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INFLUENCE OF PHOSPHORUS FERTILIZER RATES AND PLANT SPACING ON GROWTH AND YIELD OF GROUNDNUT (*Arachis hypogeae* L.) IN BAUCHI STATE, NIGERIA

Isah, Y.; Sabo, M. U. & Shuaibu, Y. M.
Department of Crop Production, Faculty of Agriculture and Agricultural Abubakar Tafawa Balewa University Bauchi
Email: ymshuaibu@atbu.edu.ng
Corresponding author: Isah, Y

ABSTRACT: A field experiment to study the influence of phosphorus fertilizer rates and plant spacing on the growth and yield of groundnut was conducted at Bauchi State University (Main Campus) Gadau teaching and research farm during 2018 and 2019 cropping seasons. The treatments comprised of four levels of phosphorus fertilizer (0, 30, 60 and 90 kg P_2O_5/ha) and three spacing (20cm x 60cm, 25cm x 60cm and 30cm x 60cm). These were factorially combined to give 12 treatments combination and laid out in a Randomized Complete Block Design (RCBD) with three replications. The results of the experiment revealed a significant (P<0.01) difference among the treatments used throughout the study period. The result further indicated that, application of 90kg P_2O_5/ha significantly (P<0.01) recorded the highest plant height, number of leaves, leaf area, pod and grain yield than the other treatments used. However, all the treatments were better than the control. Spacing on the other hand, widest spacing (30cm x 60cm) significantly (P<0.01) gave the highest plant height, hundred seed and pod weight, shelling percentage and harvest index. The result also showed that, closest spacing (20cm x 60cm) recorded the highest yields per hectare with the highest grain yield of 1520.2 kg/ha and 1530.5 kg/ha in 2018 and 2019 seasons respectively. Based on the result of this findings, it can be concluded that, the use of 90kg/ha P_2O_5 and closest spacing (20cm x 60cm) significantly gave the highest yields per hectare and can be adopted by farmers for profitable groundnut production in the study area.

Key words: Groundnut, Growth, Phosphorus and Spacing.

INTRODUCTION

Groundnut (*Arachis hypogeae* L.) is an important cash and food grain legume crop grown for its edible oil and protein rich kernels in Sudan savanna and Northern Guinea savanna of Nigeria. Groundnut cultivation in Northern Nigeria is expected to increase. As a leguminous crop, it does not require high amounts of nitrogenous fertilizers, hence most farmers in these ecological zones prefer to grow groundnut on poor soils without fertilizer application. Groundnut is also an easily marketed cash crop that lead to increase in farmers income. It is sometimes grown as sole crop or in rotation with cereals to reduce infestation by parasitic weed, *Striga hermonthica*. Phosphorus deficiency is the most frequent nutrient stress for growth and development of grain legumes including groundnut (Oudhia, 2007) in the Nigerian savannas. Mean soil phosphorus levels were 1.50 and 2.51mg kg^{-1} in bush field and compound field in Sudan savanna and 3.68 and 4.70 mg kg^{-1} in bush field and compound field in Northern Guinea savanna (Paulraj and Ignacimuthu, 2006). As with other legumes, added phosphates may have beneficial effects on growth, nodulation, and nitrogen fixation of groundnut. Crop species and varieties however, differ in their tolerance to low soil phosphorus and in their ability to utilize weakly soluble phosphorus sources under different climatic, soil and management conditions. This study was therefore carried out to study the influence of phosphorous fertilizer rate and spacing on the growth and yield of groundnut.

MATERIALS AND METHODS

A field experiment to examine the influence of phosphorus fertilizer rates and plant spacing on the growth and yield of groundnut was conducted at Bauchi State University (Main Campus Gadau) teaching and research farm during 2018 and 2019 cropping seasons. The treatments comprised of four levels of phosphorus fertilizer (0, 30, 60 and 90 kg P_2O_5/ha) and three spacing (20cm x 60cm, 25cm x 60cm and 30cm x 60cm). These were factorially combined to give 12 treatments combination and laid out in a Randomized Complete Block Design (RCBD) with three replications. A composite soil samples (0-30cm depth) were collected from experimental site with an auger before the onset of the experiment. Each composite sample contained

