



**PERFORMANCE OF OKRA (*ABELMOCHUS ESCULENTUS* (L) MOENCH) AS
INFLUENCED BY DIFFERENT SPACING IN MAIDUGURI, BORNO STATE, NIGERIA**

Dala, A. B., Babagana, M. and Usman, A.

Department of Crop Production, Faculty of Agriculture, University of Maiduguri

Corresponding Author's Email: bgmuktar@unimaid.edu.ng

ABSTRACT

The experiment was carried out to determine the effects of plant spacing on the growth and yields of okra (*Abelmoschus esculentus* (L) Moench). The variety used was NHEA47-4. The experiment was conducted at teaching and Research Farm, Department of Crop Production, faculty of Agriculture, University of Maiduguri. The treatment consisted of four (4) plant spacings (60x30cm, 45x20cm, 70x35cm and 80x40cm), laid out in a Randomized Complete Block Design (RCBD) and replicated three times. Data were collected on; plant height, number of leaves per plant, number of branches per plant, days to 50% flowering, number of fruits per plant, fresh fruits weight per plant and fruit yield per plot which was converted in fruit yield per hectare. The data obtained were subjected to statistical analysis using the procedure for analysis of variance (ANOVA). Significance mean was compared using the least significant differences (LSD) at 5% level of significance. Results from the study showed that, spacings had no significant effect on growth parameters, however, 70 x 35cm spacing performed better than the other treatments assessed as it produced the highest (1.73) number of fruits per plant, highest (27.98g) fresh fruits weight per plant and highest (1008.30 kg/ha) fresh fruit yield per hectare. Based on the results of this findings, 70 x 35cm spacing is recommended for optimum production of okra in the study area.

Keywords: Okra, Performance, Spacing

INTRODUCTION

Okra (*Abelmoschus esculentus* (L) Moench) is one of the vegetable crops with great importance. It is an annual vegetable crop of high level of benefits to the general populace (Adesina and Wiro, 2020). Okra is a popular vegetable in tropical and subtropical countries of the world, and it is grown for its 'Pod' (Adelakun *et al.*, 2010). Okra is a plant belonging to the family Malvaceae and has been duly domesticated as a vegetable crop. The crop is believed to have originated from tropical Africa although now widely cultivated throughout the tropic, sub-tropic and the warm temperate regions (Farinde *et al.*, 2017). The leading world producing Okra countries are India with 4,528,000 tons per year while Nigeria is second with 1,039,000 million ton in 2.7 million hectares. Others are Sudan, Iraq and Cote d'Ivoire with 223,650 million tons, 132,015 and 115,867 million tons, respectively. On percentage basis, India alone account for 67% of world production followed by Nigeria with 15% and Sudan with 3% while Iraq and Cote d'Ivoire with 2%, respectively (FAO, 2010). In Nigeria, okra ranks first amongst other fruit vegetable crops (Babatunde *et al.*, 2017). Its production constituted about 4.6% of the total staple food production in the years 1970–2003 (CBN, 2004). The west and central Africa (WCA) regions accounts for more than 75% of okra produced in Africa, but the average productivity in region is very low (2.5 t/ha) compared to East (6.2 t/ha) and North Africa (8.8 t/ha) (Kumar *et al.*, 2017). Nigeria is the largest producer (1,039,000 t) followed by Sudan, Cote d'Ivoire, Ghana and others (FAOSTAT, 2010). It is a source of calorie (4550Kcal/kg) for human consumption. Although the crop is classified mostly by plant height, size of fruit, colour of fruits, maturity period (early or late maturing) some prominent varieties in circulation include: lady finger, long pod, dwarf green pods, white velvet, green velvet, (Christo and Onuh, 2005; Udoh *et al.*, 2005).

Okra cultivation is widely practiced in Nigeria because of the importance attached to the crop as an important food vegetable. The crop is cultivated mainly for its immature fresh fruits which are used as vegetables in making soup or dried and milled to powder for use as flavouring (Philips *et al.*, 2010). It improves heart health, eyesight & cholesterol levels (Gorinstein *et al.*, 2001). Okra fruit provide numerous health benefits which are useful in treating cardiovascular, coronary heart diseases,



diabetes, digestive disease, genitor urinary disorders and chronic dysentery (Peter, 2011). The stems and leaves of okra are used as animal feed; the seeds are dried and ground for making coffee. It is a multipurpose crop due to various uses of the fresh leaves, buds, flowers, pods, and seeds (Mihretu *et al*, 2014). It is currently grown mainly as a vegetable crop and has potential to be cultivated as an essential oil seed crop with (20-40%) oil content (Sorapong, 2012). It contains valuable ingredients for body building, maintenance, repairs and disease defensive mechanism (Edet and Etim, 2007; Bakhru, 2003). It is a source of carbohydrates, protein, vitamins A, B1 and C, calcium, potassium, dietary fibre, and mineral matters (Adeboye and Oputa, 2016).

