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Effect of Sowing Date and Harvesting Time on Seed Yield of Sesame (*Sesamum indicum* L.) in Mokwa Agro-Ecological Zone

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A B S T R A C T

To improve the productivity of sesame in Mokwa agro ecological zone of Nigeria the effect of sowing date and harvesting time on seed yield of sesame was studied using a 2 x 3 x 3 factorial in a randomized complete block design (RCBD) with these replications. Factor A was sowing dates of June 15th, July 15th and August 15th, while factor B was harvesting intervals of 40 Days after flowering (DAF), 45 DAF and 50 DAF and factor C was sesame accessions of NCRIBEN 01M and Kenana 4, Growth and other yield parameters were significantly ($p<0.05$) affected by the sowing dates where sesame crops sown in June performed better than those planted in July and August in 2013 and 2014. Harvesting of fruits 50 Days after flowering (DAF) proved superior as 1000-seed weight was highest (4.05 g, 3.93 g) when compared with 3.14 g and 3.04 g for 45Days after flowering (DAF) across accessions for 2013 and 2014 respectively. It also produced higher number of pods, fresh weight and dry weight of pods. Planting of Sesame as early as June provided the all-time best yield in the study area and is considered the ideal planting period in the study area. Harvesting of sesame pods at 50 DAF proved ideal.

Introduction

Sesame (*Sesamum indicum* L.) also known as beniseed in West Africa, Sim-sim in East Africa is an important oil seed crop belonging to the family *Pedaliaceae* grown in the tropical and sub-tropical regions of the world (Ashri, 1998). It is an important oil yielding plant, and is one of the most ancient crops (Bedigian and Harlan, 1986). Beniseed is believed to have originated in Africa, probably the most ancient oil seed planted in many parts of the world. Currently, China, India and Myanmar (Burma) are the world's largest producers of sesame, followed by Sudan, Nigeria, Pakistan, Bangladesh, Ethopia, Thailand, Turkey and Mexico (Desai, 2004). It is grown the in tropical and temperate zones from about 40^0 N Latitude to 40^0 S Latitude (Ashri, 1989).

Soils close to a neutral pH of 7.0 are recommended. Sesame is a short day plant and flowers in 42-45 days when exposed to 10 hour of day length (Weiss, 1983).

According to Betts and Jefferson (1999) planting sesame is the most critical phase of its management. Planting close to June 1 is recommended in Missouri, soil temperatures may be two cool earlier, and sesame planted after June 15 may not mature before frost. By planting around June 1, there is still time to replant if necessary the authors opined. The optimum yield potential of a crop can only be achieved if environmental conditions suitable for its growth and development are provided. Time of planting is said to be important as it relates changes to various environmental factors. Ajali *et al.,* (2008) reported significant planting date effect on capsule numbers, percentage protein, biomass and grain yield in sesame. Mulkey (1997) also recorded significant influence of planting date on flowering, date to maturity and seed yield.

The common production practice in Nigeria is to plant major crops such as Yam, Cassava, and Maize early in the cropping season in April through June (Southern Nigeria) with the result that other crops are often planted later. In recent times however, rainfall patterns have been erratic such that sometimes rains do not stabilize until May/June compared with March/April previously reported by Van Rheenen (1973). The general approach therefore, is to relate the planting date to length of rainy season of the region (Akchust and Screedhavan, 1965). The time of planting in areas of high rainfall is usually determined by the need to avoid flowering periods coinciding with periods of maximum disease or insect pest attacks (Ugbaji, 1995) which are accentuated by high rainfall and temperature regimes.

A delay in planting date may result in reduced yields of some crops. Ajali *et al.,* (2008) reported significant planting date effect on capsule numbers, percentage protein, biomass and grain yield in sesame. Since the yielding ability of sesame crop is determined by many yield components, all of which are substantially influenced by environmental conditions and agronomic packages however, studies on sesame sowing dates in Sudan showed that sowing on 15th of June, July and August attained 536, 346 and 292 kg/ha grain yield respectively.

In India, sowing on the 15th of May, June and July attained grain yield of 325, 101 and 45 kg/ha respectively. In Korea, sowing on the 15th of April, May and June attained 677, 764 and 437 kg/ha respectively. Delay of sesame sowing increased the incidence of the sesame webworm (*Antigastra catalaunalis* Dup) (El-Bakheit, 1985). The interaction between sowing dates and varieties was also highly significant as found by Hazarika, (1998) who reported that; grain yield was highly significantly influenced by sowing date and cultivar.

