

Response of Groundnut (*Arachis hypogaea* L.) Varieties to Critical Period of Crop-Weed Interference in West Coast Region of The Gambia

S.A.F. Jallow
Manneh F.J.

School of Agriculture and Environmental Sciences,
University of the Gambia, Faraba Campus, Serrekunda, The Gambia

[Doi:10.19044/esj.2025.v21n12p73](https://doi.org/10.19044/esj.2025.v21n12p73)

Submitted: 17 January 2025

Accepted: 14 March 2025

Published: 30 April 2025

Copyright 2025 Author(s)

Under Creative Commons CC-BY 4.0

OPEN ACCESS

Cite As:

Jallow S.A.F. & Manneh F.J. (2025). *Response of Groundnut (*Arachis hypogaea* L.) Varieties to Critical Period of Crop-Weed Interference in West Coast Region of The Gambia*. European Scientific Journal, ESJ, 21 (12), 73. <https://doi.org/10.19044/esj.2025.v21n12p73>

Abstract

Field trials were conducted in the 2021 rainy season at the National Agricultural Research Institute Banjulinding (NARI Site III) and the Teaching and Research Farm of the University of The Gambia (UTG Faraba Banta). The study aimed to determine the critical period of crop-weed interference on weed attributes, growth and yield of groundnut varieties. Hence, the objective was to determine a specific timeframe critical for weed management as well as growth and yield responses of the two groundnut varieties (Fleur 11 and Philippine pink) to weed competition. The experiment was conducted in a Randomized Complete Block Design with Nine (9) treatments replicated three times. The treatments tested were as follows: Weed-free up to 21 DAS, Weed-free up to 42DAS, Weed-free up to 63DAS, Weed-free check (75DAS), Weed Infestation up to 21DAS, Weed Infestation up to 42 DAS, Weed Infestation up to 63 DAS, Weedy check. The Groundnut variety used as a test crop was Fleur 11. The results revealed that weed-free check (75 DAS) recorded the highest mean weed control efficiency (98.3 %) and lowest percentage of weed infestation (22.0%) followed by Weed-free up to 63DAS with 85% weed control efficiency and 39% weed infestation in both locations. The critical period for crop-weed interference in the groundnut variety tested was observed to be between 21 DAS to 63 DAS. The mean pod yield of the groundnut

varieties was found to increase from 769kg/ha at 21 DAS to 967kg/ha at 63 DAS with a decrease in weed density in both trials. The weedy situation was found to decline the pod yield of the groundnut varieties by 58% to 87% in Site III and UTG Faraba, respectively.

Keywords: Groundnut, weed interference, weed, growth, yield

Introduction

In the Gambia, groundnut (*Arachis hypogaea* L) is the most important crop; occupying 40-50% of the cultivated area followed by early millet (25%), rice (8%), sorghum and maize (7% each) (Jallow *et al.*, 2025). It is an important and alternative source of protein for many Gambians who cannot afford meat as a source of protein. The haulms are a good source of feed for livestock, especially during the dry season when fresh green grasses are not available. This serves as an additional source of income for farmers in the dry season when the fodder is in high demand. The nuts are eaten fresh, boiled or grilled and prepared for soup. In addition, groundnut kernels are processed into a wide variety of edible products such as edible oil, groundnut butter, salted groundnut, etc. (Georges *et al.*, 2016). However, the production of groundnut has not been consistent in the country over the past years mainly due to problems such as climate change and variability, Aflatoxin contamination, poor soil fertility and high weed infestation. Despite the introduction of improved high-yielding varieties and Good Agricultural Practices, the productivity of groundnuts has been low. The total production of groundnut declined from 116,420 MT in 2009 to 94,371 in 2013. In 2019, the total groundnut area harvested in The Gambia was 115,000ha, average yield was 956.5kg/ha and production was 110,000 tons (FAOSTAT, 2019). Intensive weed competition is one of the major constraints among the factors limiting groundnut production and productivity in the subregion (Korav *et al.*, 2020). The morphological structure and initial slow-growing nature of the groundnut crop make it vulnerable to weed attack and multiplication. This makes weed control very expensive and time-consuming since the majority of The Gambian farmers are small-scale and lack farm equipment to effectively manage weeds. Small-scale farmers use simple hand hoes to control weeds in groundnuts. This type of weed control method urges farmers to start weeding very early mostly at the emergence of the crop and in most cases, they weed 3 to 4 times before harvest. Weed removal requires a lot of human and capital resources, and frequent weeding during crop production may not be economical (Korav *et al.*, 2020). Therefore, the knowledge of crop-weed interaction will help to determine the exact time/period when weed removal from a crop is critical to maximize production and reduce cost. However, limited research has been carried out in The Gambia to determine the most

critical weed removal period in order to reduce crop losses. The critical period of crop-weed competition is an important principle of integrated weed management (Hakeem *et al.*, 2015). This can certainly help in attaining the level of food security, economic growth and development of poor resource farmers in The Gambia. The removal of weeds throughout the crop season may not be economical. In order to avoid unnecessary expenses on weed management, the critical period of crop-weed competition during the growing period of groundnut has to be determined (Mekdad *et al.*, 2021). The use of appropriate varieties for particular agroecology is also very important in groundnut production.

