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Response of Groundnut Varieties to Weed Management Strategiesin Southern Guinea Savanna of the Gambia

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Abstract: ***Field trials were conducted in 2018 rainy season at National Agricultural Research Institute Banjulinding and Teaching and Research Farm of the University of The Gambia UTG Faraba Banta to determine the effect of various weed management strategies on weed management, growth and yield of groundnut varieties. The experiment consisted of three groundnut varieties (Senegal 28/206, Fleur 11 and Samnut 24) and ten levels of weed management strategies (Pendimethalin at 1.0kg a.i h^{-1}, Pendimethalin at 1.5kg a.i ha^{-1}, Quizalofop-P-Ethyl at 1.0kg a.i ha^{-1}, Quizalofop-P-Ethylat at1.5kg a.i ha^{-1}, Pendimethalin at 1.0kg a.i ha^{-1} followed by Quizalofop-P-Ethyl at 1.0kg a.i ha^{-1}, Pendimethalin at 1.0kg a.i ha^{-1} followed by supplementary hoe weeding at 6 weeks after sowing, Manual hoe weeding at 3 and 6 weeks after sowing, Pendimethalin at 1.5kg a.i ha^{-1} followed by supplementary hoe weeding at 6 weeks after sowing, Pendimethalin at 1.5kg a.i ha^{-1} followed by Quizalofop-P-Ethyl at 1.5kg a.i ha^{-1} and Weedy check). The experiment was laid out in a Split plot design, replicated three times with the weed management strategies as the main plots while the groundnut varieties as the sub plots. The results revealed that, manual hoe weeding at 3 and 6 weeks after sowing recorded the highest weed control efficacy index (8.41) atBanjulinding. However, at UTG Faraba Banta, pendimethalin at 1.5kg a.i ha^{-1} followed by quizalofop-p-ethyl at 1.5kg a.i ha^{-1} recorded the highest weed control efficacy index (5.09).Application of pendimethalin at 1.5kg a.i ha^{-1} followed by quizalofop-p-ethyl at 1.5kg a.i ha^{-1} recorded kernel yield (817.3 kg $ha^{-1)}$ at Banjulinding. At UTG Farba Banta pendimethalin at 1.0kg a.i ha^{-1} followed by quizalofop-p-ethyl at 1.0 kg a.i ha^{-1} had higher kernel yield (765.2 kg ha^{-1}). Samnut 24 out yielded other varieties in both locations. Further research is recommended to evaluate the acceptability of the variety in the Gambian.***

Keywords: Groundnut, Weed, Management, Herbicides, yield, competition

1. Introduction

Groundnut is one of the most important oil crop in many tropical countries. Its world production stood at 34.9 million metric tonsfrom 23.4 million ha (Vara Prasad *et al*., 2017). Groundnuts are mainly grown in developing countries (Africa), where the crop finds the appropriate climates for optimum production (Romain, 2001). Groundnut production in The Gambia was estimated at 151,069 metric tons in 2001 and 71,526 metric tons in the following year giving a 53% decline. A thirty percent increase in groundnut production was recorded between 2002 and 2003. It is the main cash crop in The Gambia and one of the most important export crops in the country. It occupies 40-50% of the Gambian cultivated area followed by early millet (25%), rice (8%), sorghum and maize (7%) (Permanent Interstates Committee for Drought Control in the Sahel, 2008).

The nuts are eaten fresh, boiled or grilled and used in preparation of soup. Kernels are processed into a wide variety of edible products such as edible oil, groundnut butter, salted groundnut, etc. Two- thirds of the world production is used for producing edible oil which provides a good salad and cooking oil used in the margarine production industries. Groundnut also provides cake for human and animal consumption. The groundnut haulm is used as animal feeds and has about the same nutritional value as hay. The shells are used as fuel and fertilizers. Other non-food used of groundnuts includes soap, cosmetic and for medicinal purposes (Romain, 2001). Groundnut plays a significant role in soil fertility management. It fixes 49-297kg atmospheric nitrogen N ha^{-1} through its rhizobium bacteria in the root noodles (Jallow, 2012).

