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EFFECTS OF SOWING DATE ON PERFORMANCE OF SESAME (*Sesamum indicum* L.) VARIETIES IN MAIDUGURI, BORNO STATE, NIGERIA

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ABSTRACT

Field trials were conducted to evaluate the optimum sowing date and suitable sesame variety in Borno State, Nigeria. Treatments consisted of three sowing times (14th July, 28th July and 11th August) and three varieties (Ex-sudan, Kenana-4 and Gwoza) laid out in Randomized Complete Block Design (RCBD) with three replicates. All the yield attributing parameters were significantly affected by different sowing dates and varieties sown on 11th August. Growth and grain components of sesame varieties differed with different planting dates within a given environment. Gwoza variety was taller than Kenana-4 and Ex-sudan. Ex-sudan variety recorded higher number of capsules per plant (190.3), seeds per capsule (76.22), thousand seed weight (1710.30g) and grain yield (3.42 kg ha $^{-1}$), compared with Kenana-4 and Gwoza varieties. Variety Ex-sudan planted in the second week of August is recommended for cultivation in the agro-climatic conditions of Maiduguri.

Keywords*:* Sesame; sowing date; Sahel savannah

INTRODUCTION

Sesame (*Sesamum indicum* L.) popularly known as beniseed in Nigeria (Alegbejo *et al*., 2003) belongs to the family Pedaliaceae (Purseglove, 1969). The crop has early origins in East Africa and India (Bedigian, 2003). Today, India and China are the world's largest producers of sesame followed by Myanmar, Sudan, Uganda, Nigeria, Pakistan, Tanzania, Ethiopia, Guatemala and Turkey (Iorlamen and Odiaka, 2012). In Nigeria, the major producing states are Adamawa, Abuja, Benue, Borno, Gombe, Jigawa, Kano, Katsina, Kebbi, Kogi, Nasarawa, Plateau, Taraba and Yobe (Anon., 2002). Nigeria's current annual export is estimated at 20 million USD and the country is the primary supplier of sesame seed to Japan being the world's largest importer (Anon., 2002). Sesame seed, popularly

called "big treasure in small capsule" is currently ranked as second best to cocoa in terms of export volume and value (Anon., 2004). The crop is primarily grown for its seed (Burden, 2005) which contains 50-60% edible oil and 42% protein, rich in trypophan and methionine, an excellent feed for animals and layers (Hatam and Abbasi, 1994). The presence of antioxidants such as sesamolin and sesamol makes the oil easy to preserve as it does not go rancid (Aliyu *et al*., 1971). In spite of its multidimentional uses, the commercial and mechanized cultivation of sesame in Nigeria is not encouraging and its yield is very low (Kolawale *et al*., 2012). Its production however, is not sufficient to meet consumption demand in Nigeria. Appropriate time of sowing and suitable varieties have been reported to be the major constraints experienced by sesame farmers in Nigeria. Use of landraces, with low yield potential (Adebisi, 2005), inappropriate sowing time (Adebisi, 2005; Shaikh *et al.*, 2009) in addition to other production constraints are predisposing factors in this respect.

It is in view of the above that this study was conducted to evaluate sesame varieties under different sowing dates in Maiduguri, Borno State.

MATERIALS AND METHOD

The Study Area

Field experiments were conducted during 2012 and 2013 rainy seasons at the Teaching and Research Farm, University of Maiduguri (11^0 47.840′ N; $13^0$12.02′ E: and 345 m above sea level). Maiduguri is characterized by an annual rainfall of 372-500 mm, temperature ranging 22 - 45^{o}C (Arku *et al*., 2012) and a hot dry spell which extends from March to May (Alhassan *et al*., 2006). The soil pH of the experimental field was 6.69 with sandy loam textural class (Table 1).

Planting Materials

Three varieties of sesame, namely: Ex-Sudan, Kenana-4 and a local variety, Gwoza-local were sourced from Lake Chad Research Institute, Maiduguri. The varieties were selected because of their high yield potentials, earliness in maturity and resistance to drought, pest and diseases.