Materials and Methods

The study was conducted during the wet growing season of 2021 at two different locations in The Gambia. The purpose of the study was to determine the critical period of crop-weed interference on weed attributes, growth and yield of groundnut varieties. This will help to enhance the understanding of crop-weed interaction and increase groundnut productivity through the development of sustainable weed control practices for farmers. The first location was at the National Agricultural Research Institute farm in Banjulinding (NARI Site III), which lies between 13° 22.171 N and 16° 38.858W. The second location was at the University of The Gambia (UTG) Research Farm at Faraba Banta (13° 14.910 N and 16° 32.040W), Kombo East. The monthly rainfall and temperature of the trial sites were obtained from the nearby weather stations in the Department of Water Resources of The Gambia. The result indicated that the soil was sandy clay at NARI Site III while at UTG Faraba Banta it was sandy clay loam. The pH was moderately acidic in both locations. The organic carbon content was slightly low in both locations, however the total N and available P were high in both locations. The exchangeable bases and CEC were low in both locations. The experiment was laid in a Randomized Complete Block Design with 9 treatments replicated three times. The treatments tested were: Weed-free up to 21 DAS, Weed-free up to 42DAS, Weed-free up to 63DAS, Weed-free check (75DAS), Weed Infestation up to 21DAS, Weed Infestation up to 42 DAS, Weed Infestation up to 63 DAS, Weedy check. The groundnut variety used was Fleur 11. Gross and net plot sizes were 6 m² and 3 m², respectively. Fertilizer was broadcasted one week after sowing at the rate of 20 kgha⁻¹ of nitrogen, 40 kgha⁻¹ of phosphorous and 20kgha⁻¹ of potassium and single super phosphate 18%. Data were collected on weed dry matter at the physiological maturity of groundnut, weed density, Weed control efficiency according to Jayapal *et al.* (2021) and percentage of weed infestation according to Singh *et al.* (2024). Also, observations were made on the number of branches, canopy height, Pod and Kernel Yield (kg ha⁻¹). All the data generated from the experiment were

subjected to Analysis of Variance (ANOVA) using GentStat software. Students-Neumans Keuls Test (SNK) was used to separate the means where there are statistically significant differences under each variable. Similarly, simple linear regression was used to test the relationship between the pod-yield of groundnut and weed density. The regression analysis shows the level of influence of weed density on the pod-yield of groundnut.

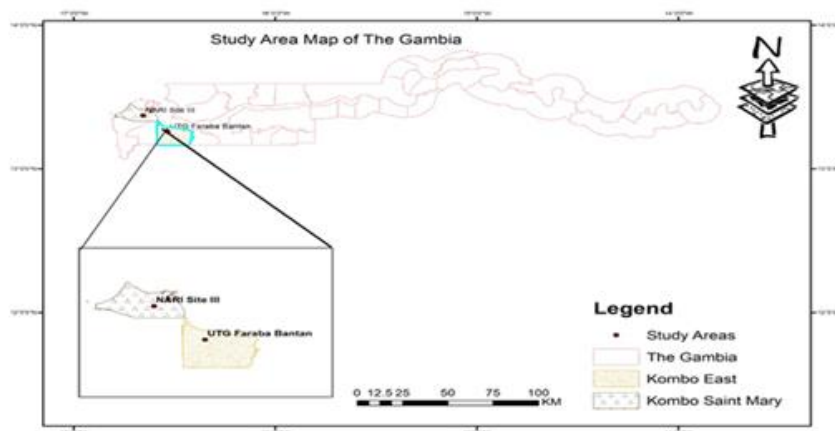


Figure 1. Map of the study site

Results

Climatic Conditions (Rainfall and Temperature) of the Trial Sites

Figures 2 & 3 show rainfall data collected during the 2021 rainy season at NARI Site III and UTG Faraba Banta, respectively. The rainfall began in June and ended in October with the highest recorded in August at NARI Site III. The monthly total rainfall during the 2021 rainy season at NARI Site III was recorded at 976.4mm with the highest monthly rainfall recorded in August (493.4mm). (Figure 2). The temperature at NARI Site III was found to be relatively stable with minor variation from 27.6°C to 29.2°C during the period of the experiment with the lowest temperature recorded in August and September (27.6°C) and the highest obtained in June (29.2°C) (Figure 4). In the case of UTG Faraba Banta, the rainfall began in July and stopped in October in the year under review. The monthly total rainfall varied from 49mm to 400.1mm with the peak recorded in September. The annual total rainfall recorded in UTG Faraba Banta was 982.3mm (Figure 3). The temperature recorded in the area during the course of the experiment (June to October) ranged from 27.5°C to 29.4°C. The highest temperature was observed in June (29.4°C) while the lowest was recorded in August (27.5°C) (Figure 5).

