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Forage yield and quality of maize (*Zea mayz* L.) intercropped with groundnut (*Arachis hypogea*) in Northern Guinea Savannah

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***Target Audience:** Researchers and Local farmers*

Abstract

This study was conducted to investigate the effect of intercrop on quality and forage yield of maize (Zea mayz L.) and groundnut (Arachis hypogea) in Northern Guinea Savannah at the National Animal Production Research Institute Shika, Zaria, Nigeria. The experiment was laid in a Completely Randomized Design (CRD) replicated 3 times. The treatments consist of five intercropping pattern (sole maize (M), sole groundnut (G), 1:1 M-G, 1:2 M-G and 2:1M-G). Forage yield, proximate composition, and mineral concentrations were determined at 14 weeks after sowing (WAS). Intercropping significantly (P<0.05) affected fresh forage yield of maize and dry forage yield of maize and groundnut. The highest fresh forage yield of maize and dry forage yield of maize and groundnut (20.33, 8.63 and 6.53 t/ha, respectively) were obtained at 1:2 M-G intercrops. The percentage proximate composition and fibre fractions were significantly (P<0.05) affected by intercropping. The crude protein and crude fibre ranges between 6.60 – 7.30 % and 19.46 – 22.81 %, respectively. Mineral concentration for Ca, Mg, P and Cu were significantly influenced (P<0.05) by intercropping pattern. This study reveals that intercropping maize and groundnut at 1:2 M-G ratio produced the highest forage yield and improved percentage composition of DM, CP and CF. Therefore, intercropping of maize and groundnut at 1:2 M-G planting pattern is recommended for farmers and livestock producers in Northern Guinea Savanna of Nigeria.

***Keywords:** Maize; Groundnut; Intercrop; Forage*

Description of Problem

Low agricultural productivity in sub Saharan Africa is caused by low soil fertility, limited availability of resources to farmers, nutrient mining and drought (1). Fertilizer is essential to improve agricultural production in densely populated region; this was acknowledged during the African fertilizer summit held in Abuja, Nigeria in 2006. Mineral fertilizer prices continue to increase. A way to minimize the use of fertilizer and increase crop productivity is by intercropping legumes and cereals. (2) reported that, intercropping system can improve the productivity of agricultural land and crops if the types of plants that are combined in this system do not compete with each other in terms of sunshine, taking water and nutrients.

Another advantage gained from intercropping planting patterns are ability to provide the balance of nutrients, control of weeds, maintaining of soil fertility, prevent erosion and the tendency of increase in pests and reduce the risk of harvest crop failure. A suitable combination is maize and groundnut intercrop due to the compatibility of several properties owned by these plants (2). Maize plants require high light intensity for photosynthesis, grow tall, erect, unbranched and loose canopy allows for other plants growing underneath.

Fibrous root system of maize plants need nitrogen in large quantities. Groundnut plants are shade-tolerant plants, grow short, erect and with a taproot system forming nodules capable in symbiotic Nitrogen (N) fixation by *Rhizobium* sp. (3) also reported that intercrops of legumes in cereals are a better choice to increase the quality of cereal fodder. However, intercropping gave higher crude protein yields than pure maize. Legumes can transfer fixed N to intercropped cereals during their together growing cycle and this N is an important resource for the cereals. The presence of a cereal, exploiting the soil mineral N, may even stimulate legumes to fix N (1).

Maize is the third most important cereals grown in Nigeria after sorghum and millet, with annual production of about 7 million metric tons (4). Maize has as a major source of energy and of all cereals gives the highest yield per man-hour investment. It is easy to grow as sole crop or intercropped with other crops. A high proportion of maize produced is used as stock feed e.g. 40 % in tropical area and up to 85 % in developed countries (5). It can be fed to stock as green chop, dry forage, silage or grain. Various fraction of milling processes can be used as animal feed. Stover is the term used to describe the dried stalks and leaves of a crop used as animal fodder after the grain has been harvested.

Groundnut plants are a source of protein and minerals forage for ruminants in the tropics. This plant is sensitive to nutrient phosphorus (P) deficiency and currently has been addressed with superphosphate fertilizer (6). It is an annual legume crop grown in semi-arid regions of the world. It is the world's fourth most important source of edible oil and third most important source of vegetable protein (7). The smallholder farmers grow groundnut for income to cater for the health, education and other needs of the family is intense. Maize production is also necessary to feed the family.

