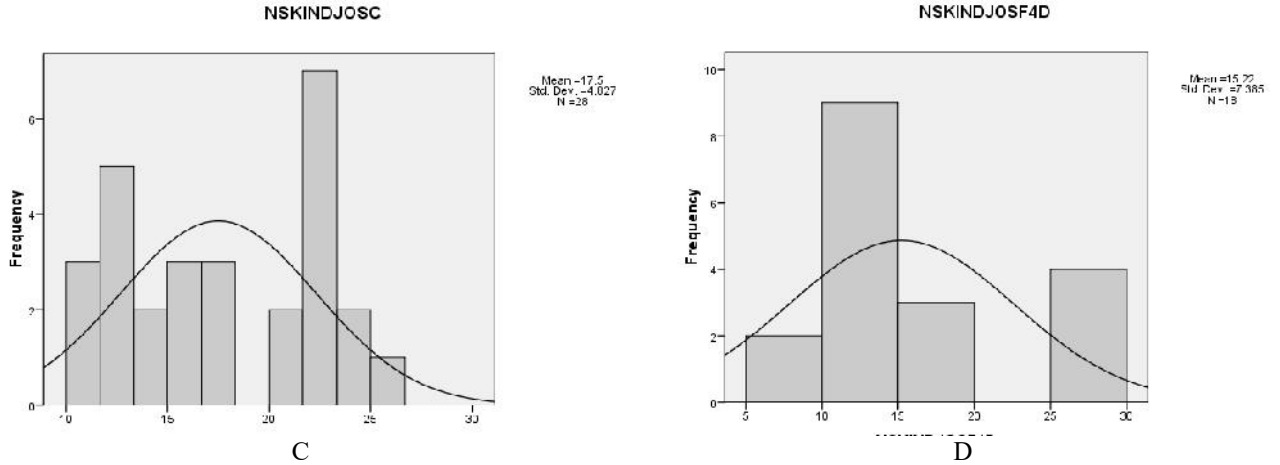
**Fig.6c and d: Frequency Distribution of Number of Fruits at $F_3$(c) and $F_4$(d) for the cross Yalo × Nsukka Indigenous (Y×NI).**




A B

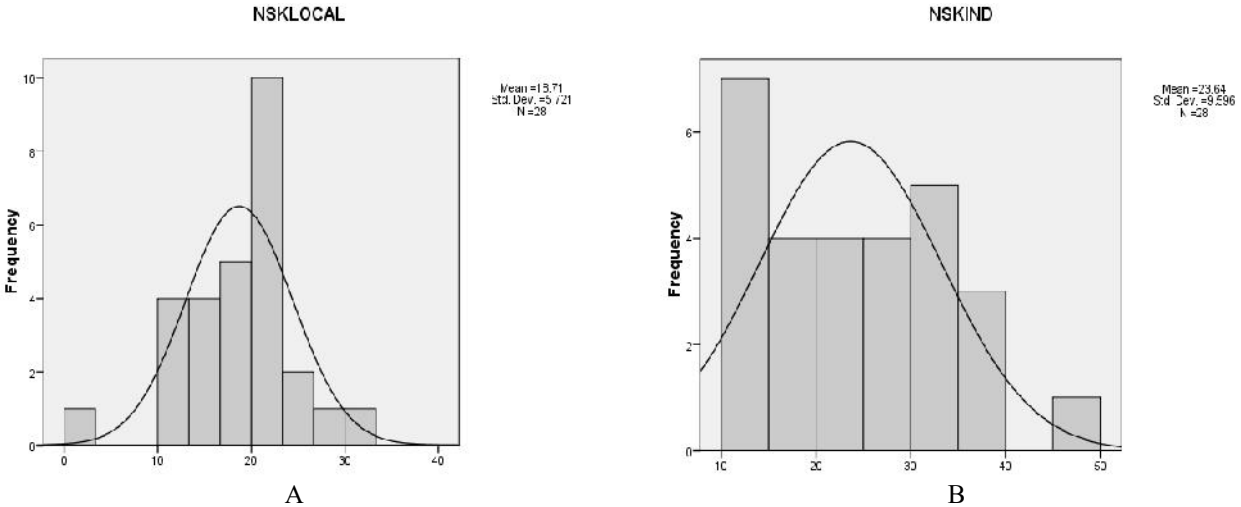
**Fig.7a and b: Frequency Distribution of Number of Fruits for Nsukka Indigenous (a) and Jos (b).**