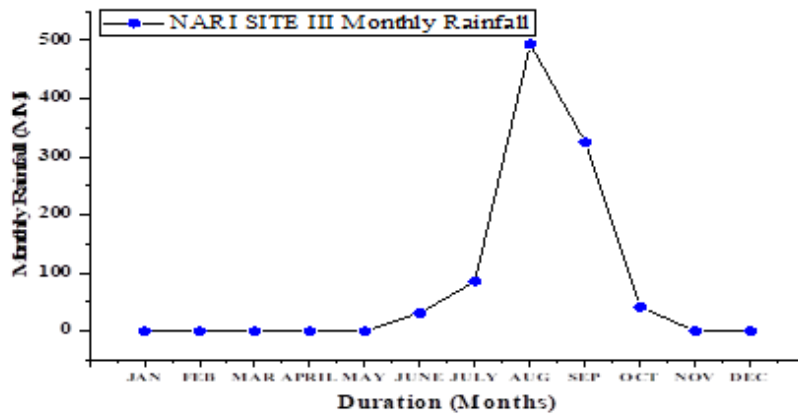


Figure 2. NARI site III monthly rainfall during 2021 rainy season

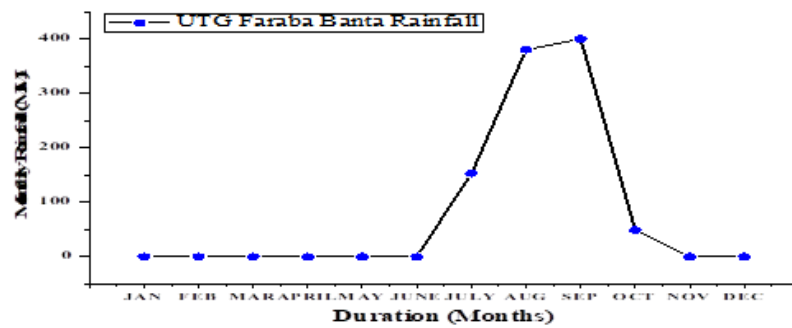


Figure 3. UTG Faraba monthly rainfall during 2021 rainy season

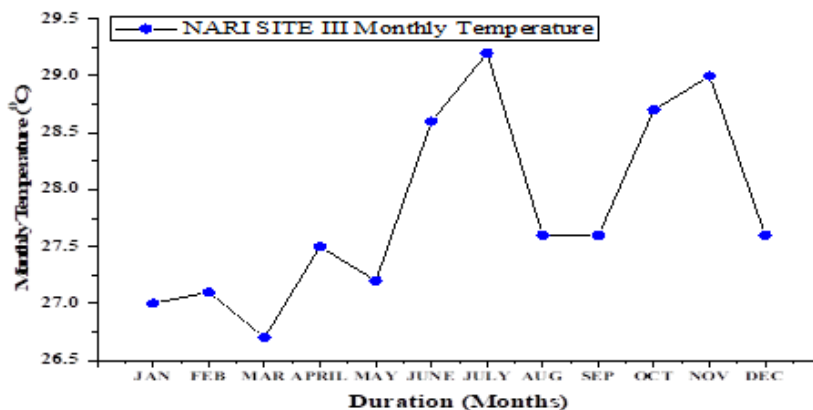


Figure 4. NARI site III monthly temperature during 2021 rainy season

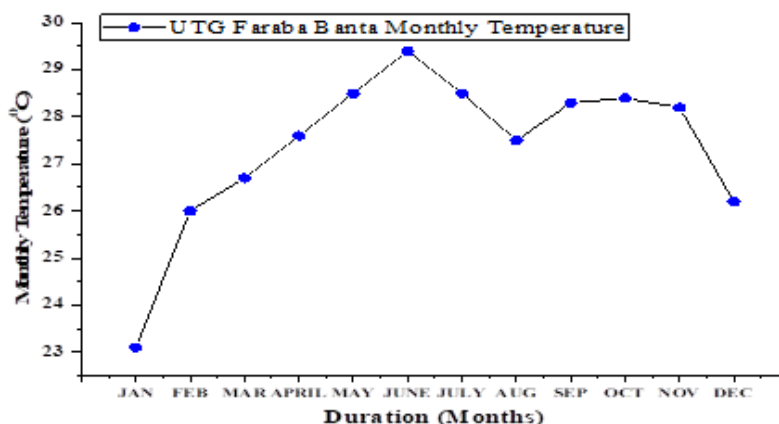


Figure 5. UTG Faraba monthly temperature during 2021 rainy season

Effect of Critical Period of Crop - Weed Interference and Groundnut Varieties on Weed Density (ha^{-1}) and Weed Dry Weight (kg ha^{-1})

The effects of the critical period of crops - weed interference and groundnut varieties on weed density and weed dry weight at harvest are presented in Table 1. The results indicated that the critical period of crop-weed interference had a significant effect on weed density and weed dry weight at both locations. The weed density and weed dry weight were significantly higher in the weedy check at both locations followed by weed infestation up to 63 Days after Sowing (DAS). The lowest weed density and weed dry weight were recorded in the weed-free check. The results show significant differences amongst the weed-free treatments from 21-63DAS and weed-infested treatments 21-63 DAS for both weed density and weed dry weight. Similarly, the weed-free check (75 DAS) and weed-free up to 63 DAS were significantly different from the 21 and 42-day weed-free after sowing. There were no significant differences between weed-free checks and weed-free up to 63DAS. Also, no significant difference was observed between 21 and 42 days weed-free after sowing. The weed density and dry weight were significantly higher at the level of un-weeded control (weedy check) than all the other treatments under the two varieties at both locations. The weed-free check recorded the lowest weed density and dry weight at both locations as shown in Table 1. The varieties had a significant effect on weed dry weight at both locations. Fleur 11 recorded higher weed dry weight than the other variety.

The critical period of crop-weed interference and groundnut varieties interacted significantly for weed dry weight at both locations. Unweeded control (weedy check) of all the two varieties significantly recorded the highest weed density and weed dry weight than the other critical period of

crop-weed interferences at NARI Site III as shown in Table 2. The weed-free check recorded the lowest weed density and dry weight at both locations as shown in Table 2.

