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EFFECT OF WEED CONTROL STRATEGIES ON THE GROWTH PERFORMANCE OF GROUNDNUT (*Arachis hypogaea* L.) VARIETIES IN THE NIGERIAN SAVANNA

M. Haruna[1] and D. M. Jibrin[1*].
[1]Samaru College of Agriculture, Division of Agricultural Colleges, Ahmadu Bello University PMB 1082, Zaria, Nigeria.
Corresponding Author: dahiru62@yahoo.com +2347038785335

ABSTRACT

A field trials was conducted in 2015 wet seasons at the Teaching and Research Farm of Samaru College of Agriculture, Ahmadu Bello University Zaria (11° 11' N, 07° 38' E, and 686m above sea level) located in the northern Guinea Savanna ecological zone of Nigeria and Institute of Agricultural Research Station, Minjibir, Kano state (11^0 50'N, 08^{0}36'E and 458m above sea level) in the Sudan savannah ecological zone of Nigeria respectively. The treatment was factorially combined and laid down in a split plot design with three groundnut varieties SAMNUT24, SAMNUT23 and KAMPALA occupying the main plot and five level of weed control that is weedy check, black polythene mulching, white polythene mulching, pre-emergence herbicide only (Pendimenthalin at 1.5 kg a.i. ha^{-1}) and manual weeding at 3 and 6 WAS allocated to the subplot and replicated thrice. The results indicated that Plot grown to SAMNUT23 and SAMNUT24 significantly produced the highest hill count with early flowering than to KAMPALA at both locations. SAMNUT24 were generally taller than SAMNUT23 and KAMPALA at 9 WAS. The use of black polythene mulch or hoe weeding twice at 3 and 6 WAS resulted to taller plants at 9 WAS as well as had the earlier in days to 50% flowering than the weedy check. Plots with black and white polythene mulch, pendimenthalin at 1.5 a.i. kg ha^{-1} and hoe weeded at 3 and 6 WAS respectively, significantly led to production of more fresh and dry biomass, at 70 days and better haulm weight at harvest than plot grown to weedy check. Based on the results, it can be concluded that SAMNUT24 groundnut variety outperformed SAMUNT23 and KAMPALA with respect to growth characters. While, the use of black polythene mulch or hoe weeded at 3 and 6 WAS controls weed more effectively and resulted in better growth of groundnut in both locations.

Keywords: Groundnut varieties, growth, weed control, weedy check and black polythene.

INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is a member of the genus *Arachis* in the family *Fabaceae*. Groundnut is an important food crop worldwide with an annual production of over 53.6 million tonnes on nearly 31.5 million hectares in 2020, according to the Food and Agriculture Organization (FAOSTAT, 2020)

In Africa, groundnut is grown mainly in Northern Nigeria, Sudan, Senegal, Chad, Ghana, Congo and Niger. In 2025, groundnut yield in Africa was about 995.1 kg /ha with an area harvest of about 17,082187 ha (FAO,2025).

Groundnut being mainly grown during rainy season by peasant farmers in Nigeria encounters several weed problems, since the annual grasses and seasonal broad leaf weeds grow luxuriantly and dominate during the season as compared to dry season. The weed competition in early stages of groundnut is maximum because of slow initial foliage growth depending upon the degradation of food reserve in the cotyledons. Although emergence of radicle in groundnut is fast (24hrs for pish and 36 – 48 hrs for Virginia types) root development is slow (5 – 10 days). The root is capable of absorbing nutrients and the epicotyls (region of an embryo) is exposed to light in groundnut whereas the situation is reverse in the case of weeds which emerge faster and grow rapidly as compared with groundnut and consequently take a lead in crop – weed competition. The critical period of weed competition is estimated to be between 2 – 6 WAS.

According to Ndam *et al.* (2025) weed competition is particularly detrimental to groundnut, given the crop's slow initial growth and short stature, especially during the first 40 days after planting. Weeds not only compete aggressively for nutrients, water, light, and space, but also serve as hosts for insect pests and disease vectors, and may produce allelochemicals harmful to groundnut. Consequently, weed management is a critical determinant of groundnut productivity, with unchecked weed growth responsible for yield losses of up to 47% (Jopale *et al*., 2024). Rapid weed emergence and growth during the early crop stages have been shown to significantly reduce groundnut yields (Kaur, *et al.,*2018; Korav *et al.,*2018). In areas where agricultural labour is scarce and costly, herbicides may be used as pre- and post- emergence application to control weeds (Rao, 2004). Pre-emergence application of pendimethalin/metolachlor at the rate of 0.75 kg a.i ha^{-1}, alachlor at the rate of 1.0 kg a.i ha^{-1}, or pre-plant incorporation of fluchloralin at the rate of 0.75 kg a.i ha^{-1} controlled weeds effectively (Rao, 2004).

