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Intra-Row Spacing and Variety Interaction Effects on the Yield Performance of Sunflower (Helianthus Annuus L.) in Calabar

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Abstract

There is an increasing interest in Sunflower production in Nigeria as a substitute oil crop to complement oil palm and soybean. Two year field experiments were conducted at the Teaching and Research Farm of the University of Calabar to evaluate the interactive effects of intra-row spacing on sunflower varieties, using a 3 x 4 factorial experiment consisting of four spacing regimes (75 x 25, 75 x 30, 75 x 35 and 75 x 40 cm) and three sunflower hybrids (SSL 807, 806 and 803) in randomized complete block design having three replications. The 40 cm intra-row spacing resulted in the highest yield of sunflower seeds (3.95 t ha^{-1}), while SSL 806 and 803 were statistically similar in yield (3.44 and 3.05 t ha^{-1}). The interaction between SSL 806 at 75 x 40 cm gave the best achene yields (5.61 t ha^{-1}). Therefore variety SSL 806 is a more promising variety for production in Calabar.

Key words: Sunflower, intra row spacing, varieties, yield, oil crop, rain forest

1. Introduction

In Nigeria, there is a renewed effort towards increasing the yield output of oil crops in order to achieve food sufficiency. Production of edible oil in Sub-Saharan Africa has largely been from oil palm and soybean which are inadequate for the teeming populations (FAO, 2011). Sunflower (Helianthus annuus L.) is an important oil crop globally and also possesses a great aesthetic appeal (Myers, 2002). A member of the Compositae family, its cultivation is spreading in the tropics. The high yield potential of sunflower and great adaptability, evidenced by a characteristically high photosynthetic capacity and harvest index makes the crop suitable to contrasting environments (Agele *et al*., 2007; Amujoyegbe *et al*., 2012). Ogunremi (1988) reported that sunflower matures within 90 -120 days, contains good quality oil (drying oil and low cholesterol) of about 38 %. Two types of sunflower hybrids exist; the oilseed and non-oilseed types (Johnson *et al*., 2009). According to McClure *et al*., (2013), oilseed types have higher oil content and are produced primarily for oil extraction while the non-oilseed types are used in confections, baking industry and as bird seed mixes. The cake after oil extraction is protein rich and could supply about 50 % of protein requirements for laying chicken without compromising egg production (Smith, 1965).

The effects of spacing on growth and yield of crops are very pronounced. Spacing affords the crop the available surrounding soil volume for exploration and the above ground aerial space for canopy spread and harnessing of aerial resources. Under wide spacing and reduced plant density, plants face less competition due to wider spatial availability (Tanimu *et al*., 1991). Under low spacing conditions however, the effects of higher population density and overcrowding could result in compensatory etiolation, where plants struggle to reach incident radiation at the upper canopy. Massey (1971) reported that spacing did not affect plant height or the number of leaves but there was an increase in stem diameter as plants spacing increased by 15 cm. Plant density has an extremely important relation on the seed size (Holt and Zentner, 1985).

The size of seeds ultimately affects the weight, total dry matter, oil content as well as the final achene yield. Higher weight of seeds per plant therefore implies higher tonnage per hectare.

Tanimu, *et al*., (1991) reported significant intra-row spacing effects on the number of days to first flowering and grain yield. El-Naim and Ahmed (2010) observed that varietal differences and intra-row spacing at 30 cm resulted in high vegetative performance in sunflower. Similarly, Al- Doori (2012) reported that cultivar differences and intra-row spacing significantly influenced performance and yield of sunflower while Beg *et al*., (2007) found that higher populations as a result of lower intra-row spacing resulted in higher yields compared to lower densities at wider spacing.

USDA (2014) estimates of sunflower production (1000 M t) ranks Ukraine (4.259 M t) as the leading producer followed by the Russian Federation (3,510 M t). South Africa (335 M t) ranked 7th and is the leading African producer while others are perhaps insignificant by trade or production volume for mention. However with the renewed interest in sunflower production, there will be an expansion of production activities and efforts into all possible agro-ecological zones. As yet, there is no record of sunflower cultivation in the south east rainforest agro-ecological zone of Calabar and its environs. There is need for a ground swell of scientifically based research to support expansion into this area. This study was therefore undertaken to examine the effects of intra-row spacing regimes on the yield performance of three varieties of sunflower in Calabar (a humid rainforest agro-ecology).