Okra tolerates a wide variety of soils, but prefers a well-drained sandy loam with pH of 6-7 and soil with high organic matter content. The pod mucilage has its medicinal properties as an emollient laxative and expectorant. It also contains protein which plays a particular important role in human nutrition. Okra has been called “a perfect villagers vegetable” because of its robust nature, dietary fiber and distinct seed protein balance of both lysine and tryptophan amino acid unlike the protein of cereals and pulses (FAO, 2010). The objective of this study is to assess the effect of different spacing on growth and yield of okra in Maiduguri

MATERIALS AND METHODS

The experiment was conducted at teaching and Research Farm, Department of Crop Production, faculty of Agriculture, University of Maiduguri. The farm is located between latitude 13.4°E and longitude 11.4N and at altitude of 352mm above sea level. The site was located in the Sudan Savanna ecological zone of Nigeria. The experiment was conducted during 2021 dry season.

The treatment consisted of four spacings (60x30cm, 45x20cm, 70x35cm and 80x40cm), laid out in a Randomized Complete Block Design (RCBD) with three replications. The four spacings were assigned randomly to plots in the blocks using a table of random numbers. The total experimental area was 8m x 9.5m (76m²) and was divided into twelve (12) plots of 2m x 2m (4m²) size with 1m alley between replications and 0.5m between plots. Data were collected on; plant height, number of leaves per plant, number of branches per plant, days to 50% flowering, number of fruits per plant, fresh fruits weight per plant and fruit yield per plot which was converted in fruit yield per hectare. The data obtained were subjected to statistical analysis using the procedure for analysis of variance (ANOVA). Significance mean was compared using the least significant differences (LSD) at 5% level of significance.

RESULTS AND DISCUSSION

Plant Height

Table 1 showed the result of effect of spacing on plant height per plant. The result revealed that, there was no significant ($P>0.05$) differences between the treatments on plant height at 45, 60 and 75 days after sowing (DAS). However, significant ($P<0.05$) difference between the treatments were observed at 30 days after sowing (DAS). The tallest plant was recorded in spacing of 45cm x 20cm while the shortest plant was recorded in spacing of 80cm x 40cm. This might be attributed due to the competition for light and other growth resources among the plants that were crowded at the spacing of 45cm x 20cm. These results agree with the findings of Ekwu and Nwoku (2012) who observed significant rigorous tall plants with closer plant spacing than wider plant spacing due to intra specific competition.

Table 1: Effect of Spacing on Plant Height per Plant of Okra

Spacing (cm)	<u>Plant height (cm)</u>			
	30 DAS	45 DAS	60 DAS	75 DAS
60 x 30cm	6.33	7.14	9.63	14.83
45 x 20cm	7.63	8.39	11.94	18.73
70 x 35cm	6.44	7.14	9.53	16.12
80 x 40cm	5.20	6.25	9.39	15.43
LSD (0.05)	2.04	NS	NS	NS

DAS = days after sowing

NS = not significant

LSD = Least significant differences

Number of Leaves

Table two shows the result of effect of spacing on number of leaves per plant. The result indicated that spacing had no significant differences ($P>0.05$) between the treatments on number leaves per plant. However, the highest number of leaves were observed in spacing of 45cm x 20cm when compared with 80cm x 40cm spacing which produced the lowest number of leaves.

Table 2: Effects of Spacing on Number of Leaves per Plant of Okra

Spacing (cm)	<u>Number of leaves per plant</u>			
	30 DAS	45 DAS	60 DAS	75 DAS
60 x 30	6.00	6.93	8.20	10.73
45 x 20	6.20	7.00	8.33	11.60
70 x 35	6.27	7.00	8.00	11.00
80 x 40	6.33	6.47	7.27	10.60
LSD (0.05)	NS	NS	NS	NS

DAS = days after sowing

NS = not significant

LSD = Least significant differences

Number of Branches

Table 3 showed result of the effects of spacing on number of branches per plant and days to 50% flowering. The result indicated that, the respective plant spacing did not show any significant ($p>0.05$) differences on the number of branches per plant and days to 50% flowering. However, spacing of 70 x 35cm produced the highest number of branches per plant compared to 60cm x 30cm, 45cm x 20cm and 80cm x 40cm spacings respectively. Nevertheless, flowering was early expressed in 80cm x 40cm spacing which was followed by spacings of 60cm x 30cm and 45cm x 20cm and much delayed in 70cm x 35cm.