On the other hand plastic film mulching has been a common agricultural practice since it was introduced to China in 1978 (Dong *et al.,* 2009; Zhang *et al*., 2012). Polyethylene (PE) film mulching can conserve soil moisture and raise soil temperature (Dong *et al*., 2008), promote growth and increase yields (Dong *et al.,* 2009). In peanut production, clear plastic film is the most commonly used for weed control and conservation of moisture, however, higher temperature under the clear mulch during pod development may restrict pod and

kernel growth (Reddy *et al.,* 1988) and weed control also could be a problem (Waterer,2000) which will reduce the pod yield. Groundnut yield is as high as 3000kg ha^{-1} in USA, the yield in tropical Africa is about 800 kg ha^{-1} which is traceable to weed infestation (Akobundu, 1987). Uncontrolled weed in this crop results in yield loss which is as high as 60% to 80% (Ikisan, 2000; Reddy *et.al*, 1990).

Despite the increasing popularity of improved groundnut varieties in Nigeria, majority of farmers are yet to achieve the yield potential of these improved groundnut varieties due to poor agronomic practices particularly the use of comprehensive weed management approach (Polythene mulch, herbicide and hoe weeding) so as to reduce the level of weed infestation over time, reduce farmers dependence on herbicides and increase moisture conservation by plants and thus boast haulm yield of the groundnut crop.

Based on the foregoing the objective(s) of this study therefore are as follows;

- To determine the growth performances of three groundnut varieties under Sudan and Northern Guinea savanna conditions of Nigeria.
- To determine the most effective weed control method for optimum groundnut growth in the Sudan and Northern Guinea Savanna agro-ecological zones of Nigeria.

MATERIALS AND METHODS

The experiment was conducted in 2015 wet seasons at the Teaching and Research Farm of Samaru College of Agriculture, Ahmadu Bello University Zaria (11° 11' N, 07° 38' E, and 686m above sea level) located in the northern Guinea Savanna agro ecological zone of Nigeria and Institute of Agricultural Research Station, Minjibir, Kano state (11^0 50'N, $08^0$36'E and 458m above sea level) in Sudan savannah ecological zone of Nigeria. The land was harrowed twice to a fine tilth and ridged up to 1m between rows and then marked out into 45plots with 1 m spacing between blocks and 1m spacing between plots. The gross and net plot size was 16 m^2 (4m x 4m) and 8 m^2 (2 m x 4m) respectively. However, the gross plot consisted of 4 ridges while the net plot consisted of 2 ridges. The groundnut seed was sown at 10 cm spacing with 2 seeds per hole. The treatments consist of factorially combination as three groundnut varieties (SAMNUT24, SAMNUT23 and KAMPALA) occupying the main plot and five level of weed control (Zero mulching, black polythene mulching, white polythene mulching, pre emergence herbicide only (Pendimenthalin at 1.5 kg a.i. ha^{-1}) and manual weeding at 3 and 6 WAS) allocated to the subplot and replicated thrice in a split plot arrangement. Five plants were randomly tagged from the net plot at 70 days. Data on hill count was collected by counting the numbers of plants that emergence within the net plot. Plants height was measured at 9 WAS using metre rule from the ground level to tip of the last fully expanded leaf. Fresh biomass at 70 days was determined by weighing the whole fresh plant (shoot and pods). Days to 50% flowering were recorded by regular observation and counting the days from the time of sowing to when 50% of the plants in each plot flowered. Dry biomass at 70 days was determined by weighing the whole dry plant (shoot and pods) after being oven dried to a constant weight. Haulm weight was obtained by air drying haulm to a constant weight after detaching the pod of the groundnut. The data collected was subjected to Analysis of Variance (ANOVA) using general linear model GLM of the Statistical Analysis System package (SAS, 2003) and the means was separated using the Duncan's Multiple Range Test (5% probability level) (Duncan, 1955).

RESULTS AND DISCUSSIONS

Table 1 shows the effect of weed control strategies on hill count, plant height 9WAS and fresh biomass at 70 days of groundnut varieties at Zaria and Minjibir in 2015 wet season. SAMNUT23 and SAMNUT24 significantly recorded the highest hill count when compared to KAMPALA at both locations. SAMNUT24 were consistently taller than SAMNUT23 and KAMPALA at 9WAS. The reason for significant difference among the tested varieties could be due to the genetically makeup of the improved varieties over the local variety in terms of seed viability and more haulms. Likewise, SAMNUT 24 was bred to serve as a dual-purpose variety with high potential for both haulm and pod yield. Patel *et al.* (2008) reported that varieties of groundnut differ in their potential productivity.

The responses of fresh biomass at 70 days to weed management practices were not consistent in both locations. However, the use of black polythene mulch produced the tallest plant at 9 WAS in both location than the weedy check. With the exception of weedy check, all other weed control strategies significantly produced higher biomass yield at 70 days at Zaria and Minjibir. The variation in the aforementioned vegetative characters could be due to the fact that black polythene mulch tends to trap more moisture and heat which in turn help in enhancing rapid growth and development of the plant and thus smothering weeds without inflicting injuries to the plants in the affected plots as opposed to plot grown to weedy check. This is in accordance with the findings of Mubarak (2004) reported that efficient weed control facilitates plant to have more resources for growth. Yadava and Kaura (2007) reported that weed control in groundnut led to increased number of branches $plant^{-1}$ as compared to groundnut plants whose plot was left unweeded. Also Hu *et al.* (1995) recorded earlier seedling emergence, improved crop growth and nodule development in groundnut as a result of use of polythene mulch.