Despite huge economic potentials of groundnut in The Gambia its production was however, constrained by lack of improved cultural practices, inadequate rainfall, soil fertility, chemical fertilizers, low yielding varieties and lack of appropriate weed control strategies (Jallow, 2012). The major limiting factors of groundnut production in the study area were diseases and pests including weeds. The presence of weeds as pest is more pernicious and serious because it can drastically reduce the growth of groundnut (Garko*et al.*, 2016).Ihala*et al.* (2005) had reported groundnut yield reduction due to weed competition as high 74% in India. According to Ayomide (2010), weed caused much damage to the groundnut crop during the first 45 days of its growth. Weeds can deplete 30 – 40 kg of Nitrogen per hectare, 10-15kg of phosphorous per hectare and 20-40kg of potassium per hectare (Das ,2011). Among all the crop pests, weeds alone are responsible for about one third loss in crop production (Jat*et al.* 2011). In groundnut, the loss in pod yield ranges from 13 to 100% depending on the season, cultivars, weed composition and duration of crop-weed competition (Jat*et al.* 2011). Most of the groundnut varieties cultivated in The Gambia are low yielding with low fodder value. They usually shed their leaves before maturity and are mostly spreading type that compete poorly with weeds and has low oil contents (ANR, 2015). Cultivating higher yielding varieties is not only important but necessary. The usual method of weed control is by manual hoe weeding. This has been associated with lots of challenges. The availability of labour at time of

high demand is a major concern. It can also reduce kernel yield due to its interference with pegging and cannot support large scale production to cater for the needs of increasing population. Patel *et al*. (2008) reported that in areas where labour is shortage, the use of herbicide or combinations of manual hoe weeding and herbicide applications reduced weed dry weight and recordedhigher weed control efficiency in groundnut.The use of herbicide as a means of weed management is fast gaining momentum especially in groundnut cultivation. Herbicides are efficient in suppressing or modifying weed growth in such a way as to prevent interference with crop establishment (Kunjo, 1981). Although several studies have been conducted in various part of the world to determine the effect of weed on groundnut, there is currently limited information on the effect of weeds and variety on growth and yield of groundnut in The Gambia. Hence the objective of this study is to evaluate the yield and performance of groundnut varieties as influenced by weed management strategies in Southern Guinea Savanna of The Gambia.