2. Materials and Methods

2.1 Description of the study location

The study was conducted from September, 2014 to January, 2015 and September, 2015 to January, 2016 at the Teaching and Research Farm of the University of Calabar (4.5 ^{0} – 5.2 ^{0} N, 8.0 – 8.3 ^{0}E, 39 m ASL). Bi-modal rainfall prevails in Calabar, ranging from 3,000 – 3,500 mm annum^{-1} with a temperature range of 27-35 ^{0}C. The soil in the experimental area is classified as ultisol (Akpan-Idiok *et al.*, 2012). The physical and chemical properties of the studied soil are presented in Table 1.

Table 1. Physical and chemical properties of the soil at the study area

Chemical composition	Value	
	2014	2015
pH	5.60	5.56
Organic C (%)	1.38	1.39
Total N (%)	0.12	0.12
Available P mg kg^{-1}	39.12	37.43
Ca (cmol kg^{-1})	3.40	3.42
Mg (cmol kg^{-1})	2.00	2.10
K (cmol kg^{-1})	0.08	0.09
Na (cmol kg^{-1})	0.05	0.06
Al^{3+} (cmol kg^{-1})	0.64	0.64
H^+ (cmol kg^{-1})	1.08	1.08
ECEC (cmol kg^{-1})	7.25	7.39
BS (%)	76.0	76.70
Physical composition		
Clay (%)	13.0	13.40
Silt (%)	8.70	8.50
Sand (%)	78.30	78.10
Soil texture	Sandy loam	Sandy loam

2.2 Source of experimental materials

Fertilizer was sourced from the Cross River State Ministry of Agriculture fertilizer stores, while the sunflower seeds were obtained from Institute of Agricultural Research, Samaru, Zaria.

2.3 Treatments and Experimental design

The study design was a 3 x 4 factorial experiment laid out in a randomized completed block design. It consisted of two factors which were three sunflower varieties (SSL 807, 806 and 803) and four intra-row spacing regimes 75 x 25 cm , 75 x 30 cm, 75 x 35 cm, and 75 x 40 cm. The corresponding plant populations were 53,333, 44,444, 38,095 and 33,333 plant ha^{-1} respectively.

2.4 Soil sampling and laboratory analysis

Soil samples were collected at random from 0-20 cm depth from the study site and bulked, air-dried, sieved to pass through a 2 mm mesh and kept for routine physico-chemical analysis. A sub-sample was taken for laboratory analysis to determine the physical and chemical properties of the soil of the site according to the procedure of IITA (1982).

2.5 Field planting and maintenance

Two Apron plus treated seeds were sown at a depth of 4 cm on 14^{th} September, 2014 and 12^{th} September, 2015. At two weeks after sowing, seedlings were thinned to one per hill. Weeds were hand hoed at 3 and 7 WAS. All plots received a single application of 150 kg ha^{-1} (N-P-K 15: 15: 15) after thinning.

2.6 Data collection on growth and yield parameters

Six plants were tagged within the central portion of the plots for collection of data, which is reported here for 10 weeks after sowing (WAS). Plant height (cm) was measured from the soil mark to the tip of the plants and up to the heads during heading and the number of all mature leaves was counted. Leaf area was measured by the method of Rouphael *et al*., (2007) which states that $LA = 6.720 + 0.6494\ W^2$; (where W is the square of the leaf width). Leaf area index (LAI) was computed as the leaf area per area of ground occupied by a plant, stem girth was measured at 10 cm above the ground using a vernier caliper. Days to 50 % heading, head diameter (cm), weight of seeds per plant (g), 100-seed weight (g), head weight (kg ha^{-1}) and the achene yield (t ha^{-1}) were also measured.

2.7 Data analysis

Data collected were subjected to analysis of variance (ANOVA) to determine the effects of treatments on variables measured. Significant treatment means were compared using Fisher's Least Significant Difference (FLSD) at 5 % level of probability.

3. Results

3.1 Effects of intra- row spacing on vegetative growth and yield of sunflower

The effects of intra-row spacing on vegetative attributes of sunflower varieties are presented in Table 2. Plant height, the number of leaves, number of days to 50 % heading in both years, leaf area index and stem girth in 2016 were not significantly affected by spacing regimes at 10 WAS. Leaf area index (LAI) significantly increased (P<0.05) at 75 x 30 cm spacing. LAI was statistically similar at all other spacing regimes and significantly higher than at 75 x 30 cm. Stem girth at 75 x 30-40 cm respectively was significantly higher (P<0.05) than that observed among plants sown at 75 x 25 cm (Table 2).