According to Ojikpong *et al.,* (2007) sowing dates had significant effects on some Yandev 55 morphological characteristics and seed yield and yield components. According to the authors, while plant height and number of leaves were increased, number of branches and shoot dry matter were decreased with delay sowing to July or August. Similar, reduction in shoot dry matter of African yam bean and soybean have been reported following delay in planting date (Opkara, 1999 and Opkara *et al.,* 2005).

Investigations have shown that sowing sesame in late July significantly increased seed yield and that seed yields declined generally as sowing dates was extended from late July to early August (Ojikpong *et al.,* 2007). In a study involving sesame cultivars in the guinea savanna, Adeyemo and Ogunwolu (1996) attributed the decline in seed yield following delay in sowing to reduced seed filling duration (shorter flowering period), reduced pod production and lighter weight of seed while Busari and Ajewole (1993) reported earlier flowering and reduced number of capsule/plant in late plantings made in September. Seed yield obtained in the late July planting was higher than the yields of late June, early July and early August sowing dates by 109, 62 and 44 % respectively. Weiss (1971) reported that environmental influences especially rainfall determines the extent to which the genetic potential of a variety of sesame is expressed or suppressed while Yayock *et al.,* (1988) indicated that sesame requires five months of rainy season and 500 mm of rain, conditions which can be met by planting in the fourth week of July in areas of high rainfall and long duration as in southeastern Nigeria. Ogbonna and Umar-Shaaba (2011) also reported that, early planting in the season increased yield in the crop sesame which is attributed to high nutrient content in the soil during the early period of the season which declines with time as a result of leaching away of nutrients from the soil by more frequent rainfall as earlier submitted by Jones (1976).

As regards to time of harvesting, Mya Thandar *et al.,* (2010) reported that where pods harvested at 52 DAF it gave greater yields than those harvested at 56 DAF and 60 DAF

In Nigeria, sesame was first grown in 1940s following the mandate given to West Africa Oil seed mission to investigate the possibility for the production of groundnut and other oilseeds. However, sesame is still regarded as a minor oil seed crop; hence little research has been done to identify appropriate agronomic practices to promote its production in Nigeria. This work therefore seeks to contribute to identifying appropriate agronomic practices that would increase sesame production in Nigeria.

The objective of this study is to evaluate the influence of sowing dates and harvesting regimes on the yield and seed quality of sesame.

Materials and Methods

To address the objectives of the study, two field trials were conducted at the Ahmadu Bello University Research Farm (ABU), Mokwa substation (lat. 90^0N, long.5^0E) and an altitude of 382m above sea level in the southern Guinea savanna ecological zone of Nigeria in 2013/2014 wet and dry seasons. It has an annual rainfall of 1400m. The experiment was laid in a 2 x 3 x3 factorial in a randomized complete block design (RCBD). There were eighteen (18) treatment combinations replicated in 3 blocks. Each plot measured 2.0 m x 2.0 m with 0.5 m between plots and 1.0 m between blocks. The total plots per replication were 18 plots amounting to 54 plots. Two varieties of sesame were used for this experiment: NCRIBEN 01M and Kenana 4. Sowing dates were: June 15th, July 15th and August 15th. Harvesting intervals were: 40 days after flower initiation (DAF), 45 days after flower initiation and 50 days after flower initiation

Data collection and analysis

Records were taken on days to seedling emergence, days to 50% flowering, plant height at 4, 6, 8, 10 weeks after planting and at maturity, number of branches at maturity, height of the lowest branch at maturity, average stem girth at maturity, pod girth, average number of pods/plant at maturity, average pod length at maturity, average stem girth at maturity, average pod girth at maturity, pod dehiscence at harvest, incidence of aphids fresh weight of pod/plant at maturity, dry pod weight/plant and 1000-seed weight. These data were subjected to statistical analysis to test treatments effects for significance using GenSTAT 14.2 version Statistical package. The means were compared using the least significant difference at 5% probability.

Meteorological Data

Meteorological records were collected from National Cereals Research Institute (NCRI) Mokwa sub-station, Mokwa.