2. Materials and Methods

The experiment was conducted during the wet season of 2018 at two locations in The Gambia. The first location was at the National Agricultural Research Institute Farm in Banjulinding (Latitude 13^0 22.171 N and Longitude $16^0$38.858W) while the second was at Teaching and Research Farm of the University of The Gambia Faraba Banta (Latitude 13^0 14.910 N and Longitude 16^0 32.040W). The two locations were characterized by two seasons, wet season (June to October) and dry season (November to May). The annual rainfall of the first location (Banjulinding) was 859 mm and the second location (UTG Faraba Banta) was 951mm (courtesy of The Gambia Meteorological Office in Banjul).The soil texture of Banjulinding site was sandy clay while at UTG Faraba Banta was sandy clay loam with a total organic carbon of 0.94 gkg^{-1}; N, 0.35 gkg^{-1}; available P,17.32 $mgkg^{-1}$; pH,5.7 while that of UTG Faraba Campus site was sandy clay loam; organic carbon,0.49 gkg^{-1}; total N, 0.28 gkg^{-1}; available P,17.75$mgkg^{-1}$ and a pH of 5.5. The experiments consisted of two factors; groundnut varieties (Senegal 28/206, Fleur 11 and Samnut 24) and ten levels of weed management strategies (Pendimethalin at 1.0kg a.i h^{-1}, Pendimethalin at 1.5kg a.i ha^{-1}, Quizalofop-P-Ethyl at 1.0kg a.i ha^{-1}, Quizalofop-P-Ethylat at 1.5kg a.i ha^{-1}, Pendimethalin at 1.0kg a.i ha^{-1} followed by Quizalofop-P-Ethyl at 1.0kg a.i ha^{-1}, Pendimethalin at 1.0kg a.i ha^{-1} followed by supplementary hoe weeding at 6 weeks after sowing, Manual hoe weeding at 3 and 6 weeks after sowing, Pendimethalin at 1.5kg a.i ha^{-1}followed by supplementary hoe weeding at 6 weeks after sowing, Pendimethalin at 1.5kg a.i ha^{-1} followed by Quizalofop-P-Ethyl at 1.5kg a.i ha^{-1} and Weedy check). The treatments were factorial combined and were laid out in a Split plot design replicated three times. Level of weed management strategies were assigned to the main plots while the groundnut varieties allocated to the sub plots. The land was cleared, tilt, harrowed, loosened and ridged before sowing. Gross and net plots sizes were 13.5m^2 and 4.5m^2 respectively.Sowing was done when the rainy season was fully established and the crops were spaced at 75cm inter rows and 25cm intra rows with two seeds planted per stand. The pre-emergence herbicide was applied a day after sowing according to the treatments while the post-emergence herbicide (Quizalofop-P-Ethyl) was applied at 6 weeks after sowing using knapsack sprayers. Fertilizer was applied at rate of 20 $kgha^{-1}$ of nitrogen, 40$kgha^{-1}$ of phosphorous (P_2O_5) and 20$kgha^{-1}$ of potassium using NPK 15:15:15 and single super phosphate 18%. Data were collected on weed control index, canopy height, number of branches $plant^{-1}$ at maturity, number of pods and kernels $plant^{-1}$, as well as on haulm and kernel yields ($kgha^{-1}$). Data generated were subjected to analysis of variance (ANOVA) using GenStat software**,** 17th Edition and the significance means were compared using Students-Neuman Keuls' Test (SNK).

3. Results

The results in Table 1 revealed that weed control indexwas significantly affected by weed management strategies in both locations.Manual hoe weeding at 3 and 6 weeks after sowing recorded the highest weed control index at Banjulinding while pendimethalin at 1.5 kg a.i. ha^{-1} followed by quizalofop-P-Ethyl at 1.5 kg a.i. ha^{-1} had higher control index at UTGFaraba Banta. Lowest weed control index was consistently observed in weed check plots in both locations.The groundnut varieties had no effect on weed control indexin both locations (Table 1). The interaction between variety and weed management strategies was also not significance in both locations.

Weed management had no effect on canopy height at Banjulinding while significant effect was observed at UTGFaraba Banta (Table 1). Where weed arecontrolled, had taller plants than the weedy check. Shorter plants were observed on weedy check control plants..Samnut 24 was observed to be taller than the other two varieties in both locations.

Number of branches $plant^{-1}$ was significantly affected by weed management strategies in both locations.The weed controlled plots had higher number of branches $plant^{-1}$ than weedy check plots which recorded the lowest branches in both locations. Senegal 28/206 consistently recorded the highest number of branches $plant^{-1}$than the other varieties in both locations.

The interactions of groundnut variety and weed management strategies was found to be significant on number of branches $plant^{-1}$ at Bajaunlinding(Table 2) as well as on canopy height and number of branches at UTG Fara Banta (Table 3). Controlling weeds by herbicide application, hoe weeding or combination of the two on Sengal 28/206 had more number of branches $plant^{-1}$ than where weeds were not controlled. However, weeding Fleur 11 and Samnut 24 had similar branches with their unwedded control counterpart.

