INFLUENCE OF SOWING DATES ON GROWTH AND YIELD OF COWPEA (*Vigna unguiculata*) (L) Walp) VARIETIES IN BADEGGI, NIGER STATE, NIGERIA

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ABSTRACT

Field trial was carried out at the Research farm of National Agricultural Extension and Research Liason Services (NAERLS/ABU Badeggi Zone, to determine the influence of sowing dates on growth and yield of Cowpea varieties during 2020 and 2021 rainy season. The experiment was a 3 x 4 factorial laid out in a split plot design with three replications. The main plot comprised the time of sowing (June, July, August and September), while subplots comprised the varieties. IT8ID-1228-12 (Semi erect), IT81D-1228-14 (erect) and UAM14-126-L28 (climbing).Results indicated that Leaf Area for 2020 and 2021 cropping seasons increased from 4-10 Weeks After Sowing (WAS) and decreased at 12 WAS. Total dry weights increased with age upto 12 WAS. IT81D-1228-14 produced longer pods of 16.78cm in 2020 and 16.64cm in 2021. Higher Number of dry pods/plant of 8.83 pods in 2020 and 9.12 pods in 2021, number of seeds/plant of 114.9 seeds in 2020 and 119.8 seeds in 2021, number of seeds/pod of 13.07 seeds in 2020 and 13.78 seeds in 2021, seed weight of 12.80g (2020) and 11.87 (2021), as well as seed yield of 420kgh^{-1} and 413 kg/ha^{-1} in 2020 and 2021 respectively, compared with IT81D-1228-12 and UAM 14-126-L28, which produced shorter pods, lower number of dry pods, and number of seeds in the two copping seasons. Sowing in June produced longer pods (17.68cm and 17.70cm), higher number of dry pods/plant (8.99 pods and 9.38 pods) and higher number of seeds/plant (117.7 seeds and 124.6 seed), number of seeds/pod (13.31 seeds and 13.61 seeds), higher seed weight (13.00g and 11.77g), higher seeds yield (417.00 kg/ha^{-1}and 428.00kg/ha^{-1} in 2020 and 2021, respectively. Based on the result sowing cowpea in June performed better, while IT81D-1228-14 performed better than other varieties in all the characters studies.

***Keywords**: Cowpea Varieties, growth, Sowing dates, yield*

INTRODUCTION

Cowpea (*Vigna unguiculata* (L.) Walp) is a food and feed crop grown in the semi-arid tropics of Africa, where Nigeria is the largest producer and consumer, accounting for 61% of production (Ewansiha and Tofa, 2016). Cowpea is an important legume of the tropics, with its various uses as grain in processed foods; as a vegetable and as dry haulms and fodder. It is inexpensive source of plant protein and a hardy crop well adapted to relatively dry environment (Remison, 2012; Igbokwe *et al.,* 2013 and Ano, 2006). Cowpea's high protein content, its adaptability to different types of soil and intercropping systems, its resistance to drought, and its ability to improve soil fertility and prevent erosion makes it an important economic crop in many developing regions (Ewansiha and Tofa, 2016). There are several types of Cowpea varieties which differ in growth habit (Remison, 2012 and Udoh *et al.,* 2015). These include improved spreading type, improved erect type, improved semi-erect type and improved semi-determinate type. Cowpea sowing date varies from area to area depending on the distribution of rains, light and temperature (Ewansiha and Tofa, 2016). According to Ewansiha and Tofa, (2016) reveals that sowing at optimum time enables the crop to best use the available growth factors such as temperature and solar radiation at different stages of growth for high productivity. Early erect Cowpeas which begins flowering about 30 days After Sowing (30 DAS) in the tropics have proved to be useful in some dry environment because of their ability to escape drought (Naim and Jabereldar, 2010; Okaka *et al.,* 2002). Indeterminate Cowpea that begins flowering early have been discovered, but have delayed leaf senescence (DLS) after producing the First Flush of pods, which enables them to produce a second flush of pods (Udealor, 2002). Many cowpea varieties such as Vita-5, IT84E; IT84e-124; IT84E-108; and IT845-2246-4 have been developed in Nigeria to suit the different ecological zones and consumers taste (Remison 2012; and Udealor, 2002). Ogunbodede and Fatunla (1985) reported that number of seeds per pod is moderately to highly heritable. Siddique and Gupta (2016), equally acknowledged that additive gene effects were important in conditioning both seed yield and number of pods per plant, while Emebiri and Obisesan (1991) stressed that seed yield of crops are often influenced by the developmental pattern. Reddy (2012), also reported that pod number is the most important yield attribute of Cowpea. In a recent publication, Kamara *et al.* (2010) suggested that early and medium maturing cowpea varieties should be sown in mid-August and sprayed twice, whereas late-maturing indeterminate varieties should be sowed in early August and sprayed thrice in the savannahs of North-eastern Nigeria. Location may influence cowpea response to planting date of cowpea.