Soil data

At the time of planting, soil samples were taken at different locations in each experimental site at the depth of 0 to 20cm and were analyzed to determine the physical and chemical properties of the soil.

Results and Discussion

Analysis of data for days to emergence indicates that no significant differences were observed in 2013 and 2014 as the accessions germinated within four days after sowing (Table 3). No significant interaction effect was recorded across accession, planting dates, harvesting periods and between accessions x planting dates x harvesting periods respectively. Results on table 3 shows that accession, planting dates and harvesting times and their interactions had no significant effect on days to 50 % flowering in both years.

The effect of accession on plant height shown on table 4 reveals the superiority of Kenana 4 over NCRIBEN 01M across 4, 6, 8, 10 weeks after planting and at maturity in 2013 and 2014 (Table 4). The differences was however non-significant at 4, 6, 8, weeks after planting. At maturity, the accessions had significant effect ($p<0.05$) on plant height in 2013 and 2014 respectively.

The planting dates had significant effect ($p<0.05$) on plant height at 6 WAP in 2014 only and had no effect ($p>0.05$) across other growth periods. The planting date on the other hand had significant effect ($p<0.05$) on plant height at 4, 6, 8, 10 and at maturity in 2013 and 2014 respectively.

There was no significant interaction between accessions x planting dates, between accessions x harvesting periods, planting dates x harvesting periods and between accessions x month x harvesting periods across 4, 6, 8, 10, and at maturity (Table 4). A significant interaction difference was however observed between the planting dates (month) x harvesting periods on plant height at 6 WAP in 2014 only (Table 4).

The number of branches per plant at maturity did not vary significantly between NCRIBEN 01M and Kenana 4 accessions. Number of branches was also not significantly affected by the planting dates (July, August and September) in 2013 and 2014. It was not significantly affected by the harvesting periods in 2013 and 2014. Significant interaction effect is recorded between the accessions x planting dates in 2013 and 2014. There was no significant interaction effect of accessions x harvesting periods and between months (planting dates) x harvesting periods, between accessions x planting dates x harvesting periods in 2013 and 2014 (Table 5). The height of the lowest branch at maturity did not significantly vary among the two accessions in 2013 and 2014 respectively (Table 5).

The height of the lowest branch shows appreciable differences between the different planting dates with plants planted early in June recording higher lowest branches followed by those planted in July and August respectively.

Significant differences were therefore seen with Sesame planted in 2014 but with no significant differences within those planted in 2013. Harvesting periods for both 2013 and 2014 had no significant on the height of the lowest branch. Significant interaction effect however, was recorded between accessions x planting dates in 2014 (Table 5).

Stem girth differed significantly between accessions in 2013 but not in 2014 (Table 6). Average stem girth at maturity was no significantly affected by planting dates in 2013 and 2014. Sesame crop planted in June produced bigger stems, followed by those planted in July and August in that order.

Average stem girth at maturity also was not significantly affected by harvesting periods. There was no significant interaction the accessions x planting dates, accessions x harvesting periods, planting dates x harvesting periods and accessions x planting dates x harvesting periods interaction effects for 2013 and 2014.

Pod girth did not differed significantly in 2013 and 2014 as it affected by different planting dates (Table 6). There was no significant ($p>0.05$) difference among the two accessions at the three harvesting periods in 2013 and 2014. There were no significant accessions x planting dates, accessions x harvesting periods, the planting dates x harvesting periods and the accessions x planting dates x harvesting period's interaction effect for 2013 and 2014.

Table 7 shows that number of pods produced among the accessions significantly differed in 2013 and 2014 planting season with NCRIBEN 01M producing more number of pods in both years. Number of pods/plant was significantly affected by the planting dates with Sesame crops planted in July producing higher number of pods and closely followed by those planted in August and the ones planted in September producing the least number of pods. The number of pods also was significantly affected by the harvesting periods across the two years.