At UTG Fara Banta, the weeded and unweeded Senegal 28/206 and Fleur 11 varieties had similar height (Table 3). HoweverSamnut 24 responded differently to weed management on plant height. Application of pendimethalin at 1.5 kg a.i.ha^{-1}followed by supplementary hoe weeding at 6WAS to this variety had taller plants which were similar to other management strategies but different from the control (Table3). The branching pattern of all the three varieties

does not change with changing weed management strategies at UTG Faraba Banta. However irrespective of weed management strategies, Senegal 28/206 had more branches than either Fleur or Samnut 24.

The effect of weed management strategies and groundnut varieties on number of pod and kernel plant^{-1} were significant in both locations (Table 4). Pendimethalin at 1.5kg a.i ha^{-1} followed by quizalofop-p-ethyl at 1.5kg a.i ha^{-1} recorded the higher pod and kernel plant^{-1} which were statistically similar with other weed management strategies except weedy check at Banjulinding. However, pendimethalin at 1.5kg a.i ha^{-1} followed by supplementary hoe weeding at 6 weeks after sowing recorded higher pod plant^{-1} than other weed management strategies at UTG Faraba Banta. Similarly, pendimethalin at 1.0kg a.i ha^{-1} followed by supplementary hoe weeding at 6WAS had higher kernel plant^{-1} which was statistically similar to all other weed management strategies but different from the weedy check at UTG Faraba Banta. The weedy check plots recorded the lowest number of pods and kernels plant^{-1} in both locations. The interaction between groundnut varieties and weed management strategies on number of pods and kernels plant were not significant in both locations.Samnut 24 consistently recorded the highest number of pods and kernels plant^{-1} than other two varieties in both locations.

The effect of weed management strategies and groundnut varieties on haulm and kernel yield was significant in both locations (Table 5). Manual hoe weeding at 3 and 6 WAS had higher haulm and kernel yield which was similar to other weed management strategies but different from the weedy check controlled plots at Banjulinding. Similarly, the manual hoe weeding at 3 and 6 WAS recorded higher haulm yield while post-emergence application of quizalofop-P-ethyl at 1.0 kg a.i. ha^{-1} had higher kernel yield which were similar to other management strategies but different from weedy check plots at UTG FarabaBabanta. Weedy check plots consistently recorded the lowest haulm and kernel yield in both locations.Samnut 24 recorded the highest kernel yield which was statistically similar to Fleur11but different from Senegal 28/206 at Banjulinding. Similarly, at UTG Faraba Banta Samnut 24 significantly recorded the highest haulm and kernels yield than other two varieties. The interactions of weed management strategies and groundnut varieties on haulm and kernel yield were not significance in both locations.

4. Discussion

The weed management strategies employed in this research were significance and efficient in weed management. Manual hoe weeding resulted in cutting of the weed seedlings and burial of weed seeds into the soil at greater depth than other management strategies. Similar opinion was reported by Pabitra*et al.* (2016). At Banjulinding, all the plots treated with herbicides showed minimum weed control index compared to UTG Faraba Banta. This could be attributed to the fact that there was heavy rainfall few minutes after application of pre- emergence herbicide which might have reduced the weed efficacy of the applied herbicide in this location. That could have explained the good performance of manual hoe weeding in this which is not affected by weather. Das (2011) reported that high rainfall might reduce the persistence and efficacy of applied herbicides.

