BIJE – Bichi Journal of Education
ISSN(Print): xxxx-xxxx ISSN(Online): 2734-3375
Vol. 10, No.1 2010; pp: 101-112.
Publisher: School of Education, F.C.E (T) Bichi.
URL: https://bijejournal.com/BIJE

EFFECTS OF STAND DENSITY AND SOWING DATE ON THE GROWTH OF ROSELLE *(Hibiscus sabdariffa L.)*

DAUDA IBRAHIM DAUDAWA
DEPT. OF AGRIC. ISA KAITA COLLEGE OF EDUATION.
DUTSIN-MA KATSINA STATE.

ABSTRACT

Field experiment were conducted during the wet seasons in 2005 and 2006 at Samuru in the Northern Guinea Savanna to study the effect of varying number of plant per stand using 1,2,3,4 and 5 plants per stand and four sowing dates (30th July, and 14th July and August) on the growth of Roselle. Factorial combinations of the treatments were laid out in a Randomized Complete Bock Design and replicated three times. The highest stand density of 5 plants per stand significantly produces tallest plants, lowest number of leaves and branches. One plant per stand generally improved the growth of the crop. Similarly, sowing Roselle in June also resulted in good growth of the crop.

INTRODUCTION

Roselle or sorrel (Hibiscus sabdariffa L.) belongs to the family Malvaceae and is native of India and Malaysia, where were commonly cultivated. From there, cultivation of the crop spread to other parts of Africa. (Lakshmi et.al, 1994). The crop is an herbaceous upright plant growing up to 2-3m in height (Rice et.al; 1993 Messiaen, 1993). The leaves vary in size and shape; the flowers are yellow or red sometimes with dark red centers. The edible calyx is bright red, some yellow or brown and swells to become fleshy. The fruit are up to 2.5cm in length and seed contains 17% oil (Rice et.al., 1993). Roselle grows best in tropical and subtropical regions from sea level up to 900m. India, it requires a rainfall of about 1500-2000mm during its growing season (Gupta, 1989). Where rainfall is adequate, irrigation can be used as supplement. The crops grow on a deep sandy loam soil. It cultivated throughout West Africa, especially in Sierra

Leone, where is being intercropped with over vegetables (Kirby, 1993). In Nigeria, it is customary to grow it in mixture with other crops, such cereals, tree crops and on the boarders or edges of fields devoted to other crops. Roselle is usually propagated by seed, but grows readily from cuttings which result in shorter plants preferred in India for inter-planting with tree crops though the yield of calyx obtain from this type of inter-cropping is relatively low (Gupta, 1989). Seedlings may also be raised in beds and transplanted when it is 7.5 to 10cm high, but seeds are commonly planted directly in the field.

Roselle is a short - day plant. Chemical fertilizer may not be required, however, basal dose phosphorous at the rate of 30kg /ha and 50kg N/ha of nitrogen in two split doses may be applied for better yield (Aliyu, 2005). Commercial NPK fertilizer has also proved satisfactory (mansur et,al. 1995). Weeding is necessary and can be done manually at the initial stage though at 45 to 60cm height, weeds are shaded out. Harvesting of Roselle is timed according to which part is desired. For herbage purposes, the plant may be cut off 6 weeks after transplanting depending on the variety (Sarma, 1967). As the fruits of rosella ripen progressively tiers of the last of the fruits are allowed to mature. At this time the plants are cut down, stacked for a few days and then threshed. The yied in Roselle like other corps depends on proper agronomic practices and variety. Taller varieties that have more leaves yield better (Aliyu, 2005). However, calyx yield under favourable condition may range between 3 to 3.5 t/ha.

In Nigeria the leaves are normally cooked either fresh or dried and mixed with groundnut cale for eating while the dried calyx can be boiled to make juice (Zobo drink). The seeds are somehow better but are roasted as a substitute for coffee (El-Adawy and Khali, 1994). The seeds contain 17% oil (Rice et al, 1993)> nutritionally, 100g of the fresh calyx contains 1.5g protein, 2.61g fat, 12.0g ash, 126mg calcium, 273.2 phosphorous, 8.98mg iron, 0.029mg carotene, 0.117mg thiamine, 0.277mg riboflavin, 3.76mg nniacin, 6.7mg ascorbix acids and 9.2g moisture including all the essential amino acids in reasonable quantities (Rahman et al., 1991). Both the fresh leaves and seed contains reasonable amount of protein fat and carbohydrate. The seeds are excellent feed for chicken, the residue after oil extraction is valued as cattle feed. The leaves or calyxes are used as diuretic to decrease blood viscosity and stimulate intestinal peristalsis in Africa and elsewhere. The Roselle extract reduces blood pressure. Calyx infusion called sudan te’ is taken to relieve cough in East Africa. The voiled leaves are applied to cracks in the feet, on boils and ulcers for medication. A lotion made from the leaves is used on sores and wounds.