However, competition between the two crops for limited land holdings by farm families to enable them meet its household food needs and cash requirements, by the practice of intercropping in which groundnut frequently forms an important part of the system (8; 9). The aim of the study is to determine the forage yield and quality of Double-Red maize and SAMNUT-22 groundnut planted in sole and intercropping pattern in Northern Guinea Savannah.

Materials and Methods

Description of the experimental site

The study was conducted at the Experimental Farm of the Feeds and Nutrition Research Programme, National Animal Production Research Institute, Shika, during the 2016 wet season. Shika is stuated on latitude 110 12'W and longitude 070 33'E, with an altitude 660m above sea level, along Zaria-Funtua Road in the Northern Guinea Savannah zone of Nigeria (10). The climate of the study area is characterized by a welled defined wet and dry season. Wet season starts from late April to early May and ends in late September to early October, while the dry season last from October to April. The total annual rainfall ranges from 748.6-1156.7 mm with long term average of 1058.60mm with a maximum air temperature of 350C in May and minimum air temperature of 11.150C in December/

January and relative humidity of approximately 75% (11).

Meteorological data of the experimental site

Weather observations at Shika during the experimental period in 2016 are presented in Table 1. The maximum and minimum air temperatures 32.27^{0}C and 22.65^{0}C respectively were recorded for the months of May to October during the rainy days which were slightly below previous records. The total annual rainfall 1045.90 mm with an average of 209.18 mm over a period of 5 months was recorded in 2016. The number of rain days in Shika, was 61 rainy days. A mean relative humidity of 73.33% and mean sunshine of 7 hours was observed during the rainy season.

Table 1: Weather observations at Shika during the 2016 experimental period

Months	Max. Air Temp ^{0}C	Min. Air Temp ^{0}C	Rainfall Mm	Relative Humidity %	Sunshine Hours
May	35.16	24.16	81.30(6)	66.39	7.83
June	31.40	23.20	133.30(14)	75.50	7.12
July	30.84	22.94	218.40(10)	80.39	5.90
August	30.55	21.90	268.80(16)	81.94	6.68
September	32.46	25.45	344.10(15)	77.28	6.31
October	33.23	18.23	-	58.45	8.16
Total	193.64	135.88	1045.90(61)	439.95	42.00
Mean	32.27	22.65	209.18(12)	73.33	7.00

Number of rainy days is in parenthesis
Source: (11)

Soil sampling and analyses

Soil samples were randomly collected from the experimental site with the aid of soil auger at four corners and centre of the plots at 15cm depth and make a composite sample for soil analysis at the beginning of the experiment. The soil sample was analyzed for physical and chemical properties. Properties such as; texture, particle size, total nitrogen, total carbon, phosphorus, soil pH and cations exchange capacity (CEC) were determined. The analysis was done at the Department of Soil Science, Faculty of Agriculture, Ahmadu Bello University, Zaria.

Experimental materials and crop establishment

Groundnut variety SAMNUT 22 seeds for the experiment were obtained from the Institute for Agricultural Research (IAR), Samaru-Zaria. Maize variety (Double-Red) seeds were obtained from the Kaduna State Agricultural Development Project (KSADP). The seeds of the maize and groundnut were dressed with Apron plus, at the rate of 3 kg per sachet of the chemical, after which they are planted on ridges at 2 cm depth, at a spacing of 25 cm within row and 85 cm between rows. The planting was done when the rain was well established in June 2016 and soil moisture was about 25- 30 cm depth. Weeding was done at 3 and 6 weeks after sowing.

Experimental Layout, Design and Treatment

A total 60 net plots measuring 4.8 m^2 with 50 cm inter-plot walk path was used for the experiment. The experiment was a randomized complete design (RCD), with five treatments (intercropping pattern); sole maize (M), sole groundnut (G), 1:1alternate rows (M: G), 1:2 alternate rows (M: G) and

2:1 alternate rows (M: G). The treatment groups were replicated three times. The field was cleared, harrowed by tractor drawn implement and ridged with two work Bulls (*Bunaji*), before planting. All experimental plots received uniform application of 120 kg/ha of fertilizer at two split doses. The first dose was 60 kg/ha of NPK (15; 15; 15) at planting and the second dose was 60 kg/ha of Urea (46; 0; 0) at four weeks post-planting after the first weeding.

Parameters Measured

Growth Parameters and Percentage Field Germination

Data on yield and crop phenology was measured on five (12) randomly tagged plants per plot using the standard procedure as reported by (13).