Weed management strategies significantly affected of most of the characters studied in both location except canopy height at Banjulinding. In these cases where weeds were controlled, the performance of the groundnut was higher than where weeds were not controlled as reported by Pabitra*et al.* (2016) in India. Where weeds are not controlled the growth and yield of the groundnut was significantly reduced. This is because weeds compete with crops for limited environmental resource and weeds have competitive advantage over crops, hence the reduction of growth and yield characters of the groundnut. The environmental resources which are supposed to have been used by the crop, are now diverted to support the growth and development of the weed at the expense of the crop. This report is in conformity with the findings of Ayomide (2010) who reported that weed caused stressed which reduced yields of groundnut by competing with the crop for minerals, light, nutrients and space. Other researchers have equally reported significant reduction of groundnut' canopy height, branching habit, pod, haulm and kernel yielding ability of groundnut due to weed competition in various localities (Pabitra*et al.* 2016;Ojelade*et al.*, 2018;Korov*et al.*, 2018;Kasaur*et al.*, 2019; Olayinka and Etejere, 2015). The reduction of growth and yield character of groundnut due to weed competition may also be due to allelophatic potentials of some weed species which sometimes lead to total elimination of groundnut stands due to secretion of allelochemicals that are lethal to some plants including groundnut as reported by Das (2011). Among the weed controlled treatment, applications of herbicide alone proved to be promising in pods and kernel yields than the use of manual hoe weeding alone. This could probably be attributed to the fact that manual hoe weeding may leads destruction of pegs after pollination before or after reaching the soils. Under this conditions pods may not be formed or destroy after being formed (Ojelade*et al.*, 2018). This suggested that the use of herbicide (pre-and post-emergence) seems to be the best option for managing weeds in groundnut. However, the activities of the applied herbicide may be affected by weather suggesting that, it should not be applied under rainy condition or when rainy hours is being expected immediately after application. Similar opinionwere reported by Das(2011).

Samnut 24 appears to be superior to the other varieties tested in both locations. It was taller and leafier than the other two varieties. This makes it to be superior to the otherin terms of number of pod and kernels palnt^{-1}, haulm and kernel yield in both locations. The superiority of the Samnut 24 over Senegal 28/206 and Fleur 11 could also be attributed to the fact that it was an improved variety with superior growth and yield character. The superiority of Samnut 10 over local cultivar of groundnut having reported by Olayinka and Etejere (2015)in Lafiagi, Nigeria. Samnut 24 was intentionally developed at IAR, Zaria, Nigeria with intention of bursting groundnut production in the country. The study confirmed that Samnut 24 is adoptable to the Gambian region and can equally help in increasing groundnut production the Gambia. It was also evident from this study that, employing any weeding strategy does not reduced or

increased canopy height and branching habit of Samnut 24. This could be attributed to the fact that tallness of this variety helped in suppressing weed growth. Similar observation were reported by Akobundu (1987) who noted that plant height is one of the character that may affect the competitive ability of crop against weeds.

In conclusion, pre-emergence application of pendimethalin followed by post-emergence application of Quizalofop-P-Ethyl at 1.5 kg a.i ha^{-1} increased growth and yield characters of groundnut of the two varieties compared to other weed management strategies. Samnut 24 proved to be more productive than the other two varieties tested and can burst groundnut production in the Gambia. Further research need to be carried in different part of the Gambian to a certain its adoptability and acceptability by the farmers.

Table 1: Effect of Weed Management Strategies and Groundnut Varieties on weed control index, canopy height (cm) and number of branches $plant^{-1}$at Banjulindingand UTG Faraba Banta during 2018 Rainy Season