Table.1 Meteorological data showing mean monthly rainfall (mm), temperature ($^{\circ}$C), relative humidity (%) and sunshine of the study area (ABU Farm) Mokwa

YEAR 2013

Months	Temperature Minimum c	Maximum	Rainfall (mm)	Relative Humidity (%)	Sunshine (Hr)
January	41.97	20.03	-	54.21	7.00
February	35.21	18.5	-	62.18	4.50
March	40.29	23.65	56.00	68.16	9.16
April	47.27	23.47	97.80	69.13	11.67
May	42.87	22.06	140.20	70.13	20.94
June	40.80	20.87	222.7	71.30	16.1
July	42.42	20.87	22.6	72.65	32.23
August	38.35	24.35	42.60	73.74	30.35
September	40.07	21.37	172.0	73.27	39.53
October	26.06	20.23	51.90	70.74	29.09
November	30.91	18.21	-	78.66	35.50
December	28.06	17.74	-	71.00	10.87

YEAR 2014

Months	Temperature ^{o}c Maximum	Minimum	Rainfall (mm)	Relative humidity (%)	Sunshine (Hr)
January	41.27	20.06	-	68.19	6.68
February	34.21	22.89	-	62.46	0.18
March	35.61	26.52	-	67.26	0.19
April	34.27	22.60	-	71.0	-
May	34.63	24.05	37.6	70.49	55.65
June	32.55	23.51	203.8	82.11	185.19
July	31.59	23.94	88.6	78.91	198.95
August	29.27	22.54	151.6	80.86	163.41
September	31.02	23.10	251.4	85.02	191.43
October	32.95	24.40	81.2	80.55	224.99
November	33.87	22.12	-	74.76	221.63
December	34.99	17.66	-	54.76	202.34

The number of pods per plant however, was not significantly effected by accessions x planting dates but significantly effected by accessions x harvesting periods in 2014 only (Table 7). Planting dates x harvesting periods in 2013 and 2014 also had significant interaction effect on the number of pods. No interaction effect was recorded between the accessions x planting dates x harvesting periods in both 2013 and 2014 (Table 7).

NCRIBEN 01M produced longer pods in 2013 but produced shorter pods in 2014. There was however, no significant difference between the two accessions in both years. There was a significant effect on average pod length by the planting dates in 2013 but had no significant effect in 2014 for the same parameter. The parameter of harvesting periods had no significant effect on average pod length for both 2013 and 2014 respectively. No significant interaction was recorded in the accessions x planting dates, accessions x harvesting periods, planting dates x harvesting periods and accessions x planting dates x harvesting periods for 2013 and 2014 respectively (Table 7). Accession had no significant ($p>0.05$) effect on pod dehiscence in 2013 and 2014. The planting dates also recorded no significant ($p>0.05$) differences in pod dehiscence in both 2013 and 2014 planting seasons. However in 2013, the harvesting periods significantly ($p<0.05$) effected the pod dehiscence but recorded no significant ($p>0.05$) effect in 2014. Accessions x planting dates, accessions x harvesting periods, planting dates x harvesting periods, and accessions x planting dates x harvesting periods all had no interaction effect ($p>0.05$) on the pod dehiscence for the 2013 and 2014 two cropping seasons (Table 8).

Table.2 Effect of accession, planting dates and harvesting period on days to seedling emergence and 50% flowering

Treatments	Days to emergence		Days to 50% flowering	
	2013	2014	2013	2014
Accession(Access) NCRIBEN 01M	4.04	4.00	38.30	38.37
Kenana 4	4.11	4.00	38.26	38.26
LSD (0.05)	NS	NS	NS	NS
Planting dates (PD) **June**	4.06	4.00	38.50	38.28
July	4.11	4.00	38.06	38.56
August	4.06	4.00	38.28	38.11
LSD (0.05)	NS	NS	NS	NS
Harvesting periods (HP) **40**	4.11	4.00	38.11	38.5
45	4.06	4.00	38.39	38.28
50	4.06	4.00	38.33	38.17
LSD (0.05)	NS	NS	NS	NS
INTERACTION				
Access. X PD	NS	NS	NS	NS
Access. X HP	NS	NS	NS	NS
MONTH X HP	NS	NS	NS	NS
Access. X PD X HP	NS	NS	NS	NS

PD- Planting dates, HP- harvesting periods, Access-accessions, F-LSD- least significant difference at 5% level of probability and NS- not significant.

