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THE APPROPRIATE PLANTING TIME FOR THE PROFITABLE PRODUCTION OF THE QUALITY SEED OF KENAF (*HIBISCUS CANABINUS* L.) IN SOUTHWESTERN NIGERIA

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Abstract: The low seed yield of kenaf in different agro-ecologies in southwestern Nigeria has been partly attributed to the effect of climate change. An experiment was, therefore, conducted to determine the response of kenaf to prevailing weather conditions and the most appropriate planting time to produce optimum seed yield of acceptable quality that will be profitable in humid agro-ecologies of Nigeria. The study was conducted at five research stations (Ibadan, Ilora, Ikenne, Orin Ekiti and Kishi) of the Institute of Agricultural Research and Training (I.A.R.&T) in Ibadan, Nigeria, in the 2018 and 2019 planting seasons (June to August). Seeds of five varieties of kenaf (Cuba108, Ifeken DI 400, Ifeken100, Ifeken 400 and Tianung-2) were planted at monthly interval between June and August of each year in a randomised complete block design (RCBD) with three replicates. Harvesting, threshing and cleaning were manually done, and samples of clean seeds were analysed for seed quality. Data were obtained on plant height at harvest, seed yield-related traits and seed quality parameters. Profitability analysis was also conducted to estimate the cost and returns to production in the different locations. Kenaf seed yield and quality were highly influenced by the production environment. It is concluded that planting of kenaf in mid-June in southwestern Nigeria will give optimum seed yield of high quality with profitable gross return on investment.

Key words: kenaf, sowing date, quality seed, humid agro-ecology.

Introduction

Kenaf (*Hibiscus canabinus* L.) is an annual fibre crop that is closely related to cotton (*Gossypium hirssutum* L.) and okra (*Abelmoschus esculentus* L.) (Amusat and Ademola, 2014). It is the third largest fibre crop of economic importance after cotton and jute. The crop, which has numerous potentials that can enhance the

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economy of developing countries through diverse uses of its fibre, is commercially cultivated in some Asian countries like India, China, Thailand and Vietnam (Olasoji et al., 2014). Although the multi-purpose uses of kenaf are gradually increasing its demand, the scarcity of the quality seed of the crop has been reported as a major limiting factor in the expansion of its production at the commercial level. In Bangladesh, the shortage of the supply of quality seeds of kenaf has been attributed to the inadequate knowledge of farmers regarding seed production technology (Mollah et al., 2015). This has resulted in the use of low quality seeds in the country and other parts of Africa.

The main products of kenaf are core and bast fibres. However, the production of acceptable high-quality fibre for industrial uses cannot be combined with seed production as the process for obtaining the two products differs. Seed production of kenaf requires adequate attention and a longer time than cultivation for fibre. In most developing countries where kenaf is produced, farmers are not well equipped with the technological requirements for commercial quality seed production of the crop, hence the crop is currently grown as a subsistence crop in Nigeria. There is a renewed interest of the government in the production of kenaf for fibre in Nigeria. Therefore, farmers are increasingly becoming aware of its economic potentials, making it gradually become a major crop in the country (Ogunniyan, 2016), and thereby increasing the demand for quality kenaf seeds across the country.

Kenaf has high adaptability to various growing environments, and its cultivation is easy (LeMahieu et al., 2003). However, recent efforts to produce kenaf seeds in different agro-ecologies in southwestern Nigeria resulted in low seed yield than expected. This could be attributed to several reasons, among which is the effect of climate change on the crop. The flowering was delayed and irregular, while the capsule formation was poor. Kenaf can be photosensitive, thus it will respond to the time of planting, which can be influenced by climate change. Consequently, it becomes pertinent to determine the response of the crop to prevailing weather conditions and the most appropriate planting time for the crop to produce optimum seed yield of acceptable quality. This study was, therefore, conducted to determine the appropriate planting time for optimum quality kenaf seed yield, as well as the profitability of the seed production in humid agro-ecologies of Nigeria to provide information that will encourage the private sector involvement in kenaf seed production.