Treatments and Experimental Design

The treatments consisted of three varieties above and three sowing dates (14^{th} and 28^{th} July and 11^{th} August) representing; middle and late July, and early August. The experiment was factorially laid out in RCBD with three replications. Gross and net plot sizes are 4.2 × 3 m and 1.2 × 1.95 m, respectively. Alleyways were created between replications and plots, of width 1.0 and 0.5 m, respectively.

Data Collection and Analysis

Data were collected on plant height at harvest which was determined by measuring five randomly tagged plants within the net plot from the ground level to the tip of the plant using a graduated meter rule. Also number of capsules/plant was determined by counting the number of capsules per plant on five tagged plants within the net plot and mean

recorded. Number of seeds/capsule was obtained at harvest by counting all the capsules on the same tagged plants. 1000 seed weight was obtained by counting of 1000 seeds and weighed using a sensitive balance and the mean recorded. Seed yield was determined by weighing seeds from the net plot and extrapolated to kilogramme per hectare. Data were subjected to analysis of variance using SAS statistical software (SAS, 1999) version 8.1 and treatment means were separated using Duncan New Multiple Range Test (DNMRT).

Table 1: Soil physical and chemical properties and monthly rainfall

Parameter	2012	2013
Soil pH (H_2O)	6.69	6.69
Organic carbon (g kg^{-1})	0.23	2.2
Total N (g kg^{-1})	0.5	0.4
Available P (mg kg^{-1})	2.94	2.92
C.E.C (cmol kg^{-1})	6.9	6.91
Exchangeable K (cmol kg^{-1})	0.46	0.46
Exchangeable Na (cmol kg^{-1})	0.03	0.05
Exchangeable Ca (cmol kg^{-1})	3.5	3.6
Exchangeable Mg (cmol kg^{-1})	2.7	2.8
Textural class	Sandy loam	Sandy loam
Monthly rainfall (mm)		
March	0.0	18.0
April	7.6	36.0
May	33.8	53.0
June	76.9	64.0
July	311.9	72.0
August	221.8	66.0
September	193.1	42.0
October	26.4	21.0
Total	871.5	372.0
Mean	108.94	46.5

RESULTS AND DISCUSSION

Effect of Sowing Date and Variety on Plant Height

Results presented in Table 2 indicated that different sowing dates significantly influenced growth and yield attributes of sesame. Sowing of sesame crop on 14th July significantly enhanced its plant height compared to all other sowing dates with statistically similar effect. The possible reason could be that early sown crop had experienced prolonged photoperiod for vegetative growth. As a result of this, earlier planted plants grow

taller than the late planted. Alam Sarkar *et al.* (2007) and Anjum and Mohy-Ud-Din (2004) reported that significant effect of plant height on early sown sesame as compared to late sown. However, results showed no significant effect in the 2013 trial. Sesame varieties tested varied significantly in terms of plant height with Gwoza-local being the tallest followed by ex-sudan and kenana-4 being the shortest. This could be linked to their genetic variability (Ioramen and Odiaka, 2012). Early findings by Khidir (1981), Osman (1985), Ahmed (1998) and Mahasin and Farah (1999) showed that sesame varieties were variable in their response to sowing dates. Generally, variety Gwoza is significantly taller than others. Similar finding was reported by Adebisi, (2005); Biabani and Pakniyat, (2008). Similarly, differences between cultivars in plant height were reported (Abdalla, 2003; Ahmed, 1998 and El Naim, 2003). Interaction effect of sowing date and variety on plant height was not significant in all the trials.

