EFFECT OF DATE OF PLANTING ON THE PERFORMANCE OF GROUNDNUT (*Arachis Hypogaea)* IN YOLA ADAMAWA STATE

***ABDU A. SAJO AND OTHMAN B. MOHAMMED**
Department of Crop Production & Horticulture
Federal University of Technology, Yola

***Corresponding author**

ABSTRACTS

The field experiments were conducted during the 1999 and 2000 cropping seasons at Mbamba area of Yola, Adamawa State to study the effect of time of planting of groundnut (Arachis Hypogaea). The experiment was laid out in a Randomized Complete Block Design (RCBD) and replicated six times. The planting dates used were early June, late June, early July and late July (10th June, 24th June, 8th July and 22nd July), respectively. Parameters measured include growth traits, phoenological traits and final grain yield. The data collected were subjected to analysis of variance appropriate for RCBN using Genstat for windows (Genstat release 3.2 1995). Mean separation was done using Least Significant Difference (LSD). Results obtained showed that the tallest plants were produced from the early and late June planting giving the highest value of 42.5cm in 1999 and 40.5cm in 2000. Similarly, the planting dates of early and late June gave the earliest flowering, and higher values for numbers of pods per plant in both seasons (43.9 days and 44.2 pods per plant in 1999 and 2000 respectively). These treatments also performed better in other parameters, e.g. grain yield, shelling percentage, 100-grain weight and harvest index. It is therefore concluded that, planting groundnut by late June could give earlier flowering and higher pod and grains yield than all the other planting dates investigated in Yola. And, it is advisable to allow the rains to be well established before planting. Delay planting to the month of July may result in lower total grain yield, resulting from lower number of pods per plant and shorter growing period.

KEY WORDS: Date of Planting, Performance, Groundnut, haulm, yield, grain yield.

INTRODUCTION

The cultivated groundnut (Arachis hypogaea L.) is thought to have originated in the eastern foothills of the Andes in Southern Bolivia – North West Argentina. In literatures, it is believed that Spanish, Portuguese and Dutch explorers and traders transported the species to Africa during the 16th Century (Purseglove, 1988 and Bishop et al, 1983). Groundnut is a widely grown leguminous crop in tropical and subtropical countries between latitude 40° North and South. In Nigeria the crop is mostly grown in the Northern States, which lie between latitude 7° and 13°N situated in Guinea and Sudan Savanna Zones. It is estimated that about 5 million hectares are put under groundnut production in Nigeria every year with an average yield of 2 metric tones per hectare, and a total production of 10 million metric tones (FAO, 1992). In Adamawa State, groundnuts have the highest tonnage among the legumes cultivated and ranks only to cowpea in terms of area under cultivation.

In 1997, a total of 511,130ha were put under cultivation, with a total production of 729,080 metric tones (ADP, 1998). In Adamawa State, groundnuts are produced in nearly all the 21 Local Government Areas as food and cash crop. The semierect varieties are the most cultivated in these areas, and notably among them are SAMNUT10 (RMP12) and SAMNUT11 (RMSP91), which have gained wide acceptability (ADP, 1995).

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Groundnut is highly nutritious and contains approximately 25% protein and 45-50% oil. The haulms are useful in livestock feeds and as farmyard manures, and have been categorized amongst the most degradable sources of protein in animal feeds (Anon, 1980). Its food value as animal feeds has been found to be higher than any other hay sources (Ikhatus and Adu, 1984) and degradability greatly improves the incorporation of nutrients in plant residue into the soil by micro flora (Alexander, 1977).

The area under groundnut cultivation and yield per hectare in Yola as observed for some years have not been encouraging as compared to the other areas of the state. The average yield of 0.94 mt/ha in Yola is below the state average of 1.30 mt/ha (ADP, 1998). This is also well below the yield potential of the popularly cultivated SAMNUT10 variety of 2.8-3.5 mt/ha (ADP, 1995).

Although the total annual rainfall of 1,018mm of this area (ADP, 2000) is adequate, for groundnut production, the amount of rainfall during April and May is usually low and therefore, not optimal for good germination and establishment of groundnut plants. The rain however, get stabilized around mid-June, but at times the distribution becomes erratic (ADP, 1998 and 2000). The farmers do start planting with the onset of the rains (often replanting the field due to poor germination because of moisture stress) and such planting continues till the end of July at various locations.