Plant Height, Leaf Number, Branch Number and Leaf Area Index

The plant height of maize was determined by measuring from the base of the plant to the flag leaf with the aid of a tape rule. The plant height of groundnut was determined by measuring from the base of the plant to the meristem. The number of leaves per plant was estimated by counting individual leaf per plant and the mean number of leave per plant was recorded. The number of branch was estimated by counting the number of branches per plant and The mean number of branches per plant was recorded. Leaf area index was determined at 6, 8, 10 and 12 weeks after emergence using the method described by (14), i.e LAI was calculated as the ratio of leaf area to the ground area covered by the plant, multiply by a factor (0.75) to the unit ground area covered by each plant.

$$LAI = \frac{\text{leaf area per plant (cm) x 0.75}}{\text{Area of ground per plant (cm)}}$$

Determination of Forage Yield of Double-Red Maize and Samnut-22 in t/ha

This was determined by harvesting the fresh forage within each sub-plot at the end of the 12-weeks establishment period, using a 1m^2 quadrat. The forage was cut at 15cm from the ground, using a hand sickle. The total fresh forage was determined and sub sample of (200g) was weighed and oven dried at 65^{0}C for 48 hours and reweighed to estimate dry matter yield.

Dry matter production was calculated as: (Total FW x (DWss/FWss)) x 10 = Dry matter kg/ha. (13) where:

Total FW = Total fresh weight from 1 m^2 in (g)

DWss = Dry weight of the sub-sample in (g)

FWss = Fresh weight of the sub-sample in (g)

Chemical Analyses

Samples of the forage materials harvested were taken to Biochemical laboratory for chemical analysis at the Department of Animal Science, Ahmadu Bello University, Zaria. The dried samples of forages were ground using a simpler mill and passed through 1-2mm sieve. Proximate analysis was done to determine Nitrogen (N) for crude protein determination (Nx6.25), crude fibre (CF), Ether Extract (EE), Nitrogen Free Extract (NFE) and ash content according to (15). Neutral detergent fibre (NDF) and acid detergent fibre (ADF) were determined by method of (16). The constituent of acid detergent fibre and neutral detergent fibre were determined as described by (15). Mineral contents like Calcium, Magnesium and Phosphorus were determined by (15) methods using the atomic absorption spectrophotometer.

Statistical Analyses

The general linear model procedure (Proc. GLM) of (17) was used to analyzed all variables. Significant ($P<0.05$) differences among treatment means was compared using the Duncan Multiple Range Test (DMRT) of the SAS package (18).

Model:

$Y_{ij} = \mu + A_i + E_{il}$

Where:

Y_{ijk} = is the record of observations

μ= is the population mean

A_i = effect of intercropping (i=1, 2, 3, 4 and 5)

E_{ijk} = random residual error

Results and Discussion

Soil Characteristics of the Experimental Site

Table 2 shows information on the physiochemical characteristics of the composite soil sample taken from 0-15cm and depth of the Experimental Site. The soil consists of 16.00 % clay, 30.00 % silt and 54.00 % sand. The organic carbon was between 0.67%. The pH values were 4.8. This shows that the soil of this Experimental Site is acidic in nature.

The soil of the experimental site was low in total nitrogen (0.18 %) and available phosphorus was 23.28%. The exchangeable cations present in the soil consist of Ca2+, Mg2+, K + and Na+ needed for plants growth and development. The soil has cation exchange capacity, exchangeable acidity and electrical conductivity of 8.70cmol/kg, 0.80Cmol/kg and 0.070dsm, respectively.

Table 2: Physical and Chemical Properties of Soil Samples Collected at Shika, Zaria in 2016

Soil Properties	Soil Depth at 0 – 15cm
Particle size (%)	
Clay	16.00
Silt	30.00
Sand	54
Textural Class	Sandy Loam
Chemical Properties	
Total Nitrogen (%)	0.18
Organic Carbon (%)	0.67
Available Phosphorus (ppm)	23.28
pH H_2O	5.20
pH (0.01M $CaCl_2$)	4.80
Exchangeable Cation (meq/100g of soil)	
Ca^{2+}	4.0
Mg^{2+}	1.50
K^+	0.64
Na^+	0.32
Exchangeable Acidity ($H – Al^{3+}$)	0.80
Cation Exchange Capacity (CEC)	8.70
Electrical Conductivity (dsm)	0.07

Growth Component of Double-Red Maize and SAMNUT-22 Groundnut Planted Sole and Intercropped