Table 1. Effect of Critical Period of Crop - Weed Interference and Groundnut Varieties on Weed Density (ha⁻¹) and Weed Dry Weight (kg/ha) at NARI Site and UTG Faraba Banta during 2021 Rainy Season

Treatments	Location			
	NARI Site III		UTG Faraba	
	Weed density at Harvest (ha ⁻¹)	Weed dry weight at harvest (kg/ha)	Weed density at harvest (ha ⁻¹)	Weed dry weight at harvest (kg/ha)
Crop - Weed Interference				
Weed Free up to 21DAS	141667bc	135.8bc	147778bc	116.4bc
Weed Free up to 42DAS	108889bcd	104.4bc	122778bc	83.4cd
Weed Free up to 63DAS	78889cd	88.7bc	90556c	52.2cd
Weed free check (75DAS)	38333d	49.4c	47222c	16.8d
Weed Infestation up to 21DAS	109444bcd	113.7bc	118333bc	104.5bc
Weed Infestation up to 42 DAS	137222bc	141.7.4bc	142222bc	119.4bc
Weed Infestation up to 63DAS	187222b	162.6b	211667b	183.3b
Weedy check	988333a	953.6a	1136667a	943.4a
Level of significance	**	**	**	**
LSD	87694.4	82.5	102288.4	73.9
SE±	42811.0	40.27	49935.6	36.1
Fleur 11	219306	236.9a	252153	220.4a
Philippine Pink	228194	200.6b	254028	184.45b
Level of significance	NS	**	NS	*
LSD	110326.3	12.24	53272.8	33.3
SE±	25641.5	2.84	12381.4	7.7
Interaction V*CWI	NS	**	NS	**

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, DAS=Days after sowing, V= Variety, CWI= Crop- Weed Interference, NS= Not Significant, LSD= Least significant different

Table 2. Interaction between Critical Period of Crop – Weed Interference and Groundnut varieties on Weed Dry Weight at NARI Site III during 2021 Rainy Season

Crop - Weed Interference	Varieties	
	Fleur 11	Philippine Pink
Weed free up to 21 DAS	134.8cde	137.0cd
Weed Free up to 42DAS	104.4cdef	104.4cdef
Weed Free up to 63DAS	90.8cdef	86.7cdef
Weed free check (75DAS)	77.8cdef	21.1df
Weed Infestation up to 21DAS	111.9cdef	115.6cdef
Weed Infestation up to 42 DAS	138.9c	144.4c
Weed Infestation up to 63 DAS	146.2c	178.9c
Weedy check	1090.8a	816.3b
LSD	109.3	
SE±	53.6	

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, LSD= Least significant different, DAS=Days after sowing

Effect of Critical Period of Crop - Weed Interference and Groundnut Varieties on Weed Control Efficiency (%) and Weed Infestation (%)

The effect of the critical period of crops - weed interference and groundnut varieties on weed control efficiency and weed infestation at harvest is presented in Table 3. The critical period of crop-weed interference significantly affected weed control efficiency and weed infestation in both locations. Weedy-free check was found to be more efficient in controlling weeds followed by weed-free at 63 days after sowing at both locations. The least was recorded by the weedy check control (Table 3). The groundnut varieties showed no significant effect on weed control efficiency and weed infestation at both locations. There was no significant interaction between the critical period of crop-weed interference and groundnut varieties on weed control efficiency at both locations.

Table 3. Effect of Critical Period of Crop - Weed Interference and Groundnut Varieties on Weed Control Efficiency (%) and Weed Infestation (%) at NARI Site and UTG Faraba Banta during 2021 Rainy Season

Treatments	Location			
	NARI Site III		UTG Faraba	
	Weed Control Efficiency (%)	Weed Infestation (%)	Weed Control Efficiency (%)	Weed Infestation (%)
Crop - Weed Interference				
Weed free up to 21DAS	63.67d	54.74e	68.00e	66.83d
Weed Free up to 42DAS	72.33c	44f.02f	78.5c	54.74e

Weed Free up to 63DAS	83.53b	33.77g	87.68b	45.98f
Weed free check (75DAS)	98.28a	21.08h	98.11a	22.45g
Weed Infestation up to 21DAS	73.39c	64.5d	76.00d	65.50d
Weed Infestation up to 42DAS	65.00d	75.83c	65.00f	76.67c
Weed Infestation up to 63DAS	53.00e	87.33b	52.83g	85.50b
Weedy check	0f	95.17a	0.00h	96.31a
Level of significance	**	**	**	**
LSD	2.3	2.36	1.44	2.37
SE±	0.81	0.82	0.62	0.88
Variety				
Fleur 11	63.87	59.70	66.16	63.98
Philippine Pink	63.43	59.41	65.37	64.51
Level of significance	NS	NS	NS	NS
LSD	1.8	5.84	2.96	5.13
SE±	0.30	0.84	0.42	0.22
Interaction	V*CWI	NS	NS	NS

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, DAS=days after sowing, V= Variety, CWI= Crop- Weed Interference, NS= Not Significant, LSD= Least significant different

Effect of Critical Period of Crop - Weed Interference and Groundnut Varieties on Crop Growth Rate and Plant Dry Matter (gplot⁻¹)

The effect of the critical period of crop-weed interference and groundnut varieties on crop growth rate and plant dry matter is presented in Table 4. The critical period of crop-weed interference had a significant effect on crop growth rate and plant dry matter in both locations. The weed-free plot recorded the highest crop growth rate and plant dry matter in both locations. The weedy check recorded the lowest crop growth rate and plant dry matter at both locations. The crop growth rates were found to be significantly higher at both weed-free check and weed-free treatment up to 63 Days after sowing than the rest of the treatments. Similarly, the weed-free at 42 days after sowing was significantly different from weed-free at 21 DAS, weed-infested at 21 DAS, weed-infested at 42 DAS and weed-infested at 63 DAS ($p < 0.05$) at both locations.