(Ewansiha and Tofa, (2016) report that sowing date and cowpea variety significantly influenced yield and yield components, however, t he indeterminate late maturing varieties produced the highest fodder yields whereas, the plant population of the early and medium maturing varieties be increased to raise their grain yield. Onwueme and Sinha (1999), opined that sowing date for cowpea varies among regions and that the best time for sowing in tropical and sub-tropical regions is just after the rain are well established, while Akpan (2014) and Ndiaga (2000), reported that delayed planting has been found to decrease the number of branches and number of pods per plant. This study therefore measured the influence of sowing dates on the yield of cowpea varieties in Badeggi, Niger State in the Southern Guinea agro ecological zone of Nigeria.

Materials and Methods

Field trial was conducted in 2021 and 2022 rainy season in the research farm National Agricultural Extension and Research Liasion

Service (NAERLS/ABU) Badeggi Zone (Lat $90^0$45', Lat $6^0$07', and 420m above sea level within the southern Guinea Savannah ecological zone of Nigeria to assess the influence of sowing dates on growth and yield of Cowpea varieties.

It was a 3 x 4 factorial, laid out in a split plot design with three replications. The main plot treatment comprised the sowing dates June, July, August, September) while the sub-plot treatment comprised the Cowpea varieties IT81D-1228-12 (Semi erect), IT81D-1228-14 (erect) and UAM14-126-128 (climbing variety). The varieties were all sourced from the International Institute for Tropical Agriculture (IITA), Ibadan. The size of the plot was 3m X 3m, while the distance between one plot and the other was 0.5m and 1m spacing between replicates. Plant spacing was 0.7m x 0.5m which gave 29,153 stands per hectare. With a total land area of 45.5m x 30.5m.Before cultivation, the site was mechanically ploughed and harrowed while sowing was done on the flat 5th June, 5th July, 5th August and 5th September respectively.

Three seeds were sown per hole and was thinned to one plant per stand at about 10-14 days after sowing (WAS) (Fininsa, 1997), while the varieties were sprayed with chemical (Karate) at the rate of 80g/15 ltr of water to check pests (Omotunde, 1996). Vacant stands were supplied between 4-7 days after sowing (DAS) (Akpan, 2015).Similarly, 20kg N/ha from Urea fertilizer was applied 5-7 days after sowing (DAS) to boost vegetative growth, and enhanced nodulation as well as soil nitrogen fixation (Akpan 2014).

Data collection on Leaf Area was conducted at 4 WAS, 8 WAS, 10 WAS and 12 WAS, respectively. A conversion factor of leaf area determined by multiplying the length and width of sampled leaves with total number of leave and a constant of 2.325(Osei-Yeboah *et al.,* 1983). Others data collected are pod length/plant, number of dry pods/plant, number of seeds/plant, number of seeds/pods, 100 seed weight, and seed yield, were done by the collection of mature pods from individual stand. Pod length was obtained by measuring with a centimeter ruler to measured the length of the pod of Ten (10) sampled dry pods from three cowpea stands and total divided by 3. Number of dry pods/plant was determined by counting total dry pods from three, samples stand and the total divided by three while number of seeds/plant was by dividing total number of dry seeds by three 3. Number of seeds/pod was by dividing total number of dry seeds from ten selected dry pods by ten. 100-seeds weight was by weighing 100-seeds from ten sampled pods, while seed yield/ha^{-1} was determined based on this formula: Plot yield X 10,000 m^2 / plot size. Total dry weight (leaves + stems + boots) was obtained by uprooting three sampled plants/pod and sun-drying them between 3-5 days depending on duration of solar radiation before their weights were obtained with a weighing balance. Data were subjected to analysis of variance (ANOVA) method (Gomez and Gomez 1984), while fisher's least significant different (LSD) at 5% probability level was adopted to compare means.

Results and Discussion

Table 1 showed weather information of the research site. Rainfall and humidity rose from January to December and then decreased preparatory to the commencement of dry season. Sunshine hours dropped from in May, due to the interception of rainfall appreciated in November, following the beginning of dry season (Table 1).