The variation of days to 50% flowering, dry biomass at 70 days and haulm weight among three groundnut varieties and use of different weed management strategies

is presented in Table 2. Variation in groundnut varieties significantly recorded more number of days to 50% flowering at both locations alone. The use of KAMPALA groundnut variety have delayed flowering when compared with SAMNUT23 and SAMNUT24 that are earlier in flowering According to Jibrin (2022) who reported that the reasons for these variation and inconsistencies that manifested among the tested groundnut varieties in terms of growth and yield characters could be as a result of the differences in genetic makeup of the three varieties in response to environment.

The weedy check plots flowered late in both locations while plot grown to black polythene mulch at both site and plot weeded at 3 and 6 WAS Minjibir flowered earlier. Properly managed field (weed control) leads to early flowering due to less competition with weeds in terms of space and growth factors.

At Zaria, use of black polythene mulch recorded the highest dry biomass at 70 days and haulm weight than the rest of the weed control methods strategies employed. At Minjibir, the weedy check recorded the least value for dry biomass at 70 days and haulm weight. This is in line with the findings of Adepke (2005) crop are known to perform better under good weed management. Also the higher competition for growth factors in the weedy check plots might have led to the poor performance of the groundnut crop.

CONCLUSION

Based on the findings of this study, it can be concluded that the SAMNUT24 groundnut variety outperformed SAMNUT23 and KAMPALA in terms of growth characteristics. Additionally, the use of black polythene mulch or hoe weeding at 3 and 6 weeks after sowing (WAS) provided more effective weed control and enhanced groundnut growth across both locations.

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Table 1: Effect of weed control strategies on hill count, plant height at 9 WAS and fresh biomass at 70 days of groundnut varieties in Nigerian savanna in 2015 wet season.

	Zaria			Minjibir		
Treatment	**Hill count**	**Plant height at 9 WAS**	**Fresh biomass at 70 days**	**Hill count**	**Plant height at 9 WAS**	**Fresh biomass at 70 days**
Variety (V)						
SAMNUT23	59.933a	39.400b	195.6	55.600a	40.273b	417.1
SAMNUT24	61.467a	44.733a	216.4	59.333a	47.167a	400.2
KAMPALA	50.333b	38.700b	406.6	45.333b	34.693b	343.6
SE±	2.8427	1.7800	105.51	2.7700	1.9423	38.68
Weed control (W)						
Weedy check	51.444	31.189c	102.8b	47.778	31.000c	244.5b
White polythene mulch	55.333	38.989b	203.3ab	54.333	43.033ab	386.1ab
Black polythene mulch	62.333	49.156a	271.8ab	54.444	49.889a	416.8a
Pendimenthalin at 1.5 kg a.i. ha^{-1}	60.556	41.033b	231.8ab	52.111	40.689b	4330a
Hoe weeding at 3 and 6 WAS	56.556	44.356ab	554.7a	58.444	38.944b	454.3a
SE±	3.6700	2.5075	136.22	3.5760	2.5075	49.93
Interaction						
V x W	NS	NS	NS	NS	NS	NS

Means followed by the same letter (s) within treatment group are not significantly different using D.M.R.T at 5% level of probability. NS=Not significant.

Table 2: Effect of weed control strategies on days to 50% flowering, dry biomass at 70 days and haulm weight of groundnut varieties in Nigerian savanna in 2015 wet season.

	Zaria			Minjibir		
Treatment	**Days to 50% flowering**	**Dry biomass at 70 days**	**Haulm weight (g)**	**Days to 50% flowering**	**Dry biomass at 70 days**	**Haulm weight (g)**
Variety (V)						
SAMNUT23	25.933b	103.57	705.1	24.467b	131.07	684.2
SAMNUT24	23.267b	104.02	1975.7	20.467c	127.40	839.2
KAMPALA	30.733a	99.34	1523.1	29.333a	105.13	772.8
SE±	1.0064	7.818	635.63	0.6890	10.992	69.49
Weed control (W)						
Weedy check	32.556a	75.40b	459b	31.222a	78.78b	467.7b
White polythene mulch	25.778b	99.50b	809b	23.667bc	125.89a	787.3a
Black polythene mulch	20.333c	134.02a	3846a	21.444c	131.78a	737.7a
Pendimenthalin at 1.5 kg a.i. ha^{-1}	27.000b	100.57b	901b	25.222b	132.00a	856.8a
Hoe weeding at 3 and 6 WAS	27.556b	102.06b	991b	22.222c	137.56a	977.8a
SE±	1.2993	10.093	820.59	0.8895	14.191	89.71
Interaction						
V x W	NS	NS	NS	NS	NS	NS

Means followed by the same letter (s) within treatment group are not significantly different using D.M.R.T at 5% level of probability. NS=Not significant.