15 subsamples taken along three transects across the field and mixed together. The soil samples were air dried and crushed using a pestle and mortar and passed through a 2mm sieve and stored in sealed polythene bags for analysis. The soil samples were analyzed for texture, pH, organic carbon and total N. Exchangeable K, available P, Zn and Cu were also determined. The experimental site was cleared and ridges were prepared manually using simple farm tools. The groundnut seeds (SAMNUT 26) were sown on June 28 2018 and June 12 2019 with two seeds per hole. Phosphate fertilizer were applied twice; first dose during planting and the second dose at six weeks after planting. All cultural practices including refilling, thinning, pest and disease control were undertaken. Data were collected on plant height, number of leaves, leaf area, 100 pod weight, 100 seed weight, shelling percentage, harvest index, pod yield and grain yield. All data collected were subjected to analysis of variance (ANOVA) and means were separated using Duncan's Multiple Range Test (DMRT).

RESULTS AND DISCUSSION

Plant Height

The results as presented in Table 2 revealed a significant ($P \leq 0.05$) difference among the treatments used on plant height. The result further indicated that, application of 90 kg P_2O_5/ha significantly ($P \leq 0.05$) gave the highest plant height followed by 60kg/ha P_2O_5 in both 2018 and 2019 cropping seasons. The least plant height was obtained under the control. Spacing on the other hand, except at 8 and 12 WAS where widest spacing proved to be significantly ($P \leq 0.05$) better, no significant ($P \leq 0.05$) difference was observed throughout the study period. The present study revealed that, plant height increased with increase in phosphorous rate in both the two wet seasons. The result of this work is in agreement with the findings of Sandler (2007) who reported that an increase of groundnut plant height was recorded from 25.65cm to 36.63cm due to the application of 50 to 120kg phosphorus fertilizer per hectare. He further revealed that phosphorus fertilizer significantly brought about increase in LAI. The result of this findings further showed significant influence of spacing on plant height of groundnut. The widest spacing recorded the highest plant height of 27.28cm. This result is in conformity with the findings of Smith (2002) who reported that groundnut grown in widest spacing (30 x 45cm) gave the highest plant height of 36.86cm and this is probably due to lower plant population and less interspecific competition for available resources. The present study also lend support from the findings of Kathirvelan and Kalaiselvan (2007) who reported that plant height of groundnut increased linearly with wider row spacing as a result of reduced interspecific competition.

Number of Leaves

Results of number of leaves per plant is presented in Table 2. The result revealed a significant ($P \leq 0.05$) difference among the various treatments used on number of leaves of groundnut. The result further showed that, application of 90 and 60 kg P_2O_5/ha were statistically ($P \leq 0.05$) similar but significantly ($P \leq 0.05$) recorded the highest number of leaves than the other rates used but all the rates were better than the control. No significant ($P \leq 0.05$) difference was observed with regards to the spacing in both 2018 and 2019 growing seasons. The findings of this experiment showed that number of leaves per plant in both the two cropping seasons increased with an increase in phosphorus fertilizer application. The application of 90kg/ha P_2O_5 rate give the higher number of leaves per plant with 301.73 and 312.63 in 2018 and 2019 wet seasons respectively. In comparison to the control, all the P_2O_5 rates displays a significant increased on the average number of leaves per plant in both growing seasons. The results of this research is in agreement with the report of Ramesh and Sabale (2001) who reported that, increase in application of single super phosphate (SSP) fertilizer from 40kg to 90kg per hectare increased number of leaves and numerous branches of groundnut. Consequently, the report of this study is in conformity with the findings of Subramaniyan *et al.,* (2000) and Waale and Swanvelder (2001) who reported that increased phosphorus fertilizer application resulted in increasing number of leaves of soybean and lentil respectively. However, the result of this work is not in agreement with the findings of Shuaibu *et al*., (2019) who stated that, no significant influence was observed on number of leaves as a result of phosphorus fertilizer applied on irrigated groundnut.

Conversely the report of the present study did not show any significant effect on promoting number of leaves among spacing, this was also in agreement with the report of Shuaibu *et al*., (2019) who reported that no significant differences were observed among spacing of irrigated groundnut. However, the research work of Sabo *et al*., (2017) who reported that vegetative growth increase with the increased in row spacing that reduced plant population was contrary to the findings of the present result.

