International Journal of Agriculture Innovations and Research
Volume 4, Issue 1, ISSN (Online) 2319-1473
Manuscript Processing Details (dd/mm/yyyy) :
Received : 27/05/2015 | Accepted on : 04/06/2015 | Published : 03/08/2015

Influence of Planting Spacings on Seed Yield, Chemical and Energy Compositions of Pigeon Pea (*Cajanus cajan*) Seeds in Derived Savannah Zone of Nigeria

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***Abstract* – The study investigated the seed yield, proximate (moisture, crude protein (CP), crude fibre (CF), acid detergent fibre (ADF), neutral detergent fibre (NDF), ether extractives (EE), ash, nitrogen free extractives (NFE)) and gross energy constituents of *Cajanus cajan*. The experimental treatments comprised three planting spacings (P1: 40cm x 40cm;P2: 50cm x 50cm and P3: 60cm x 60cm) on nine seed beds equally (n = 3) shared by the treatments in a Completely Randomized Design. Though, the total seed yield increased with increase in planting distances, comparisons of all treatments means were not significant ($p>0.05$). Moisture contents of seeds of P1 and P2 were significantly ($p<0.05$) higher than that of seeds of P3. Comparison of treatments means of moisture contents of seeds of P1 and P2 was not significant ($p>0.05$). CF content of seeds of P1 was significantly ($p<0.05$) and marginally ($p(>0.05$) higher than CF contents of P2 and P3, respectively. The difference between CF contents of P2 and P3 was not significant ($p>0.05$).ADF content of seeds of P1 were significantly ($p<0.05$) higher than the values recorded for P2 and P3. Comparisons of treatments means of ADF of seeds of P2 and P3 were marginal and not significant ($p>0.05$). The NDF contents of seeds of P2 and P3 were significantly ($p<0.05$) higher than the value recorded for P1. Comparisons of treatments means of NDF content of seeds of P2 and P3 were not significant ($p>0.05$). EE content decreased with increase in planting distances but the differences between treatments' means were not significant ($p>0.05$). EE content of seeds from P1 was significantly higher than that P3. NFE content of seeds of P3 was significantly ($p<0.05$) higher than NFE contents of P1 and P2. The difference between NFE contents of P1 and P2 was not significant ($p>0.05$). Planting distances had no significant influence on CP, ash and GE contents of *Cajanus cajan* seeds.**

***Keywords* – Planting Distance, *Cajanus cajan,* Seed Yield, Chemical And Energy Compositions.**

I. INTRODUCTION

Cultivation of *Cajanus cajan* (Pigeon pea) dated back to over 3,000 years with its India as its center of origin [1]; from where it found its way to Africa and America continents via the salve trade.The official Food and Agriculture Organisation (FAO) production record was from only six African countries [2]. However, cultivation of pigeon pea had been reported in Nigeria [3], Niger, Mali, Benin [4], Ethiopia, Zimbabwe [5], Zambia [6], Botswana [7], and South Africa [8]. Production in Africa was estimated to be 9.3% of world production; this is small when compared to the 74% contribution from India. Its seed protein content (approx. 21%) compares well with that of other legumes [9]. The crushed dry seeds of *Cajanus cajan* are used as animal feed [10]. Numerous legumes abound in the tropics and subtropics and tremendous efforts have been made on how to improve their seed yield. Considering the potential of *Cajanus cajan* seeds as feed resource, there is dearth of information on influence of planting spacings on seed yield and chemical composition of seeds of *Cajanus cajan* in derived savannah zone of Nigeria. The main objectives of the study were to investigate the influence of planting spacings on seed yield, chemical and energy compositions pigeon pea (*Cajanus cajan*) seeds in derived savannah zone of Nigeria.

II. MATERIALS AND METHODS

A. Experimental site

The study was conducted at the New Pasture Introductory Unit, Teaching and Research Farm (T&RF), Ladoke Akintola University of Technology (LAUTECH), Ogbomoso, Oyo State Nigeria. The T&RF is located in the derived savannah zone of Nigeria and lies on Longitude $4^{o}15^{1}$ East of the Greenwich meridian and on Latitude $8^{o}15^{1}$ North East of the equator. The means annual temperature and precipitation are 27^{o}C and 1247mm, respectively [11].

B. Preparation of land, experimental treatments and sowing of seeds

The land that was used for propagating the seeds of *Cajanus cajan*was ploughed and harrowed and nine seed beds were manually made using hoes. Each seed bed measured 5m x 5m in area and 1m separated every two seed beds. The experimental treatments comprised three planting spacings ((40cm x 40cm; 50cm x 50cm and 60cm

x 60cm); each planting spacing had three seed beds. *Cajanus cajan* seeds used in the study were seeds harvested from previous studies conducted at the site of study. Between 2 and 3 seeds were sowed perhole drilled 3-5cm deep.

C. Harvesting and processing of mature pods

On 233 post-sowing of seeds, over 95% of the pods were observed to be dried and ready for harvesting. All the dry pods on the nine seed beds were separately harvested into polythene sacs. The harvested pods were further subjected to sun drying for one week to ease threshing and winnowing. The sun dried pods were threshed and winnowed till clean seeds were obtained. The seeds from the nine seed beds were separately weighed using an electronic scale (CAMRY model EK5350). Samples of seeds were randomly taken from the seeds of each bed and preserved pending laboratory analysis.