Table shows 40 shows that accession had no significant effect (p>0.05) on the incidence of Aphids; planting dates had also no significant (p>0.05) effect on the incidence of aphids. However, harvesting dates in 2014 planting season recorded significant (p<0.05) effect on the incidence of aphids. accessions x planting dates, accessions x harvesting periods and accessions x planting dates x harvesting periods recorded no significant (p>0.05) interactions for both years under study (Table 8). The result presented in Table 9 shows that NCRIBEN 01M produced heavier fresh pods than Kenana 4 across 2013 and 2014 with very significant (p<0.05) difference shown for both years. The fresh weight of pods was significantly (p<0.05) effected by the planting dates for 2013 and 2014 with pods harvested from crops planted in June weighing significantly higher than those planted in July and August.

There is significant (p<0.05) differences among fresh weight of pods harvested at 40, 45 and 50 days after flowering with pods harvested at 50 DAF weighing significantly higher than those harvested at 45 DAF. Those harvested at 45 DAF significantly weighed higher than those harvested at 40DAF. There was significant (p<0.05) interaction between accessions x planting dates and between planting dates x harvesting periods. There was significant interaction effect of accessions x planting dates in 2013 and 2014 (Table 9). There was no significant (p>0.05) interaction between the accessions x harvesting periods on fresh weight of pods. Significant interaction effect was recorded between months x harvesting periods for 2013 and 2014. No significant interaction between the accessions x planting dates x harvesting periods too in both years for the fresh weight of pods.

Table.3 Effect of accession, planting dates, harvesting period and their interaction effect on plant height at different weeks after planting

Treatment	Plant height(cm) at 4 WAP		Plant height (cm)at 6 WAP		Plant height(cm) at 8 WAP		Plant height(cm) at 10 WAP		Plant height(cm) at Maturity	
	2013	**2014**	2013	2014	2013	2014	2013	2014	2013	2014
Accessions(Access) NCRIBEN 01M	30.85	40.86	36.27	43.13	48.46	51.70	90.9	102.53	107.3	115.33
Kenana 4	33.59	44.12	37.15	43.36	49.32	54.90	104.3	103.85	118.7	118.00
LSD (0.05)	NS	NS	NS	NS	NS	NS	6.51	NS	4.60	2.278
Planting dates (PD) June	29.49	41.51	35.19	41.18	47.02	48.80	99.4	104.49	112.8	117.29
July	33.29	42.93	38.20	46.57	50.26	54.70	99.5	104.74	114.4	117.72
August	33.87	43.02	36.74	41.99	49.38	56.40	93.9	100.34	111.7	114.98
LSD (0.05)	NS	NS	NS	4.42	NS	NS	NS	NS	NS	NS
Harvesting periods (HP) 40	15.23	30.28	18.51	27.04	33.02	41.90	79.1	81.08	101.2	101.04
45	29.57	40.71	33.77	40.4	44.85	56.50	100.4	105.43	113.9	118.50
50	51.85	56.48	57.86	62.3	68.80	61.40	113.4	123.08	123.8	130.46
LSD (0.05)	3.48	4.09	3.81	4.42	3.87	10.02	7.97	4.168	5.64	2.790
Interaction										
Access X PD	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Access X H	NS	NS	NS	NS	NS	NS		NS	NS	NS
PD X HP	NS	NS	NS	7.65	NS	NS	NS	NS	NS	NS
Access X PD X HP	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

PD – planting dates, HP- harvesting periods, WAP- weeks after planting, Access- accessions, F-LSD- least significant difference at 5% level of probability and NS- not significant.

Table.4 Effect of accession, planting dates, harvesting period and their interaction effect on number of branches/plant and height of the lowest branch at maturity

Treatment	No. of branches/ at maturity		Height of the lowest branch at maturity (cm)	
	2013	2014	2013	2014
Accessions (Access) NCRIBEN 01M	1.41	1.81	66.00	58.34
Kenana 4	1.52	1.85	67.00	61.46
LSD (0.05)	NS	NS	NS	NS
Planting dates (PD) June	1.44	1.78	64.30	66.69
July	1.44	2.11	68.70	55.39
August	1.50	1.61	66.40	57.64
LSD (0.050	NS	NS	NS	8.95
Harvesting periods (HP) 40	1.50	1.78	64.60	61.59
45	1.44	1.89	63.40	58.55
50	1.44	1.83	71.40	59.58
LSD (0.05)	NS	NS	NS	NS
Interaction				
Access X PD	0.61	0.73	NS	12.66
Access X HP	NS	NS	NS	NS
PD X HP	NS	NS	NS	NS
Access X PD X HP	NS	NS	NS	NS

PD-planting dates, HP- harvesting periods, Access-accession, F-LSD- least significant difference at 5% level of probability and NS- not significant.