OBJECTIVES OF THE STUDY

The objectives of this study are to investigate:

1. the effect of stand density on the growth of Roselle
2. the effect of sowing date on the growth of Roselle
3. the interaction of stand density and sowing date on the growth of Roselle.
4.

MATERIALS AND METHODS

Experimental site:

Fields experiment were conducted during the 2005 and 2006 wet seasons at the research farm of the institute for Agricultural Research (IAR), Samaru (11°11'N, 7°38'E) in the Northern Guinea Savanna ecological zone of Nigeria.

TREATMENT AND EXPERIMENTAL DESIGN

The treatment consisted of four different sowing dates at intervals of two weeks each, starting from 30th June to 11th August, 2005 (end of June, middle of July, end of July and middle of August) and five stand densities viz: 1,2,3,4 and 5 plants/hole (26,666,53,332,79,998,106,664 and 133,330 plants/hectare, respectively) that were factorily combined and laid out in randomized complete block design. The treatments were replicated three times.

CULTURAL PRACTICES

The land was ploughed, harrowed, ridged and marked out into plots. The gross plot size was 11.3m^2 (3x3.75m) involving four rows while the net plot size was 9 m^2 The plants were sown as per the sowing date treatment in both years. The plant/stand were spaced at 75x50cm using seed rate in accordance with the standard population for each treatment. Local variety (Samaru 1882) of Roselle was used. Hoe weeding was carried out at intervals of three to keep the plots weed free. A total of four hoe weeding were carried out beginning from three weeks after sowing (WAS) Nitrogen fertilizer at the rate of 50kgN/hectare was applied in two split doses at 3 and 6 WAS at the rate of 25kgN/ha each using urea fertilizer. However, there was a basal application of 30kgP_2O_5/hectare at planting using single super phosphate fertilizer.

DATA COLLECTION.

Recording of observations were done at 4,6,8 and 10 WAS on the following growth parameters.

Plant Height: Four plants were randomly tagged/plot. The heights of the tagged plants were measured in centimeters from the ground level of tip of the plants using a meter rule. Mean height per plants was later determined.

Number of Leaves/Plants: This was taken by counting the total number of leaves from the tagged plants and the mean was later calculated.

Number of Branches/Plants: This was taken by counting the total number of branches from the tagged plants and later the mean determined.

RESULTS AND DISCUSSION

EFFECT OF STAND DENSITY AND SOWING DATE ON PLANT HEIGHT.

Table 1 shows the effect of varying stand densities and sowing dates on plant height of Roselle at 4,6,8 and 10 weeks after sowing (WAS). Highest stand density of 5 plants/stand significantly produced the tallest plants in both years when compared with lowest density which had the shortest plant. Showing on 30th June at all sampling periods except at WAS of 2006 significantly resulted in taller plants in both years. Sowing on 14th July produced tallest plants at 4 WAS in 2006, each delay in sowing resulted in significantly shorter plants as 8 and 10 WAS in both seasons.

Table 2 shows the interaction between stand density and sowing date of Roselle on height at 8 WAS in 2005. When different sowing dates were compared at the sane density, it was observed that at 8 WAS in 2005 wet seasons, 2 plants/stand produced tallest plants while 3,4 and 5 plants per stand were statistically at par but taller than 1 plant/stand.

NUMBER OF LEAVES/PLANT

Table 3 shows the effect of stand density and sowing date on the number of leaves of Roselle/plant at different sampling periods of the two year trials. One plant/stand significantly had more leaves per plant compared with other densities in both years. Similarly, sowing on 30th June significantly resulted in higher number of leaves/plant in both years. However, there were no significant differences in leaves produced by plants sown on 30th June and 28th July and also between 30th June and 14th July at 4 and 6 WAS respectively in 2005.

NUMBER OF BRANCHES/PLANTS

Table 4 shows the effect density and sowing date on the number of Roselle branches/plant at different periods of sampling. One plant/stand had significantly recorded higher number of branches/plant between 6 - 10 WAS in both years. The difference in number of branches/plant between 1 and 2 plants/stands at 4 WAS in 2005 and in all the densities at 4 WAS in 2006 was no significant. Sowing on 14th July significantly result in higher number of branches/plants compared to those sown on 30th June at 4 WAS in 2006 was not significant. Each delay in sowing significant interaction between stand densities and sowing date of Roselle on the number of branches/plant at 10 WAS (Table 5) in both years. In the table when 2 and 3 plants/stand were used, each delay in sowing resulted in significant reduction in number of branches/plant.