Treatments	Location					
	Banjulinding			UTGFaraba Banta		
	Weed control index	Canopy height	Branches $plant^{-1}$	Weed control index	Canopy height	Branches $plant^{-1}$
Weed Management Strategies						
Pendimethalin at 1.0kg a.i h^{-1}	1.11b	53.28	26.11a	1.02ab	45.87a	23.97a
Pendimethalin at 1.5kg a.i ha^{-1}	1.53b	55.66	25.11a	1.19ab	42.01a	20.56a
Quizalofop-P-Ethyl at 1.0kg a.i ha^{-1}	1.45b	51.11	23.67a	1.81ab	42.58a	19.83a
Quizalofop-P-Ethyl at 1.5 kg a.i ha^{-1}	0.85b	50.49	23.89a	1.29ab	43.4a	18.97a
Pendimethalin at 1.0kg a.i h^{-1} fb Quizalofop-P-Ethyl at 1.0kg a.i ha^{-1}	1.62b	49.98	26.22a	2.78ab	43.08a	20.64a
Pendimethalin at 1.0kg a.i h^{-1} fb SHW at 6 WAS	1.95b	54.14	26.33a	2.41ab	41.42a	22.31a
Manual hoe weeding at 3 and 6 WAS	8.41a	53.93	24.78a	2.62ab	43.86a	22.14a
Pendimethalin at 1.5 kg a.i h^{-1} fb SHW at 6 WAS	2.18b	55.73	26.89	4.04ab	44.66	24.06
Pendimethalin at 1.5kg a.i h^{-1} fb Quizalofop-P-Ethyl at 1.5 kg a.i ha^{-1}	2.13b	50.54	25.89a	5.09a	43.19a	25.42a
Weedy check	0.0b	43.22	10.00b	0.0b	33.58b	12.28b
Level of Significance	0.001	0.161	0.001	0.021	0.009	0.001
SE±	0.604	2.835	1.646	1.389	1.737	1.462
Vareity (V)						
Senegal 28/206	1.65	36.93c	37.73a	2.360	31.60c	39.23a
Fleur 11	2.66	48.04b	18.97b	2.280	40.10b	12.72b
Samnut 24	2.06	70.45a	14.97c	2.040	55.33a	11.10b
Level of Significance	0.424	0.001	0.001	0.859	0.001	0.001
SE±	0.544	1.198	0.902	0.4221	0.631	0.862
Interaction						
WM*V	0.176	0.101	0.043	0.815	0.002	0.001

Means followed by the same letter(s) in a column are not significantly different at 5% level of probability using Students-Neuman Keuls (SNK) Test. SHW= Supplementary Hand Weeding, WAS=week after sowing, fb= followed by

Table 2: Interaction between Weed Management Strategies and Groundnut Varieties on Number of Branches at Banjulindingduring during 2018 Rainy Season

Weed management strategies		Variety	
	Senegal	Fleur 11	Samnut24
Pendimethalin at 1.0kg a.i ha^{-1}	42.33a	20.67f	15.33f
Pendimethalin at 1.5kg a.i ha^{-1}	44.33a	15.00f	16.00f
Quizalofop-P-Ethyl at 1.0kg a.i ha^{-1}	37.67a-d	17.67f	15.67f
Quizalofop-P-Ethylat at 1.5kg a.i ha^{-1}	37.67a-e	20.00ef	14.00f
Pendimethalin at 1.0kg a.i ha^{-1}fb Quizalofop-P-Ethyl at 1.0kg a.i $ha^{-1}ha^{-1}$	39.67ab	20.33f	18.67f
Pendimethalin at 1.0kg a.i ha^{-1}fb SHW at 6WAS	41.67a	22.00c-f	15.33f
Manual hoe weeding at 3 and 6 WAS	38.33abc	20.67cf	15.33f
Pendimethalin at 1.5kg a.i ha^{-1}fb SHW at 6WAS	45.00a	20.33f	15.33f
Pendimethalin at 1.5kg a.i ha^{-1}fb Quizalofop-P-Ethyl at 1.5 kg a.i $ha^{-1}ha^{-1}$	39.00ab	23.00b-f	15.67f
Weedy check	11.67f	10f	8.33f
SE± 2.830			

Means followed by the same letter(s) in a column are not significantly different at 5% level of probability using Students-Neuman Keuls (SNK) Test. SHW= Supplementary Hand Weeding, WAS=week after sowing, fb= followed by

Table 3: Interaction between Weed Management Strategies and Groundnut Varieties on Canopy Height(cm) and Number of Branches at UTG Faraba Banta during 2018 Rainy Season