Table 2: Effect of sowing date and different sesame (*Sesamum indicum* L) varieties on plant height (cm) in 2012 and 2013 rainy seasons

	Plant Height (cm)	
Treatments	2012	2013
Variety (V)		
Ex-sudan	183.08^{b}	171.97^{b}
Kenana-4	163.22^{c}	161.28^{c}
Gwoza	201.72^{a}	179.58^{a}
SE±	1.981	0.432
Sowing date (Sd)		
14th July	194.19^{a}	171.42
28th July	189.11^{b}	170.89
11th Aug	164.72^{b}	170.53
SE±	2.689	0.697
Interaction:		
V × Sd	ns	ns

Means followed by the same letter(s) within column are statistically similar (P>0.05)

Effect of Sowing Date and Variety on Number of Capsule/Plant and Seeds/Capsule

There was no significant difference in number of capsules/plant (Table 3) between crops sown 28th July and 11th August in the 2012 and 2013 trial. However in 2013 trial, higher number of seeds/capsule (160.75) were recorded during the 11th August compared to the other planting dates. The reason for that could be the effect of prolonged photoperiod which might have resulted in assimilates production and consequent partitioning of such to capsules and seeds. Alam Sarkar *et al.* (2007) recorded higher number of seeds/capsule in early sown as compared to late sown. Ahmed (1992) noted that early sown sesame crops

produced significantly higher number of capsules per plant than the mid and the late sown crops while delayed sowing severely reduced the period of capsule setting and development. Similarly, Abdalla *et al.* (2004) found that the number of capsules/plant was greatly influenced by sowing date.

Table 3: Effects of sowing date and different sesame (*Sesamum indicum* L.) varieties on number of capsule/plant and seeds/capsule in 2012 and 2013 rainy seasons

	Capsule/plant		Seeds/capsule	
Treatment	2012	2013	2012	2013
Variety (V)				
Ex-sudan	76.22[a]	76.22[a]	168.31[a]	190.36[a]
Kenana-4	67.78[b]	67.17[b]	129.89[b]	145.72[b]
Gwoza	61.56[c]	58.58[c]	78.72[c]	160.75[c]
SE±	0.796	0.493	1.716	0.796
Sowing date (Sd)				
14th July	64.39[b]	61.25[b]	111.64[b]	121.75[c]
28th July	71.00[a]	70.83[a]	131.53[a]	152.78[b]
11th Aug	70.18[a]	69.89[a]	133.75[a]	160.75[a]
SE±	0.711		2.578	0.796
Interaction:				
V × Sd	ns	ns	ns	ns

Means followed by the same letter within column are statistically similar (P>0.05)

Ex-sudan variety had more number of capsules/plant and seeds/capsule than the other two varieties (Table 3). The variations in morphological characteristics were detected in sesame varieties in previous studies (Abdalla, 2003 and ElNaim, 2003). Variations among sesame genotypes in morphological characters have been observed by Abdalla, (2003) who indicated the presence of considerable amount of variation among sesame genotypes in plant height, leaf number, number of branches, number of capsules per plant, number of nodes per plant and dry matter production. This might explain the consistent differences amongst the tested varieties in all growth parameters that were measured in this study. Interaction of sowing date and variety on number of capsules/plant and seeds/capsule were not significant in all the trials.

Effect of Sowing Date and Variety on Seed Yield and 1000 Seed Weight of Sesame

Seed yield differed significantly among varieties and different sowing dates. Yield increased linearly with delayed planting as shown in Table 4. Sowing in the second week of August recorded significantly higher grain yield in 2012 trial. However, in 2013 trial, no significant difference was observed among the different sowing dates. This might not be unconnected with variation of the cropping season. The amount of rainfall received in 2012 was evenly spread unlike in 2013 when there were erratic shower. Enhanced germination due to optimum soil temperature and later on favourable climatic condition might have favoured growth and development under Mid-August (11th) as compared to early (14th July) sowing. Early research findings by Khidir, 1981; Osman, 1985; Ahmed, 1998 and Mahasin

and Farah, (1999) showed that sesame cultivars were variable in their response to sowing dates. There was no significant difference between the three planting dates during 2013 trial in terms of 1000-seed weight. These results are in agreement with the findings of Ahmed and Haque (1986) on black cumin, Rassam *et al*. (2004) on anise, Zehtab-Salmasi *et al*. (2006) on crambe, Alam Sarkar *et al.* (2007) on sesame and Carrubba *et al.* (2006) on coriander. On the effects of different varieties on 1000-seed weight, Gwoza produced the least 1000-seed weight than either of the two varieties. Ex-sudan produced higher 1000-seed weight than Kenana-4 and Gwoza. This is in contrast to the work of Ahmed (1992) who reported that early sown sesame crops produced significantly higher number of capsules per plant than the mid and the late sown crops, while delayed sowing severely reduced the period of capsule setting and development. Interaction effects of sowing date and variety on seed yield and thousand seed weight were not significant.

