EFFECT OF INTRA SPACING ON THE GROWTH AND YIELD OF ROSELLE (*Hibiscus Sabdariffa* L.) IN JOS, PLATEAU STATE, NIGERIA.

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ABSTRACTS

The experiment was conducted at the Teaching and Research Farm University of Jos, Jos during the raining season of 2019\2020 to determine the effect of plant spacing on the growth and yield of Rosell Hibiscus sabdariffa L. It is laid out in [RCBD] with four [4] treatments replicated three [3] times. The treatment are 15cm by 75cm, 20cm by 75cm, 25cm by 75cm and 30cm by 75cm and the parameters of the studies are viz; PH, NB, LL, LW, data collected were subjected to ANOVA using a Statistical Analysis [SAS] and means were separated using Least Significant Difference [LSD]. Base on there sult obtained from this study, it shows that for optimum yield of hibiscus sabdariffa L, wider spacing of 30cm by 75cm shows superiority over other treatment, hence wider spacing is recommended for Hibiscus Sabdariffa L because at a wider spacing, plants do not compute for growth resources, and the plants has the oppoturnity to produce more numbers of productive branches and the more the productive number of branches, the more the yield.

INTRODUCTION

Background to the Study

Roselle *Hibiscus sabdariffa L*. originated from India and Malaysia where is commonly cultivated and must have been carries out on early date to Africa (Babaji*etal*.2004) in Nigeria, the major areas of production in Nigeria are Kogi. Bauchi, Niger, and Borno state (Aliyu, 2009). The green type is generally more common in the western part of the country. According to the Bebaji *et al.* (2004), in India, Africa and Mexico, all the above ground part of the plant are value in native medicine. Infusions of the leaves are regarded as diuretic, cholectic, febrifugal and hypothesize.

El-Naim and Ahmad (2010) stated that Roselle *Hibuscus sabdariffia var L*. is locally called "Kerkadi" InSudan, fully developed fleshy calyx is peeled off from the fruit by hand and dried natural consumable production. The plant normally grown as annual crop is 0.5 to 2 metre in height. It has a bushy shape with what dense canopy of dark green leaves, the colour of the calyx play important role in deterring the quantity of the crop. The crimson red colours is the characteristic and most popular and desirable colour of Roselle, while other colours. Exist, including the white or greenish white colour.

Traditionally the products from Roselle (*HibiscussabdariffaL.*) has been used for medical purposes for relief of soar throat and for healing wounds as an anti–septic recently, the crop has been greatly revived and is currently gaining importance in the manufacture of many small industries, e.g cosmetics, sweets, sauce, jams, and jellies and a substitute for a tea. And also used as a colouring materials for food and wine. It is also used in medicine, especially with problems related to the digestive track. The leaves are also used as a pot herb and some

varieties are grown for their fibre. The total cultivated Roselle area in Sudan during 1999/2000 season was estimated at 140,000ha (Elawad, 2000).

Importance of Roselle (*Hibiscus sabdariffa*)

Lim *et al.* (2011) reported that, specific extraction of *Hibiscus sabdariffa* exhibit activities against a therosclerosis liver disease, cancer, diabetes and other metabolic syndromes. It is also an important crop in tropical region, and the economic part of the plant is the fleshy (Sepal) and surrounding of fruit (capsule).

FAO, (1999) reported that Roselle has two main uses; as vegetable and for the preparation of beverages. Young Roselle shoots and Leaves are used to make soup.

Arvind M, (2011) Roselle is used in many folk medicines. It is valued for its mild laxative effect, ability to increase urination, relief during hot weather and treatment of cracks in the feet, bilious, sores and wounds.

The deep red tea calyxes are popular as a refrigerant; a beverage that helps lower body temperature in Egypt, preparation from the calyx has been used to stimulate dieresis. Elsewhere in North Africa, and the emollient lead pulps is used for treating external wound, free beverages tea (Neuwinger, 2000)

The calyx of the red type when partially boiled in hot water is strained and sweetened to taste, the latex is taken as a soft drink commonly known as Soborodo or simply sobo currently, it has good prospect for industrial purposes (Alegbego, 2000).