Material and Methods

Experimental locations

The study was conducted at five research stations of the Institute of Agricultural Research and Training (I.A.R. &T) in Ibadan, Nigeria, in the 2018 and 2019 planting seasons. The stations are located in Ibadan (transitional-rain forest), Ilora (derived savannah), Ikenne (high rain forest), Orin Ekiti (rain forest) and Kishi (southern guinea savannah) (Figure 1). The rainfall records in terms of the number of rain days and volume were obtained from the meteorological stations in each location.

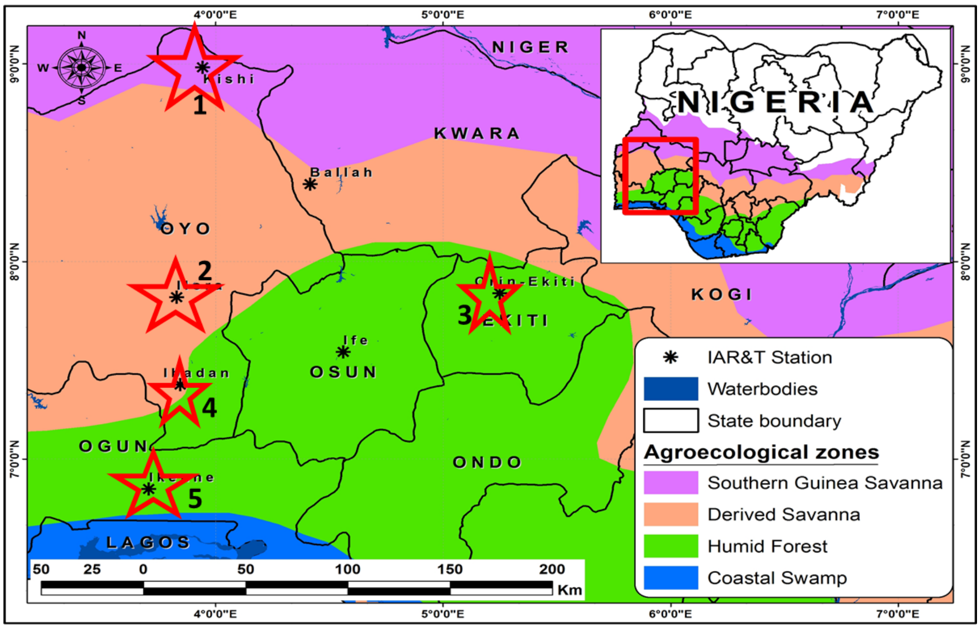

Figure 1. The geographical location of the experimental sites.
1: Kishi, 2: Ilora, 3: Orin Ekiti, 4: Ibadan, 5: Ikenne.

Field experiments and experimental designs

Seeds of five varieties of kenaf (Cuba108, Ifeken DI 400, Ifeken100, Ifeken 400 and Tianung-2) were planted at a spacing of 50 cm x 20 cm at monthly intervals from June to August (June 10, July 10 and August 10) of 2018 and 2019. The plot size was 5 m by 5 m, resulting in 180 plants per plot. The experimental design was a randomised complete block design (RCBD) with three replicates. Four seeds were planted per hole and later thinned to two plants per stand at 2 weeks after planting (WAP). Weed control was done through the application of pre-emergence herbicide (Pendimethalin 500 EC) at the rate of 2.0 kg ha^{-1}a.i. Supplementary weeding was done manually at 5 WAP. The NPK-20-10-10 fertiliser was applied immediately after the manual weeding at the rate of 300kg ha^{-1}, while urea was applied to top dress the plants at 10 WAP at the rate of 200kg ha^{-1} in both years. Insects were controlled with Cypermethrin+Dimethoate ® applied at the rate of 20ml/20 litres of water, sprayed three times at 2-week intervals, beginning from 5 WAP, when the plants attained 50% flowering until when capsules were well formed. Harvesting of the plant was manually done at about 5 months after planting when 80% of the capsules became brown. Thereafter, the capsules were sun-dried for three days, threshed and cleaned to obtain the seeds. Clean seeds were then bagged into hessian sack bags, and samples were taken. The quality analysis was conducted in the seed testing laboratory of IAR&T, Ibadan, Nigeria, using the procedure of International Seed Testing Association (ISTA, 2003).