$F_3$ $F_4$



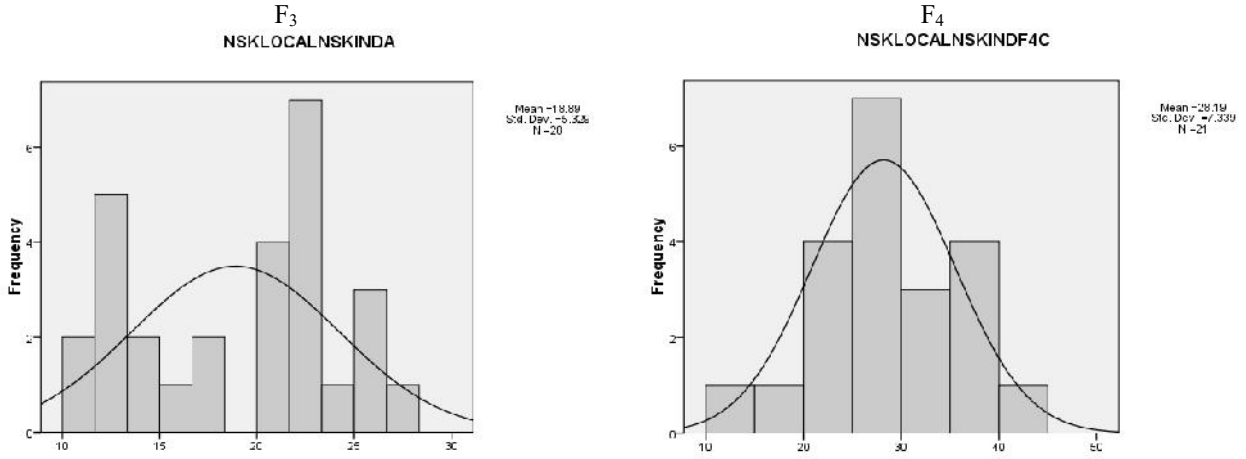

C D

**Fig.7c and d: Frequency Distribution of Number of Fruits at$F_3$ (c) and $F_4$(d) for the cross Nsukka Indigenous × Jos (NI × J).**