CONCLUSION

From the study, it can be concluded that early planting of Roselle using 1 plant/stand improved both number of leaves and branches but decreased plant height.

RECOMMENDATION

Farmers in the Northern Guinea Savanna should plant Roselle earlier (in June) and use fewer stand density (1 plant/stand)

REFERENCES

Aliyu, L. (2005). Evaluation of the agronomic, genetic variability and heritability in Roselle *(Hibiscus sabdariffa L.)* at Samaru Nigeria. *Crop Research.* 30 (3): 409-413

EL-Adawy, T.A. and Khalil, A.H. (1994). Characteristics of Roselle seeds as a new source of protein and Lipid. *Journal of Agriculture and Food Chemistry* 42 (9): 18961900

Gupta, S.K (1989). Studies on intercropping in Roselle *(Hibiscus sabdariffa L.)* Indian *Phytopathology* 34 (3): 361-363

Kirby, R.H. (1963). Vegetable fibres, Leonard Hill; London PP.358

Lakshmi, M.B, Naidu, M.V. Reddy C.V. (1995) .Effect of time of sowing and topping on seed yield of roselle *(Hibiscus sabdariffa L.) Indian journal of Agronomy* 40 (4):682-685

Mansur, CP, Kubsad, V.S, Gowda, D.S. (1995). Nutrient uptake in mesta (Hibiscus sabdariffa L.) under varying fertilizer combinations *Madras Agricultural Journal.* 82 (68): 480-482.

Messiean, C.M. (1994). The tropical vegetable Garden 1st ed. CTA Macmillan, London. Pages 428

Rahman, M.M. Anwar, K. Maniruzzaman, A.F. and Roy, N.C. (1991). Effect of topping of cotton sown on different dates *Bangladesh journal of scientific and industrial Research.* 26 (1-4)

Rice, R.P. Rice, L.N. and Tindal, H,D. (1993). Fruits and Vegetable production in Warm Climate. 2nd ed. The Macmillan Press, London. Pages 533

Sarma, M.S. (1967). Breeding procedures for hibiscus. Indian Council of Agricultural Research Tech.Bull (Agr.) No. 11, New Delhi, India.PP.22.

Table 1: height of Roselle as affected by stand density and sowing date during 2005 and 2006 wet seasons at Samaru

Plants height (cm)

Treatment	2005				2006	
Stand Density (P)	4 WAS	6 WAS	8 WAS	10 WAS	4 WAS	6 WAS
	8 WAS	10 WAS				
1. plants/stand	13.61c	22.70c	31.4d	38.37b	13.37b	19.47b
	25.76c	38.09d				
2. plants/stand	13.43c	24.72c	34.89c	42.05d		
	13.48ab	19.48b	27.25bc	41.58d		
3. plants/stand	13.89bc	27.62b	37.94c	50.22c		
	14.29ab	19.49b	29.63b	49.20c		
4. plants/stand	15.09b	28.89b	41.98b	57.55b		
	14.45ab	21.73ab	29.24b	60.54b		
5. plants/stand	17.59a	33.33a	46.65a	62.84a	15.03a	23.35a
	36.85a	80.21a				
SE ±	0.486	0.937	1.099	1.214	0.509	0.749
	1.030	1.984				
Sowing Data (D)						
30th June			55.40a	63.58a	15.26b	28.11a
	17.48a	32.38a				
	33.23a	62.93a				
14th July	15.01b	32.28a	45.70b	53.64b	18.33a	24.82b
	31.97a	42.04c				
28th July	13.87b	23.90b	28.16c	25.74d	11.24c	14.15c
	25.09c	55.53b				
11th August	12.52c	20.37c	25.08d	47.95c	11.65c	15.73c
	28.69b	55.12b				
SE ±	0.434	0.838	0.983	1.086	0.455	0.670
	0.922	1.775				
Interaction						
P X D	NS	NS	**	NS	NS	NS
	NS	NS				

Means in a column of any set of treatment followed by different letter (s) are significantly different at 5% level using DMRT **= Significant at 1% level NS = Not significant

Table 2: interaction between stand density and sowing date on plant height (cm) at 8 WAS during 2005 wet at samaru

Treatment sowing Date (D)

Stand Density (P)	30th June	14th July	28th July	11th August
1.	49.60c	34.44e	23.30f	18.50g
2.	58.29ab	35.66e	22.87f	22.74f
3.	56.37b	42.85c	28.90f	23.61f
4.	56.09b	53.26b	30.13e	28.44f
5.	56.64b	62.30a	35.59e	32.08e
SE ±	2.197			

Interaction means followed by different letter (s) are significantly at 1% level of significance using DMRT.