Although early planting is beneficial, it often exposes the crop to dry spells, which usually occur early in the rainy season. This results in some young seedlings of the crop drying up completely or reducing the plant stands due to poor germination while late planting exposes the crop to high rainfall which can result in water logging and subsequent yield reduction (Kadams, 1995). For this reasons, cropping recommendations were found to be too generalized even though varietal pre-release multi-locational trials were conducted under the Nationally Co-ordinated Research Projects (NCRP) and state trials under the auspices of the Institute of Agricultural Research (IAR). Yayock (1981), observed that because of the unpredictable variation in rainfall from year to year, from one location to another, it is difficult to make definite recommendation on sowing dates of groundnut for the various agro-ecological zones. The optimum planting date on one site may not apply at other locations due to regional and locational variations in weather. This necessitates further trials at each site to validate the general recommendations (Azamali, et al.; 1993).

It has therefore become imperative to determine the effect of planting dates on the performance of groundnut, especially for the popular variety, SAMNUT10 in Yola with a view to coming up worth appropriate recommendations that might assist the farmers in general and groundnut producers in particular in Yola. Adamawa State. The objective of the experiment therefore, was to study the effects of planting date on the performance of SAMNUT10 groundnut variety in Yola.

Materials and Methods.

The research was conducted at Mbamba, along Yola-Fufore road, located on latitude 9o 30'N and longitude 12o 11'E during the 1999 and 2000 cropping seasons. The area is in the

Northern Guinea Savanna Zone with a mean annual rainfall of 990.4mm (ADP, 2000). Soil testing of the site was conducted prior to land preparation. The soil was typically sandyloam, low in CEC, organic matter, total N and available P, but high in K and well drain (Table 1). The experimental treatment consisted of four planting dates D1-D4) 10th June, 24th June, 7th July and 22nd July in both 1999 and 2000 laid out in a Randomized Complete Block Design and replicated six times.

Ridging of the plots was done for each treatment at the corresponding dates of planting using bullock drown ridges. Ridges were 5m long and 75cm apart from the net plot area was $18.75m^2$.

Fertilizer dosage of 15kg N/ha of NPK 15-15-15 and 36lag Pro5/ha of single super phosphate (SSP 18% P_2O_5) per hectare was used as recommended for the groundnut crop in the area (ADP, 1995). The 15kg N ha-1 applied basely was to serve as starter nitrogen. Thus, each plot received 28gn of NPK 15-15-15. This was divided into 5 equal parts (5.6g) and broadcasted evenly on each of the 5m ridges and thoroughly worked into the soil before planting.

SAMNUT10 (RMP12) a semi-erect medium maturing groundnut variety was used. After dressing with Apron plus at the rate of 2kg seeds per 10g sachet of the chemical. A single seed was planted per hill giving one plant per stand at germination. Replacement of missing stand was carried out within one week of germination.

Manual hoe weeding was employed at 4,6 and 8 weeks after planting. Harvesting (lifting and picking) was manually done when each treatment mature. These were carried out on 7th October, 21st October, 2nd November and 8th November respectively corresponding to the dates of planting. The parameter measured include days of 50% flowering, days to harvest, plant height haulm dry weight, number of pods per plant, weight of 100 grain shelling percentage, pod yield, shelled grains weight final grain yield).

Data collected were subjected to analysis of variance appropriate for Randomized Complete Design using Genstat for windows (Genstat 5 release 3.2, 1995). Means showing significant differences were compared using the Least Significant Different (LSD) method.

RESULTS

The result of the soil test showed a typically sandy loam soil, low in cation Exchange Capacity (CEC), organic matter, total Nitrogen and available Phosphorus but high in potassium (table 1).

TABLE 1: Soil physical and chemical properties of the experimental site at Mbamba in Yola in 1999.

Properties	Values
Soil texture	Sandy loam
Particle density (pd)	2.57 gm cm^{-3}
Bulk density (bd)	1.48 gm cm^{-3}
Percent pore space	42.59%
Moisture holding capacity on dry weight basis (pw)	19.34%
Soil pH	6.10
Organic carbon	0.64%
CEC	18.69 c mol kg-1
Total N	0.058 g kg^{-1}
Available P	0.87 mg kg^{-1}
Exchangeable basis	2.9 cmol kg^{-1}
Exchangeable K	1.73 cmol kg^{-1}
Exchange ca + mg	5.16 cmol kg^{-1}

TABLE 2: The effects of planting date on some phonological and growth parameters of groundnut in Yola during 1999 and 2000 seasons