D. Laboratory analysis

The nine seed samples were taken to the laboratory of the Department of Animal Production and Health, LAUTECH, and analysed for proximate (moisture, crude protein, crude fibre, ether extractives, ash, nitrogen free extractives) and gross energy according to the [12]procedures.Acid detergent fibre (ADF) and neutral detergent fibre (NDF) were determined according to the procedures of [13].

E. Statistical analysis

The experimental data was be subjected to a one way analysis of variance (ANOVA)using theMinitab Software Statistical Package [14]. Treatments means were compared using thestandard error of the difference between means (s.e.d.) for significance ($p<0.05$).

III. Results and Discussion

A. Total seed yield of Cajanus cajan

The total seed yield data of are presented in Table 1.The total seed yield increased with increase in planting distances but comparisons of treatment means were not significant ($p>0.05$). The estimated total seed yields on planting distances 40cm x 40cm, 50cm x 50cm and 60cm x 60cm were 872, 1012 and 1364kg/ham, respectively. The mean (118kg/ha) of the range values (872-1364kg/ha) of total seed yield in the study was lower than the mean (1350) of the range values (1,200-1,500kg/ha) reported by [15]. The mean (118kg/ha) of the range values 872-1364 kg/ha in this study was higher than 893 kg/ha reported by [16] . The differences in seed yield between studies perhaps were due to differences in soil status, agronomic practices and environmental condition between studies

B. Proximate and gross energy constituents of Cajanus cajan seeds

The proximate and gross energy data of *Cajanus cajan* seeds are presented in Table 1. Moisture contents of seeds of planting distances 40 cm x 40cm and 50cm x 50cm were significantly ($p<0.05$) higher than that recorded for seeds of planting distance 60cm x 60cm. Comparison of treatments means of moisture contents of seeds of planting distances 40 cm x 40cm and 50cm x 50cm was not significant ($p>0.05$). The CP, ash and GE contents of seeds were unaffected by the imposed treatments. The 23.91-25.95% range values of CP content of seeds of *Cajanus cajan* obtained in this study were higher than the range values of 17.9-24.3% contained in the report of [17]. The range values (3.34-3.80%) of ash contents of seeds of *Cajanus cajan* were within the range values of 3.1-4.2% reported by [18]**.**The CF content of seeds of planting distance 40cm x 40cm was significantly ($p<0.05$) and marginally ($p(>0.05$) higher than CF contents of planting distances 50cm x 50cm and 60cm x 60cm, respectively. Difference between CF contents of planting distances 40cm x 40cm and 60cm x 60cm was not significant ($p>0.05$). The range values (6.86-7.49%) of CF contents of seed of *Cajanus cajan* in the study were higher than the 6.8-7.1% range values contained in the report of [19]. The ADF content of seeds of planting distance 40cm x 40cm were significantly ($p<0.05$) higher than the values recorded for planting distances 50cm x 50cm and 60cm x 60cm. Comparisons of treatments means of ADF of seeds of planting distances 50cm x 50cm and 60cm x 60cm were marginal and not significant ($p>0.05$).The NDF contents of seeds of planting distances50cm x 50cm and 60cm x 60cm were significantly ($p<0.05$) higher than the value recorded for planting distance 40cm x 40cm. Comparisons of treatments means of NDF content of seeds of planting distance 50cm x 50cm and 60cm x 60cm were marginal and not significant ($p>0.05$).EE content of the seeds decreased with increase in planting distances; EE content of seeds of planting distance 40cm x 40cm was significantly ($p<0.05$) higher than the EE values recorded for seeds of planting distances50cm x 50cm and 60cm x 60cm.

Table 1: Total seed yields, Proximate (%) and gross energy (Kcal/100g) constituents of *Cajanuscajan* seeds

Planting Distances	Seed Yields (kg)	Moisture	CP	CF	ADF	NDF	EE	Ash	NFE	GE
40cm x 40cm	2.18 (872kg)	6.88^{a}	25.12	7.49^{a}	9.53^{a}	16.95^{a}	3.20^{a}	3.53	53.77^{a}	374.39
50cm x 50cm	2.53 (1,012kg)	5.98^{a}	25.95	5.11^{b}	7.67^{b}	18.35^{c}	2.74^{ab}	3.80	56.38^{a}	374.41
60cm x 60cm	3.41 (1,364kg)	5.16^{b}	23.91	6.86^{a}	7.93^{b}	20.0^{bc}	2.30^{b}	3.34	58.43^{b}	377.65
s.e.d.	0.84	0.49	1.25	0.37	0.50	1.08	0.12	0.32	1.78	3.51

^{a,b}Means with different superscript within a column are significantly different ($p<0.05$)
Figures in parenthesis are estimated total seed yield per hectare.

Difference between EE values of seeds of planting distances 50cm x 50cm and 60cm x 60cm was marginal and not significant ($p>0.05$). The range values (2.30-3.20%) of EE of seeds of *Cajanus cajan* were higher than range values of 1.7-2.1% reported by [18].The NFE content of seeds of planting distance 60cm x 60cm was significantly ($p<0.05$) higher than NFE contents of seeds of planting distances 40cm x 40cm and 50cm x 50cm. The difference between NFE contents of seeds of planting distances 40cm x 40cm and 50cm x 50cm was not significant ($p>0.05$). The range value of energy content (374.39-377.65Kcal/100g) of *Cajanus cajan* seeds was higher than the 340-347 Kcal/100g reported by [19]. The disparities in values between studies could be attributed to variations in soil status and climates of sites of studies.

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