Table 2. Effects of intra-row spacing and variety on vegetative growth of sunflower in 2015 and 2016

Treatment	Plant height (cm)		Number of leaves		Leaf area index		Stem girth (cm)		Number of days to 50 % flowering	
	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015
Interow spacing										
25	85.63	74.52	18.23	18.07	0.72	0.69	3.53	3.75	57.78	57.67
30	93.38	81.30	19.44	18.31	0.95	0.66	4.19	3.97	58.00	57.67
35	84.77	74.97	20.09	19.07	0.68	0.68	4.18	4.20	57.89	57.78
40	86.89	76.11	20.34	19.79	0.60	0.69	4.47	4.25	58.22	58.67
LSD (0.05)	NS	Ns	NS	NS	0.11	0.12	0.35	NS	NS	NS
Variety										
SSL 807	84.02	72.06	19.93	18.44	0.88	0.78	4.08	4.11	59.00	58.75
SSL 806	94.31	82.72	20.28	19.54	0.67	0.63	4.39	4.06	57.58	57.92
SSL 803	84.68	75.38	18.38	18.44	0.67	0.69	3.81	3.95	57.33	57.17
LSD (0.05)	6.83	NS	1.27	NS	0.12	0.13	NS	NS	0.77	0.93
Interaction (intra- row spacing x variety)										
25 x 807	80.73	60.73	16.80	16.93	0.60	0.69	2.93	3.53	58.33	58.00
25 x 806	88.87	75.53	19.00	18.60	0.80	0.79	3.83	3.85	57.67	57.33
25 x 803	87.30	87.30	18.90	18.67	0.76	0.72	3.83	3.87	57.33	57.67
30 x 807	83.20	70.07	18.00	18.03	1.15	0.97	3.66	3.66	58.33	58.33
30 x 806	93.00	79.67	21.53	18.00	0.73	0.72	4.76	4.16	58.67	59.33
30 x 803	103.93	94.17	18.80	18.90	0.93	0.97	4.16	4.08	58.33	55.33
35 x 807	76.70	70.03	21.47	17.53	0.89	0.84	4.08	4.15	59.33	58.33
35 x 806	96.87	87.20	18.20	19.73	0.57	0.63	4.10	3.91	56.00	56.33
35 x 803	80.73	67.67	20.60	19.93	0.59	0.66	4.35	4.55	58.33	58.67
40 x 807	95.43	87.43	23.43	21.27	0.86	0.73	5.64	5.10	60.00	60.33
40 x 806	98.50	88.50	22.40	21.83	0.57	0.61	4.85	4.34	58.00	58.67
40 x 803	66.73	52.40	15.20	16.27	0.38	0.41	2.91	3.31	56.67	57.00
LSD (0.05)	11.83	NS	2.20	NS	0.21	0.23	0.69	0.31	1.33	1.60

Means with NS at the bottom of the column are not significant at 5 % probability level

The effect of treatments on 100-seed weight in both seasons was not significant (Table 3). Head diameter and the weight of seeds plant^{-1}, head weight (kg ha^{-1}) and achene yield (t ha^{-1}) were however significant. Except at 75 x 35 cm spacing, head diameter at all other spacing regimes was statistically similar and significantly higher than at 75 x 35 cm ($P<0.05$) in 2015. In the second season however, head diameter at 75 x 25 cm was significantly higher ($P<0.05$) than head diameter at 75 x 30 cm, both of which were in turn significantly higher than head diameter values at 75 x 35 and 40 cm respectively, but statistically at par. The weight of seeds plant^{-1} was however statistically similar at 75 x 35 and 40 cm and higher than seed weight plant^{-1} at 75 x 30 and 75 x 25 cm respectively. During the 2016 season, the 75 x 35 cm spacing resulted in the highest weight of seeds ($P<0.05$), followed by 75 x 30 and 40 cm spacing respectively which were statistically at par but significantly higher ($P<0.05$) than the weight of seeds at 75 x 25 cm spacing (Table 3). In 2014, weight of heads ha^{-1} was statistically at par ($p>0.05$) at 75 x 25, 30 and 40 cm spacing respectively but significantly higher ($P<0.05$) than the weight of heads from plants sown at 75 x 35 cm. in 2015 however, at 75 x 25 and 30 cm spacing, head weight was statistically at par, significantly higher ($P<0.05$) than head weight of 75 x 40 cm spaced plants. The lowest head weight values were obtained among 75 x 30 cm spaced plants (Table 3). Achene yield in 2014 was highest ($p<0.05$) at 75 x 40 cm (3.95 t ha^{-1}) than yield from 75 x 30 and 35 cm spaced plots (2.81 and 2.64 t ha^{-1} respectively) which were also significantly higher than yields from 75 x 25 cm plots (2.05 t ha^{-1}). Yield ranged from 2.05 – 3.95 t ha^{-1} in the order of 75 x 40 > 75 x 30 > 75 x 35 > 75 x 25 (Table 3). The 75 x 40 cm spacing regime therefore increased yield by 48.18, 28.86 and 33.16% above the 75 x 25, 75 x 30 and 75 x 35 cm regimes respectively. In 2015 however, highest achene yield was obtained from plots sown at 75 x 30 cm, significantly higher than yield among 75 x 25 and 35 cm sown plants, being statistically similar and significantly higher ($p<0.05$) than yield from the 75 x 40 cm sown plants. Results of the combined achene yield (Table 3) indicated that IRS of 30 – 40 cm resulted in statistically similar achene yield ($p>0.05$), which was significantly higher than yield of SSL 803 sown at 30 cm IRS ($p<0.05$). However, achene yield at 25 and 35 cm spacing were also statistically at par ($p>0.05$).