Table 3: Number of leave/plant of Roselle as affected by stand density and sowing date during 2005 and 2006 wet season of Samaru

Number of Leaves/Plant

Treatment	2005					2006				
Stand Density (P)	4 WAS	6 WAS	8 WAS	10 WAS	1	4 WAS	6 WAS	8 WAS	10 WAS	1
1. plants/stand	14.25a	28.56a	38.56a	52.02a	6.06a	12.60a	26.25a	34.08a		
2. plants/stand	11.60b	22.07b	31.04b	44.60b	5.24b	10.40b	15.64b	19.99b		
3. plants/stand	10.33bc	21.12b	27.29c	37.13c	5.00b	8.76c	13.51bc	18.53b		
4. plants/stand	10.20bc	21.35b	27.36c	33.07cd	5.00b	8.52cd	11.32c	17.92b		
5. plants/stand	9.38c	20.31b	25.61c	29.73d	4.73b	7.97d	12.42bc	15.38b		
SE ±	0.577	0.718	1.154	1.674	0.272	0.255	1.292	2.100		
Sowing Date (D)										
30th June	14.67a	30.76a	32.30a	37.32a	52.42a	60.91a	7.99a	18.34a		
14th July	11.32b	13.80b	30.93a	15.11b	34.92b	39.62a	5.14b	7.50b		
28th July	13.35a	9.36c	19.24b	18.78b	22.08c	26.69c	4.41c	6.66c		
11th August	5.27c	9.39c	8.25c	13.51b	10.46d	30.02c	3.29d	6.11c		
SE ±	0.516	1.156	0.642	1.876	1.032	1.497	0.244	0.228		
Interaction										
P X D	NS	NS	NS	NS	NS	NS	NS	NS		

Means in a column of any set of treatment followed by different letter (s) are significantly different at 5% level using DMRT

NS = Not significant

Table 4: Number of branches/plant of Roselle as affected by stand density and sowing date during 2005 and 2006 wet season of Samaru

Number of branches/Plant

Treatment	2005				2006	
Stand Density (P)	4 WAS	6 WAS	8 WAS	10 WAS	4 WAS	6 WAS
	8 WAS	10 WAS				
1. plants/stand	3.60a	9.31a	12.15a	18.79a	2.10	6.13a
	12.52a	15.50a				
2. plants/stand	3.57a	5.92b	10.32b	14.25b	1.87	4.76b
	6.61b	8.62c				
3. plants/stand	3.09a	5.56b	8.37c	10.68a	1.99	4.37b
	6.51bc	18.53b				
4. plants/stand	2.50b	4.97b	6.00d	8.65d	1.81	4.30bc
	6.75b	8.32c				
5. plants/stand	1.94c	3.37c	3.86e	5.47e	1.88	3.62c
	5.92b	7.23c				
SE ±	0.577	0.718	1.154	1.674	0.272	0.255
	1.292	2.100				
Sowing Date (D)						
30th June	4.05a	8.02a	13.04a	19.33a	1.65b	7.75a
	12.10a	15.09a				
14th July	2.69b	7.58a	9.53b	11.69b	3.39a	5.71b
	8.05b	95.0b				

28th July		3.68a	5.15b	7.12c	8.75c	1.45bc
	3.05c	7.33b	9.37b			
11th August		1.34c	2.56c	2.86d	6.50d	1.22c
	2.02d	4.41c	6.63c			
SE ±		0.159	0.326	0.305	0.561	0.009
	0.222	0.618	0.520			
Interaction						
P X D	NS	NS	NS	NS	NS	
	NS	NS	NS			

Means in a column of any set of treatment followed by different letter (s) are significantly different at 5% level using DMRT

** Significant of 1% and 5% levels respectively

NS = Not significant

Table 5: Interaction between stand density and showing date on the number of branches/plant at 10 WAS during 2005 and 2006 wet season as samaru

Number of branches/plant at 10 WAS

Treatment 2005 2006

Stand Density (P) Sowing Data (D)

Sowing Data (D)

	30th June,	14th July,	28th July,	11th August	30th June,
	14th July,	28th July	11th August		
1.	30.67a	22.08c	13.17d	9.25ef	23.92a
	14.50b	16.08b	7.50		
2.	26.06b	13.21d	9.54e	8.17e	14.83b
	11.87c	10.34c	7.21		
3.	19.72c	10.50d	7.70e	4.80f	14.36b
	7.02d	7.97d	5.14		
4.	12.72d	8.08e	8.82e	5.54f	12.56c
	6.63d	7.31d	6.79		
5.	8.05e	4.60f	4.50f	4.73f	9.77c
	7.48d	5.13d	6.53		

SE ± 1.254

Interaction means in the year followed by different letter (s) are significantly at 1% level of significance using DMRT