There were no significant differences among weed-infested at 21 DAS, weed-infested at 42 DAS and weed-infested at 63 DAS ($p < 0.05$) at both locations (Table 4). The groundnut varieties showed no significant effect on crop growth rate and plant dry matter at both locations. There was no significant interaction between the critical period of crop-weed interference and groundnut varieties on crop growth rate and plant dry matter at both locations.

Table 4. Effect of Critical Period of Crop - Weed Interference and Groundnut Varieties on Crop Growth Rate and Plant Dry Matter (gplot-1) at NARI Site and UTG Faraba Banta during 2021 Rainy Season

Treatments	Location			
	NARI Site III		UTG Faraba	
	Crop growth rate at 6 WAS	Plant Dry matter (gplot ⁻¹)	Crop growth rate at 6 WAS	Plant Dry matter (gplot-1)
Crop - Weed Interference				
Weed free up to 21 DAS	12.21e	68.9cd	6.24e	56.9
Weed Free up to 42 DAS	18.98d	72.9cd	11.48d	58.5c
Weed Free up to 63DAS	31.07c	83.7c	16.72c	67bc
Weed free check (75DAS)	65a	133.9a	32.13a	102a
Weed Infestation up to 21DAS	11.11e	55.2d	5.96e	43.7c
Weed Infestation up to 42DAS	9.96e	54.4d	5.24e	45c
Weed Infestation up to 63 DAS	8.09e	63.4cd	3.85e	56.6bc
Weedy check	4.63e	22.2e	2.53e	19.5d
Level of significance	**	**	**	**
LSD	6.16	15.70	3.81	9.12
SE±	2.148	5.47	1.327	6.45
Variety				
Fleur 11	22.56	68.1	11.23	57.9
Philippine Pink	22.2	71	11.7	58.4
Level of significance	NS	NS	NS	NS
LSD	2.97	6.8	1.08	4.44
SE±	0.489	1.12	1.327	3.14
Interaction V*CWI	NS	NS	NS	NS

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, DAS=day after sowing, V= Variety, CWI= Crop- Weed Interference, NS= Not Significant, LSD= Least significant different

Effect of Critical Period of Crop - Weed Interference and Groundnut Varieties on Pod and Kernel Yield (kg ha⁻¹)

Pod and kernel yield kg/ha-1 as influenced by the critical period of crop-weed interference and groundnut varieties is shown in Table 5. The pod and kernel yields/ha ranged from 370kg/ha-1 – 1350.7kg/ha-1 and 138.0kg/ha-1 – 1336.1kg/ha-1, respectively in Site III. A similar scenario was recorded at the Faraba trial site. The highest pod and kernel yield/ha was obtained in the weed-free check followed by weed-free at 63 DAS, while the lowest pod and kernel yields/ha were found in the weed-infested check in all the sites. The critical period of crop-weed interference had a significant effect on pod and kernel yield in both locations. Weed free check was significantly higher than all the tested treatments. Also, there were significant differences among weed-free at 42 DAS and 63 DAS and weed-free at 21 DAS, weed-infested at 21

DAS, 42 DAS and 63 DAS in all the locations ($p < 0.05$). There was no significant difference between weed-free at 42 DAS and 63 DAS.

The varieties showed no significant effect on pod and kernel yield ha⁻¹ in both locations. The interaction between the critical period of crop-weed interference and groundnut varieties on pod and kernel yield ha⁻¹ was not significant in both locations.

Table 5. Effect of Critical Period of Crop - Weed Interference and Groundnut Varieties on Pod and Kernel Yield (kg ha⁻¹) at NARI Site and UTG Faraba Banta during 2021 Rainy Season

Treatments	Location			
	NARI Site III		UTG Faraba	
	Pods Yield (kg ha ⁻¹)	Kernel Yield (kg ha ⁻¹)	Pod Yield (kg ha ⁻¹)	Kernel Yield (kg ha ⁻¹)
Crop - Weed Interference				
Weed free up to 21DAS	785.3bcd	683.2bcd	753.7d	668.9d
Weed Free up to 42DAS	864.3bc	787.6bc	872.3c	778.0c
Weed Free up to 63DAS	984.8b	915.6ab	950.4b	835.7b
Weed free check (75DAS)	1350.7a	1092.6a	1336.1a	1235.7a
Weed Infestation up to 21DAS	693.5cde	608.3cd	711.1d	634.1d
Weed Infestation up to 42 DAS	622.2de	545.0cd	640.2d	552.4d
Weed Infestation up to 63DAS	516.2ef	483.8d	522.8f	447.4f
Weedy check	370f	412.7d	138g	93.3g
Level of significance	**	**	**	**
LSD	195.8	271.3	46.1	42.5
SE±	97.56	93.6	15.9	14.6
Variety				
Fleur 11	749.4	629.5	740.55	653.4
Philippine Pink	797.6	752.7	740.7	657.9
Level of significance	NS	NS	NS	Ns
LSD	237.4	234.9	28.8	39,2
SE±	39.0	35.8	4.73	6.4
Interaction V*CWI	NS	NS	NS	NS

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, DAS=day after sowing, V= Variety, CWI= Crop- Weed Interference, NS= Not Significant, LSD= Least significant different

Effects of Weed density on Pod yield of Groundnut under different Weeding Regimes at Site III and UTG Faraba

Figures 6 and 7 show the effects of weed density on pod yield of groundnut under different weeding regimes in Site III and UTG Faraba, respectively. The results in both locations showed a similar trend in terms of the effects of weed densities on the yield of groundnut. The pod yield of groundnut at both locations began to increase at weed densities of 108,889/ha

in Site III and 122,778 in UTG Faraba at weed-free up to 63 Days after Seeding. This shows that the most critical period of crop-weed interactions starts from weed-free up to 21 Days after seeding to weed-free up to 63 Days after seeding.