3.2 Effects of variety on vegetative growth and yield of sunflower

Variety SSL 806 had significantly taller plants at 94.31 cm ($P<0.05$) and higher number of leaves (20.28) comparatively. The Leaf area index (0.88) was highest for SSL 807 in both years, which also took the longest number of days to 50 % heading than other sunflower varieties (Table 2). Except for head weight in 2015 and achene yield for 2014 and 2015, head diameter, weight of seeds per plant, 100-seed weight and head weight (kg ha^{-1}) were not significant. Achene yields of SSL 806 and 803 were statistically at par (3.44 and 3.05 t ha^{-1}) but significantly higher than yield of SSL 807 (2.07 t ha^{-1}). In 2015, SSL 803 (3.71 t ha^{-1}) yielded significantly higher achene value ($p<0.05$) than SSL 806 and 807 (2.88 and 2.15 t ha^{-1}) respectively (Table 3). In the combined yield analysis, varieties SSL 806 and 803 had superior achene yield which was statistically at par ($p>0.05$) and significantly higher ($p<0.05$) than yield from variety SSL 807, with a yield increase of 33.23 and 37.57 % respectively.

Table 3. Effects of intra- row spacing and variety on yield variables of sunflower in 2014 and 2015

Treatment	Head diameter (cm)		Weight of seed plant^{-1}		100-seed weight (g)		Head weight (t ha^{-1})		Achene yield (t ha^{-1})		Achene yield (t ha^{-1})
	2014	2015	2014	2015	2014	2015	2014	2015	2014	2015	
Interow spacing											
25	13.06	15.37	9.13	31.61	4.44	4.48	7687.70	7501.64	2.05	2.15	2.10
30	14.84	14.03	11.76	43.23	4.93	4.89	7887.90	7582.22	2.81	2.75	2.78
35	10.38	11.69	13.43	56.10	4.51	4.50	6046.10	6641.01	2.64	2.28	2.46
40	13.31	12.24	13.26	41.57	4.41	4.54	7102.02	7182.02	3.95	1.56	2.76
LSD (0.05)	2.67	0.91	1.93	9.96	NS	NS	875.30	113.55	0.53	0.40	0.47
Variety											
SSL 807	14.62	17.74	13.29	58.14	5.02	6.41	7081.90	9936.69	2.07	2.15	2.11
SSL 806	12.23	17.59	11.17	54.98	4.27	5.72	7484.00	9755.58	3.44	2.88	3.16
SSL 803	12.23	18.00	11.23	59.38	4.50	6.28	6997.00	9214.73	3.05	3.71	3.38
LSD (0.05)	NS	NS	NS	11.50	NS	NS	NS	131.11	0.61	0.46	0.54
Interaction (intra- row spacing x variety)											
25 x 807	14.51	15.14	10.01	31.37	5.27	5.23	7588.00	7653.33	1.80	1.75	1.78
25 x 806	12.23	17.38	6.70	25.70	4.30	4.30	8103.10	7710.57	2.20	1.85	2.03
25 x 803	12.45	13.59	10.69	37.77	3.77	3.90	7472.00	7141.03	2.15	2.86	2.51
30 x 807	16.09	14.51	14.22	46.67	4.70	4.57	6946.70	7019.40	2.25	1.70	1.98
30 x 806	14.29	12.19	10.11	32.75	4.33	4.37	9017.80	8008.03	2.65	2.62	2.64
30 x 803	14.13	15.39	10.96	50.27	5.77	5.73	7699.30	7719.23	2.65	3.93	3.09
35 x 807	12.42	10.67	15.17	35.00	4.67	4.60	6113.00	7279.27	1.40	1.32	1.36
35 x 806	10.19	11.57	12.63	65.53	4.00	3.97	5575.20	6182.60	3.41	2.47	2.94
35 x 803	10.14	12.84	12.47	67.77	5.10	4.93	6450.10	6460.67	3.10	3.04	3.07
40 x 807	15.45	12.91	13.75	61.40	5.43	4.83	7780.00	7858.07	2.84	1.70	2.27
40 x 806	12.17	11.62	15.23	40.97	4.43	4.53	7239.80	7365.53	5.61	1.69	3.65
40 x 803	12.31	12.18	10.80	22.33	3.37	4.27	6286.70	6323.27	3.41	1.29	2.35
LSD (0.05)	NS	1.82	NS	19.92	0.94	NS	NS	227.09	1.05	0.80	0.93

