GLOBAL JOURNAL OF BIOLOGY, AGRICULTURE & HEALTH SCIENCES
(*Published By*: Global Institute for Research & Education)
www.gifre.org

EFFECTS OF PLANTING SPACING ON SEED YIELD, PROXIMATE AND GROSS ENERGY COMPOSITIONS OF *Clitoria ternatea* IN DERIVED SAVANNA ZONE OF NIGERIA

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Abstract

A field experiment was conducted at the Teaching and Research Farm, Ladoke Akintola University of Technology (LAUTECH), Ogbomoso, Oyo State, Nigeria, to determine the effect of planting spacing on seed yield, proximate composition and gross energy contents of *Clitoria ternatea* seeds. Treatments consisted of three different planting spacings (30cm x 30cm, 45cm x 45cm and 60cm x 60cm) laid out in a Randomized Completely Block Design and each treatment was replicated thrice. Results showed that seed yield decreased ($P<0.05$) with increasing spacing but not in sequential order. Seed yields of 259.4kg, 22.7kg and 202.2kg were recorded for spacing 30cm x 30cm, 60cm x 60cm and 45cm x 45cm, respectively. Crude protein and gross energy contents of the seed increased with increasing spacing. Crude protein contents were 31.7, 33.7 and 35.5% for 30cm x30cm, 45cm x 45cm and 60cm x 60cm, respectively. Similar result trend was observed for gross energy contents and were 400.1, 407.6 and 426.0 (Kcal/100g) for 30cm x 30cm, 45cm x 45cm and 60cm x 60cm, respectively. It can be concluded from this research that 30cm x 30cm spacing produced highest seed yield, while the crude protein and gross energy were appreciable 60cm x 60cm spacing.

Key words: *Clitoria ternatea; Planting spacing, Proximate composition; Gross energy*

Introduction

Productivity of forage is influenced by species of forage, environmental and soil status on which it is cultivated (Jayanegara and Sofyan, 2008). Many legumes abound in the tropics; among them is *Clitoria ternatea*, with the common names butterfly pea, blue pea, kordofan pea etc. *Clitoria ternatea* originated from Latin America and Asia but it is now naturalized in semi- arid and sub- humid tropics of Asia, Africa and Australia (Staples, 1992). The legume is rich in protein and is often referred to as "protein bank" (Cook *et al.*, 2005) and does well in dry season which enhances its use as dry season feed (Nworgu and Ajayi, 2005). Livestock prefer the legume to other legumes; this makes it a valued pasture legume (Gomez *et al.*, 2003). It is widely acknowledged that climate and edaphic factors differ from one geographical location to another and these influence plant growth and chemical composition. Agronomic practices such as spacing and stage of growth also influence chemical composition and energy. However, the search for literatures on *Clitoria ternatea* revealed no study conducted in Ogbomoso (a town located in derived savannah zone of Nigeria) that examined the effects of plant spacing on seed yield of the legume, proximate and gross energy compositions the legume seeds.

Materials and Methods

Experimental site

This study was carried out at the New Pasture Introductory Unit of the Teaching and Research Farm, Ladoke Akintola University of Technology (LAUTECH), Ogbomoso, Oyo State, Nigeria. The farm is located in the derived savannah zone of Nigeria situated on Longitude $4^0 29^{'}$N and Latitude $8^0 26^{'}$N and with annual rainfall range of 785mm-1486mm (Adeniyi, 2005).

Land and seed beds preparation and experimental treatments

The area of land used was $20m^2$ .The land was plough and harrowed before the seed beds were prepared. Later, it was laid out in completely randomized block design. The seeds of the legume (*Clitoria ternatea*) were

procured from the International Institute of Tropical Agriculture (IITA), Ibadan, Oyo State, Nigeria. *Clitoria ternatea* seeds were planted by drilling at the rate of 3seeds per hole with 4cm deep to the soil. Treatments were three different spacing of 30x30, 45x45 and 60x60cm respectively. Each treatment was replicated thrice and each experimental plot measured 5mx5m with 1m path between every two seed beds (Figure 1). Weeding was done manually as often as required to prevent weeds from competing with the legumes.