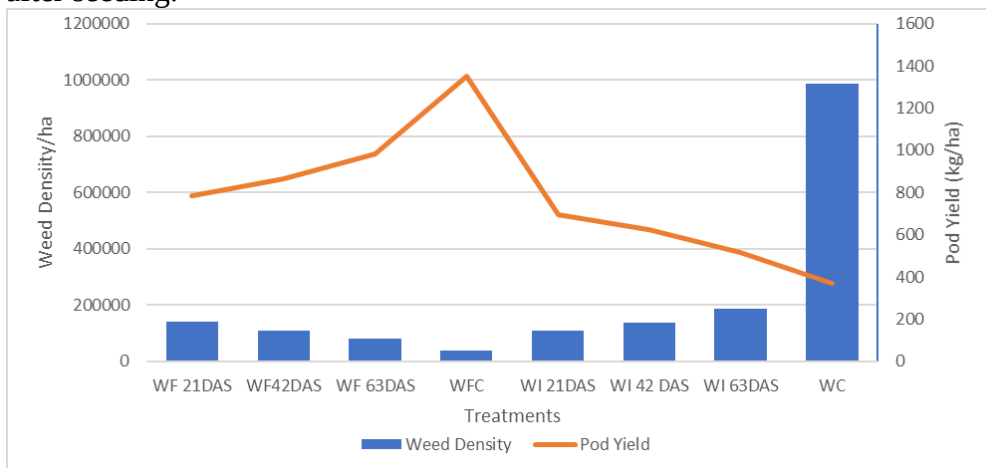


Figure 6: Show the Effects of Weed Density on Pod Yield of Ground under Different Weeding Treatments in Site III

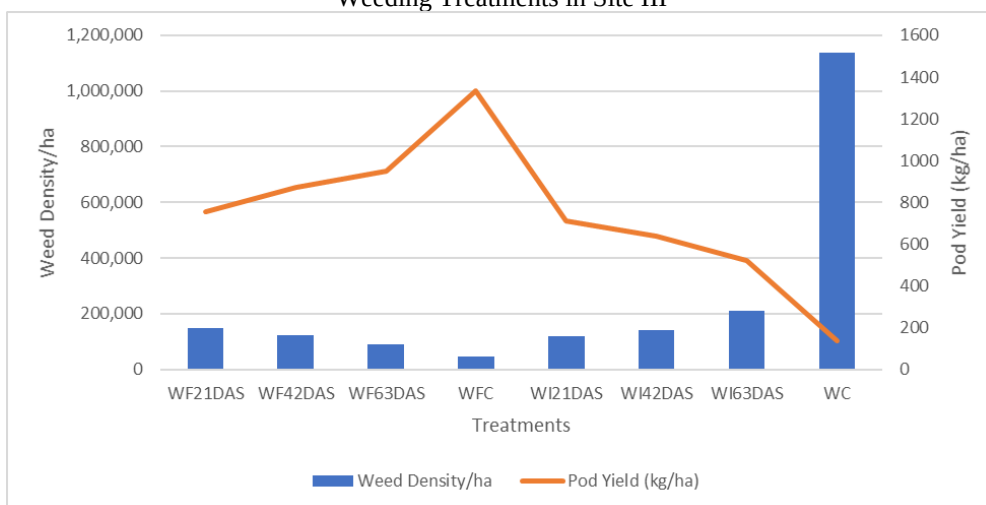


Figure 7: Show the Effects of Weed Density on Pod Yield of Ground under Different Weeding Treatments at UTG Faraba

Effect of Weed Density on Pod yield at NARI Site III

A simple linear regression analysis between weed density and pod yield was significant at NARI Site III (Table 6). The weed density had a negative relationship with the pod yield per hectare. The adjusted coefficient of determination was R^2 0.578 which revealed that the variation in pod yield per hectare could be explained by variation in weed density in a ratio of about 58% represented by the nearest dots to the linear line (Figure 8) indicating that

an increase in one weed of weed density could lead to a decrease in pod yield per hectare. This result is in agreement with Tasmiya *et al.*, (2017) who reported that weed density could reduce groundnut yield as high as 24 to 70%.

Table 6. Regression Analysis between weed density and Pod yield (kgha-1) at NARI Site III

Source	d.f.	Sum of squares	Mean Squares	R ²	Adjusted R ²	F	Significant Level
Regression	1	2983376.39	2983376.395	0.5785	0.5694	63.13	0.0001
Residual	46	2173516.381	47250.356				
Total	47	5156892.776					