Means with NS at the bottom of the column are not significant at 5 % probability level

3.3 Effects of interaction of intra- row spacing and variety on vegetative growth and yield of sunflower

Mean values of interactive effects of plant spacing regimes and varieties of sunflower are presented in Tables 2 and 3. The interaction between factors showed that there were significant ($P<0.05$) effects on plant height and number of leaves in 2015, leaf area index, stem girth, number of days to 50 % heading in both seasons (Table 2) and in 2015, head diameter 100-seed weight and achene yield (t ha^{-1}). However the head diameter and weight of seeds per plant did not show any response to interactive effects in 2015. Variety SSL 806 showed the greatest response to intra – row spacing at 75 x 40 cm or 33,333 plants ha^{-1} for seed yield of 5.61 t ha^{-1} in 2014 but not in 2015. In 2014, sunflower plants received relatively lower rainfall compared to 2015 (Table 4). The lowest yield values were observed for SSL

807 at 75 x 25 and 75 x 35 cm (1.40 and 1.80 t ha^{-1}) respectively. The variety SSL 806 gave a yield increase of 67.86 and 74.04 % more than SSL 807 at the stated spacing regimes (Table 3). The combined achene yield of both seasons showed that statistically similar yields ($p>0.05$) occurred among varieties SSL 806 at the intra row spacing of 30 – 40 cm and SSL 803 at 35 cm (3.65, 3.09 and 3.07 t ha^{-1}), being significantly higher than achene yield among SSL varieties 803 x 30 cm and variety 807 at 25 and 30 cm respectively (1.36, 1.78 and 1.98 t ha^{-1}), which were statistically at par ($p>0.05$).

Table 4: Meteorological observations of Calabar for 2014 and 2015 planting seasons

Month	Total rainfall (mm)		Relative Humidity (%)		Monthly mean temp (^{0}C)	
	2014	2015	2014	2015	2014	2015
January	81.1	30.29	82	82	27.3	34.2
February	61.1	85.16	84	85	28.6	35.3
March	366.2	176.83	87	83	27.8	34.0
April	245.0	226.34	84	83	27.7	33.1
May	332.2	345.18	84	85	26.9	31.5
June	220.0	401.71	87	88	25.7	29.8
July	249.9	508.67	92	90	24.5	28.9
August	410.3	501.42	90	91	24.4	28.2
September	501.5	368.15	90	89	24.8	28.9
October	136.8	278.24	89	86	25.4	31.6
November	136.8	143.01	88	85	26.1	30.9
December	18.3	28.06	80	83	26.9	30.5
Mean	229.93	257.75	86.42	85.83	26.34	31.4

Source: Nigeria Meteorological Agency (NIMET), Margaret Ekpo International Airport, Calabar, Nigeria