Table 1: Meteorological data for annual rainfall (mean) air temperature, relative humidity and sunshine hours during 2020 and 2021 wet season at Badeggi

TREATMENTS	2020					2021				
Month	Rainfall (mm)	Temp. Max.	Min.	Rel. Humidity (%)	Ave. Sunshine Hrs. (6am-6pm)	Rainfall (mm)	Temp. Max.	Min.	Rel. Humidity (%)	Average Sunshine Hrs. (6am 6pm)
January	0.00	31.1	14.31	20.11	124.2	0.00	30.44	18.93	23.43	124.1
February	0.00	33.2	16.68	22.06	116.1	0.00	34.89	17.76	27.32	114.5
March	24.34	35.19	18.13	46.06	123.8	95.11	36.84	22.23	47.03	122.4
April	15.16	36.27	21.53	52.92	118.5	29.40	36.67	23.10	54.80	117.5
May	132.21	32.35	23.5	64.82	120.3	24.40	33.94	22.58	68.39	120.1
June	249.93	30.63	20.13	74.20	113.8	215.80	30.23	21.33	79.73	97.3
July	307.06	28.63	19.79	66.21	102.5	298.80	29.42	21.06	66.74	71.6
August	349.90	27.67	19.50	68.52	89.5	304.20	28.16	20.32	72.83	66.4
September	282.81	29.62	19.45	69.31	110.8	208.41	30.04	21.44	70.34	92.5
October	16.71	31.23	18.23	54.45	123.5	54.40	32.81	21.52	58.68	121.4
November	0.00	30.83	12.80	20.83	930	0.00	30.53	18.32	28.83	10.51
December	0.00	29.10	14.58	20.94	8.86	0.00	26.97	14.42	28.61	9.98
Mean	134.25	31.44	19.06	53.88	114.2	129.01	32.17	21.23	56.04	104.6

Source: Meteorological Unit National Cereal Research Institute, Badeggi, Niger State.

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Table 2shows leaf area of cowpea varieties at 4, 8, 10 and 12 WAS as affected by sowing dates during 2020 and 2021 cropping season. Leaf Area of Cowpea not significantly (P>0.05) affected by both varieties and sowing dates.Leaf area increased with age from 4, 8, 10 WAS and a decline at 12 WAS in both 2020 and 2021, due to leaf fall caused by senescence. Although, the three varieties IT810-1228-12, IT81d-1228-14 and UAM 14-126-L28 produced more leaves at 8 and 10 WAS respectively.

IT81D-1228-14 produced more leaves compared with others (Table 2), suggesting the emergence of many leaves with larger surfaces for eventual absorption of solar radiation. Planting in June produced more leaves compared with other months in both years. This result confirms on earlier report by Akpan (2015) and Abuzar *et al.* (2011) that higher leaf area LA is expected earlier and that variety of plant whose LA is greater yields higher because incident light spread over a larger canopy area. Similarly Abuzar *et al.* (2011) asserted that canopy of leaves that develop quickly will make use of solar radiation in early stages of growth. The small LA at 4 WAS was earlier attributed to smaller leaves with small surfaces which are often few in number (Akpan 2014 and Akpan 2015).

Table 2: Leaf Area of Cowpea varieties at 4, 8, 10 and WAS as affected by sowing dates during 2020 and 2021 cropping seasons

Cowpea Variety	Leaf area/plant (cm^2) 4 WAS		8 WAS		10 WAS		12 WAS	
	2020	2021	2020	2021	2020	2021	2020	2021
IT81D-1228-12 (Semi - erect)	252	183	1122	1092	1071	1028	907	1026
IT81D-1228-14 (Erect)	168	162	1577	1466	1437	1453	1229	1204
UAM 14 -126-128 (Climbing)	154	155	1224	1105	1189	1307	1059	1032
LSD (0.05)	ns	ns	ns	ns	ns	ns	ns	ns
Sowing Dates								
5th June	197a	238a	1722a	1436a	1520a	1521a	1415a	1196 a
5th July	141c	139c	1131b	1106b	1108b	1151c	867c	872c
5th August	189b	190b	1204b	1178b	1164b	1078c	971c	1050b
5th September	192b	145c	1173c	1163c	1138c	1301c	1027b	1232b
LSD (0.05)	ns	ns	ns	ns	ns	ns	ns	ns

Means followed by the same letter in a column are not significantly different at 5% level of probability