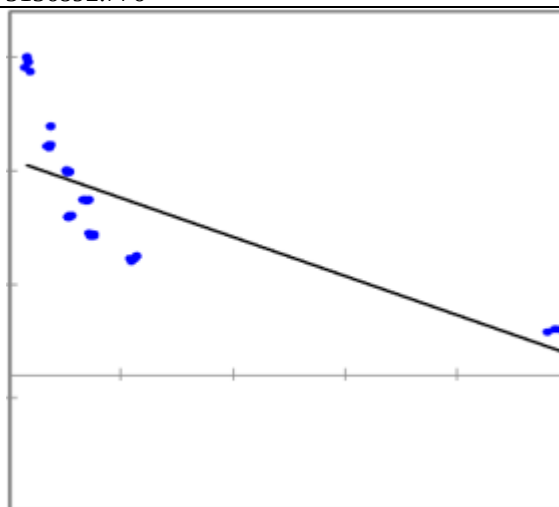


Figure 8. Effect of weed density on pod yield (kg/ha-1) at NARI Site III

Effect of Weed Density on Pod yield at UTG Faraba

A simple linear regression analysis between the pod yield per hectare and the weed density was significant at UTG Faraba Banta (Table 7). The pod yield per hectare had a negative relationship with the weed density, the adjusted coefficient of determinant was $R^2=0.582$ which indicated that the reduction in in pod yield per hectare was caused by the increase in weed density in a ratio of about 58% and this rate is represented by the nearest dots to the linear line (Figure 9). The linear regression equation was formed as follows: $Y = -0.00086 + 951.94 \text{ WD}$ where Y= pod yield per hectare and WD= weed density -0.00086 constant, and 951.94 regression coefficient (b), indicating that an increase in one weed could lead to a decrease in pod yield per hectare in rate of 951.94. This result is in conformity with the finding of Tasmiya *et al.*, (2017) who reported that weed density could reduce groundnut yield as high as 24 to 70%.

Table 7. Regression Analysis between weed density and Pod yield (kgha-1) at UTG Faraba Banta

Source	d.f.	Sum of squares	Mean Squares	R ²	Adjusted R ²	F	Significant Level
Regression	1	2958298.709	2958298.709	0.582	0.573	64.06	0.0001
Residual	46	2124244.084	46179.219				
Total	47	5082542.799					

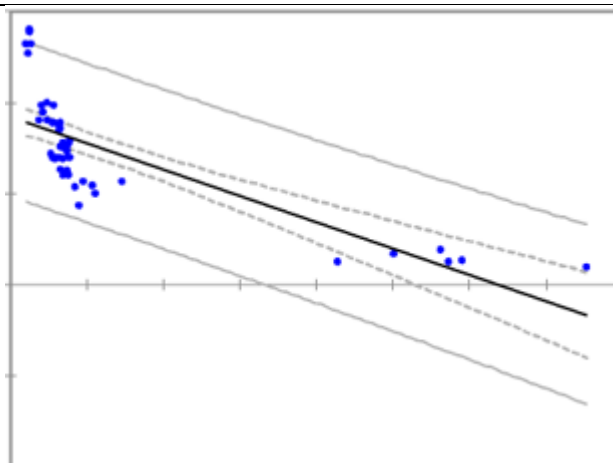


Figure 9. Effect of weed density on pod yield (kgha-1) at UTG Faraba Banta

Discussion

The results obtained showed that weed dry matter accumulation increased with increasing the duration of the weed competition period in both locations. The highest weed dry weight, a number of broad leaves, grasses and sedges, weed density, and low weed control efficiency, the higher weed infestation were recorded in weedy check than other critical periods of crop-weed interference treatments. This is in line with the findings of Ayana, (2024) who reported that maximum weed dry weight and weed density were due to the non-removal of weeds in the weed check plots. This is because the experimental sites were species-rich weed communities that were able to emerge freely because no weed management measures were applied. This is in line with Pabitra *et al.* (2016) who reported that maximum weed density and dry matter were recorded in the weedy check treatment. Less weed competition resulted in a higher weed control efficacy index and lower weed dry matter by weed-free check than other critical periods of crop-weed interference treatment. This is because manual hoe weeding resulted in the cutting of the weed seedlings and burial of weed seeds into the soil at greater depth than other management strategies. Weed dry matter accumulation increases with increasing the duration of the weed competition period in both locations. This is in conformity with the findings of Ayana (2024). The weed-free check and weed-free up to 63 DAS were effective in reducing weed

density and decreasing weed dry matter compared to the weedy check. The highest weed density and lowest weed control efficiency were recorded by the weedy check. This is because of the available dormant seeds in the soil seed bank which germinate as they are not controlled. This result agreed with Pabitra *et al.* (2016) who reported that maximum weed density was noticed in the weedy check on groundnut field. Less weed competition resulted in higher weed control efficiency by weed-free check than other critical periods of crop-weed interference treatment. This is because manual hoe weeding resulted in the cutting of the weed seedlings and the burial of weed seeds in the soil at greater depth than other management strategies. This is in conformity with the findings of Korav *et al.* (2020). The lack of weed control throughout the growth period caused a significant reduction in plant dry matter in both locations. This is because weeds compete with crops for growth resources hence reducing plant dry matter. This finding is corroborated by the findings of Jat *et al.* (2011) reported that crop plants and weeds share the same ecological niche and they compete for nutrients, sunlight, moisture and space and therefore, reduce the supply of these inputs to the crop plant and that can drastically reduce plant dry matter. In both locations, Weedy check (unweeded) and weed infestation up to 63 DAS treatments had the lowest yield component and yield. This could be related to the reduction of dry matter production due to competition between crops and weeds for limited environmental resources. This agreed with Sathya *et al.* (2013) who reported that groundnut yield decreased with increasing time of weed interference with all types of weed species. These findings also corroborated the finding of maintaining (Osunleti *et al.*, (2022) who reported that a weed-free environment resulted in maximum yields of groundnut. Similarly, Jallow *et al.* (2019) reported weedy check control plots resulted in increased weed germination and growth which translated into higher weed density, weed dry matter and lower weed control index in various locations. The consequence of all these is serious competition between the weed and groundnut which also explains the reasons for low pod yield on the control plots (Jallow *et al.*, 2019). According to Korav *et al.* (2020), the critical period for weed competition in groundnut was estimated from 22 days after emergence to 62 days after emergence. Similarly, the pod yield of groundnut declined as weeding was delayed up to 21 Days after seeding and 63 Days after seeding, respectively. The highest pod yield was obtained at the lowest weed density in the Weed-free Control (75 DAS) while the lowest pod yield was observed at the highest weed density in the weedy check (no weeding). A similar result was reported by Mekdad *et al.* (2021).