4. Discussion

4.1 Effects of intra-row spacing on vegetative growth and yield of sunflower

Although dense planting may elicit apical response among plants leading to compensatory etiolation, as an attempt to intercept incident radiation and aerial resources, neither plant height nor number of leaves was significant in this study. Vijayalakshmi (1975) did not observe consistency in plant height and number of leaves at different sampling periods. Massey (1971) and Robinson *et al*. (1976) reported no significant effects of intra row spacing on plant height and number of leaves. However, Al-Doori (2012) reported increasing plant height with increase in plant density. Increasing leaf area and leaf area index which peaked at 75 x 30 cm IRS but decreased thereafter implies that the optimum leaf area expression was attained at this spacing, which corresponds to maximum solar radiation interception and assimilates partitioning. Vega *et al*. (2011) reported that row spacing may modify the availability of resources per plant, which according to Egli (1998), affects the plants ability for allocating maximum assimilates for seed set. The highest stem girth at 75 x 40 cm indicates possibility of higher assimilate partitioning as a result of reduced interplant competition. This is consonant with Vega *et al*. (2011) and also agrees with Lopez (1972) report that increase in IRS resulted in larger sunflower stalk diameter. Days to 50 % heading was not significant with respect to spacing, although Holt and Zentner (1985) reported significant differences in days to 50 % flowering for different row spacing regimes.

Larger head diameter at 75 x 35 cm did not necessarily result in higher achene yields. Rather the widest spacing of 75 x 40 cm resulted in significantly greater (P>0.05) achene yields (3.95 t ha^{-1}). Robinson *et al*. (1976) found no significant effects of intra-row spacing on seed size and yield of Sundak sunflower, whereas several workers have reported that increasing the IRS resulted in higher seed weight and increased yields (Curroti and Rosania, 1971; Lopez, 1972 and Al-Doori, 2012). However, Sedgli *et al*. (2008) reported that maximum seed yield, oil and protein quality occurred at lower spacing or dense population, which agrees with the findings in our current study.

4.2 Effects of variety on vegetative growth of sunflower

Although vegetative parameters except stem girth were significantly increased by variety effects, yield parameters except achene yield were not positively affected. The leaf area and LAI have a direct effect on biological yield production per unit of ground area due to interception of daily photosynthetic active radiation on the crop. Mohammed *et al*. (1992) attributed differences in seed yield between sunflower cultivars to morphological characters and yield component differentials. In the present study, SSL 806 and 803 had yields of 3.37 and 3.05 t ha^{-1} respectively above SSL 807 (2.07 t ha^{-1}), with a percentage increase of 9.49 and 38.57 % respectively.

4.3 Interaction effects of intra- row spacing and variety on vegetative growth and yield of sunflower in two seasons

The absence of significant interactions among several mean effects indicates that the individual treatments were acting independent of each other. However, significant interactions showed the complimentary effects of combined treatments (Tables 3). SSL 803 grew tallest (103.93 cm) at 75 x 30 cm; SSL 807 had highest number of leaves (23.43). At 75 x 30 cm, SSL 807 had the highest leaf area and LAI (138.47 cm, 1.15), while the widest girth (5.64 cm) occurred for SSL 807 at 75 x 40 cm. However these interactions did not transmute to the highest achene yield (5.61 t ha^{-1}) which rather occurred for SSL 806 at 75 x 40 cm. This suggests that SSL 806 at the spacing of 75 x 40 cm with a density of 33,333 plants ha^{-1} gave the best performance of all the varieties tested, perhaps affected by the fact that lower rainfall regime especially in 2014, accentuated yield performance over 2015. At lower density, better assimilate partitioning and reduced intra specific competition for resources are possible. This could be the main attributing reason for better yield of SSL 806 over other varieties. The non-significant effects of intra – row spacing and variety on the other traits, shows that each of these factors may have acted independently on those traits.

5. Conclusion

Intra-row spacing and variety effect on the growth and yield performance of three Sunflower varieties was demonstrated in Calabar in 2014 and 2015 planting seasons. The best performance of Sunflower was observed for variety SSL 806 sown at an intra –row spacing of 40 cm, which yielded the highest tonnage of sunflower seeds in Calabar. From the results, mean achene yield at 30 – 40 cm intra-row spacing was statistically at par and only higher ($p<0.05$) than the yield at 25 cm intra-row spacing. Also, varieties SSL 803 and 806 were statistically at par with respect to yield, and out yielded SSL 807 by 49.76 and 60.24 % respectively. Having established the performance potential of sunflower in Calabar rainforest zone, the nutrient requirement threshold and corresponding yield potential under full fertilization plan should be investigated. It can be concluded that all varieties tested in this trial could possibly adapt to the ecological zone with correspondingly good performance.

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