Weed management strategies		Variety	
	Senegal	Fleur 11	Samnut24
Canopy height (cm)			
Pendimethalin at 1.0kg a.i ha^{-1}	33.67fgh	42.27b-f	61.67a
Pendimethalin at 1.5kg a.i ha^{-1}	30.07fgh	41.1d-h	54.87abc
Quizalofop-P-Ethyl at 1.0kg a.i ha^{-1}	30.03fh	41.93c-g	55.77ab
Quizalofop-P-Ethylat at 1.5kg a.i ha^{-1}	34.83fgh	39.63fgh	55.73abc
Pendimethalin at 1.0kg a.i ha^{-1}fb Quizalofop-P-Ethyl at 1.0kg a.i $ha^{-1}ha^{-1}$	32.63fgh	38.97fgh	57.63a
Pendimethalin at 1.0kg a.i ha^{-1}fb SHW at 6WAS	30.13fgh	39.93fgh	54.20a-e
Manual hoe weeding at 3 and 6 WAS	32.93fgh	40.53e-h	58.10a
Pendimethalin at 1.5kg a.i ha^{-1}fb SHW at 6WAS	30.97fgh	39.37fgh	63.03a
Pendimethalin at 1.5kg a.i ha^{-1}fb Quizalofop-P-Ethyl at 1.5 kg a.i ha^{-1}	33.00fgh	41.70b-h	54.87a-d
Weedy check	27.70h	35.60fgh	37.43fgh
SE± 2.382			
Number of Branches $plant^{-1}$			
Pendimethalin at 1.0kg a.i ha^{-1}	48.42a	11.67b	10.42b
Pendimethalin at 1.5kg a.i ha^{-1}	36.83a	13.25b	11.58b
Quizalofop-P-Ethyl at 1.0kg a.i ha^{-1}	36.00a	13.25b	10.25b
Quizalofop-P-Ethylat at 1.5kg a.i ha^{-1}	33.42a	12.90b	10.58b
Pendimethalin at 1.0kg a.i ha^{-1}fb Quizalofop-P-Ethyl at 1.0kg a.i $ha^{-1}ha^{-1}$	40.33a	11.17b	10.42b
Pendimethalin at 1.0kg a.i ha^{-1}fb SHW at 6WAS	44.58a	11.17b	11.17b
Manual hoe weeding at 3 and 6 WAS	41.33a	14.67b	10.42b
Pendimethalin at 1.5kg a.i ha^{-1}fb SHW at 6WAS	47.33a	12.25b	12.58b
Pendimethalin at 1.5kg a.i ha^{-1}fb Quizalofop-P-Ethyl at 1.5 kg a.i $ha^{-1}ha^{-1}$	46.75a	17.00b	12.50b
Weedy check	17.25a	9.92b	9.67b
SE± 2.662			

Means followed by the same letter(s) in a column are not significantly different at 5% level of probability using Students-Neuman Keuls (SNK) Test. SHW= Supplementary Hand Weeding, WAS=week after sowing, fb= followed by

Table 4: Effect of Weed Management Strategies and Groundnut Varieties on Number of Pods and Kernels $Plant^{-1}$ at Banjulinding and UTG Faraba Banta during 2018 Rainy Season

Treatments	Location			
	Banjulinding		UTG Faraba Banta	
	Number of pods $plant^{-1}$	Number of kernels $plant^{-1}$	Number of pods $plant^{-1}$	Number of kernels $plant^{-1}$
Weed managements strategies (WM)				
Pendimethalin at 1.0kg a.i ha^{-1}	15.00a	27.44a	14.00a	25.67a
Pendimethalin at 1.5kg a.i ha^{-1}	14.22abc	27.22a	14.00a	24.33a
Quizalofop-P-Ethyl at 1.0kg a.i ha^{-1}	12.67a-d	22.89a	14.56a	26.44a
Quizalofop-P-Ethylat at 1.5kg a.i ha^{-1}	14.44abc	27.67a	13.22a	24.44a
Pendimethalin at 1.0kg a.iha^{-1} fb Quizalofop-P-Ethylat at 1.0kg a.i ha^{-1}	12.33a-e	21.11a	15.22a	28.11a
Pendimethalin at 1.0kg a.iha^{-1}fb SHW at 6 WAS	13.11a-d	23.44a	14.44a	26.78a
Manual hoe weeding at 3 and 6 WAS	14.67ab	26.67a	12.67a	23.33a
Pendimethalin at 1.5kg a.iha^{-1}fb SHW at 6 WAS	18.22a	34.00a	11.90b	21.53b
Pendimethalin at 1.5kg a.iha^{-1} fb Quizalofop-P-Ethylat at 1.5kg a.i ha^{-1}	18.56a	33.56a	12.56a	22.56a
Weedy check	6.00bd	9.56b	5.56b	8.89b
Level of significance	0.011	0.003	0.001	0.001
SE±	1.857	3.267	0.954	2.026
Variety(V)				
Senegal 28/206	13.03b	23.33b	11.90b	21.53b
Fleur11	13.70ab	24.83b	12.23b	22.00b
Samnut 24	15.00a	27.90a	15.03a	27.60a
Level of significance	0.022	0.010	0.001	0.002
SE±	0.497	1.027	0.561	1.210
Interaction				
WM*V	0.203	0.100	0.518	0.541