Table 3: Effects Spacing on Number of Branches per Plant and Days to 50% Flowering

Spacing (cm)	<u>Number of branches per plant</u>			Days to 50% flowering (%)
	60 DAS	75 DAS	90 DAS	
60 x 30cm	1.87	2.27	4.40	64.67
45 x 20cm	1.67	2.53	4.27	63.33
70 x 35cm	1.93	2.60	4.47	63.00
80 x 40cm	1.40	2.20	4.40	67.00
LSD (0.05)	NS	NS	NS	NS

DAS = days after sowing

NS = not significant

LSD = Least significant differences



Yield Components

The effects of spacing on yield components of okra are presented in Table 4. The results indicated that, there were significant differences ($p < 0.05$) between the treatments with respect to number of fruits per plant, fresh fruits weight per plant and fresh fruit yield per hectare. Spacing of 70 x 35cm produced the highest number of fruits per plant with mean value of 1.73. This was followed by 80 x 40cm spacing with mean value of 1.40 which did not differ significantly from 45 x 20cm spacing with 1.25 number of fruits per plant. Spacing of 60 x 30cm produced the lowest (1.09) number of fruits per plant. Moreover, 70 x 35cm spacing recorded the highest fresh fruits weight of 27.98g per plant whereas spacing of 60 x 30cm recorded lowest (13.51g) fresh fruits weight per plant. Furthermore, 70 x 35cm spacing produced the highest fresh fruit yield of 1008.30 kg/ha. This was followed by spacing of 80 x 40cm with 608.30, then 45 x 20cm with 408.31 and 60 x 30cm spacing with 291.70 which did not differ significantly from each other. Spacing 60 x 30cm produced the least fresh fruit yield with 291.70 kg/ha. The result obtained are close confirmative to finding of Firoz *et al.*, (2007). The fresh weight of fruit is increased with increase in spacing due to widest spacing which might be due to more accumulation of dry matter on fruit by the plant.

Table 4: Effect of Spacing on Yield Components of Okra

Spacing (cm)	Number of fruits per plant	Fresh fruit weight per plant (g)	Fruit yield per hectare (kg/ha)
60 x 30	1.09	13.51	291.70
45 x 20	1.25	17.35	408.31
70 x 35	1.73	27.98	1008.30
80 x 40	1.40	22.44	608.30
LSD	0.23	4.49	393.02

LSD = Least significant differences

CONCLUSION AND RECOMMENDATION

Based on the finding of the above study, it can be concluded that spacing of 70 x 35cm had the highest yield components when compared with other spacings assessed. It is therefore recommended for farmers in the study area.

REFERENCES

- Adeboye, O.C. and C.O. Oputa. (2016). Effects of galex on growth and fruit nutrient composition of okra (*Abelmoschus esculentus*). *Ife Journal of Agriculture*. **18**(1&2): 1-9.
- Adelakun OE, Ade-Omowaye BIO, Adeyemi IA, Van De Venter M (2010) Functional properties and mineral contents of a Nigerian okra seed (*Abelmoschus esculentus* Moench) flour as influenced by pretreatment. *Journal of Food Technology*, **8**: 39-45.
- Adesina OL, Wiro KO. (2020). Impact of spacing on the growth and yield characteristics of okra (*Abelmoschus esculentus* (L) Moench) in southern region of Nigeria. *International Journal of Multidisciplinary Research and Development*, **7**(10): 64-67.
- Anonymous. 2012. Complete package and practices for cultivation of vegetable crops in Himachal Pradesh. Directorate of Extension Education Publication, CSK Himachal Pradesh Agricultural University, Palampur, India, pp. 213.
- Anonymous 2013. Package of Practice for Cultivation of Vegetables. Additional Director of Communication Publication, Punjab Agricultural University, Ludhiana, pp. 158.
- Babatunde, R.O., Omotesho, O.A and Sholotan, O.S. (2017): Socio-economic Characteristics and Food security status of farming household in Kwara State, North – Central Nigeria. *Pakistan Journal of Nutrition Vol.* **6**(1): 16.
- Bakhru, H.K. (2003): Foods that heal. The Natural way to good health. Orient paperbacks, Delhi, pp82 – 90.
- Central Bank of Nigeria (CBN) (2004): Annual Report and Statistical Bulletin, Vol. 6, No. 12, December 2004.