Table.5 Effect of accession, planting date, harvesting periods and their interaction on stem girth and fruit girth in 2013 and 2014

Treatment s	Average stem girth (cm) at maturity		Average fruit girth (cm) at maturity	
	2013	2013	2014	**2014**
Accessions (Access) NCRIBEN 01M	3.31	2.71	2.68	3.19
Kenana 4	4.14	2.68	2.70	3.17
LSD (0.05)	0.48	NS	NS	NS
Planting dates (PD) June	3.69	2.71	2.70	3.27
July	3.90	2.71	2.69	3.14
August	3.58	2.65	2.68	3.13
LSD (0.05)	NS	0.04	NS	NS
Harvesting periods (HP) 40	3.93	2.70	2.69	3.283
45	3.57	2.69	2.68	3.169
50	3.67	2.69	2.70	3.088
LSD (0.05)	NS	NS	NS	NS
Interaction				
Access X PD	NS	NS	NS	NS
Access X HP	NS	NS	NS	NS
PD X HP	NS	NS	NS	NS
Access X PD X HP	NS	NS	NS	NS

PD- planting dates, HP- harvesting periods, Access-accessions, F-LSD- least significant difference at 5% probability level and NS- not significant.

Table.6 Effect of accession, planting date, harvesting periods and their interaction on mean number of pods/plant and pod length at harvest in 2013 and 2014 plantings

Treatment	Number of pods/plant at40/45/50 DAF		Average pod length (cm) at harvest	
	2013	2014	2013	2014
Accessions (Acces) NCRIBEN 01M	18.63	20.54	2.92	2.68
Kenana 4	14.90	16.17	2.89	2.76
LSD (0.05)	1.309	1.253	NS	NS
Planting dates (PD) June	19.79	23.25	2.96	2.728
July	17.74	18.76	2.92	2.66
August	12.77	13.05	2.84	2.77
LSD (0.05)	1.603	1.534	0.08	NS
Harvesting periods (HP) 40	11.33	12.16	2.93	2.736
45	15.43	17.82	2.92	2.71
50	23.54	25.09	2.87	2.71
LSD (0.05)	1.603	1.534	NS	NS
Interaction				
Access. X PD	NS	NS	NS	NS
Access. X HP	NS	2.170	NS	NS
PD X HP	2.776	2.657	NS	NS
Access. X PD X HP	NS	NS	NS	NS

PD- planting dates, HP- harvesting periods, DAF- days after flowering, Access-accessions, F-LSD- least significant difference at 5% level of probability and NS- not significant.

Table.7 Effect of accession, planting dates, harvesting methods and their interaction on Aphids population and pod dehiscence at harvest in 2013 and 2014 planting

Treatment	**Incidence of Aphids (6WAP)**		**Capsule dehiscence (shattering) at harvest**	
	2013	2014	2013	**2014**
Accessions (Access.) NCRIBEN 01M	1.41	1.41	1.37	1.56
Kenana 4	1.41	1.48	1.41	1.44
LSD (0.05)	NS	NS	NS	NS
Planting dates (PD) June	1.44	1.44	1.33	1.44
July	1.44	1.50	1.39	1.61
August	1.33	1.39	1.44	1.44
LSD (0.05)	NS	NS	NS	NS
Harvesting periods (HP) 40	1.56	1.00	1.00	1.39
45	1.28	1.33	1.17	1.61
50	1.39	2.00	2.00	1.50
LSD (0.05)	NS	0.19	0.61	NS
Interaction				
Acces X PD	NS	NS	NS	NS
Acces X HP	NS	NS	NS	NS
PD X HP	NS	NS	NS	NS
Acces X PD X HP	NS	NS	NS	NS

PD- planting dates, HP- harvesting periods, WAP- weeks after planting, Acces- accession, F-LSD- least significant difference at 5 % level of probability and NS- not significant.