Plant height, number of leaves per plant, number of branches per plant and leaf area index of maize and groundnut as affected by intercrop were presented in Table 3. Intercropping significantly ($P<0.05$) affected plant height, number of leaves per plant, number of branches per plant and leaf area index. The highest plant height in maize (154.3 cm) was obtained in sole treatment which was similar to (151.7 cm) for 2:1 M-G intercropped, but was at par with (140.4 cm) and (131.3 cm) for 1:1 and 1:2 M-G. The plant height of groundnut was recorded highest at 1:1M-G which was significantly (P<0.05) higher than that of 1:2 M-G, but similar to that of sole G and 2:1 M-G. Number of leaves per plant of maize and groundnut followed similar pattern (P>0.05) 1:2 and sole. However, number of leaves per plant of maize recorded at 1:2 and sole treatment were at par but sole treatment was significantly lower than that of 1:1 and 2:1 M-G.

Number of leaves per plant of groundnut was recorded highest at 2:1 M-G which was not significantly (P>0.05) different from 1:2 and 1:1 M-G but was at par with sole G. the highest (85.86 cm) leaf length of maize was recorded at sole M compared to 78.78 cm for 1:2 M-G which was similar to 83.47 cm (2:1 M-G) but significantly lower than 84.83 cm (1:1 M-G). The leaf length of groundnut observed at 2:1 and sole (5.19 and 4.53 cm), respectively were significantly different, but that observed at sole G (4.53 cm) was significantly lower than that of 1:1 and 1:2 M-G (5.14 and 4.99 cm), respectively.

Plant growth is translated by plant height, number of leaves per plant and number of branches per plant (19). The highest plant height of 154.3 cm was observed in sole maize (Table 3) which was similar to that of 2:1 M-G intercrop. This was in agreement with the report of (3). This implies that farmers can adopt intercropping ratio of 2:1 M-G, without fear of reduction in plant height which is a vital component of biomass yield. The highest plant height of groundnut was recorded at 1:1 M-G which is in line with the findings of (20). The highest (11.29) number of leaves per plant of maize was recorded in 1:2 M-G which was far below the highest value reported by (21) who intercropped SAMAZ-14 (an improved maize variety) with lablab, this may be as a result of differences in the genetic make-up between the varieties.

Table 3: Effect of Intercropping on Agronomic Indices of Double-Red Maize and SAMNUT-22 Groundnut

Treatment	Plant Height		Leaf Number		Leaf Area Index	
	Maize	Groundnut	Maize	Groundnut	Maize	Groundnut
Sole M	154.3[a]	--	10.65[b]	--	2.65[b]	--
Sole G	--	37.3[ab]	--	60.39[b]	--	1.04
1:1 M/G	140.40[b]	38.90[a]	10.97[ab]	79.10[a]	2.98[a]	1.09
1:2 M/G	131.30[c]	34.70[b]	11.29[a]	81.63[a]	2.72[ab]	1.03
2:1 M/G	151.70[a]	36.70[ab]	11.09[ab]	84.78[a]	2.86[ab]	1.21
SEM	4.09	1.68	0.31	5.89	0.15	0.14

[abc] Means with different superscripts within columns differed significantly, * significant at P<0.05, SEM = Standard error of mean,

The number of leaves per plant of groundnut was recorded highest (84.78) at 2:1 M-G which was higher than (73.7) observed by (22). The number of branches per plant obtained in this study (Table 3) was less than that observed by (22) which may be ascribed to differences in the variety, climatic condition and the farming system. The low number of branches may reduce biomass yield, while on the contrary the higher number of leaves may increase digestibility, since the branches are more lignified than the leaves.

Leaf is the principal photosynthetic functional unit. Leaf area and arrangement of foliage (the canopy architecture) determine the interception of radiation by a crop and its distribution among individual leaves (23). Maximum crop productivity requires complete capture of incident solar radiation. The leaf area index of maize reported in this study (2.65-2.98) was similar with the range of 1.6 to 3.0 for maize reported by (21) in a study under irrigation. The LAI was higher in intercropping as compared to sole cropping. The high LAI of maize observed in this study may be attributed to the vertical plant architecture which might have favoured maize over groundnut which grows beneath.