Table 4: Effects of sowing date and different sesame (*Sesamum indicum* L) on seed yield and 1000 seed weight in 2012 and 2013 rainy seasons

	1000 seed weight (g)		Seed yield (kg/ha)	
Treatment	2012	2013	2012	2013
Variety (V)				
Ex-sudan	1415.20^{a}	1710.30^{a}	3.36^{a}	3.42^{a}
Kenana-4	513.90^{b}	886.10^{b}	3.08^{a}	3.28^{b}
Gwoza	355.60^{c}	494.10^{c}	2.63^{b}	2.47^{c}
SE±	11.533	5.778	0.085	0.031
Sowing date (Sd)				
14th July	698.69^{c}	962.70^{c}	2.97^{b}	3.00
28th July	780.56^{b}	1031.60^{b}	2.90^{b}	3.05
11th Aug	805.42^{a}	1096.20^{a}	3.20^{a}	3.11
SE±	5.85	6.532	0.033	0.052
Interaction:				
V × Sd	ns	ns	ns	ns

Means followed by the same letter within column are statistically similar (P>0.05)

CONCLUSION

In the present study, growth and grain yields of sesame varieties differed with different planting dates within a given environment. The growth performance of Ex-sudan is slightly greater than Kenana-4 and Gwoza. In terms of number of capsules per plant, seeds per capsule, thousand seed weight and final seed yield. Based on these results, variety Ex-sudan planted during the second week of August could be recommended for cultivation in the agro-climatic conditions of Maiduguri.

REFERENCES

Abdalla, A. A. (2003). Effect of sowing date and plant population on performance of sesame (*Sesamum indicum* L) cultivars under irrigation. M.Sc. Thesis, Faculty of Agricultural University of Khartoum.

Abdalla, A. A., Mohamed, M.O. and Fiasal, E.A. (2004). Response of sesame (*Sesamum indicum* L.) cultivars to sowing date under irrigation. A paper presented in the Crop Husbandry Committee Meeting Jan.-2004, ARC, Sudan.

Adebisi, M. A. (2005). Variation, Stability and Correlation Studies in Seed Quality and Yield of sesame (*Sesamum indicum* L.), PhD thesis, University of Agriculture, Abeokuta, Ogun State, Nigeria.

Ahmed, M. A. (1992). Effect of Sowing Date and Genotype on Growth and Yield of Rain-fed Sesame (*Sesamum indicum* L.). M. Sc. Thesis, University of Khartoum, Sudan.

Ahmed, M.A. (1998). Yield stability of sesame in the central rain lands of the Sudan. A note of performance on two sesame (*Sesamum Indicum* L.) genotypes suggested for release. Paper submitted to the Variety Release Committee.

Ahmed, N. U. and Haque, K. R. (1986). Effect of row spacing and time of sowing on the yield of black cumin (*Cuminum carvi* L.). *Bangladesh Journal of Agricultural Research*. 1: 21-24.

Alam Sarkar, M.N, Salim, M., Islam, N. and Rahman, M. M. (2007). Effect of sowing date and time of harvesting on the yield and yield contributing characters of sesame (*Sesamum indicum* L.) seed. *International Journal of Sustainable Crop Production*, 2(6): 31-35.

Alegbejo, M. D., Iwo, G. A., Abo, M. E. and Idowu, A.A. (2003). Sesame: A Potential Industrial and Export Oilseed Crop in Nigeria. *Journal of Sustainable Agriculture*, 23 (1): 59-75.

Alhassan, A. B., Chiroma, A. M. and Kundiri, A. M. (2006). Properties and Classification of Soils of Kajimaram Oasis of Northeast Nigeria, *International Journal of Agriculture and Biology*, 2: 256–261

Aliyu, K. I., Sekton, J. S. and Gupta, T. R. (1971). Effect of some cultural treatments on the yield and chemical composition of sesame (*Sesamum indium* L.). *Indian Journal of Agronomy*, 16(4): 445-448.