- Christo, E.I. and Onuh, M.O. (2005): Influence of plant spacing on the growth and yield of Okra (*Abelmoschus esculentus* (L) Moench. Proceedings of the 39th conference of the Agricultural Society of Nigeria (ASN) held at Benin, 9th- 13th October, PP 51-53.
- Dikwahal, H.D., Hoggai, P.T. and Aliyu, L. 2006. Effects of sowing date and plant population density on growth and yield of okra (*Abelmoschus esculentus* L) varieties in the northern guinea savanna of Nigeria. *Nigerian Journal of Horticultural Science*, **11**(1): 56-62.
- Edet, G.E. and Etim, N.A. (2007): Gender Role in fluted Pumpkin (*Telferia occidentalis*) production in Akwa Ibom State. Proceeding of the 41st. Annual Conference of the Agricultural society of Nigeria (ASU) held at Zaria, 22nd– 26th October, pp 612 –615.
- Ekwu LG, Nwoku GN. (2012). Effect of plant spacing and planting date on the growth and yield of okra (*Abelmoschus esculentus* (L) moench) Abakaliki. *International Journal of Agriculture and Rural Development*. **15**(2):1041-1048.
- FAOSTAT.2010. Food and Agricultural Organization (FAO), Statistical Data. 2010, FAO. [http :faostat.fao.org /site/339/default.aspx](http://faostat.fao.org/site/339/default.aspx) accessed on 20/2/2013
- Farinde, A.J., Owolarafe, O.K. and Ogungbemi, O.I. 2017. “An overview of Production, Processing, Marketing and Utilisation of Okra in Egbedore Local Government Area of Osun State, Nigeria.” *Agric. Engg. International: the CIGR Ejournal. Manus.* **2**(9): 1-17,
- Firoz A. B., Rajiv O. and Lipi R. 2007. Effect of Different Plant Spacing on Growth and Yield of Okra (*Abelmoschus esculentus*) Under Subabul Based Alley Cropping System. *International Journal of Chemical Studies*. *IJCS* 2007; **7**(5): 1345-1349.
- Gorinstein, S., Zachwieja, Z, Foltá, M, Barton, H, Piotrowicz, J, Zemser, M, Weisz, M, Trakhtenberg, S, and Mårtín-Belloso, O. (2001). Comparative Contents of Dietary Fiber, Total Phenolics, and Minerals in Persimmons and Apples. *Journal of Agricultural and Food Chemistry*. **49**(2): 952–957
- Kumar S, Dagnoko S, Haougui A, Ratnadass A, Pasternak D, Kouame C. (2017). Effect of Spacings and Varieties on Yield Attributes and Fruit Yield of Okra (*Abelmoschus* spp.) in West and Central Africa: Potential and progress on its improvement. *African Journal of Agricultural Research*; **2**: 17-26.
- Mihretu, Y., Wayessa, G, and Adugna, D. (2014). Multivariate Analysis among Okra (*Abelmoschus esculentus* L.) Moench) Collection in South Western Ethiopia. *Journal of Plant Sciences*. **9**: 43-50. Gov/pmc/articles/pmc/3178946/
- Philips, C. B., Sajo, A. A. and Futuless, K. N. (2010). Effect of Spacing and NPK fertilizer on the Yield and Yield component of Okra in Mubi, Adamawa State, Nigeria. *Journal of Agronomy*. **9**: 131-134.
- Peter, T.V. (2011). Antidiabetic and Antihyperlipidemic potential of (*Abelmoschus esculentus*. (L.). In Streptozotocin Induced Diabetics rats. *Journal of pharmacy and Bio allied sciences*. In <http://www.ncbi.nih>.
- Sorapong B., (2012). Okra (*Abelmoschus esculentus* (L.) Moench) as a Valuable Vegetable of the World. *Ratar. Povrt.* **49**: 105-112.
- Talukder, M.A.H., M.A. Munna, M.K. Alam, M.A. Salam and M.M.U. Amin (2003). “Influence of Sowing Time, Plant Spacing and Picking Interval on the Growth and the Yield of Okra.” *Pakistan J. of Biol. Sci.* **6**(18): 1626-1630.
- Udoh, D.J., Ndon, B.A., Asuquo, P.E and Ndaeyo, N.U. (2005): Crop production techniques for the tropics. *Concept publisher, Lagos, Nigeria*. PP 223-247