Leaf Area

Results of the influence of phosphorous fertilizer rate and plant spacing on leaf area of groundnut is presented in Table 3. The result showed a significant ($P \leq 0.05$) influence of the treatments used in promoting leaf area of groundnut throughout the study period. The result further revealed that, application of 90 and 60 kg P_2O_5/ha were statistically ($P \leq 0.05$) at par but significantly ($P \leq 0.05$) recorded the highest leaf area followed by 30kg/ha P_2O_5 rates in 2018 and 2019 wet seasons. The least leaf area was observed in the control. Spacing on the other hand, no significant ($P \leq 0.05$) difference was observed throughout the two cropping seasons. The significant difference observed in this study indicated the importance of phosphorous application in groundnut production. The result of the present study showed that leaf area increases with the increase of phosphorus fertilizer application. The result of this research work is in agreement with the findings of Shuaibu *et al.*, (2019) who reported that leaf area linearly increases with the increase of phosphorus fertilizer application. The result of this fin dings also lend support from the findings of Sabo *et al.*, (2013) who reaffirmed that, profuse and vigorous leaves were obtained under 60kg/ha phosphorus application and above compared to lower phosphorus levels in groundnut. The findings of this experiment contradict the report of Fagam *et al.*, (2015) who observed that groundnut grown in widest spacing (25 x 45cm) produced the highest leaf area of groundnut.

Hundred Pods and Seeds Weight

The result as presented in table 4 revealed that, phosphorus fertilizer had a significant ($P \leq 0.05$) influence on pod weight of groundnut. The result further indicated that, application of 90kg P_2O_5/ha produced significantly ($P \leq 0.05$) heavier pods and seeds of groundnut than the other rates and all the rates were better than the control. Spacing on the other hand except during 2019 rainy season where wider spacing produced significantly ($P \leq 0.05$) heavier grain than the other spacing used, no significant ($P \leq 0.05$) difference was observed in 2018.

The significant difference observed in this study could be as a result of increase in leaf area as a result of phosphorous application leading to increase in dry matter accumulation. The result of this findings collaborates the findings of Shuaibu *et al.*, (2018) who reported that, increased fertilizer rates lead to an increase in grain weight of sorghum. However, the highest hundred pod and grain weight was associated with the widest and the intermediate spacing. This could be due to sufficient space between rows, less interplant competition for resources which resulted in an efficient dry matter partitioning leading to heavier individual seed sizes and weights. The result of this findings is in conformity with the work of Kawure *et al.* (2018) who observed that at the widest spacing, sufficient moisture and lesser competition led to efficient dry matter partitioning in rice.

Shelling Percentage

The results as presented in table 4 showed that, P_2O_5 treatments significantly ($P \leq 0.05$) increased shelling percentage over the control treatment indicating that phosphorus fertilizer generally influenced shelling percentage irrespective of the levels. Shelling percentage, an index of crop yield indicates the proportion of the total dry matter synthesized that has been allocated to the seeds. According to Ramesh and Sabale (2001), this parameter is affected by varietal and environmental factors affecting photosynthesis, dry matter accumulation and partitioning. The higher shelling percentage recorded by the widest spacing could be due to reduced mining of resources, maintenance of optimal temperature, lower incidence of pests and diseases and efficient allocation of assimilates. The result of this findings contradicts the findings of Kathirvelan and Kalaiselvan (2007) who found that total dry matter yield of groundnut generally increased with narrow spacing.

Harvest Index

Table 4 presented the result of the effect of phosphorous fertilizer rates and plant spacing on harvest index of groundnut. The result revealed that, harvest index as an indicator of how much dry matter accumulated by the plants is partitioned into the economic part (pod) was not significantly ($P \leq 0.05$) affected by phosphorous application. Pod filling is sensitive to moisture stress. Moisture stress and soil fertility factors have been reported to adversely influence dry matter production and partitioning among plant parts in groundnuts (Fagm, *et al.*, 2016). The result of this work is contrary to an earlier finding of Donald and Hamblin (1976) who found in Dixie Runner, a harvest index of 0.23 and a biological yield of 10.8 Mg (metric ton)/ha. They again, indicated that Early Runner showed a 50%

increase in seed yield over Dixie Runner, primarily due to an increased harvest index of 0.36. Similarly, Florunner showed a 20% increase in seed yield over Early Runner, due to a harvest index of 0.41.