Ten plants were randomly selected and tagged within the three inner rows to obtain the following agronomic data:

i. Plant height at harvest: Measured with a steel meter ruler from the ground level to the highest point (cm). The average height of the 10 tagged plants was recorded as plant height;

ii. The number of capsules per plant: The average number of capsules counted from the 10 tagged plants per plot;

iii. The number of seeds per capsule: The average number of seeds counted from 10 randomly selected capsules from the total capsules in each plot;

iv. Seed weight per capsule (g): The average weight of seeds from 10 randomly selected capsules in each plot;

v. Seed yield per plant (g): The average value of seed weight from 10 randomly selected plants per plot;

vi. Seed yield/plot (g): The weight of total seeds from each plot;

vii. 100-seed weight (g): The weight of one hundred seeds taken randomly in three replicates from the threshed seeds and weighed using a sensitive Seedburo™ laboratory scale model 9000AG/A. The average of the three replicates was recorded for each plot;

viii. Seed yield per hectare (kg): Calculated from the seed weight per plot, the number of plants per plot at harvest and expected plant population per hectare and a constant factor of 1000 to convert gramme to kilogram. The calculation was done using the following formula:

Seed yield per hectare =

$$\left[\frac{Seed\ weigth\ per\ plot\ (g)}{Number\ of\ plants\ per\ plot}\right] \mathrm{x} \left[\frac{Plant\ population\ /\ hectare}{1000}\right] \quad (1)$$

where plant population per hectare was calculated as:

$$\text{Plant population} = \frac{Land\ area}{Plant\ Spacing} x \frac{Number\ of\ plants\ per\ stand}{1} \quad (2)$$

Seed quality assessment

The samples of the harvested seed from each location for each planting time were evaluated for seed viability and seedling vigour. Seed viability was determined by placing three sub-samples of 100 seeds each on sterilised river sand that was adequately moistened with 300ml of distilled water and allowed to germinate at room temperature.

The germination counts were done on 3, 5, and 7 DAP. The final count was done on the 7th day of planting as described by Adetumbi et al. (2019):

$$\text{Seed viability} = \frac{\text{Number of normal seedlings}}{\text{Number of seeds planted}} \times 100 \quad (3)$$

The seedling vigour index (SVI) was evaluated on the seventh day of planting as the product of seed viability (%) and seedling length at 7 DAP using the formula:

$$\text{SVI} = \frac{(\text{Seed viability} \times \text{Seedling length})}{100} \quad \text{(Adetumbi et al., 2019).} \quad (4)$$

The mean germination time (MGT) represents the average number of days taken for all the viable seeds to germinate. It was calculated based on the modified method described by Al-Mudaris (1998) as MGT = $\frac{\sum f x}{\sum f}$ where f is the number of seeds germinated on day x.

Economic performance evaluation

The market valuation of yield components using adjusted yield per hectare at a current market price of kenaf seeds, associated cost of production comprising labour cost, input purchases and other expenses were noted and used to conduct a partial budgeting analysis. The associated cost of the production differed from location to location. Therefore, the cumulative gross margin and net benefit associated with production costs were calculated and compared among treatments and locations. The profitability analysis was conducted to estimate the costs and returns to production in the different locations. The gross margin analysis is expressed as: gross margin (GM) = TR – TVC, where TR = total revenue and TVC = total variable cost.

Data analysis

The collected data were analysed for each year with SAS using the General Linear Model (GLM) procedure, and significant means were separated using Duncan's Multiple Range Test (DMRT) at a 5% probability level. Correlation analysis was used to determine the relationship between plant height and seed yield attributes of kenaf.

Results and Discussion

Distribution of rainfall during the experiment

The rainfall distribution patterns of the two years, 2018 and 2019, were erratic and unpredictable (Figures 2 and 3). In all the locations, the amount of rainfall reduced drastically in November, with a total stoppage in December. Rainfall was more erratic in 2018 than in 2019. In June 2018, Ilora (derived savannah) recorded the highest rainfall while Ikenne (rain forest ecology) recorded the lowest. The Ibadan station site, located in a transitional savannah ecology, had the highest amount of rainfall in August 2018, while all other locations experienced the usual August break. However, in June 2019, rainfall recorded in Ikenne (rain forest ecology) was higher than in all other locations. The volume of the rainfall declined towards August before getting to its climax in October 2019. Global effects of climate that are characterised by variations in the seasonal amount, timing, distribution and intensity of precipitation are a reality. These varying factors have a significant impact on crop productivity, especially in Africa, where over 80% of total agriculture in Africa is rain-fed (Gornal et al., 2010).

