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Nutritional Potential of Berlandier Nettle Spurge (*Jatropha cathartica*) Seed

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Abstract: The proximate composition, mineral content and some antinutritional components of *Jatropha cathartica seed* were studied. Proximate analysis showed that *Jatropha cathartica* contains 2.53% moisture, 47.13% crude fat, 1.60% crude fibre, 38.50% crude protein, 6.32% ash 6.45% carbohydrate. The seeds are rich in various minerals with highest values occurring for Nitrogen (6.16%), Phosphorus (2.13%) Magnesium (1.03%) and Potassium (0.99%). Copper and Nickel were not detected in the sample. The seeds contain 2.95% and 0.41% phytate and tannin respectively. It could therefore be inferred that the seeds of *Jatropha cathartica* is nutritionally promising because of its high nutrient content and low antinutrient level.

Key words: *Jatropha*, nutrient, antinutrient, mineral content

Introduction

The difference between the world's supply of quality foods and the growth of global population continues to widen, ways and means of bridging this gap have become a matter requiring an urgent attention. The current surge in the search for nutritious foods is therefore not surprising. The ultimate has not been achieved and this is evidenced by the paucity of literature available on the subject.

The importance of plant seeds, legumes, cereals, etc as sources of protein is well recognized as they contribute to world protein intake (Oshodi and Ekperigin, 1989; Dashak and Fali, 1993). Legumes and plant seeds are important part of the diet when combined with cereals to provide protein of good biological value (Anzaidua-Morales *et al*., 1996).

Several plants exist with very high nutritive value and yet remain unexploited for human and animal benefits. *Jatropha cathartica* is one of such plants.

Jatropha cathatica is a perennial plant, which does not require much care and produces well for 30 to 40 years after establishment. It deserves as much attention as it can receive worldwide so that as many people as possible can benefit from the obvious advantages.

Jatropha cathartica or Berlandier nettle spurge is a perennial herb that grows from enlarged, tuber like woody roots up to 10 inches thick. The hairless stems, 4 to 10 inches tall, are branched and spreading. Its palm-shaped leaves are up to 4 inches long and very deeply lobed five to seven times. Showy red flowers up to 0.5 inch in diameter are arrayed in loose clusters at the ends of the stems. The fruit is a three-lobed capsule containing three seeds. (http: //texnat.tamu. edu/cmplants/toxic/plants/berlandiernettle.html)

In Texas, these plants are limited to the Rio Grande Plains. They can be found scattered among the brush growing on clay soil and are now found in other parts of the world. In western Nigeria they are normally referred to as *lapalapa pupa.*

The toxic agent or agents of nettle spurge are not known. Very little research has been conducted on this plant. The tubers of nettle spurge allow it to respond rapidly after rain during drought, hence it is available for consumption by animals before there is much growth of other plants.

(http://texnat.tamu.edu/cmplants/toxic/plants/berlandier nettle.html

Materials and Methods

Jatropha cathartica seeds were collected at Iju in Ondo State, Nigeria, where the plant is normally used as boundry and to demarcate farmlands and plots of land. The reagents used were of analytical grade, while the water was glass distilled.

The seeds were de-husked and de-hulled to gain access to a cream-coloured endocarp, which is the sample material. The sample materials were sun dried, and then blended to powder form with a high-speed blender. This was stored in an airtight polythene bag and kept in a refrigerator prior to analysis.

Moisture content was obtained by heating the samples to a constant weight in a thermostatically controlled oven at 100^{o}C. The ash and crude fat contents were obtained using the methods described by Association of Official Analytical Chemists (1990). Protein was determined using the micro-Kjeldhal method (*N*_6.25). The method of Pearson (1981) was used for the determination of crude fibre while carbohydrate was calculated by difference.

The mineral composition was determined on aliquots of the solutions of the ash by established atomic absorption/emmision spectrophotometer model 200-A produced by Buck Scientific. Phosphorus was determined by calorimetric means using the Vanadomolybdate (yellow) Method (AOAC, 1990).

The phytate content was determined by the method of (Wheeler and Ferrel, 1971) based on the ability of

Table 1: Proximate Composition *cathartica* Seeds (Dry Wt. Basis)

Composition	*J. cathatica*
*Moisture	2.53±0.10
Crude Fat	47.13±0.12
Crude Fibre	1.60±0.18
Crude Protein	38.50±0.49
Ash Content	6.32±0.17
Carbohydrate	6.45±0.51

*Moisture content was determined on the fresh materials after sun-drying

Table 2: Mineral Content (mg/100g) of *Jatropha carthatica* seeds (dry sample basis)

Mineral	*J. cathartica*
Calcium	721.58±12.83
Sodium	85.56±1.15
Potassium	987.48±2.23
Magnesium	1030.71±13.13
Zinc	47.22±0.24
Iron	3.39±0.52
Copper	Nd
Manganese	36.31±5.74
Nickel	Nd
Phosphorus	2125.19±0.00
Lead	0.19±0.02

nd: not detected

standard ferric chloride to precipitate phytate in dilute HCl extracts of the sample. The tannin content was determined using the method of (Makker, 1996).