Table 3 showed that Total Dry weight of Cowpea varieties at 4, 8 10 and 12 WAS as affected by sowing dates during 2020 and 2021 cropping seasons. Total Dry Weight (Leaves + Stem + Roots) for 2020 and 2021 cropping seasons increased from 4, 8, 10 and 12 WAS, irrespective of the variety of sowing date, suggesting that the more the age of a given crop, the higher the dry weight. Total Dry weight varied non significantly (P>0.05) among variety and sowing date. The climbing variety produced higher total dry weight (leaves + stem + roots), probability due to poor flowering trait and the possession of longer vines although values were statistically similar. This typifies the growth habit of UAM 14-126-L28 compared with semi-erect and erect varieties with shorter vines and high flowering trait. The month of July produced higher total dry weight probably due to observed poor flowering by the three varieties. This poor flowering is attributed by high rainfall and relative humidity (Table 1), while June planting recorded the least. Akpan (2015) reported that poor flowering prolong vegetative growth period and shortens the reproductive growth period.

Table 3: Total dry weight (leaves + stems + roots) of cowpea varieties at 4, 8, 10 and 12 WAS as affected by sowing dates during 2 020 and 2021 cropping seasons

Cowpea variety	Total dry weight (leaves + stems + roots) (g)							
	4 WAS		8 WA S		10 WA S		12 WA S	
	2020	2021	2020	2021	2020	2021	2020	2021
IT81D-1228-12 (Semi - erect)	0.767	0.588	26.13	25.67	27.64	26.64	53.6	54.2
IT81D-1228-14 (Erect)	0.842	0.825	27.62	26.03	28.72	27.29	51.5	52.9
UAM 14 -126-128 (Climbing)	0.958	0.858	27.53	27.56	30.85	29.91	60.0	64.9
LSD (0.05)	ns	ns	ns	ns	ns	ns	ns	ns
Sowing Date								
5th June	0.856b	0.729a	25.0c	26.14b	26.42c	25.02c	50.6c	55.0bb
5th July	0.711b	0.778a	26.29b	25.59b	28.03b	26.22b	53.1b	52.1c
5th August	0.978a	0.856a	28.83a	25.77b	30.08a	31.23b	64.3a	67.5a
5th September	0.878a	0.667a	28.24a	28.18a	31.76a	29.31a	52.2b	54.6b
LSD (0.05)	ns	ns	ns	ns	ns	ns	ns	ns

Means followed by the same letter in a column are not significantly different at 5% level of probability.

Table 4showed length of pods/plant, number of dry pods/plant and number of seeds/plant of cowpea varieties as affected by sowing dates. Pod length/plant was not significantly (p>0.05) affected by both the variety and sowing dates, while number of dry pods/plant as well as number of seed/plant as well as number of seed/plant, were significantly (p<0.05) affected by both variety and sowing dates in 2020 and 2021 respectively (Table 4). IT81D-1228-14 gave longer pods of 16.78cm (2020) and 17.64cm (2021), higher number of dry pods/plant of 8.83 pods (2020) and 9.12 pods (2021) as well as greater number of seeds/plant of 114.9 seeds and 119.8 seeds in (2020) and 2021 compared with IT81D-1228-12 and UAM-126-L28 (Table 4) June sowing on other hand produced longer pods of 17.68cm (2020) and 17.70cm (2021), highest number of dry pods/plant of 8.99 pods (2020) and 9.38 pods (2021), as well as higher number of seeds/plant of 117.7 seeds (2020) and 124.6 seeds (2021) (Table 4).

Table 4: Length of pods/plant, number of dry pods/plant and number of seeds/plant of cowpea varieties as affected by sowing dates

Cowpea Variety	Length of pods/plant (cm)		No. of dry pods/plant		Number of seeds/plant	
IT81D-1228-12 (Semi-erect)	16.77	17.53	8.78	8.73	112.8	119.6
IT81D-1228-14 (Erect)	16.78	17.64	8.83	9.12	114.9	119.8
UAM 14-126-128 (Climbing)	16.67	17.20	6.36	6.83	80.8	90.2
Sowing Date	ns	ns	1.42	1.16	19.50	14.77
5th June	17.68a	17.70a	8.99a	9.38a	117.7a	124.6a
5th July	16.43b	17.56a	8.04a	8.41b	99.3b	114.1b
5th August	16.28b	16.90b	7.79b	7.89c	98.9b	106.8b
5th September	17.24a	17.02a	7.14c	7.22c	95.3c	94.0c
LSD (0.05)	ns	ns	1.13	0.94	15.55	18.82

Means followed by the same letter in a column are not significantly different at 5% level of probability.