The results indicated that harvest index was higher (0.346) in wider spacing 2018. The higher harvest index recorded by widest spacing could be ascribed to reduced competition for available resources, efficient partitioning of assimilates, higher number of pods per plant and grain yields. Results of harvest index obtained in this study conform the work of Agasimani *et al*. (2007). Though closest spacing were statistically similar with widest spacing in promoting harvest index, the closest spacing were among the spacing recorded the highest value of harvest index, this could be ascribed to complete canopy closure which may have encouraged adequate light interception, photosynthate production and higher seed yield. The complete canopy closure would smother weed growth which could reduce nutrient and moisture mining by weeds. The results are in agreement with those of Dokli (2007) who found that the loss of efficiency at the widest spacing reflected greater intra-plant competition resulting in fewer seeds per pod and lower harvest index compared to denser stands.

Pods and Grain Yields

The result as presented in Table 5 indicated that, there is a significant ($P \leq 0.05$) difference among the treatments used in promoting yield of groundnut. The results further revealed that, application of 90 and 60 kg P_2O_5/ha were statistically similar and significantly ($P \leq 0.05$) recorded the highest pod and yield. However, all the treatments were better than the control throughout the study period. The study further indicated that, closest spacing (20cm x 60cm) was found to be significantly ($P \leq 0.05$) better than the wider spacing in promoting pod and grain yield of groundnut in both the seasons studied.

The significant difference observed in this revealed the importance of phosphorous fertilization and spacing on yield of groundnut. The highest pod and grain yields recorded could be due to sufficient supply of P_2O_5 to the plant which resulted in large number of flowers production and high yields. The results of this findings is in agreement with the earlier findings of Donald and Hamblin (1976) who found that increased grain and pod yields of groundnut were primarily due to increase in application of phosphorus fertilizer. The results also lend support from the findings of the Fagm, *et al.*, (2015) who affirmed that, increased yields of semi prostrate and erect groundnut is associated with increased application of phosphorus fertilizer. The result is also in accordance with the work of Weiss (2000) who stated that, phosphorus deficiency could reduce groundnut yield by 18-70%.

The results showed that the closest spacing (20cm x 60cm) recorded the highest pod yield of 2232.6kg/ha and 2252.5kg/ha in 2018 and 2019 respectively. For grain yield, the greatest values of 1520.2kg/ha and 1530.5kg/ha in 2018 and 2019 seasons respectively were revealed by the closest spacing. The highest pod and grain yields recorded by the closest spacing could be due to the optimum plant population per unit area, efficient use of resources, higher number of pods per unit area, less crop-weed competition and a better ground cover leading to higher moisture conservation as observed by Kathirvelan and Kalaiselvan (2007). Asibuo, *et al.*, (2008) and Agasimani *et al.* (1984) reported that narrow row culture called for higher plant densities that ensured faster canopy development to compete successfully against weeds resulting in higher pod and grain yields. The higher pod and grain yields observed could be due to optimum plant population. Ramesh and Sabale (2001) and Hameed-Ansari *et al.* (2007) also lend support to the findings of this study. The result of this experiment also collaborates the findings of Ahmad and Mohammad (2007) who reported that, pod yield was 16% higher in narrow-row plantings compared with traditional wide-row plantings.

CONCLUSION/RECOMMENDATION

The results of the experiment revealed that the 90kg/ha P_2O_5 significantly ($P<0.01$) recorded the highest growth parameters, biomass yield, pod yield, grain yield, hundred pod yield and hundred seed yield. Among the different plant spacing, the closest spacing (20 x 60cm) significantly ($P<0.01$) recorded the highest biomass, pod and grain yields per hectare. Based on the result of this findings, application of phosphorous at the rate of 90 kg/ha to groundnut spaced at 20 x 60 cm can be adopted by farmers in the study area for increased groundnut production.