Rainfall is one of the most important criteria used for the objective analysis of climatic variations over time (Murumkar et al., 2013). The unpredictable and erratic weather situation is evident in the rainfall pattern recorded in the five locations during the two seasons. Contrary to the expectation that the amount of rainfall in the savannah will be lower than in forest ecologies, the rainfall recorded in 2018 at Ilora (derived savannah) was higher than in Orin Ekiti (rainforest ecology). The varied changing rainfall pattern of the two years is an indication of the year-to-year variability of the rainfall pattern with an overall negative effect on crop yield. This confirms the earlier assertion of Huho et al. (2012) on a general effect of rainfall patterns on agricultural productivity. The amount of rainfall recorded in each location revealed that the rainfall pattern of each location differed within the two years of the study.

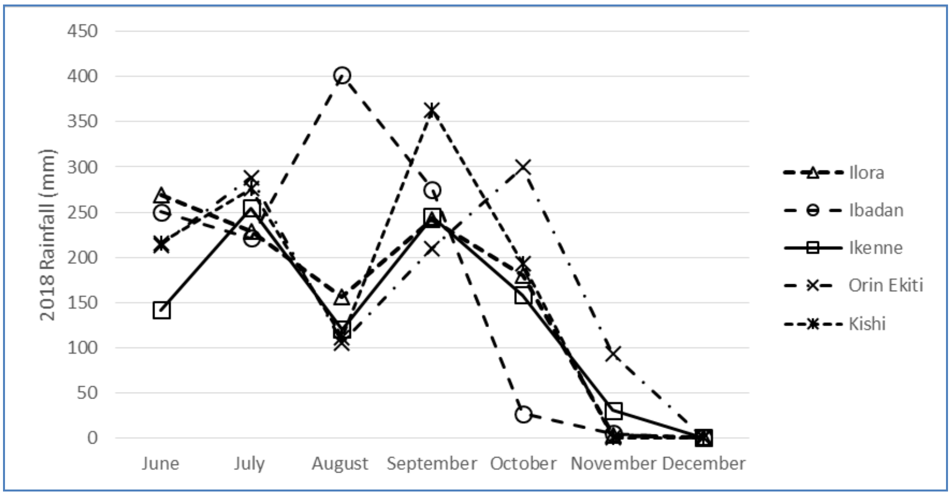

Figure 2. The rainfall distribution pattern during the experiment in 2018.

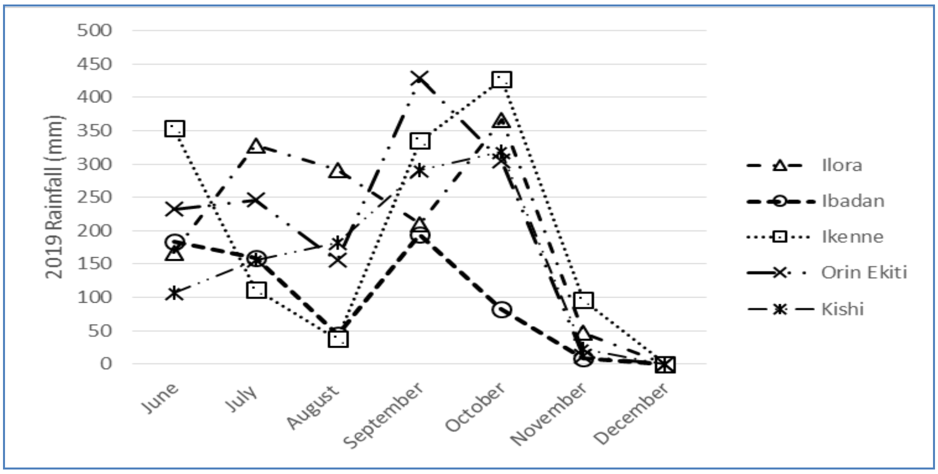

Figure 3. The rainfall distribution pattern during the experiment in 2019.

