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Proximate and Mineral Elements Composition of Water Soaked *Carnavalia ensiformis* Seeds

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Abstract: The study examines the proximate and mineral elements constituents of water soaked Jack Bean (*Carnavalia ensiformis*) seeds. The seeds were subjected to four treatments which comprised: 24 hrs, 48 hrs, 72 hrs and 96 hrs soaking in cold water with each treatment made up of three replicates. After the expiration of each soaking period, the water was discarded, sun-dried for 7 days and thereafter milled to pass through 1 mm sieve and subjected to laboratory analysis. The study revealed the following: dry matter increased after 96 hrs of soaking. Crude protein (CP) however decreased in value from 21% to 17%. Soaking for 48 hrs led to a reduction in the crude fibre (CF) content of seeds. Prolonged soaking period of 96 hrs increased the ether extract (EE) level. However, total ash content was reduced in seeds soaked for 96 hrs soaking. Soaking for 96 hrs increased Mg, Fe and Cu contents but Zn content recorded a decrease. Differences between treatments for all the parameters considered in the study were significant ($P < 0.01$).

Key words: Jack Bean seeds, mineral elements, water soaked, crude fibre

INTRODUCTION

Feed constitutes a major input in all livestock enterprise. Livestock operators are faced with the problem of inadequacy of feed resource because of the stiff competition between humans and livestock for the available feed ingredients. Though ruminants can be maintained economically on naturally occurring vegetation (pasture grasses and legumes leaves and succulent branches of shrubs and trees), the naturally occurring vegetation is generally low in nutrients. This inadequacy can be addressed by the use of legume seeds that are rich in protein (Bressani *et al*., 1982; Akanji *et al*., 2003). Jack bean (*Carnavalia ensiformis*) is a leguminous plant; its seeds and herbage are good source of protein (Udedibie and Nkwocha, 1990) and mineral elements such as Ca, Zn, P, Mg and Cu. Also there is less competition between humans and animals in the use of Jack bean seeds. The protein content of Jack bean seed exceeds that recorded for its herbage (Bogdan, 1977) an indication that it can serve as valuable protein feed ingredient. The nutritive value of Jack bean seed is adversely affected by its anti-nutrients constituents (Essien and Udedibie, 2007). The search of literature reveals that processing can improve nutritive value of legume seeds. However, there were no reports on chemical composition of soaked Jack bean (*Carnavalia ensiformis*) seeds. The main objective of the study was to examine the proximate and mineral elements composition of water soaked *Carnavalia ensiformis* seeds.

MATERIALS AND METHODS

The study was carried out at the Animal Production and Health Laboratory of the Ladoke Akintola University of Technology (LAUTECH), Ogbomoso, Oyo State. The raw *Carnavalia ensiformis* seeds used were harvested from the pasture plot of LAUTECH Teaching and Research Farm. Five hundred grams of cleaned Jack bean seeds in three replicates were weighed for each treatment that comprised: 24 hrs; 48 hrs; 72 hrs and 96 hrs periods of soaking in cold water. Excess water was ensured throughout the soaking period. After the expiration of the soaking time, the water was discarded and each replicate sun-dried for 7 days and milled to pass through 1 mm sieve and subjected to proximate and mineral analysis. The dry matter content of raw Jack bean seeds was determined by weighing 500 g of the seeds in triplicate and placed in an oven at 60°C for 72 hrs followed by cooling in a desiccator and weighed. The nitrogen content of each processed samples was estimated using the Kjeldahl technique and the CP content was estimated using the expression N x 6.25. The ash content was determined by subjecting 2-4 g of each replicate to 600°C for 6 hrs while the EE was determined using the Soxhlet apparatus. The CF was determined as described by AOAC (1990). The mineral elements (Mg, Cu, Fe and Zn) were determined by wet ashing 2 g each replicate with a mixture of nitric acid, perchloric acid and sulphuric acid (10: 4: 1) as described by AOAC (1990). The data were subjected to one way analysis of variance (ANOVA) using the Minitab Software Statistical Package (Minitab, 1998). Treatment means were compared using the standard error of the difference between means (S.E.D.) for significance ($P<0.05$).

RESULTS AND DISCUSSION

Proximate composition: The dry matter (DM) content increased from 88-92% after 96 hrs of soaking in water.