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Table 1: Influence of phosphorus fertilizer rates and plant spacing on plant height of groundnut in 2018 and 2019 wet seasons

	Weeks After Planting									
	4		6		8		10		12	
Treatments	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019
Phosphorous (kg/ha)										
Control	8.20[d]	9.16 [d]	11.31[d]	13.33[d]	15.31[d]	17.29[d]	18.34[c]	20.31[d]	21.84[c]	23.86[c]
30 kg	8.86[c]	9.71[c]	12.74[c]	14.73[c]	18.70[c]	20.67[c]	21.78[b]	23.77[c]	24.92[b]	27.26[b]
60 kg	9.70[b]	10.67[b]	15.70[b]	17.57[b]	22.66[b]	24.71[b]	26.67[a]	28.62[b]	30.29[a]	32.20[a]
90 kg	10.14[a]	11.10[a]	16.11[a]	18.14[a]	23.14[a]	25.19[a]	26.78[a]	29.08[a]	30.66[a]	32.71[a]
L S	**	**	*	**	**	**	**	**	**	**
SE±	0.013	0.047	0.085	0.094	0.079	0.095	0.182	0.087	0.168	0.215
Spacing (cm)										
20 x 60	9.21	10.16	14.04	15.95	19.74[b]	21.46[b]	23.54	25.53	26.48[b]	29.25
25 x 60	9.22	10.19	14.04	16.08	20.04[a]	22.00[a]	23.56	25.48	27.00[a]	29.13
30 x 60	9.20	10.13	13.82	15.80	20.08[a]	22.13[a]	23.09	25.33	27.28[a]	28.63
L S	NS	NS	NS	NS	*	*	NS	NS	**	NS
S E±	0.011	0.040	0.073	0.082	0.069	0.083	0.157	0.075	0.145	0.186
Interaction										
P * S	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

LS= Level of significant, SE= Standard error, NS= not significant difference, *= significant at P<0.05, **= significant at P< 0.01, Means with different superscripts in the same column are significantly different according to Duncan's Multiple Range Test.

Table 2: Influence of phosphorus fertilizer rates and plant spacing on number of leaves of groundnut in 2018 and 2019 wet seasons

	Weeks After Planting									
	4		6		8		10		12	
Treatments	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019
Phosphorous (kg/ha)										
Control	42.86^{c}	47.77^{c}	71.92^{c}	83.00^{b}	141.64^{d}	152.68^{c}	201.47^{d}	212.72^{d}	247.99^{c}	259.06^{c}
30 kg	49.68^{b}	54.62^{b}	92.08^{b}	93.30^{b}	169.89^{c}	178.83^{b}	229.81^{c}	240.98^{c}	269.86^{b}	281.24^{b}
60 kg	54.93^{a}	60.00^{a}	103.73^{a}	113.14^{a}	198.47^{b}	212.29^{a}	258.31^{b}	268.78^{b}	298.47^{a}	309.29^{a}
90 kg	55.26^{a}	60.36^{a}	105.88^{a}	116.44^{a}	201.39^{a}	212.09^{a}	261.61^{a}	272.47^{a}	301.73^{a}	312.63^{a}
L S	**	**	**	**	**	**	**	**	**	**
SE±	0.273	0.287	0.995	5.402	0.743	2.150	0.739	0.976	3.255	3.199
Spacing (cm)										
20 x 60	50.23	55.33	93.33	104.1	177.88	192.00	237.98	249.76	277.95	289.40
25 x 60	50.18	55.17	93.72	97.00	177.48	186.64	237.28	248.20	277.33	288.69
30 x 60	51.13	55.07	93.17	103.30	178.83	188.23	238.15	248.25	283.26	293.58
L S	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
SE±	0.236	0.248	0.861	4.681	0.643	1.862	0.640	0.846	2.819	2.771
Interaction										
P * S	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

LS= Level of significant, SE= Standard error, NS= not significant difference, **= significant at P< 0.01, Means with different superscripts in the same column are significantly different according to Duncan's Multiple Range Test.

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Table 3: Influence of phosphorus fertilizer rates and plant spacing on leaf area (cm) of groundnut in 2018 and 2019 wet seasons

	Weeks After Planting									
	4		6		8		10		12	
Treatments	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019
P_2O_5(kgha^{-1})										
Control	4.09^c	4.43^c	4.78^c	5.28^c	5.96^c	6.46^c	7.23^c	7.76^c	8.46^c	8.96^c
30 kg	4.86^b	5.18^b	5.72^b	6.22^b	7.09^b	7.61^b	8.39^b	8.89^b	9.60^b	10.10^b
60 kg	6.27^a	6.54^a	7.47^a	7.97^a	8.67^a	9.17^a	9.97^a	10.47^a	11.16^a	11.66^a
90 kg	6.36^a	6.66^a	7.54^a	8.04^a	8.72^a	9.22^a	10.02^a	10.52^a	11.20^a	11.71^a
L S	**	**	**	**	**	**	**	**	**	**
SE$\pm$	0.036	0.040	0.040	0.040	0.064	0.065	0.064	0.064	0.064	0.064
Spacing (cm)										
20 x 60	5.40	5.70	6.39	6.89	7.66	8.16	8.96	9.46	10.16	10.66
25 x 60	5.35	5.67	6.34	6.84	7.53	8.04	8.83	9.33	10.03	10.53
30 x 60	5.42	5.74	6.40	6.90	7.64	8.14	8.94	9.44	10.12	10.63
L S	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
SE$\pm$	0.031	0.034	0.035	0.035	0.056	0.056	0.056	0.056	0.056	0.056
Interaction										
P * S	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