Anjum, M. M. and Mohy-Ud-Din, Q. (2004). Determination of grain yield of different wheat varieties as influenced by planting dates in agroecological conditions of Vehari. *Pakistan Journal of Life and Social Sciences*, 2(1): 5-8.

Anonymous (2002). Over view of the Nigerian sesame industry prepared for the United State Agency for International Development (USAID)/Nigeria. Chemonic International Inc. Washington DC, USA. 34 pp.

Anonymous (2004). Nigeria targets ₦ 1.8 billion annually from sesame export. Daily Independent Newsletter Limited, Lagos, Nigeria.

Arku, A.Y., Musa, S. M., Mofoke, A.L.E. and Dibal, J. M. (2012). Re-Examining Raw Effluents from Nigerian Bottling Company Maiduguri for Crop Irrigation. *Journal of Applied Phytotechnology in Environmental Sanitation*, 1(1):43-49.

Bedigian, D. (2003). Evolution of sesame revisited; domestication, diversity and prospects. *Genet. Resour. Crop Evol.*, 50: 779-787.

Biabani, A. R. and Pakniyat , H. (2008). Evaluation of seed yield-related characters in Sesame (*Sesamum indicum* L.) using factor and path analysis. *Pakistani Journal of Biological Sciences*, 11(8): 1157-1160.

Burden, D. (2005). Sesame profile. Available at http//:www.crop profile.mht. Accessed: 15/02/08

Carrubba, A., la Torre, R. Saiano, F. and Alonzo, G. (2006). Effect of sowing time on coriander performance in a semiarid mediterranean environment. *Crop Science*. 46: 437-447.

ElNaim, A. M. (2003). Effect of different irrigation water quantities and cultivars on growth and yield of sesame (*Sesamum indicum* L.). Ph.D Thesis, Faculty of Agricultural University of Khartoum.

Hatam, M. and Abbasi, G. Q. (1994). "Oil Seed Crop" in crop production. 1st print National Book Foundation, Islamabad, 358-362 pp.

Ioramen, T. and Odiaka, N.I. (2012). Varietal assessment of some selected sesame (*Sesamum indium* L.), *Nigerian Journal of Horticultural Science*, 17: 103-107.

Khidir, M.O. (1981). Sesame production in the Sudan. Sesame status and development, FAO, Technical Paper 29: 42-99.

Kolowale, G.O., Sonowo, C.O. and Adeyemo, R.O. (2012). Effect of time and rate of inorganic fertilizer application on the performance of *Sesamum indium* in the Southern Guinea Savanna of Nigeria, Journal of Applied Agricultural Research, 4(1): 141-148.

Mahasin, A. M. and Farah, S.M. (1999). Effect of sowing date on sesame. *Annual Report*, Gezira Research Station, ARC.

Osman, H.E. (1985). Sesame growing in the Sudan. In: Sesame Status and Development. FAO Plant Production and Protection Technical Paper, 66: 48–55.

Purseglove, W. (1969). *Tropical Crops, Dicotyledon.* Vol. 1, Longman London, pp. 435.

Rassam, Gh., Naddaf, M.and Sefidkon, F. (2004). Effect of planting date and plant density on yield and seed yield components of anise (*Pimpinella anisum* L.). Pajouhesh Sazandegi, 75: 127-133.

Shaikh, F.G., Gokhale, D.N., Rokade, B.S. and Jadhav, P.J. (2009). Effect of Sowing Date on Some Growth Characters in Linseed. *Journal of Agrometeorology*, 11(2): 203-205.

Statistical Analysis System (SAS) (1999). *Statistical Analysis System User's Guide*, Cary N.C. USA

Zehtab-Salmasi, S., Ghassemi golezani, K. and Mogbeli, S. (2006). Effect of sowing date and limited irrigation on the seed yield and Quality of Dill (*Anetum graveolens* L.). *Turkish Journal of Agriculture and Forestry*. 30: 281-286.