Table.8 Effect of accessions, planting date, harvesting period and their interaction effect on fresh fruit weight, dry fruit weight and 1000-seed weight

Treatment	Fresh pod weight/plant at 40/45/50 DAF (g)		Dry pod weight/plant at 40/45/50 DAF(g)		1000 seed weight (g)	
	2013	2014	2013	2014	2013	2014
Accessions (Access.) NCRIBEN 01M	15.98	16.45	6.94	7.17	3.565	3.291
Kenana 4	12.63	12.81	5.60	5.83	2.593	2.748
LSD (0.05)	1.515	1.553	0.776	0.809	0.1969	0.1804
Planting dates (PD) June	18.10	18.65	7.60	7.98	3.496	3.633
July	14.69	14.91	6.91	7.08	3.181	3.011
August	10.12	10.34	4.31	4.44	2.561	2.414
LSD (0.05	1.855	1.902	0.951	0.991	0.2411	0.2210
Harvesting periods (HP) 40	7.12	7.30	2.56	2.65	2.048	2.092
45	13.01	13.35	6.01	6.29	3.142	3.039
50	22.79	23.25	10.25	10.56	4.048	3.928
LSD (0.05)	1.855	1.902	0.951	0.991	0.2411	0.2210
Interaction						
Access. X PD LSD	2.624	2.690	1.344	1.401	0.3410	0.3125
Access. X HP LSD	NS	NS	NS	NS	NS	NS
PD X HP LSD	3.213	3.295	1.647	1.716	NS	NS
Access. X PD X HP	NS	NS	NS	NS	NS	NS

PD- planting dates, HP- harvesting periods, DAF- days after flowering, Access-accession, F-LSD- least significant difference at 5% probability level and NS- not significant

Table.9 Relationship between the profile characteristic of farmer and awareness of ICTs initiatives among the farmer (Pearson product-moment – correlation)

S. No	Variables	Correlation coefficient (r)	P-Value
1.	Age	-0.315**	0.00
2	Education	0.457**	0.000
3.	Experiences	-0.325**	0.000
4.	Land Holding	0.242**	0.001
5.	Family Income	0.375**	0.000
6.	Information Seeking Behavior	0.346**	0.000
7.	Media Ownership	0.428**	0.000
8.	MassMedia Exposure	0.449**	0.000
9.	Social Participations	0.402**	0.000
10.	Extension Agency Contact	0.505**	0.000

A significant accession effect on dry weight of pods per plant existed. NCRIBEN 01M recorded heavier dry pods in 2013 and 2014. Dry weights of pods were significantly affected by planting dates. Pods harvested from sesame planted in June (7.60g and 7.98g in 2013 and 2014) produced heavier dry pods, followed by those planted in July (6.91g and 7.08 g in 2013 and 2014) and those planted in August (4.31 g and 4.44 g in 2013 and 2014) recording the least dry pod weights. The effect of harvesting periods on dry pod weight was significant with pods harvested at 50 DAF producing heavier dry pods (10.25 g, 10.56 g for 2013 and 2014). This was followed by pods harvested at 45 DAF (6.01 g, 6.29 g) and pods harvested at 40 DAF with the least figures of 2.56 g and 2.65 g recorded from 2013 and 2014. Significant interaction ($p<0.05$) effect existed between the varieties x planting dates for dry weight of pods for both 2013 and 2014 (Table 9). There was no significant interaction ($p>0.05$) effect of accessions x harvesting periods. Planting dates x harvesting periods produced significant interaction ($p<0.05$) effect in 2013 and 2014 (Table 9). Accession x planting dates x harvesting periods had no significant interaction effect for 2013 and 2014.

Significant differences ($p<0.05$) were recorded in respect of 1000-seed weight among the two sesame accessions in both years (Table 9) Yields were higher in NCRIBEN 01M (3.56 g, 3.29 g in both 2013 and 2014 compared with Kenana 4 with 2.59 g and 2.74 g respectively. 1000-seed weight was significantly ($p<0.05$) effected by planting dates with crops planted in June recording 3.49 g and 3.63 g for 2013 and 2014. Significant differences in 1000-sed weight was also exhibited among the harvesting periods as crops harvested at 50 DAF recorded heavier seeds followed closely by those harvested in 45 DAF (3.14g and 3.03 g) and those harvested at 40 DAF with the least values of 2.04 g and 2.09 g. Significant interaction effect between accessions x month for 2013 and 2014 was recorded (Table 9) 1000-seed weight was significantly affected by interaction between accessions x planting dates but non-significantly affected by accessions x harvesting periods, month x harvesting periods and accessions x month x harvesting periods interactions (Table 9)