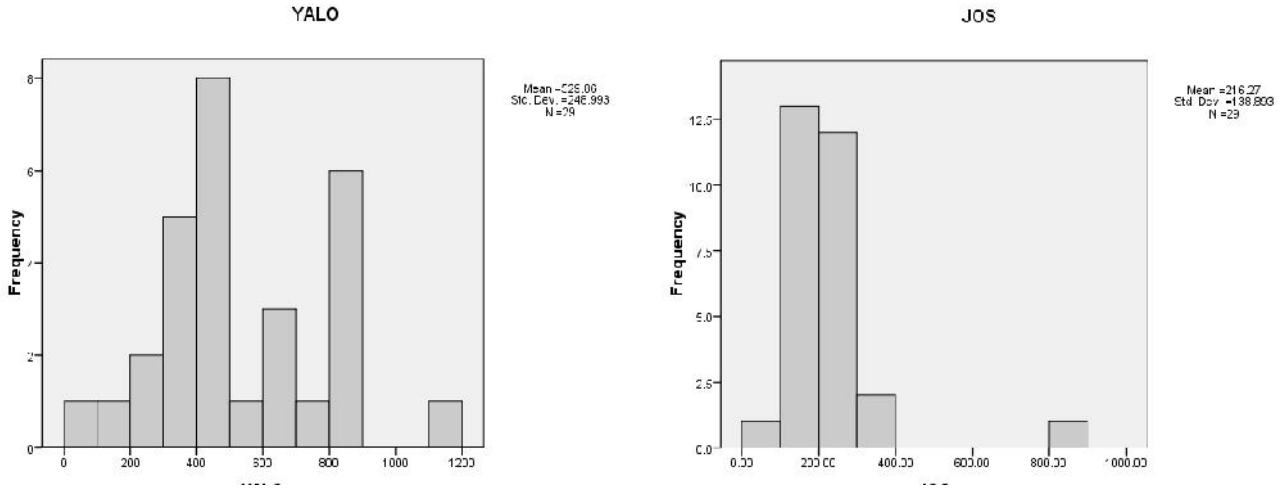

A B

**Fig.8a (b and b: Frequency Distribution of Number of Fruits for Nsukka Local (a) and Nsukka Indigenous).**



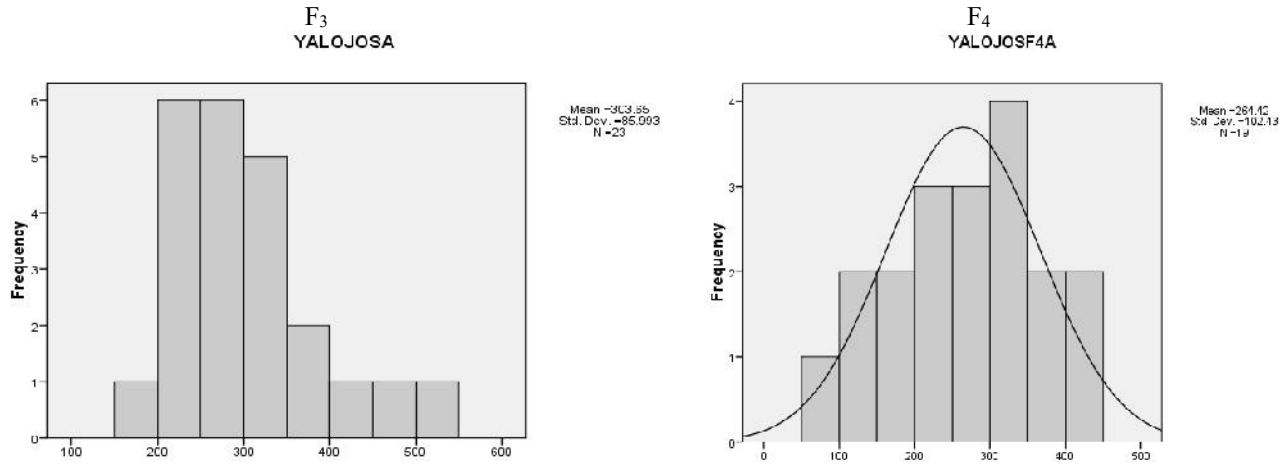

C D

**Fig.8c and d: Frequency Distribution of Number of Fruits at $F_3$(c) and $F_4$(d) for the cross Nsukka Local × Nsukka Indigenous (NL × NI).**



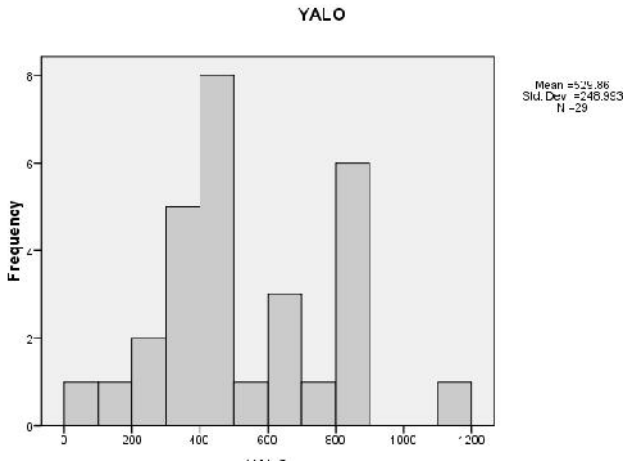

A B

**Fig.9a and b: Frequency Distribution of Fresh Fruit Weight(g) For Yalo (a) and Jos(b)**

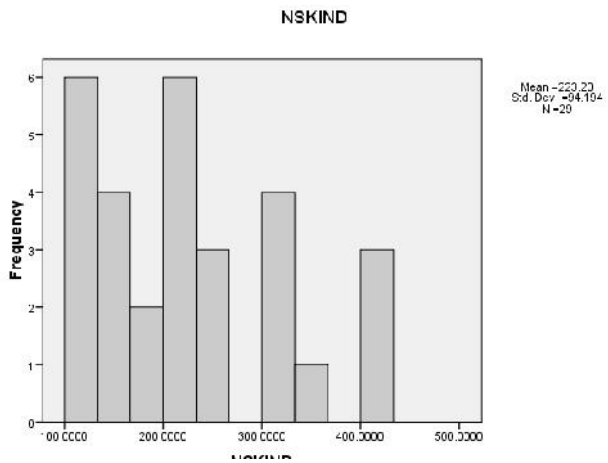



C D

**Fig.9c and d: Frequency Distribution of Fresh Fruit Weight (g) at $F_3$(c) and $F_4$(d) for the cross Yalo × Jos (Y × J).**