Harvesting, threshing and winnowing of *Clitoria ternatea* pods

The first harvesting of dry pods was carried out on 150th day post sowing of seeds; subsequent harvestings were carried out on weekly basis for nine weeks. On weekly basis the harvested seeds were threshed, winnowed and weighed using an electronic scale (CAMRY Model: EK5350). The harvested seeds of each seeds were pulled together and weighed. Sub samples of seed from each treatment were taken and preserved pending laboratory analysis.

Laboratory analysis

The nine preserved seed samples were subjected to proximate and gross energy analysis in line with the AOAC (1990) procedures.

Statistical analysis

The seed yields, proximate and energy data were subjected to a one way analysis of variance (ANOVA) using the Minitab Software Statistical Package (Minitab, 1998). Treatments means were compared using the standard error of the difference between means (s.e.d.) for significance
($P<0.05$).

Results and Discussion

Weekly and total seed yields

The weekly and total seed yields of *Clitoria ternatea* are presented in Table 1. Between weeks one and five, the total seed yield recorded for 30cm x 30cm seed beds was significantly higher than values recorded for 60cm x 60cm seed beds. The differences between treatment means of the plant distances 30cm x 30cm and 60cm x 60cm were significant in the first three weeks of the harvesting carried out. However, between weeks seven and eight total seed yield of the planting distance 60cm x 60cm recorded the highest; the differences between means of the planting distances 30cm x 30cm and 60cm x 60cm were significant. The total seed yield on planting distances 30cm x 30cm, 45cm x 45 cm and 60cm x 60cm were 259.4, 202.2 and 222.7kg/ha, respectively. The total seed yield obtained over entire periods of harvesting revealed that the planting distance 30cm x 30cm had significantly higher value than the value recorded for the planting distance 45cm x 45cm. The differences between total seed yield of 30cm x 30cm and 60cm x 60cm planting distances was marginal. The trend obtained in this study was not consistent with the previous reports (Turk and Tawaha, 2002; Thalji, 2006), that seed yield increases with increase in planting distance. The inconsistency can be attributed to the variations in soil status and climates between studies.

Proximate (%) and gross energy (Kcal/100g) compositions of seeds of *Clitoria ternatea*

The proximate and gross energy compositions of seeds of *Clitoria ternatea* are presented in Table 2. The CP content of *Clitoria ternatea* seeds increased with increase in planting spacing; CP contents of seeds increased significantly as the planting distance increased with seeds of planting distance 60cm x 60cm recording the highest. The range values (31.7-35.5%) of CP content of seeds of *Clitoria ternatea* were within range values (22-37%) reported by Odeyinka *et al.* (2004) and Fasoyiro *et al.* (2004). The CF contents were independent of planting distances and the range values of CF (17.7-18.6%) of the legume seeds were lower than the 21.5- 29% CF contained in the report of Kalamani and Gomez (2001). Seeds of planting distance 60cm x 60cm had significantly ($P<0.05$) higher EE content than seeds of the other two planting distances. Comparison of treatment means of EE contents of seeds of planting distances 30cm x 30cm and 45cm x 45cm was not significant ($P<0.05$). Planting distance 30cm x 30cm had significantly higher and lower NFE and GE, respectively, when compared with values recorded for NFE and GE of seeds of planting distance 60cm x 60cm. The range values of NFE (22.3-33.4%) of the legume seeds were also lower than 34.7% recorded by Katiyar *et al.* (1970). The ash contents decreased marginally with increase in planting distance while EE content of the seeds recorded a significant increase as the planting distance was increased from 30cm x 30cm to 60cm x 60cm. The range values of GE (400.1-426.0Kcal/100g)) of *Clitoria ternatea* seeds were lower than 4354kcal/kg reported by Nworgu and Egbunike (2013). Except the ash constituent of the seeds that was independent of planting distances, planting distance did influence other proximate parameters and gross energy contents of the legume seeds in derived savannah zone of Nigeria.