Means of seed yield and the quality of kenaf as affected by planting times and locations

Means from the analysis of variance (ANOVA) are presented in Table 1. All the seed yield and quality parameters of kenaf were significantly affected by planting times and locations ($p \leq 0.05$). There was also a significant difference in most of the results obtained during the two years of evaluation, except for seed weight per plant and seed yield per hectare. There was no significant difference among the varieties in all the variables except for the seedling vigour index. The interaction means of location and planting time (L × P) as well as year and location (Y × L) were significant ($p \leq 0.05$) for all the variables. However, the interaction means of location and variety (L × V) were significant for the number of capsules per plant and all seed quality parameters, such as seed viability, seedling vigour index and mean germination time only.

Seed yield and quality parameters of kenaf as affected by planting locations

Some of the seed yield parameters of kenaf planted in Ilora, including the number of seeds per capsule (21), seed weight per plant (7.1 g) and seed weight per plot (350.6 g), were significantly higher than in all other locations (Table 2). The number of capsules per plant (43) and seed yield per hectare (708.8 kg) in Ilora were not significantly different from the number of capsules of kenaf in Kishi (41) and seed yield per hectare in Orin Ekiti (644.7 kg) (Table 2). The SVI and MGT of kenaf seeds in Ilora and Orin Ekiti were significantly similar. On the contrary, the seed viability in Orin Ekiti (74.4%) was significantly higher than in all other locations, followed by the seed viability in Ilora (68.3), while the seeds of plants in Ikenne had the lowest (53.1) viability (Table 2). The significant influence of locations on the plant height, seed yield and quality of kenaf may be attributed to the difference in the rainfall pattern of each location. Kyei-Mensah et al. (2019) have reported that rainfall is a major natural occurrence that is indispensable in crop and food production, especially in the developing world. Akinrotimi and Okocha (2018) have also associated seasonal variations in kenaf seed yield planted in southeastern Nigeria to variations in rainfall patterns. Kenaf planted in savannah agro-ecologies (Ilora and Kishi) recorded high plant height in July and August due to the high exposure to solar radiation with an adequate water supply in the savannah during the trial. However, the plants in the forest agro-ecology recorded high plant height when planted in June as a response to the availability of soil and environmental moisture. Lee et al. (2017) have reported that vegetative and reproductive growths of *Epilobium hirsutum L.* are accelerated with the increase in moisture and organic matter content in the soil. Ogunniyan et al. (2016) have also reported that kenaf is sensitive to the amount of rainfall, especially during the vegetative growth. The significant effect of production environments and months on the quality of kenaf seed is an indication of the sensitivity of kenaf seeds to the weather situation. This may be connected to the constituent of the kenaf seed. Most of the seeds with high oil content have been reported to have physiological changes caused by enzymatic reactions within the seeds in reaction to the environmental situation (Catao et al., 2018). The oil content in kenaf seed ranges from 21.4% to 26.4% (Muhamed et al., 1995), thus the reaction of the oil within the seed to the environmental situation can trigger deterioration in the face of slightly unfavourable weather conditions.

Table 1. Means squares of analysis of variance (ANOVA) for kenaf seed yield and quality components as affected by varieties, planting dates and locations.

Source	df	Plant height	No. of capsules per plant	No. of seeds per capsule	Seed wt. per plant
Location (L)	4	122179.7*	5418.5*	1467.43*	281.95*
Planting time (P)	2	44604.9*	10350.2*	1644.74*	1742.36*
Replicate	2	212.6	23.6	49.31*	5.96
Variety (V)	4	295.2	92.5	8.16	12.02
Year (Y)	1	670991.9*	5356.1*	383.62*	3.48
L X P	8	28486.7*	1464.7*	132.32*	80.95*
L X V	16	249.6	162.9*	9.68	11.9
Y X L	4	11758.3*	4562.8*	143.46*	132.54*
P X V	8	321.8	61.6	12.78	7.83
Y X P	2	40123.9*	133.6	46.42*	439.58*
Y X V	4	1165.6*	63.4	29.18	2.81
L X P X V	32	281.2	119.0*	10.35	9.33
Y X L X P	8	24142.2*	705.8*	120.63*	82.45*
Y X L X V	16	693.7	113.5	8.97	9.88
Y X P X V	8	289.1	42.8	13.52	6.05
Error	327	480.7	79.3	12.83	8.01

Continued Table 1. Means squares of analysis of variance (ANOVA) for kenaf seed yield and quality components as affected by varieties, planting dates and locations.