Fresh and Dry Matter Yield of Double-Red Maize and SAMNUT-22 Groundnut Forage and their Intercropped Mixtures

The effect of intercropping on fresh and dry matter yield of maize and groundnut is presented in Table 4. Intercropping significantly (P<0.05) affected fresh forage yield of maize and fresh and dry matter yield of maize and groundnut. The highest (20.33 t/ha) fresh forage yield of maize was observed at 2:1 M-G which is not significantly (P>0.05) different from 18.83 and 18.57 t/ha observed at 1:1 and 2:1 M-G respectively, but they were both at par with 15.53 t/ha observed at sole M. dry matter yield of maize recorded at 1:2 M-G and 2:1 M-G were at par but higher than that of sole M which was similar to that of 1:1 M-G. The same trend was observed in dry matter yield of groundnut at 1:2 and 2:1 M-G but that of 1:2 M-G was similar to (P>0.05) that of sole G and 1:1 M-G.

Table 4: Effect of Intercropping on Fresh and Dry Matter Yield of Double-Red Maize and SAMNUT-22 Groundnut

Treatment	Fresh Forage Yield (t/ha)		Dry Forage Yield (t/ha)	
	Maize	Groundnut	Maize	Groundnut
Sole M	15.53^{b}	--	6.34^{c}	--
Sole G	--	20.23	--	5.40^{b}
1:1 M/G	18.83^{a}	20.23	7.18^{bc}	5.16^{b}
1:2 M/G	20.33^{a}	20.40	8.63^{a}	6.53^{a}
2:1 M/G	18.57^{a}	18.57	7.53^{b}	5.37^{b}
SEM	1.16	1.06	0.49	0.45

^{abc} Means with different superscripts within columns differed significantly, * significant at P<0.05, SEM = Standard error of mean, M = Maize, G = Groundnut.

Fresh forage yield is a major determinant of herbage yield. The fresh and dry matter yield obtained in this study (Table 4) as influenced by intercropping was less than that observed by (3) who intercropped improved varieties of maize and groundnut in Iran. The DM of maize was within the range of 4.20 to 14.77 t/ha reported by (24). However, it was slightly higher than the range of 8.7 to 14.5 t/ha fresh weight equivalent to 7.0 – 8.7 t/ha DM reported by (25).

The yields of the intercropping are higher than the sole cropping system. This was in agreement with the report of (26). The difference in yield between the sole and intercrops may be attributed to efficient utilization of environmental resources such as solar radiation, water and nutrient (27). The DM yield of groundnut obtained in this study was within to the range of 2.3 to 7.4

t/ha dry weight recorded by (3). The significant effect of phosphorus levels on fresh forage yield of groundnut recorded in this study was in agreement with the report of (28).

Proximate Compositions of Maize and Groundnut Forage and their Intercropped Mixtures

The effect of intercropping on proximate compositions of maize and groundnut forages is presented in Table 5. proximate composition was significantly (P<0.05) affected intercropping. The result showed that dry matter was significantly higher (94.52 %) in 2:1 M-G than sole G and sole G, but similar to that of 1:2 and 1:1 M-G. the crude protein was higher (7.30 %) in sole G than 2:1 and 1:2 M-G which were at par but significantly (P<0.05) higher than that of 1:1 M-G and sole M. the crude fibre was higher (22.81 %) in 2:1 M-G followed by 1:2 M-G and sole M and least in 1:1 M-G and sole G which were similar (P>0.05). The highest ether extract (0.57 %) and Ash (5.44 %) contents were observed in 1:1 M-G and least in sole G (0.40 %) and 2:1 M-G (4.71 %) respectively. The nitrogen free extract (68.77 %) content was higher in sole M then followed by 1:2 and 1:1 M-G which were similar and least in 2:1 M-G and sole G which were at par.

The higher percentage of herbage dry matter content of 94.52 %DM (Table 5) was observed in the intercropping than in sole maize and groundnut. This could be due to competitive ability of the species and better utilization of environmental resources (27). The values of crude protein (CP) recorded for

Table 5: Effect of Intercropping on Proximate Composition of Maize and Groundnut Forage and their Intercrop Mixtures.

treatment	DM	CP	CF	EE	Ash	NFE
Sole M	91.16[b]	6.44[c]	19.46[d]	0.43[bc]	4.99[b]	68.77[a]
Sole G	92.16[b]	7.30[a]	21.04[c]	0.40[c]	5.03[b]	66.24[c]
1:1 M/G	94.12[a]	6.60[c]	20.85[c]	0.57[a]	5.44[a]	66.54[b]
1:2 M/G	94.42[a]	6.19[d]	21.98[b]	0.46[b]	4.69[d]	66.66[b]
2:1 M/G	94.52[a]	6.92[b]	22.81[a]	0.42[bc]	4.71[c]	65.20[d]
SEM	0.27	0.11	0.13	0.02	0.09	0.11