Conclusion and Recommendation

From this study, it is concluded that the critical period for crop-weed competition was found to be from 21 DAS up to 63 DAS. This indicates that delaying weed control beyond 21DAS will increase yield loss in groundnuts due to weed competition. A weed-free check had significantly reduced weed competition and increased pod yield of groundnut more than the rest of the treatment followed by weed-free at 63 DAS, 42 DAS and 21 DAS. The weedy check had the highest pod yield loss due to higher weed density and competition compared to the other treatments. Therefore, management of weeds in groundnut crops from 21 to 63 DAS will minimize weed incidence and competition, and enhance pod yield in farmers' fields. The findings are valuable for groundnut growers in optimizing the timing of weed control as well as in developing an integrated weed control strategy.

Conflict of Interest: The authors reported no conflict of interest.

Data Availability: All data are included in the content of the paper.

Funding Statement: The authors did not obtain any funding for this research.

References:

1. Ayana, B. (2024). Determining Critical Weed Competition at Different Weed Free Periods in Linseed in Holeta District Central Ethiopia. 10(3), 101–106.
2. FAOSTAT (2021). <http://www.fao.org/faostat/en/#search/groundnut%20kg%2Fha>
3. (Retrieved, 3rd February, 2021)
4. Georges, N., Fang, S., Beckline, M., & Wu, Y. (2016). Potentials Of The Groundnut Sector Towards Achieving Food Security In Senegal. 3, 1–13. <https://doi.org/10.4236/Oalib.1102991>
5. Hakeem, A., Ajeigbe, Farid Waliyar, Candidus, A., Echekwu, Ayuba Kuniha, Babu N Motagi, Damilola Eniaiyaju and Abubakar Inuwa (2015). A Farmer's Guide to Profitable Groundnut Production in Nigeria, *International Crop Research In Semi Arid Tropics (ICRISAT)*
6. Jallow, S. A. F., Manneh, F. J., Bah, A., & Olojugba, M. R. (2025). Growth and yield response of groundnut cultivars to selected rates of phosphorous and soil amendments in the Southern Guinea Savanna of The Gambia. Archives of Agriculture and Environmental Science, 10(1), 43-50, <https://dx.doi.org/10.26832/24566632.2025.100107>
7. Jallow, S. A. F., Lado, A., & Manneh, F., J. (2019). Economic Analysis of Weed Management Strategies on Weed Attributes and Pod Yield of Groundnut Varieties in Southern Guinea Savanna of the

- Gambia. *International Journal of Agriculture and Environmental Research*, 05(06).
8. Jat, R.S., Meena, H. N., . Singh, A. L., Jaya N., Surya and Misra, J. B. (2011) weed management in groundnut (*Arachis hypogaea L*)
 9. Jayapal, A., Mini, V., Resmi, A. R., Lovely, B., & Suja, G. (2021). *Management of Chocolate weed (Melochia corchorifolia) in sesame at Onattukara sandy tracts*. 17(3), 237–240.
 10. Korav, S., Ram, V., & Ray, L. I. P. (2020). *Critical period for crop-weed competition in groundnut (Arachis hypogaea L .) under mid altitude of Meghalaya*. 16(1), 217–222.
 11. Mekdad, A. A. A., El-enin, M. M. A., Rady, M. M., Hassan, F. A. S., Ali, E. F., & Shaaban, A. (2021). *Impact of Level of Nitrogen Fertilization and Critical Period for Weed Control in Peanut (Arachis hypogaea L .)*. 1–18.
 12. Osunleti, S. O., Ajani, O. A., Olaogun, O., Osunleti, T. O., & Olatunde, E. O. (2022). *Assessing the critical period of weed interference in groundnut Arachis hypogaea L . in Ogun State , south western Nigeria*. 2022(3), 219–225.
 13. Pabitra, P., Partha, S. and Ratikanta, G. (2016). Influence of Weed Management on Growth and Yield of Groundnut (*Arachis hypogaeo*) in Gangetic Plains of West Bengal, India. *Agricultural Communication Centre. Legume Research*, 39(2) 2016: 274-278
 14. Sathya, R., Priya, C., Chinnusamy, P., Manickasudaram and Babu, C(2013). A Review on Weed Management in Groundnut (*Arachis hypogea*l.), *Internationl Journal of Agricultural Science and Research (IJASR)*, (3):163-172
 15. Singh, K.,K., Kumar. V., Kumari, A. & Kumar, H.(2024). Practical Manual on Weed Management. Rathore Academic Research Publications Sangam Vihar, New Delhi-110068, INDI. Website: www.rarpublications.com
 16. Tasmiya , Nagalika, Halepyati., Krishnamurthy and Negalur, (2017), Bio-efficacy of Herbicides on Nutrient Uptake, Yield and Economics of Groundnu. Dept. of Agronomy, University of Agricultural Sciences, Raichur, Karnataka