Source	Total seed weight	Seed yield/ha	SVI	Seed viability	MGT
Location (L)	1070388.94*	2819588.36*	140.47*	5736.44*	26.05*
Planting time (P)	4781856.96*	17423651.81*	911.59*	30328.78*	60.79*
Replicate	6715.41	59665.39	1.31	107.88	0.07
Variety (V)	11791.2	120250.33	11.15*	214.91	0.37
Year (Y)	1555006.09*	34828.79	303.78*	6905.47*	58.20*
L X P	653578.58*	809537.99*	70.15*	2178.6*	36.89*
L X V	11479.21	119047.75	6.21*	305.37*	0.93*
Y X L	681656.83*	1325409.12*	12.79*	743.48*	5.44*
P X V	11774.99	78341.37	5.31*	173.29	1.12*
Y X P	292406.07*	4395889.37*	166.88*	5237.47*	10.93*
Y X V	18997.61	28111.05	2.02	99.91	1.05*
L X P X V	12787.61	93317.57	6.09*	214.74*	0.75*
Y X L X P	296074.94*	824531.67*	100.34*	3585.43*	3.40*
Y X L X V	12132.33	98821.15	6.67*	198.62*	0.86*
Y X P X V	24812.44*	60524.98	3.46	106.79	0.72
Error	10484.66	80056.70	2.70	100.41	0.42
Location (L)	1070388.94*	2819588.36*	140.47*	5736.44*	26.05*

Table 2. Location effects on kenaf seed yield and quality components.

Location	Plant height	No. of capsules per plant	No. of seeds per capsule	Seed wt. per plant (g)	Seed weight/plot (g)	Seed yield/ha (kg)	SVI	Seed viability	MGT
Kishi	211.5[a]	41a	20b	4.2c	257.81b	418.9c	3.3b	61.3d	2.7c
Ilora	159.0b	43a	21a	7.1a	350.62a	708.8a	4.6a	68.3b	3.7ab
Orin-Ekiti	140.4c	25c	15c	6.4a	117.30c	644.7a	5.1a	74.4a	3.5ab
Ikenne	121.4d	35b	11d	2.7d	96.05c	268.1d	1.9c	53.1e	2.5c
Ibadan	120.8d	27c	19b	5.4b	276.32b	541.2b	3.7b	64.6c	3.3b

SVI: Seedling vigour index, MGT: Mean germination time (days).

Seed yield and quality parameters of kenaf as affected by planting times

All the seed parameters of kenaf planted in June were significantly higher than in other months, except for mean germination time (3.4). The kenaf planted in August recorded the significantly lowest seed yield and all the seed quality parameters (Table 3). The seed yield of kenaf planted in June was the highest, regardless of the locations, while August planting gave the lowest seed yield in all the locations. This result indicates that June plants received the required precipitation that enhanced plant growth and seed production. Kenaf is a photosensitive plant whose flowering pattern is a major determinant of the quantity and quality of produced seeds. The amount of water received through rainfall by the plants planted in August during the flowering period could cause flower abortion in the plants. In all the locations, rainfall reached the second peak when the plants were either preparing to flower or had already flowered. A similar result was recorded in Ibadan in 2015 by Olanipekun and Togun (2020).

Table 3. Planting time effects on kenaf seed yield and quality components.

Planting time	Plant height	No. of capsules per plant	No. of seeds per capsule	Seed wt. per plant	Total seed weight	Seed yield/ha	SVI	Seed viability	MGT
June	168.4a	40a	20a	8.4a	412.5a	842.5a	6.3a	79.1a	3.4b
July	150.2b	38a	18b	5.4b	186.1b	543.9b	3.4b	63.2b	3.7a
August	133.9c	25b	14c	1.6c	60.2c	162.6c	1.4c	40.7c	2.4c

SVI: Seedling vigour index, MGT: Mean germination time (days).