Means followed by the same letter(s) in a column are not significantly different at 5% level of probability using Students-Neuman Keuls (SNK) Test. SHW= Supplementary Hand Weeding, WAS=week after sowing, fb= followed by

Table 5: Effect of Weed management Strategies and Groundnut Varieties on Haulm, Pod and Kernel Yield (kg ha^{-1}) at Banjulinding and UTG Faraba Banta during 2018 Rainy Season

Treatments	Location					
	Banjulinding			UTGFaraba Banta		
	Haulm yield	Pod yield	Kernel yield	Haulm yield	Pod yield	Kernel yield
Weed Management Strategies (WM)						
Pendimethalin at 1.0kg a.i h^{-1}	6222a	1084a	762.4a	6642a	963a	614.6a
Pendimethalin at 1.5kg a.i ha^{-1}	6988a	1097a	768.2a	6247a	1024a	721.2a
Quizalofop-P-Ethyl at 1.0kg a.i ha^{-1}	5926a	969a	724.7a	4021ab	924a	728.7a
Quizalofop-P-Ethyl at 1.5 kg a.i ha^{-1}	5802a	1020a	755.8a	4321ab	910a	679.0a
Pendimethalin at1.0kg a.i h^{-1} fb Quizalofop-P-Ethyl at 1.0kg a.i ha^{-1}	6667a	954a	725.0a	5506a	1025a	765.2a
Pendimethalin at 1.0kg a.i h^{-1} fb SHW at 6 WAS	6049a	1072a	761.5a	5012ab	978a	707.9a
Manual hoe weeding at 3 and 6 WAS	5630a	1075a	751.4a	6914a	964a	705.4a
Pendimethalin at 1.5 kg a.i h^{-1} fb SHW at 6 WAS	7161a	1142a	801.0a	6815a	1030a	725.0a
Pendimethalin at1.5kg a.i h^{-1} fb Quizalofop-P-Ethyl at1.5 kg a.i ha^{-1}	7037a	1149a	817.3a	6494a	976a	710.6a
Weedy check	1728b	213b	128.9b	2889b	174b	80.0b
Level of Significance	0.001	0.001	0.001	0.001	0.001	0.001
SE±	667.3	76.1	36.97	594.8	59.6	22.37
Vareity (V)						
Senegal 28/206	6185a	959	665.3b	6563a	843b	608.4c
Fleur 11	4963b	981	704.4a	4756b	864b	648.5b
Samnut 24	6615a	992	729.5a	5156b	983a	704.3a
Level of Significance	0.011	0.696	0.003	0.001	0.004	0.001
SE±	365.5	27.7	12.54	336.1	30.0	12.27
Interaction						
WM*V	0.415	0.523	0.738	0.164	0.927	0.750

Means followed by the same letter(s) in a column are not significantly different at 5% level of probability using Students-Neuman Keuls (SNK) Test. SHW= Supplementary Hand Weeding, WAS=week after sowing, fb= followed by

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