Statement of Problems

The production of Roselle is facing many problems which resulted in unstable total production. Factor limiting the yield of Roselle according to the research, (El Naim and Gaberelder, 2010) include the amount and distribution of rainfall, labour requirement for harvesting, the uses of poor cultural practices as well as tradition cultivars.

Sowing of Roselle on closed spacing lead to competition among the crop plant and effects of spacing on the yield and the growth of the plant.

Objectives of the Study

In the context of the above, this study is design to determine the desirable spacing for the growth and yield of leafy Roselle *Hibiscus sabdariffa* L. Var sabdariffa using organic manure (poultry drooping) in University of Jos, Plateau State.

The specific objectives are to:

* Determine the desirable plant population of Roselle in jos.
* Assess the effect of different spacing on the growth and yield of the leafy Roselle plant using poultry drooping.

Materials and Methods

Experimental Site

This field experiment was carried out at the teaching and research farm University of Jos, Plateau State located at latitude 8 and 10^0N and longitude 7^0 and 11^0E, and 25^0 East with an altitude of about 1,200mm above sea level of the middle belt of Nigeria. The topography of the area lays South of Guinea Savannah of Nigeria with a mean annual rainfall of and temperature between 10^0c and 32^0c (pam, 2009).

Treatment and Experiment Deign

The experiment was layout in a Randomize Complete Block Design (RCBD) with four (4) treatments namely; Broadcast (control) 15x75cm, 25x75cm, 2x75 cm and replicated three times on a plot measure 11x16m

Parameters of study

Plant height

The height of the plant sample in each replicate was measured using tape from base of the plants to the tip taking five (5) plants at random, then put on graduated tape and the average value was recorded.

Number of leaf/plant
The number of the leaves was counted from 5 sample plants in the middle and divided by the mean, number of leaves per plant was recorded.

Number of branches
The number of primary branches for the five (5) samples was counted to get the mean number of branches per plant.

Leaf fresh weight plant and leaf fresh weight/plot
Leaf fresh weight per stand and leaf fresh per plot was determined by using weighing balance.

Statistical Analysis
All data collections was subjected to analysis of variance (ANOVA) and the different between treatment means was compared using Duncan multiple range test to determine which treatment was significant.

Results and discussion

The effects of plants Spacing on some traits of Hibiscus sabdariff
Table 1 reveals that plant height was significantly (P≤5%) not affected at different plants spacing. Plant spacing 1 gave the highest plants height with the value of (26.05cm) and spacing four gave the lowest value of plants height (25.30cm). Each increase in the plant spacing does not lead to increase in plant height respectively. Hence, plants height was not significantly different from all the treatments.

Leave length was also not significantly affected by the increased in plant spacing. Treatment 1 and 3 produces the highest value of leave length, while treatment 4 shows least value in the leave length. This implies that the increase in the spacing does not results to variation in leave length.
None of the treatments significantly affects the leave width of H. Sabdariffa in this evaluation. However, treatment 4 gave the smallest leave width of (10.97) when compare with the other treatments as shown in Table 1 above.
The number of branches was also not significantly different among the different treatments studied. Treatment 1 and 3 gave the best value in the number of branches and treatment 2 poses the least value for number of branches.
Number of leaves was not significantly different for all the different plant spacing studied for *H. Sabdariffa*.

Table 1: The effects of plants Spacing on some traits of *Hibiscus sabdar*iff

TRT	PH	LL	LW	NB	LB
1	26.05	12.93a	11.61a	9.34a	4.58a
2	25.63a	12.70a	11.76a	8.93a	4.63a
3	25.93a	12.89a	11.66a	9.32a	4.66a
4	25.30a	12.73a	10.97a	9.06a	4.58a
SE+	0.59	0.36	0.39	0.15	0.04

Means with the same letters are not significantly different

Table 2: Mean values for growth performance of Hibiscus Sabdariffa at different weeks intervals.

Table2 reveals that the plants height was significantly (P>5%) affected by the increase in plant age. The plant was at peak of (35.06) in week 8 and further increase in plant age does not resulted in increased in plant height. The plant height achieved in week 6 was statistically thesame or at par with what was obtained in week 4 and 5 which shows not significant but statistically, the plant height at week 3 WAP But, there was a significant significant different at week 1-2 and 3 and also there was no significant different between 4-6 WAP and consequently, there was no significant between at 7 and 8 WAP from the value obtained in plant height.