Interactive effects of planting locations and planting times on the plant height, seed yield and quality of kenaf

The interactive effects of locations and planting times on the plant height, seed yield and quality of kenaf are presented in Table 4. The plant height of kenaf planted in June was higher in the forest agro-ecology (Ikenne and Orin Ekiti) and the transitional ecology (Ibadan), while the plant height of kenaf planted in August was higher in Ilora (derived savannah) and Kisi (southern guinea savannah). The seed yield was the highest in June in all the locations. The highest seed yield (1611 kg ha^{-1}) was obtained from kenaf planted in June in Ilora, followed by Orin Ekiti (1431.5 kg ha^{-1}), while the lowest seed yield (296.5kg ha^{-1}) was recorded in Ikenne. The quality of seed as measured by viability and seedling vigour index of kenaf planted in June was higher than in all other months in all the locations. Seeds of kenaf plants in Ilora recorded the highest seed viability (97%) and SVI (10.1), while seeds in Ibadan recorded the second highest viability (89%) but the lowest SVI (7.5). The mean germination time of the viable seeds (approximately 3 days) in all locations was not significantly different from each other. There were no seeds of kenaf planted in August in Kishi, due to the cessation of rain at a critical time of capsule formation, while the seeds of the crop planted in August in Ikenne did not germinate during the quality test.

Table 4. Mean values of the location and planting date interaction of kenaf seed yield and quality.

Location	Planting date	Plant height (cm)	No. of capsules per plant	No. of seeds per capsule	Seed wt. per plant (g)	Total seed weight (g)	Seed yield/ha (kg)	SVI	Seed viability (%)	MGT (days)
Kishi	June	137.3	36	23	7.2	178.4	718.1	7.7	85	2.9
	July	161.9	34	20	0.2	6.9	22.3	4.0	66	3.0
	August	162.2	0	0	0	0	0	0	0	0
Ilora	June	99.7	27	22	16.1	332.3	1611.3	10.1	97	3.1
	July	129.9	47	23	7.3	250.3	729.6	5.7	73	3.1
	August	143.5	33	21	1.3	181.1	132.9	0.8	47	3.4
Orin-Ekiti	June	135.5	39	21	14.3	292.2	1431.6	8.0	88	3.1
	July	93.9	30	17	6.3	73.0	627.4	6.8	88	3.0
	August	86.6	13	6	1.3	13.1	129.2	1.3	48	3.2
Ikenne	June	83.5	22	18	3.0	169.1	296.5	8.3	88	3.4
	July	83.2	27	14	2.6	130.9	255.1	0.8	47	3.2
	August	71.8	13	10	0.7	10.5	69.1	0.0	0	0.0
Ibadan	June	107.2	45	26	11.8	591.7	1176.9	7.5	89	3.1
	July	88.6	21	20	4.6	147.1	459.5	5.2	74	3.3
	August	90.4	18	15	2.3	36.1	230.8	1.8	53	3.4

The relationship between the plant height and seed yield attributes of kenaf

The plant height had a highly significant correlation with the number of capsules per plant and the number of seeds per capsule, while it was only positively correlated with seed weight per plant and seed yield per hectare but not significant (Table 6). All the seed yield attributes were positively and highly significantly correlated.

Table 5. Correlations of the plant height and seed yield attributes of kenaf.

	Plant height	Number of capsules/plant	Number of seeds/capsule	Seed weight/plant	Seed yield/hectare
Plant height	1	0.47**	0.23**	0.11	0.11
Number of capsules/plant		1	0.29**	0.31**	0.31**
Number of seeds/capsule			1	0.41**	0.41**
Seed weight/plant				1	1.00**
Seed yield/hectare					1

The profitability of kenaf seed production across southwestern Nigeria

The gross margin analysis of kenaf seed yield across the locations revealed that the total variable cost (TVC) recorded in Orin Ekiti for each planting time was the highest when compared to other locations. Also, the TVC recorded in the plantings done in June in all the locations except Ikenne was the highest, with Orin Ekiti recording the highest (₦705,650:00) TVC (Table 6). The lowest TVC (₦250,000) was observed in August plantings in Ikenne. The gross margin value of June planting was significantly higher in all the locations. The sums of ₦701,650, ₦1,736,400 ₦1,441.750, ₦184,750, ₦1,224,950 were obtained as gross margin values for June plantings in Kishi, Ilora, Orin-Ekiti, Ikenne and Ibadan, respectively. July plantings in some locations recorded low gross margins, while all plantings done in August returned negative gross margins regardless of the production station (Table 6). The varied cost of production across locations can be connected to the price fluctuations of inputs as well as accessibility and negotiation for labour input. High TVC recorded in June across locations was due to the scarcity of farm hands.