LS= Level of significant, SE= Standard error, NS= not significant difference, *= significant at P<0.05, **= significant at P< 0.01, Means with different superscripts in the same column are significantly different according to Duncan's Multiple Range Test.

Table 4: Influence of phosphorus rates and plant spacing on 100 pod weight, 100 seed weight, shelling percentage and harvest index of groundnut in 2018 and 2019

	parameters							
	100 pods weight (g)		100 seeds weight (g)		Shelling %		Harvest index	
Treatments	2018	2019	2018	2019	2018	2019	2018	2019
Phosphorous (kg/ha)								
Control	67.07[b]	69.01[d]	26.61[d]	27.61[d]	62.07[b]	62.41[b]	0.334	0.348
30 kg	67.24[b]	75.90[c]	29.97[c]	30.91[c]	65.74[a]	66.10[a]	0.331	0.336
60 kg	84.63[a]	86.34[b]	34.18[b]	35.00[b]	67.71[a]	68.00[a]	0.343	0.346
90 kg	86.13[a]	88.03[a]	34.71[a]	35.60[a]	67.94[a]	67.69[a]	0.346	0.349
L S	**	**	**	**	**	**	NS	NS
SE±	3.390	0.408	0.115	0.123	0.999	1.046	0.005	0.006
Spacing (cm)								
20 x 60	74.63	76.43[c]	29.72[c]	30.67[c]	68.03[b]	68.32[b]	0.338[a]	0.339
25 x 60	73.28	80.27[b]	31.43[b]	32.39[b]	64.42[c]	64.38[c]	0.332[b]	0.334
30 x 60	80.90	82.79[a]	32.95[a]	33.78[a]	72.65[a]	72.96[a]	0.346[a]	0.350
L S	NS	**	**	**	**	**	*	NS
SE±	2.936	0.354	0.100	0.107	0.865	0.906	0.004	0.005
Interaction								
P * S	NS	NS	**	**	NS	NS	NS	NS

LS= Level of significant, SE= Standard error, NS= not significant difference, *= significant at P<0.05, **= significant at P< 0.01, Means with different superscripts in the same column are significantly different according to Duncan's Multiple Range Test.

Table 5: Influence of phosphorus fertilizer rates and plant spacing on pod and grain yield of groundnut in 2018 and 2019 wet seasons

Treatments	Pod yield(kg/ha) 2018	Pod yield(kg/ha) 2019	Grain yield(kg/ha) 2018	Grain yield(kg/ha) 2019
Phosphorous (kg/ha)				
Control	1218.8[c]	1379.6[d]	985.3[c]	995.3[c]
30 kg	1763.9[b]	1783.9[c]	1158.1[b]	1168.1[b]
60 kg	2154.1[a]	2174.5[b]	1464.5[a]	1473.4[a]
90 kg	2187.1[a]	2227.1[a]	1489.2[a]	1499.2[a]
L S	**	**	**	**
SE±	67.83	16.88	15.90	15.90
Spacing (cm)				
20 x 60	2232.6[a]	2252.5[a]	1520.2[a]	1530.5[a]
25 x 60	1785.1[b]	1925.2[b]	1226.3[b]	1235.5[b]
30 x 60	1475.1[c]	1496.2[c]	1076.1[c]	1086.1[c]
L S	**	**	**	**
SE±	58.75	14.63	13.37	13.77
Interaction				
P * S	NS	**	*	*

LS= Level of significant, SE= Standard error, NS= not significant difference, *= significant at P<0.05, **= significant at P< 0.01, Means with different superscripts in the same column are significantly different according to Duncan's Multiple Range Test

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