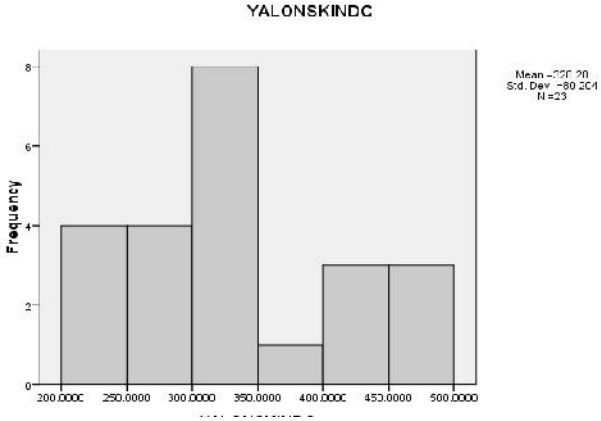

A




B

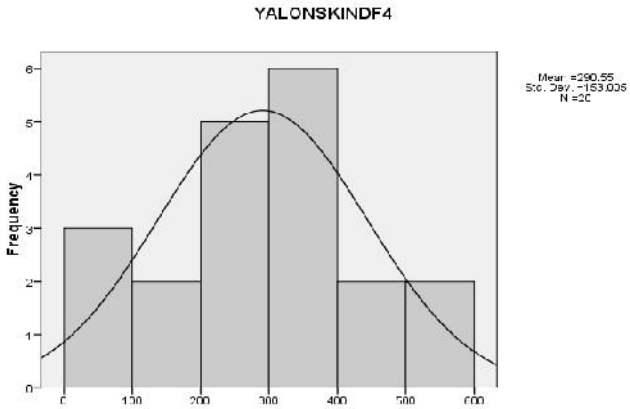
**Fig.10a and b: Frequency Distribution of Fresh Fruit Weight (g) for Yalo(a) and Nsukka Indigenous (b).**

$F_3$



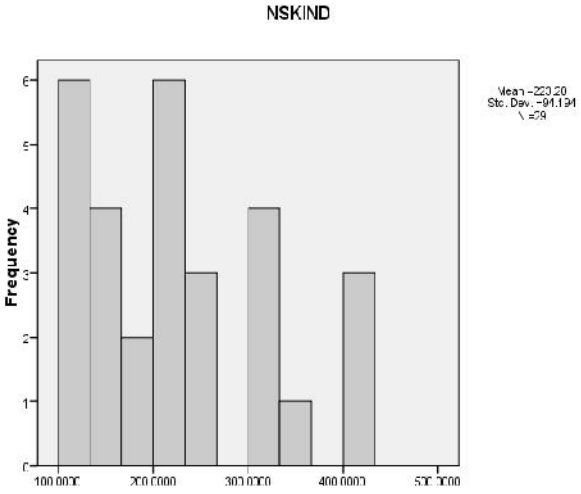

C

$F_4$

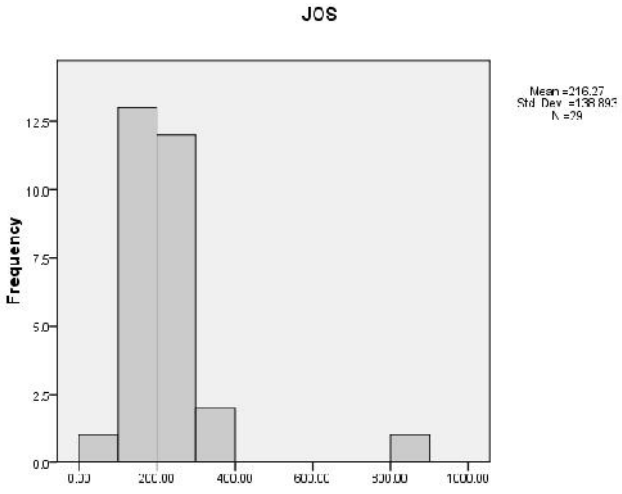



D

**Fig.10c and d: Frequency Distribution of Fresh Fruit Weight (g) at $F_3$ (c) and $F_4$ (d) for the cross Yalo × Nsukka Indigenous (Y × NI).**