Sesame plant height was significantly affected by different time of sowing. Highest plant was observed in sesame sown in 15th June though this was not significantly better than those sown 15th July and 15th August. However, it was significantly better than that sesame sown in July and those sown in July were better than those sown in August. The highest plant heights were recorded by sesame plants sowed on the 15th June could be the time when both water and sunshine was adequate for optimum growth of sesame. Ahmed *et al.,* (2009) reported good vegetative growth under adequate supply of both water and sunshine. Significant difference was observed in the number of pods per plant as a result of different time of planting. Plots planted in 15th June were highest in the number of fruits (19.79 and 23.25) for both 2013 and 2014. This was followed by plots planted on 15th July (17.74 and 18.76) and the least values from plots planted on 15th August with (12.77 and 13.05). As regards the variety, Kenana 4 grew relatively taller across board than NCRIBEN 01M. This is confirmed by Hazarika, (1998), who reported that, grain yield was highly significantly influenced by sowing dates and the cultivar. There was significant difference between the two accessions in terms of stem girth with crops planted in June still maintaining its superiority over those ones planted in July and August with no consistency among the two accessions as Kenana 4 had bigger stem girth in 2013 while NCRIBEN 01M had the upper hand in 2014.

The parameter of fruit weights saw NCRIBEN 01M produced heavier fresh pods, dry pod weights and 1000-seed weight across the two years under consideration. In all these, sesame crop planted in June still had heavier fresh, dry and 1000-seed weight over those planted in July and August respectively revealing an agreement with findings of Ogbonna and Umar-Shaba (2011) who reported that, early planting in the season increased yields in the crop sesame which according to the authors can be attributed to high nutrient content in the soil during the early period of the season which declines with time as a result of leaching away of nutrients from the soil by more frequent rainfall; This was also a position held by Jones (1976).

The same position was affirmed by Ojikpong *et al.*, (2007) who submitted that sowing dates had significant effects on some Yandev 55 morphological characteristics and seed yield and yield components. According to the authors, while plant height and the number of leaves were increased number of branches and shoot dry matter were decreased with delay sowing to July or August. Okpara (1999) and Okpara *et al.*, (2005) reported a similar reduction in the shoot dry matter of African yam bean and soybean following a delay in planting date. Further investigations revealed that, sowing sesame in late July significantly increased seed yield and that seed yields declined generally as sowing dates was extended from July to early August.

Adeyemo and Ogunwolu (1996) attributed the decline in seed yield following delay in sowing to reduced seed filling duration (shorter flowering period), reduced pod production and lighter weight while contrary to the present findings from this study; Busari and Ajewole (1993) reported that earlier flowering and reduced number of pods/plant in late plantings made in September, seed yield obtained in the late July planting was higher than the yields of late June, early July and early August sowing dates by 109, 62 and 44% respectively.

As regards to harvesting, harvesting at 50 DAF gave greater performances and yield than the other harvest times in terms fresh and dry pod weight, number of pods and 1000-seed weight. This position agrees with findings of MyaThandar *et al.*, (2010) who reported a similar result where pods harvested at 52 DAF gave greater yields than those harvested at 56 DAF and 60 DAF.

The experiment was conducted to determine the effect of sowing time and harvesting intervals on the growth and yield of sesame.

The result of the experiment shows that, growth and yield of sesame was greatly influenced by the time of sowing and the different harvesting periods or intervals. Sesame planted in June especially early June (15^{th}) performed better (growth and yield) than sesame planted in July and sesame planted in July (15^{th}) did better than sesame planted in August (15^{th}).

As regards to harvesting intervals, pods harvested at 50 DAF were observed to be more ripened, matured and produced heavier pods and seeds when put side by side with pods harvested at 45 DAF. Lowest values of growth and yield parameters were recorded from pods harvested at 40 DAF. Harvesting pods at 50 DAF is therefore recommended for optimum seed yield production of sesame for the study area.

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