[abc] Means with different superscripts within columns differed significantly, * significant at P<0.05, SEM = Standard error of mean, M = Maize, G = Groundnut.

maize and groundnut in this study (Table 5) were below that reported by (24) and (29), respectively. The values of CP and CF of groundnut were in agreement with the report of (6). The values of EE and NFE of groundnut obtained in this study were less than and greater than that reported by (30), respectively. The value for Ash of groundnut in this study was less than that observed by (31). The values of CP, Ash and NFE for maize observed in this study were similar to 6.9 %, 4.6 % and 52.6 %, respectively as reported by (32). The crude fibre content obtained in this study was higher than that of 18.50 % reported by (33).

Mineral Concentration of Maize and Groundnut Forages and their Inter-cropped Mixtures

The effect of intercropping on mineral composition of maize and groundnut forages and their intercropped mixtures are presented in Table 6. Mineral composition of maize and groundnut were significantly (P<0.05) affected by intercropping. Calcium (Ca) concentration of sole G was (34 %, 38 %, 42 % and 69 %) higher than that obtained in 1:2 M-G, 1:1 M-G, 2:1 M-G and sole M respectively. Magnesium (Mg) concentration of 2:1 M-G was 14 %, 16 %, 29 % and 50 % higher (P<0.05) than that recorded in 1:2 M-G, 1:1 M-G, sole G and sole M respectively. Phosphorus (P) concentration of 1:2 M-G was 8 %, 17 %, 22 % and 24 % higher than that observed in sole G, 1:1 M-G, 2:1 M-G and sole M respectively. Cupper (Cu) concentration of 1:1 M-G was 40 %, 66 %, 78 % and 86 % higher (P<0.05) than that of 2:1 M-G, sole M, sole G and 1:2 M-G respectively.

The mineral element plays role in proper functioning of the rumen microorganisms especially those which digest plant cellulose, utilization of energy from feeds, protein and metabolism among other functions (34). The values for calcium (Ca) and phosphorus (P) concentrations for maize obtained in this study (Table 6) were similar to those reported by (32). The value for Magnesium (Mg) in this study disagreed with that of (32) who reported higher value, but the concentration of phosphorus was higher than that of (12). However, the proportion of Ca (8846.0 – 2733.4 mg/kg) and Mg (78.98 – 157.45 mg/kg) for intercrops effect are sufficient to meet the daily requirement (0.05 – 1.1 g Ca/day) and (0.05 – 0.081 g Mg/day) for sheep and goats (35). Minerals are required by different classes of ruminant in various proportions to play a positive role in maintenance of health, growth and productions. Therefore, they should be supplemented in the diet to ensure adequacy.

Table 6: Effects of Intercropping on Mineral Concentration of Maize, Groundnut and their intercrop.

Treatments	Ca (mg/kg)	Mg (mg/kg)	P (mg/kg)	Cu (mg/kg)
Sole M	2733.4^{e}	78.98^{e}	1369.2^{e}	0.7850^{c}
Sole G	8846.0^{a}	112.23^{d}	1653.4^{b}	0.5008^{d}
1:1 M/G	5470.9^{c}	132.74^{c}	1498.4^{c}	2.3189^{a}
1:2 M/G	5871.0^{b}	135.04^{b}	1795.5^{a}	0.3250e
2:1 M/G	5070.9^{d}	157.45^{a}	1408.0^{d}	1.3875^{b}
SEM	86.4	0.19	1.42	0.02

^{abc} Means with different superscripts within columns differed significantly, * significant at P<0.05, SEM = Standard error of mean.

Conclusion and Applications

1. This study reveals that intercropping maize and groundnut at 1:2 M-G ratio produced the highest forage yield of the herbage (20.33 t/ha M and 20.40 t/ha G on fresh basis, 8.63 DM t/ha M and 6.53 DM t/ha G).
2. The intercrop produced herbage with nutrient composition and mineral concentration adequate to meet the nutritional requirements of ruminant livestock in Nigeria.
3. Farmers should adopt intercropping ratio of 1:2 M-G for better intercropping advantages, forage yield and nutrient content of the herbage. Further studies should be conducted to investigate other intercropping pattern and compatibility of maize with other leguminous plant.

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