Leave length were longer (18.47cm) at week 8 which was at per with the leave length at week 7 (17.16). The leave length rerecorded in week 6 was greater than leave length at 3 and 4 weeks but at per with that recorded for week 5. The leave length significantly tends to increase from week 3 through week 7.

Maximum leave width was recorded (18.05 and 16.87cm) at week 8 and 7 which were significantly wider than the leave length obtained in the other weeks of this evaluation. The leave length kept increasing at every fortnightly intervals.

More number of branches was noted in week 8 and 5 which were significantly the same with number of branches obtained at 6 and 7 weeks. The number of branches at week 6 was significantly more having more branches recorded at 3 and 4 weeks. There was no significant different in the number of branches in week 1 through week 4.The higher number of leaves was recorded in week 6 which was at per with number of leaves recorded in other weeks except in week 1, 2 and 3.Plant height was not significantly (P<0.005) affected by variety (Table 1). Supporting result obtained by ElNaim *et al.* (2012) who showed that crop density had no significant effect on plant height of roselle.The higher plant height was recorded at 26.05 cm; while, the lower value was recorded at 25.30cm. This could be due to high competition of plants to growth resources e.g light, nutrients, water and space. Contrasting evidences were reported by Talukder *et al.,* (2003) on okra, El Naim and Jabereldar (2010) on cowpea, Ramos *et al.*, (2011) on roselle, Wenyonu *et al.*, (2011) on okra, Zewdinesh *et al.*, (2011) on Artemisia annua and Mushayabasa *et al.,* (2014) on okra who stated that an increase in planting population will increase plant height. The tallest plants produced by the most densely populated plants might be attributed to the competition for sunlight and other growth resources among the plants that were crowded at the closer plant spacing (Maurya *et al.*, 2013).

Leaf area/plant was not significant (P<0.005) effect on leaf area/plant (Table 2 and Table 3). The highest leaf area/plant was recorded at intra-row spacing of 12.93cmx11.76cm; while, the lowest value was recorded at intra-row spacing of 12.70x10.97 (Table 2 and Table 3 Respectively). Leaf area/plant increased at increasing rate of intra-row spacing due to reduced competition of plants to light, water and nutrients. Supporting result was reported by Ijoyah *et al.*, (2010) who observed that leaf area per plant decreased as intra-row spacing reduced in okra.

Number of branches/plant was no significantly (P<0.005) affected by Spacing (Table 2). The higher number of branches/plant was recorded at 9.34, while, the lower value was recorded at 8.93 (Table 3). This could be due to the high vegetative growth nature of variety. Supporting results was obtained by Brar *et al.*, (2002) and Ali *et al.*,(2009) who reported that variety has no significant results on number of branches in cotton.

Table 2: Mean values for growth performance of Hibiscus Sabdariffa at different weeks intervals.

WEEKS	PH	LL	LW	NB	NL
1	9.720d	6.750e	2.660d	8.610d	4.490c
2	11.12d	8.020e	3.640d	8.760cd	4.530bc
3	27.20c	11.32d	10.57c	8.880bcd	4.520bc
4	29.15bc	12.73cd	11.90c	8.920bcd	4.620abc
5	29.67bc	13.55bc	13.89b	9.610a	4.600abc
6	30.24b	14.52b	14.42b	9.360abc	4.760a
7	33.65a	17.16a	16.87a	9.510ab	4.660abc
8	35.06a	18.47a	18.05a	9.640a	4.690ab
CV	11.2	13.7	16.7	7.9	4.1
SE±	0.8f33183	0.505481	0.552826	0.207814	0.0551045

Means with the same letter are not significantly different.