Planting	Plant	Height (cm)	Haulm Weight (kg/ha)		days of flowering	
Date	1999	2000	1999	2000	1999	2000
Mid June	41.1	40.5	2449	2791	22.08	21.67
Late June	42.5	40.5	2631	2760	22.08	22.17
Early July	38.1	36.3	2369	2480	22.58	22.08
Late July	28.2	28.8	1373	1151	22.25	22.08
Mean	37.5	36.5	2206	2296	22.25	22.00
SED	0.93	0.30	34.3	38.3	0.059	0.245
LSD	2.28	0.72	59.4	93.7	0.144	0.600
Prob. Of F	0.01	0.01	0.01	0.01	0.01	Ns

ns = not significantly different at P = 0.05

Table 2 shows the effect of planting dates on growth and Phoenology of groundnut in Yola during the 1991 and 2000 cropping season. All the traits measured varied significantly with the variation in planting dates at P = 0.01 in both seasons except days to 50% flowering, which did not differ with planting date at P= 0.05 in the 2000 growing season. Generally plant height decreased with delayed planting in both years giving the tallest plant of 42.5cm in 1999. In 2000 growing season, plant height progressively decreased with delayed planting from the highest value of 40.5cm for both the mid-June and late June's planting to 28.8cm for late July planting. Also, lowest values of 28.2cm and 28.8cm were recorded from the late July planting in 1999 and 2000 respectively. Days to 50% flowering were shortened (22.08 and 21.67) with early planting in both 1999 and 2000 (Table 3). On the other hand, longer days to 50% to flowering were obtained by late July planting giving values of 22.25 and 22.08 in 1999 and 2000 respectively.

Haulm weight increased from the mid June's planting to late June planting, in 1999 giving the highest value of 2,631kg ha^{-1} (Table 2). Therefore, there was a steady decreased in haulm weight with the late July's planting recording the lowest value of 1,373kg ha^{-1} However, in 2000 growing season there was no significant differences between the planting dates of mid June and late June.

There was no significant different in days to harvest due to date of planting. However, as planting date was delayed from mid-June to late July, days to harvesting showed a trend of progressive shortening. The lowest period to attain maturity of 120 days after sowing was obtained from both the mid and late June's sowing. Further delay in sowing to early and late July reduced maturity to 118 and 110 days, respectively. Yield parameters were significant (P=0.01) affected by planting date in both season (Table 3). Number of pods per plant in 1999 and 2000 increased from43.9 to 44.2 with the mid and late June planting, respectively (Table 3). The late July planting however, gave 29.0 and 28.1 pods per planting for 1999 and 2000 growing seasons (Table 3).

TABL E 3 The effect of planting date on some yield parameters of groundnut in Yola

Planting Date	Prod. No/Point		Pod yield (kg/ha)			Seed yield (kg/ha)		Shelling %		100-Seed Weight (gm)		Harvest Index
Mid June	1999	2000	1999	2000	1999	2000	1999	2000	1999	2000	1999	2000
	41.0	38.8	997	1219	664	823	66.8	67.8	37.2	38.6	19.33	20.61
Late June	43.9	44.2	1170	1198	812	840	69.5	70.4	41.3	42.2	21.38	21.27
Early July	41.2	41.5	1075	1118	733	770	68.3	69.0	39.5	39.8	21.31	21.44
Late July	29.0	28.1	544	477	332	277	61.6	59.0	32.2	30.3	17.34	17.43
Mean	38.8	38.1	947	1003	635	677	66.5	66.5	37.6	37.7	19.84	20.19
SED	0.20	2.61	6.5	25.76	8.0	12.42	0.32	1.11	0.23	0.53	0.089	0.469
LSD	0.48	6.39	15.9	63.02	19.6	30.38	0.78	2.72	0.56	1.30	0.218	1.147
Prob. Of F	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

In 1999 growing season, pod yield per hectare increased from 997 kg/ha to 1,170kg/ha with the planting date of mid and late June. Thereafter pod yield decreased from 1075kg/ha to 544kg/ha with the early and late July planting (Table 3). In the 2000 growing season, the highest pod yield of 1219kg/ha was recorded from the planting date of mid June. This decreased to 477kg/ha in the late July planting (Table 3). Similarly, seed yield gave the same trend with the pod yields in both 1999 and 2000 season (Table 3).

Shelling percentage 100-grain weight ad harvest index in both 1999 and 2000 cropping seasons showed the same pattern. Increase in shelling percentage was obtained up to late June planting. Further delay in planting resulted in reduced shelling percentage (Table 3). However, there was no significant difference between the late June and early July's planting for harvest index.0 In 2000 growing season on the other hand, delayed planting resulted in increased harvest index up to early July when the highest value of 21.44% was obtained with the lowest value of 17.43% at the late July's planting (Table 3).

The combined analysis of variance for the two cropping seasons (1999 and 2000) for the growth and yield parameters of groundnut in Yola is presented in Table 4. Significant differences (P=0.05) were obtained in both growth and yield parameters, except days to flowering (Table 4). Significant (P=0.05) interaction between date of planting and seasonal variation were also reviewed in both growth and yield parameter except in number of pods (Table 4).