Table 5 showed number of seeds/pod, 100-seed weight (g) and seed yield (kg/ha) of cowpea varieties as affected by sowing dates. Number of seeds/pod was not significantly ($P>0.05$) affected by both variety and sowing dates in 2020 and 2021. 100-seeds weight was significantly ($P<0.05$) influenced by variety and sowing date in 2020 and 2021 (Table 5). Seed yield on the other hand was significantly ($P<0.05$) affected by variety and sowing date in both years. Higher number of seeds/pod (13.07) and 13.78 seeds in 2020 and 2021 respectively), higher seed weight 12.80g and 11.87g in 2020 and 2021 respectively as well as increased seed yield of 420 and 413 $kgha^{-1}$ in 2020 and 2021 were recorded from IT81D-1228-14 (Table 5) compared with other varieties. June sowing equally gave higher number of seeds/pod of 13.31 seeds in 2020 and 13.61 (2021) as well as increased seed yield of 417 $kgha^{-1}$ and 428$kgha^{-1}$ in 2020 and 2021 compared with other months. This result corroborates an earlier report by Ogunbodede and Fatunla (1985), that number of seeds per pod is moderately to highly heritable; while Emebiri and Obisesan (2014) reported that seed yields are influenced by the development pattern of the varieties. The general low seed weight is attributed to non-availability of photosynthates for seed development and pod filling, due to mutual shading (Zamir *et al.,* 2011; Akpan and Mbah, 2016). The yield performance by June sowing (Table 5) is in agreement with the findings of Ezueh (2018) who reported higher yield in June planting and reiterated that sowing date was an important factor, significantly affecting Cowpea yield, insect damage and quality of harvest under the humid climatic conditions of southern Nigeria. The general low yield recorded in September sowing agreed with earlier reported by Ano and Ubochi (2008), who submitted that later sowing dates reduced time for vegetative development, including branching that would produce more pods thereby reducing fresh pods and seed yields respectively. The seed yield results conformed to seed yield range of 200-400 $kgha^{-1}$ earlier reported by Okeleye *et al.,* (2010), Uguru (2011) and Udoh *et al.,* (2015).

The performances by IT81D-1228-14 (erect) showed responsiveness and adaptability to the

agro-ecosystem over UAM 14-126-L28 and IT81D-1228-12. The higher total dry weight in the month of July (Table 3) as well as the seed yield recorded in June sowing (Table 5) suggested that higher total dry weight lead to higher yield although biomass accumulation is highly necessary for the vegetative growth phase of the cowpea varieties. Also the seed yield performance by IT81D-1228-14 (erect) compared with IT81D-1228-12 (Semi erect) and UAM 14-126-L28 (climbing) suggested that growth habits of any variety of Cowpea remain important yield determinants factor. Reddy (2012) reported that number of pods is the most crucial yield component in cowpea.

Table 5: Number of seeds/pods, 100-seed weight (g) and seed yield (kg/ha) of Cowpea varieties as affected by sowing dates

Cowpea variety	Number of seeds/pods		100-seed weight (g)		Seed yield (kgha^{-1})	
	2020	2021	2020	2021	2020	2021
IT81D-1228-12 (Semi-erect)	12.80	13.13	12.37	11.49	418	394
IT81D-1228-14 (Erect)	13.07	13.78	12.80	11.87	420	413
UAM 14 (Climbing)	12.67	13.22	10.37	9.07	240	236
Sowing Date	ns	ns	0.88	1.15	59.8	53.2
5th June	13.31a	13.61a	13.00a	11.77a	417a	428a
5th July	12.29b	13.36b	12.19b	10.30b	367b	323b
5th August	12.69b	13.56a	11.14c	11.59a	316b	379b
5th September	13.09a	12.98b	11.08c	9.58c	311c	261c
LSD (0.05)	0.44	ns	0.97	1.69	6.44	92.9

Means followed by the same letter in a column are not significantly different at 5% level of probability.

Conclusion

The seed yield of Cowpea is largely affected by the variety planted and the sowing date. June sowing is recommended for sole cultivation of Cowpea while September sowing completely discouraged. The erect variety (IT81D-1228-14) exhibited higher yield potentials, responsiveness and adaptability to the Badeggi agro ecosystem and therefore stand recommended. Both sowing date and variety are two major factors capable of determining the success or failure of Cowpea cultivation in Southern Guinea agro-ecological zone of Nigeria.

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