Discussion, Conclusion and Recommendations

In this study, it was observed that increase in spacing does not significantly affect the plants height but, there was a significant different in all parameters. This observation has agreed with the study of Laghan et al., (2003) that increase in fruit weigth was significantly affected by intra-row spacing of okra which also agreed with the study of Weiner (1990) who reputed that yield per unit area increased as plant density decreased Mohammed et al., (2001). It also reported that, the higher pod weight per okra plant, the lowest plant density was recorded. Its also observed that, plant height per plant has not increase with increase in intra-row spacing, but the leave length has increase with increasing in intra-row spacing. The results reveal that, the plant height was significantly (P<5%) affected by the increase in plant ages. The plant height was at peak (35.06cm)at 7 WAP but further increase in plant age does not resulted in increased plant height. The plant height achieved in week 6 was significantly the same with that of week 4 and 5 which were not different with the plant height of week 3. Leave length were longer (18.47cm) in week 8 which was at par with the leave length at week 7 (17.16cm). The leave lengths recorded in week 6 was greater than leave length and 4 weeks but at par with that recorded for week 5. The leave length significantly tends to increase from week 3 through week 7. Maximum leave width was documented (18.05cm and 16.87cm) in week 8 and 7 which were significantly wider than the leave length obtained in the other weeks of this evaluation. The leave width kept increasing at every two weeks interval. More number of branches was noted in week 8 and 5 which were significantly the same with number of branches obtained at 6 and 7 weeks. The number of branches at week 6 was significantly more than branches recorded at 3 and 4 weeks. There was no Significant different in the number of branches at week 1 through week 4. The highest number of leaves was recorded in week 6 which was at par with number of leaves recorded in other weeks except week 1, 2 and 3.

Base on the study, it is concluded that 30 x 75 cm is recommended for *Hibiscus sabdariffa*. Based on the above result, it was observed that the wider spacing of 30 x 75 cm is highly recommended in the growth and yield of Roselle plant.

REFERENCES

Ali A., Tahir M., Ayub M., Ali I., Wasaya A., and Khalid F., (2009): Studies on the Effect of Plant Spacing on the Yield of Recently Approved Varieties of Cotton. *Pak. J. Life. Soc. Sci.*, 7(1), pp25-30.

Brar Z. S., Singh N., Deal J. S., (2002): Influence of Plant Spacing and Growth Modification Practices on Yield and Its Attributing Characters of Two Cotton Cultivars (*Gossipium hirsutum L.*,). *J. Res.*, 39, pp 181-183.

E–Awad, H. O (2001) Roselle Production in Sudan during the Season (1970/71–84/84and95/2000/2001). Elobied Research Station. Elobied Sudan.

El-Naim, A., and Ahmad, S. E., (2010a), Effect of Weeding Frequencies on Growth and Yield of Two Roselle (*HibiscusSabdariffa*) Varieties under Rainfed. *Australian Journal of Basic and Applied Science*, 4(a): 4250–4255.

El-Naim A. M., Jabereldar A. A.,(2010): Effect of Plant Density and Cultivaron Growth and Yield of Cowpea (*VignaunguiculateL.Walp*). *Austria Journal of Basic. Applied Science*., 4(8), pp 3148-3153.

El-Naim A. M., Khaliefa E.H., Ibrahim K.A., Ismaeil F.M., & Zaied M.B., (2012): Growth and Yield of Roselle (*Hibiscus sabdariffa L.*) as Influenced by Plant Population in Arid Tropic of Sudan Under Rain-Fed. *International Journal of Agro Forest*., 2(3), pp88-91.

El-Naim., A.M., Edoma, M.A., and Abdalla A.E., (2010b). Effects of Weeding Frequencies and Plant Densityon Vegetative Growth Characteristics of Groundnut (*Arachis hypogeal L.*) In North Kordopan of Sudan. *International Journal of Applied Biology and Pharmaceuticals Technology,* 1(3). Pp1188–1193.

FAO (1999). Traditional Food Plants; a Resource Book for Promoting the Exploitation and Consumption of Plants in Arid, Semi–arid and Sub–humid Lands of Eastern Africa FAO Food and Nutrition Paper 42. Food and Agriculture Organisation. Rome, Italy. Pp593.

Lin, H.H., Chen J.H., Wang, G., (2011): "Chemo Preventive Properties and Macular Mechanisms of the Bioctive Compound in (*HibiscusSabdariffa*) Linen" Correct me Decimal Chemistry 18 (8): 124–5–54.