The month of June is the peak period for agricultural activities. However, the majority of the available labour was not easily accessible due to the engagement in personal farming operations, and the few available farm hands increased their charges in the cost of farming operations. This corroborates the findings of Aminu et al. (2020) that farm input use depends on the time and type of operational activities. The high cost of production in Orin-Ekiti was a result of purchases and the non-availability of inputs in the area. The transportation cost of inputs from the head office of these agencies to Orin-Ekiti often leads to the increased cost of the inputs.

Table 6. The gross margin analysis for kenaf seed yield across locations.

Location	Planting date	Total seed weight (g)	Seed yield/ha (kg)	Price/kg (#)	Revenue/ha	TVC	GM
Kishi	June	178.4	718.1	1,500	1,077,150.	375,500	701,650
	July	6.9	22.3	1,500	33,450	360,000	-326,550
	August	0	0		0	255,000	-255,000
Ilora	June	332.3	1611.3	1,500	2,416,950	680,550	1,736,400
	July	250.3	729.6	1,500	1,094,400	658,000	436,400
	August	181.1	132.9	1,500	199,350	550,000	-350,650
Orin-Ekiti	June	292.2	1431.6	1,500	2,147,400	705,650	1,441,750
	July	73.0	627.4	1,500	941,100	660,350	340,750
	August	13.1	129.2	1,500	193,800	650,000	-456,200
Ikenne	June	169.1	296.5	1,500	444,750	260,000	184,750
	July	130.9	255.1	1,500	382,650	265,500	117,150
	August	10.5	69.1	1,500	103,650	250,000	-146,350
Ibadan	June	591.7	1176.9	1,500	1,765,350	540,400	1,224,950
	July	147.1	459.5	1,500	689,250	520,650	168,600
	August	36.1	230.8	1,500	346,200	480,500	-134

TVC: Total variable cost; GM: Gross margin.

Conclusion

The study reveals that kenaf seed yield and quality are highly influenced by the production environment. The most appropriate month to plant kenaf for optimum seed yield of high quality and a profitable gross return on investment is June in southwestern Nigeria.

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ODGOVARAJUĆE VREME SETVE ZA PROFITABILNU PROIZVODNJU KVALITETNOG SEMENA KENAFA (*HIBISCUS CANABINUS L.*) U JUGOZAPADNOJ NIGERIJI

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R e z i m e

Nizak prinos semena postignut u proizvodnji kenafa u različitim agroekološkim uslovima u jugozapadnoj Nigeriji delimično se pripisuje uticaju klimatskih promena. Stoga je sproveden eksperiment kako bi se utvrdio odgovor kenafa na preovlađujuće vremenske uslove i odredilo najprikladnije vreme setve za postizanje optimalnog prinosa semena prihvatljivog kvaliteta koji će biti isplativ u vlažnim uslovima Nigerije. Istraživanje je sprovedeno u pet istraživačkih stanica (Ibadan, Ilora, Ikene, Orin Ekiti i Kisi) Instituta za poljoprivredna istraživanja i obuku u Ibadanu (Nigerija) u vegetacionim sezonama 2018. i 2019. godine (jun–avgust). Posejana su semena kenafa pet sorti (Cuba108, Ifeken DI 400, Ifeken100, Ifeken 400 i Tianung-2) u mesečnom intervalu od juna do avgusta svake godine u randomiziranom kompletnom blok dizajnu sa tri ponavljanja. Žetva, vršidba i čišćenje su ručno obavljeni, nakon čega su uzorci čistog semena analizirani u pogledu kvaliteta semena. Dobijeni su podaci o visini biljke prilikom žetve, osobinama vezanim za prinos semena i parametrima koji se odnose na kvalitet semena. Takođe je sprovedena analiza profitabilnosti kako bi se procenili troškovi i prihodi od proizvodnje na različitim lokacijama. Proizvodni uslovi imaju veliki uticaj na prinos i kvalitet semena kenafa. Zaključeno je da će setva kenafa sredinom juna u jugozapadnoj Nigeriji dati optimalan prinos semena visokog kvaliteta uz isplativ bruto povraćaj od ulaganja.

Ključne reči: kenaf, datum setve, kvalitetno seme, vlažna agroekologija.

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