Table 1: Proximate and mineral elements composition of water soaked *Carnavalia ensiformis* seeds

	Raw	Soaked 24hrs	Soaked 48hrs	Soaked 72hrs	Soaked 96hrs	S.E.D.	P-values
Proximate							
Dry Matter	88.00[a]	92.00[b]	92.00[b]	92.00[b]	92.00[b]	0.462	0.01
Crude Protein	21.00[a]	21.00[a]	21.00[a]	20.13[b]	17.50[c]	0.065	0.01
Crude Fibre	12.00[a]	12.00[a]	10.00[b]	12.00[a]	12.00[a]	0.256	0.01
Ether Extract	6.00[a]	6.00[a]	4.00[b]	6.00[a]	6.00[a]	0.290	0.01
Ash Content	4.00[a]	4.00[a]	4.00[a]	2.00[b]	2.00[b]	0.159	0.01
NFE	57.00[c]	57.00[c]	61.00[a]	59.87[b]	62.50[a]	0.250	0.01
Mineral Elements							
Mg	14.68[a]	19.94[b]	17.75[c]	17.74[c]	16.43[d]	0.016	0.01
Zn	0.73[a]	0.42[b]	0.41[b]	0.40[b]	0.43[c]	0.012	0.01
Fe	7.31[a]	3.50[b]	3.38[c]	4.05[d]	4.20[e]	0.040	0.01
Cu	0.83[a]	2.59[b]	2.49[c]	2.01[d]	2.06[e]	0.019	0.01

Differences between treatments (24 hrs, 48 hrs, 72 hrs and 96 hrs) in DM contents were not significant. Udedibie *et al*. (2005) obtained a decrease in the DM content after soaking and cooking from 91-88%. The CP content, similar to the reports of Udedibie *et al*. (2005); Essien and Udedibie (2007) decreased from 21% in raw seeds to 17% in soaked beans. The lower CP values obtained for soaked seeds indicate solubilization and loss of their nitrogenous compounds. Crude fibre reduced from 12-10% after 48 hours of soaking in water but the seeds soaked for 96 hrs recorded an increase. The high CF content of Jack bean seed can be ascribed to its thick seed coat (Udedibie *et al*., 2005; Esonu, 1996; Essien, 1995). The CF contents that were recorded for raw and processed seeds of Carnavallia species in previous studies ranged between 2-12% (Essien and Udedibie, 2007) and the values obtained in this study were within the range. The EE recorded a decrease from 6% in raw seeds to 4% after 48 hrs of water soaking. The seeds soaked for 96 hrs recorded a higher EE value. Essien and Udedibie (2007), however, reported a lower value in seeds soaked for 2 hrs. Udedibie *et al*. (2005) recorded an increase of 1.15% in seeds for 2 hrs. Udedibie (1990) reported a 3% EE in raw seeds (un-soaked). Total ash was reduced from 4% in raw seeds to 2% in seeds subjected to 96 hrs of soaking. Udedibie *et al*. (2005) also recorded a decrease in ash content in soaked and cooked Jack bean seeds similar to recent observation of Essien and Udedibie (2007) in Jack bean seeds cooked for 2 hrs. This suggests that soaking Jack bean seed in water can reduce its total ash content. The nitrogen free extract (NFE) ranged from 57.00% in raw seeds to 62.50% in seeds soaked for 96 hrs. Udedibie *et al*. (2005) reported a range of 90% in raw seeds to 53% in the seeds soaked for 2 hrs while Sridhar and Seena (2006) reported a range of 44-68% for other *Canavalia spp*.

Mineral elements: Magnesium increased from 14.68-19.94% after 24 hours of soaking but later decreased to 16.48% in seeds subjected to 96 hrs of soaking. The differences in Mg contents of seeds soaked in water for 48 and 72 hrs was not significant. However, the Mg values obtained in this study were within the range values reported for *Canavalia gladiata*, *Canavalia maritime* and *Canavalia cathartica* in a previous study (Vadivel and Janardhanan, 2001; Agbede and Aletor, 2005; Sridhar and Seena, 2006). Zinc content reduced from 0.73-0.41%. The variation between Zn contents of Jack bean seeds soaked in water for 24 and 72 hrs was not significant. The Zn content was higher than the range (0.1-1.5%) contained in the report of Sridhar and Seena (2006). Iron content reduced from 7.31% in raw seeds to 3.50% in seeds soaked for 24 hrs but recorded a higher value of 4.2% in seeds soaked for 96 hrs. The Fe content of raw seeds in this study was greater than 1% reported by other workers (NRC/NAS, 1989; Ekanayake *et al*., 1999; Siddhuraju and Becker, 2001; Arun *et al*., 2003). Copper however increased from 0.83% in raw seeds to 2.59% in seeds soaked for 24 hrs. This implies that the soaking of Jack bean seed n water can increase its Cu content. However, there was no significant difference when the Cu contents of seeds subjected to varying periods of soaking were compared. The differences between studies for all the parameters examined in this study perhaps were due to variation in environment, soil type between studies (Revilleza *et al*., 1990; Arora, 1995; Akpapunam and Sefa-Dedeh, 1997; Vadivel and Janardhanan, 2001; Agbede and Aletor, 2005).

Conclusion: Soaking of Jack bean seeds as a processing technique was found to improve the nutritive value of the seeds, however, soaking for 48 hrs was found to give the best nutritive values for most of the parameters considered in the study.

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