Table 4: Combined analysis of variance table showing means squares of different growth and yield parameters of groundnuts in 1999 and 2000 sessions

Source	df	Plant Height (cm)	Days to Flowering	Dry Matter (kg/ha)	Haulm Weight (kg/ha)	Pod no.	Pod yield (kg/ha	Seed Yield (kg/ha)	Harvest Index (%)	Shelling (%)	100 grain Weight (gm)
Planting Date (D)	3	856.405**	0.861ns	23037089**	1073235**	1120.22**	2339052**	13353477.6**	83.896**	446.028**	489.781**
Error	15	3.098	0.205	9773	8938	20.94	2151	684.1	0.58	5.809	0.691
Year (Y)	1	21.565**	1,500**	516633**	194400**	10.67ns	77214**	426727**	2.940	0.001ns	0.375ns
D x Y	3	8.565*	0.417**	729692**	326114**	8.50ns	87450**	46505.8**	2.399**	17.917**	12.292**
Total	**47**	**2.518**	**0.135**	**7460**	**4533**	**18.34**	**1560**	**731.1**	**0.508**	**1.469**	**1.021**

- Significantly different at P=0.05, ** significantly different at P=0.01 and ns = significantly different at P=0.05

DISCUSSION

Under different levels of competition, the performance of groundnut planted at different dates behaved differently. The late June planting performed better. The significant effects of planting dates on some growth parameters of groundnuts such as plant height, dry weight of haulm was an indication that environmental conditions of temperature, light duration and rainfall which is different with the planting dates did affect the performance of the groundnut. This shows that for optimum growth the right planting time must be adopted which might ensure the prevalence of the optimum environmental conditions for better growth and ultimately cultivate into final grain yield. This is consistent with the findings of Yayock and Owowubi (1985), who reported differences in groundnut yields with variations in amount and distribution of rainfall. Gibbon Panan (1985) and ADADP 91995) also reported differences in groundnut yields with variations in temperature and solar radiation intercepted.

Phonological development also differed with planting dates. This shows that since it was the environmental conditions that contributed the only difference between the planting dates, such environmental factors that were different during those growth periods as temperature and rainfall might have been responsible for the differences in the crop phonology observed. Other researchers such as the National Research Institute (1996) have associated temperature during the life cycle of the crop must have resulted in reduced thermal days, thus reducing growth rate and consequently affecting days to flowering. This agrees with the findings of Yoshitaka et al; (1974) who reported that as temperature gets higher from 24°C – 33°C, the number of days required from flowering in groundnut becomes shorter. The difference between the maximum and minimum temperatures in 1999 cropping season (16°C) was higher than the 2000-cropping season (6°C. The low night temperatures were capable of reducing the rate of dry matter production and partitioning. This agrees with the findings of Owonubi (1995) who reported that lower temperature reduced the vegetative growth of groundnut. The time of occurrence of the drought period of 1999 and 2000 in July, which coincided with the critical growth stages of the crop, must have affected its performance.

Yield components such as the number of pods per plants, pod yield per hectare total seed yield per hectare and 100 seed weight were significantly affected by the planting dates in the two seasons indicating that environmental conditions are essential for yield of groundnut. Where such environmental conditions such as temperature, rainfall, day length and thermal days are favorable yield is increased, as such planting dates must target such favorable periods for optimum yield.

The significant effects of planting date in the combined analysis of variance on all the growth and yield parameter except days to 50% flowering is an indication that similar results may be expected each year such planting date are adopted. The influence of the weather elements on the growth and phonological stages of the groundnuts must behave consequently affected the yield. The result showed that crops planted even on the same dates in different years, may have different flowering dates, since flowering is influenced by temperature, light duration (thermal days) and other stress conditions in the soil such as nutrient and moisture deficiencies.

Other yield parameters such as number of pods per plant, shelling percentage and 100-grains weight were not significantly different between the two years. This shows that, such parameters are genetically determined and except where the stress is very severe, there would be no differences between the mean values of the parameters in any of the years. It further shows that the ratio of dry matter yield to the grains is same under less stress conditions. Similarly, there would be no much difference in the size of the grains except where there are severe stress

conditions. This is because the dry matter allocation to the grains or pods does not vary much with seasonal variations.

In conclusion, most of the parameters measured during the two cropping seasons gave significant differences between planting dates. The tallest plants were observed from the early and late June's planting with the highest values of 42.5cm in 1999. Similarly the planting dates of early and late June gave the earliest flowering. The highest values for number of pods per plant in both seasons were 43.9 and 44.2 for 1999 and 2000 growing seasons respectively and were obtained from the late June's planting. Similarly, late June's planting performed best for other parameters such as seed yield, shelling percentage 100-gram weight and harvest index. This shows that, it is better to allow the rains to settle first before planting groundnut in this environment and the time and rains would have settled in normally by the late June. Delay planting beyond this period would not result in any increased yield.

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