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

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Abstract: Appropriate time of sowing and suitable varieties have been reported to be the major constraints experienced by sesame farmers in Nigeria. Thus, field trials were conducted to evaluate the optimum sowing date and suitable sesame variety in Borno State, Nigeria. Treatment 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. The results revealed that all the yield attributing parameters were significantly affected by different sowing dates and varieties. Higher number of capsule per plant, thousand seed weight and seed yield, were recorded from the cultivar Ex-sudan in plots that were sown at 11th August. Result revealed that growth and grain components of sesame varieties differed with different planting dates within a given environment. Ex-sudan variety is taller than Kenana-4 and Gwoza. Also, Ex-sudan variety recorded higher number of capsules per plant, seeds per capsule, thousand seed weight and grain yield (kg ha^{-1}), compared with Kenana-4 and Gwoza varieties. Based on these results, variety Ex-sudan planted during the second week of August is recommended for cultivation in the agro-climatic conditions of Maiduguri.

Keywords: Sesame, sowing date, Maiduguri

Introduction

Sesame (*Sesamumindicum* L.) popularly known as beniseed in Nigeria (Alegbejo *et al*., 2003) belong 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 contain 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 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. Use of landraces, with low yield potential (Adebisi, 2004), inappropriate sowing time (Adebisi, 2004; 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

Description of the study area

Field experiments were conducted during 2012 and 2013 rainy seasons at the Teaching and Research Farm, University of Maiduguri (11°47.840′ N; 13°12.02′ E; and 345 m above sea level). Maiduguri is characterized by an annual rainfall of 300-500 mm, temperature ranging 22 - 45°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.

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 (Ex-Sudan, Kenana-4 and Gwoza-local) and three sowing dates (14th July, 28th July and 11th August) representing; early July, ending and early August. The experiment was factorially laid out in RCBD with three replications. Gross and net plot sizes are 4.2 x 3 and 1.2 x 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. Plant height at harvest 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. Number of capsule/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 five tagged plants from the net plot and the mean recorded. 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. All 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).

Results and Discussion

Effect of sowing date and variety on plant height

Data 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 which reported a 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. Similar finding was reported by Anjum *et al.* (2004). 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 as reported by 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. 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 1: Soil physical and chemical properties and monthly rainfall of the experimental site during the 2012 and 2013 rainy seasons

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		
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

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

Treatment	Plant Height (cm)	
	2012	2013
Variety (V)		
V1	183.08b	171.97b
V2	163.22c	161.28c
V3	201.72a	179.58a
SE±	1.981	0.432
Sowing date (Sd)		
Sd1	194.19a	171.42a
Sd2	189.11b	170.89a
Sd3	164.72b	170.53a
SE±	2.689	0.697
Interaction		
V x Sd	ns	ns

Means followed by the same letter within column are statistically similar at 5% level of significance using DNMRT. V1= ex-sudan, V2= kenana-4, V3= Gwoza, Sd1= 14th July, Sd2= 28th July, and Sd3= 11th Aug.

Effect of sowing date and variety on number of capsule/plant and seeds/capsule

Number of capsule/plant and seeds/capsule (Table 3) were similar on crop sown 28th July and 11th August in the 2013 trial. However in 2012 trial, more number of capsule/plant 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. Similar results were reported by Alam Sarkar *et al.* (2007) who recorded higher (57) 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.

Ex-sudan variety had more number of capsules per 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). Variation 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 capsule per plant, number of nodes per plant and dry matter production. This might explain the consistent differences among the tested varieties in all growth parameter that were measured in this study. Interaction effects of sowing date and variety on number of capsule/plant and seed/capsule were not significant in all the trials.

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

	Capsule/plant		Seeds/capsule	
	2012	2013	2012	2013
Variety (V)				
V1	168.31a	190.36a	76.22a	76.22a
V2	129.89b	145.72b	67.78b	67.17b
V3	78.72c	160.75c	61.56c	58.58c
SE±	1.716	0.796	0.796	0.493
Sowing date (Sd)				
Sd1	111.64b	121.75c	64.39b	61.25b
Sd2	131.53a	152.78b	71.00a	70.83a
Sd3	133.75a	160.75a	70.18a	69.89a
SE±	2.578	0.796	0.711	
Interaction				
V x Sd	ns	ns	ns	ns

Means followed by the same letter within column are statistically similar at 5% level of significance using DNMRT, ns= not significant. V1= ex-sudan, V2= kenana-4, V3= Gwoza, Sd1= 14th July, Sd2= 28th July, and Sd3= 11th Aug

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

	Seed yield (kg/ha)		1000 seed weight (g)	
	2012	2013	2012	2013
Variety (V)				
V1	3.36a	3.42a	1415.20a	1710.30a
V2	3.08a	3.28b	513.90b	886.10b
V3	2.63b	2.47c	355.60c	494.10c
SE±	0.085	0.031	11.533	5.778
Sowing date (Sd)				
Sd1	2.97b	3.00a	698.69c	962.70c
Sd2	2.90b	3.05a	780.56b	1031.60b
Sd3	3.20a	3.11a	805.42a	1096.20a
SE±	0.033	0.052	5.85	6.532
Interaction				
V x Sd	ns	ns	ns	ns

Means followed by the same letter within column are statistically similar at 5% level of significance using DNMRT, ns: not significant. V1= ex-sudan, V2= kenana-4, V3= Gwoza, Sd1= 14th July, Sd2= 28th July, and Sd3= 11th Aug

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. 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. Nath *et al.* (2001) also reported similar results. 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 which were similar. 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 in all the trials.

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. However, in terms of number of capsules per plant, seeds per capsule, thousand seed weight and final seed yield, Ex-sudan performed better than kenana-4 and Gwoza. 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.

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