Figure 1 Experimental plots' layout

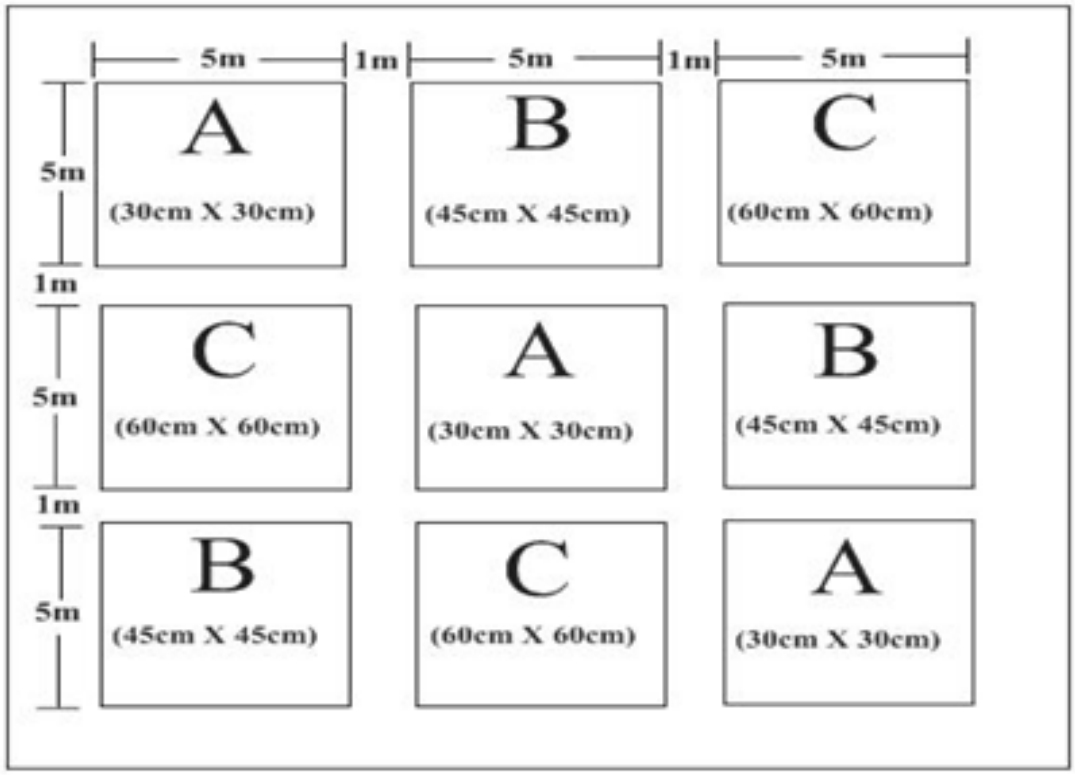

Table 1. Weekly and total seed yields of *Clitoria ternatea* on seed beds varying in planting distances

Planting distances	Wk1	Wk2	Wk3	Wk4	Wk5	Wk6	Wk7	Wk8	Wk9	Total Yield
30cm x 30cm	109.0^{a}	36.2^{a}	65.2^{a}	31.4^{a}	118.5	107.1	97.2^{a}	69.6^{a}	14.2^{ab}	648.4^{a} (259.4kg)
45cm x 45cm	41.9^{b}	13.9^{b}	26.2^{b}	18.1^{b}	92.2	113.2	116.3^{ab}	67.6^{a}	16.2^{a}	505.6^{b} (202.2kg)
60cm x 60cm	33.0^{b}	13.0^{b}	25.9^{b}	26.3^{ab}	102.9	124.5	124.0^{b}	100.8^{b}	6.3^{b}	556.8^{ab} (222.7kg)
s.e.d.	14.90	3.44	6.95	5.43	30.46	10.42	9.38	13.00	4.31	48.83

Means with different superscript within a column are significantly different ($p<0.05$)
Figures in parenthesis are estimated seed yield per hectare

Table 2. Proximate (%) and gross energy (Kcal/100g) compositions of seeds of *Clitoria ternatea* from seed beds varying in planting distances

Planting distances	Moisture	CP	CF	EE	Ash	NFE	GE
30cm x 30cm	7.1^{a}	31.7^{b}	17.7	8.2^{b}	3.1	32.8^{a}	400.1^{b}
45cm x 45cm	4.8^{b}	33.7^{ab}	18.1	7.4^{b}	2.6	33.4^{a}	407.6^{b}
60cm x 60cm	7.6^{a}	35.5^{a}	18.6	13.4^{a}	2.6	22.3^{b}	426.0^{a}
s.e.d.	0.5	1.4	0.7	1.0	0.4	3.4	5.2

Means with different superscripts within a column are significantly different ($P<0.05$)

Conclusion

It was concluded from this study that 30cm x 30cm and 60cm x 60cm planting spacings gave the highest seed yield and CP contents of seeds, respectively.

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