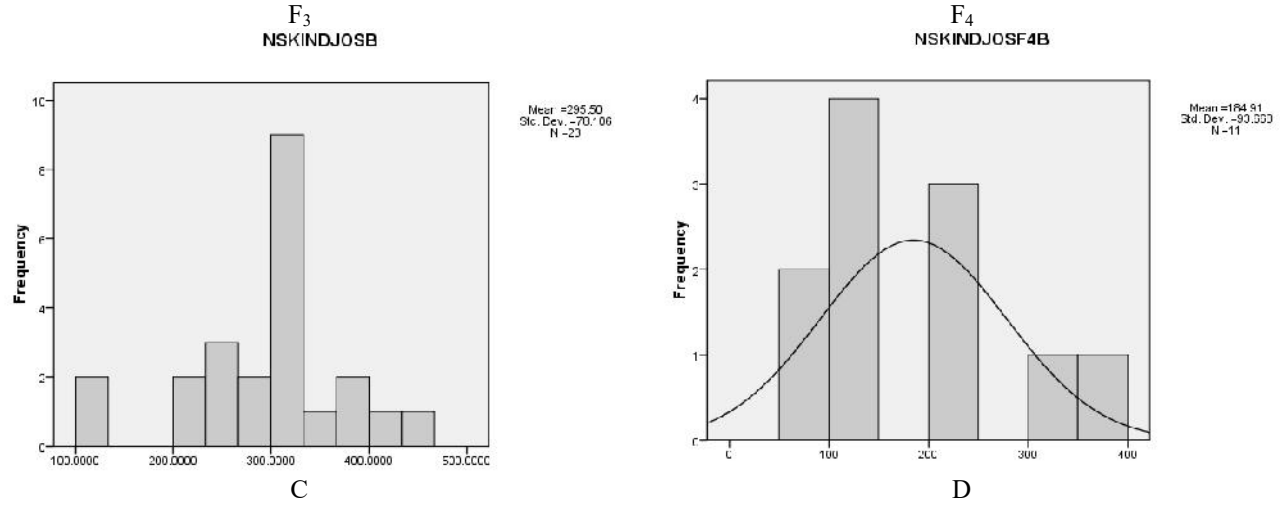



A



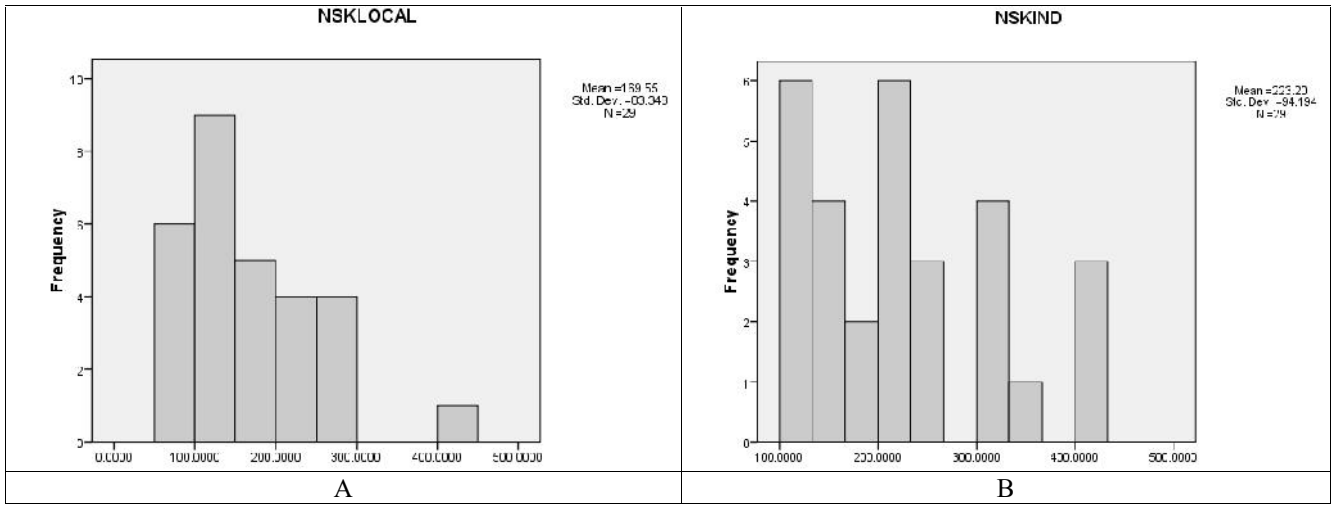

B

**Fig.11a and b: Frequency Distribution of Fresh Fruit Weight(g) for Nsukka Indigenous (a) and Jos (b).**



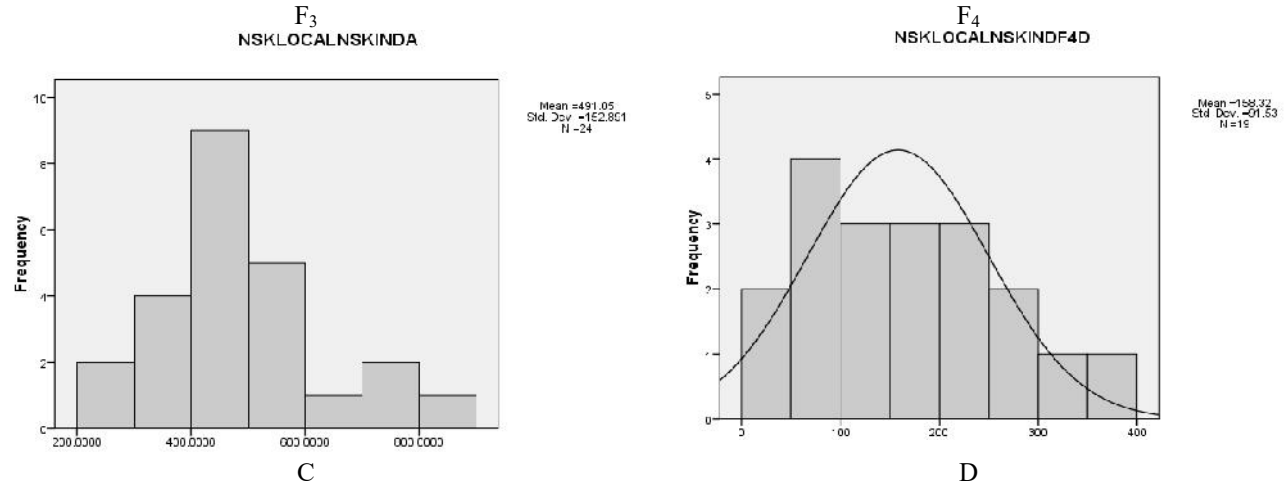

C D

**Fig.11c and d: Frequency Distribution of Fresh Fruit Weight at $F_3$(c) and $F_4$ (d) for the cross Nsukka Indigenous × Jos (NI × J).**




A B

**Fig.12a and b: Frequency Distribution of Fresh Fruit Weight (g) for Nsukka Local (aand )NsukkaIndeginous (b).**




C D

**Fig.12c and d: Frequency Distribution of Fresh Fruit Weight (g) at $F_3$(c) and $F_4$(d) for cross Nsukka Local × NsukkaIndigenous (NL× NI).**

## DISCUSSION

Genetic progress was recorded in the four traits studied in the early generation hybrids of egg plant. Progress recorded in the four traits studied suggested genetic improvement of these traits. Igili *et al* (2008) reported genetic improvement in plant girth and fruit circumference in plantain at early generations. Similarly, Atugwu (2013) reported improvement on fruit number, number of trusses, and fresh fruit weight in tomato hybrids. Highest genetic gain was recorded for number of flowers in the cross between Yalo and Nsukka Indigenous. The cross also made significant gain in number of fruits per plants. Highest genetic gain for fresh fruit weight was recorded in Nsukka Local × Yalo, an indication of good recombination for heavy fruits. Retrogression observed at generation four over generation 3 for the cross Yalo × Nsukka Indigenous which could be as a result of immature fruits harvested in the course of the experiment. Retrogression observed over the preceding generation for number of fruits per plant suggested heterogeneity because of segregation in the hybrids. Progress recorded for Fresh fruit weight for the cross Yalo × Nsukka Indigenous and Nsukka Local × Nsukka Indigenous indicated an improvement on the fruit size of the Nsukka Indigenous variety.

The parents and the hybrids showed continuous variation with respect to the traits with no evidence of segregation due to major gene effects. The distributions of the parents and the hybrid were normal, there was no skewness or kurtosis. The Nsukka local had a wide range of fruit sizes, which spread around the mean indicating the existence of large and medium sized fruits. Nsukka Indigenous parents produced small fruits. The distribution revealed that irrespective of high number of fruits the weight was lower than that of the crosses and the other parents. The change in the frequency distribution in the five traits observed in the cross combination of with Nsukka Indigenous as one of the parent revealed additive gene action. The increase in the number of fruits in the cross Yalo x Jos over the two parents which had lower fruit number indicated over dominance gene effect. A decline at $F_4$ generation in most of the traits suggested advancement of these progenies to higher generation to corroborate these results.

**Conclusion:** Nsukka indigenous variety that produced large number of fruits but of small sizes with high resistance to diseases combines easily with yalo and Nsukka local varieties which produced heavy fruits but were highly susceptible to diseases. Subsequent selection in cross having Nsukka indigenous as one the parent will consolidate the desirable traits and a standard high yielding *solanum* variety for Nsukka locality may be obtained.

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