Analysis of data: All data represent means of triplicate determinations and are expressed as mean±standard deviation.

Results and Discussion

The result of the proximate composition of the seeds of *Jatropha cathartica* is shown in Table 1. The seeds contain 38.50% protein, 6.32% ash, 1.6 crude fiber, 47.13% fat and 6.45% carbohydrate.

A low moisture content of 2.53% was reported for *Jatropha carthatica* seeds. This value is obviously lower than the 10% moisture content limit recommended for storage stability of flours. (http: //wantonfeed. com/grain/life.html)

Fats and oils are the most abundant lipids found in nature. They are a heterogeneous group of organic compounds, which are important constituents of plant and animal tissues. High crude fat value of 47.13% was recorded for *Jatropha carthatica* seeds. This oil content is much higher than the value recorded for *Bauhinia recticulata*, which belongs to the pea family (Amoo, 2003) but similar to the values reported for *Telfairia occidentalis*, (Asiegbu, 1987; Fagbemi and Oshodi 1991) and *Arachis hypogaea* (Irwin and Hegsted, 1971), which are, also oil seed crops consumed in Nigeria.

Crude fibre value of 1.6% recorded for seeds are much lower than that reported for raw African locust bean (11.7%) and raw melon seeds (15.8%) (Omafuvbe Bridget *et al.*, 2004), cowpea (3.6%), but are higher than that reported for soybean (0.2%), (Saurez *et al*., 1999). The crude fibre is the sum total of all those organic compounds of the plant cell membranes and supporting structures which in chemical analysis of plants food stuff remain after removal of the crude protein, fat and Nitrogen-free extract. Thus the crude fibre in diet consists mostly of plant polysaccharides that cannot be digested by human dietary enzymes such as cellulose, hemicellulose, and some materials that encrust the cell walls (Southland, 1975; Melon, 1980). Fibre content is a significant component of the diet. It increases stool bulk and decreases the time that waste materials spend in the gastrointestinal tract. It is commonly used as an index of value in poultry and feeding stocks feeds. (Eze and Ibe, 2005).

Crude protein value of 38.5% was observed for *Jatropha cathartica* seeds. This value is obviously much higher than most legumes/grains consumed in Nigeria, eg guinea pig has a crude protein value of 5.25 (Amoo, 1998), B. Eurycoma “Achi” has a protein content of 3.35% (Eze and Ibe, 2005).

Carbohydrate constitutes a major class of naturally occurring organic compounds. They are essential for the maintenance of plant and animal life and also provide raw materials for many industries. Carbohydrate content of 6.45% observed is comparable to that of soybean paste, 6% (www.annecollins.com).

Table 2 shows the mineral content determined for the seed. Copper and nickel were not detected in any of the samples. The level of Calcium, Potassium, Sodium, Zinc and Magnesium are quite high while those of Lead, Manganese and Iron are much lower.

The mineral content of the seeds were higher than that recorded for raw coconut by (Amoo, 2004), while studying the effect of roasting on the chemical composition of coconut (*Cocus nucifera*) seed flour and oil and that reported for gourd (*Cucurbita maxima*) seed by (Amoo *et al.*, 2004). These values were also higher than what was reported for African Oil Bean (*Pentaclethra marcrophylla*) by Odoemelam, 2005. The seed could therefore be referred to as a good source of Calcium, Magnesium, Potassium, and Phosphorus. Although Zinc is a heavy metal, it has been found to be of low toxicity to man except on prolonged consumption of large doses, which could result in some health complications such as fatigue, dizziness and neutropenia (Hess and Schmid, 2002).

The antinutrient (*phytate* and *tannin*) content of the *Jatropha cathartica* seed is shown in Table 3.

The phytate level of 2945.96mg/100g (2.95%) for *Jatropha cathartica* seeds is comparable to those of some commonly consumed tropical legumes-cowpea (2.0-2.9%), pigeon pea (2.0-2.4%) and African yam beans (2.4%), (Oboh, 2006).

Phytate is not only a very stable and potent chelating

Table 3: Phytate and Tannin contents (mg/100g) of the seeds of *Jatropha cathartica*

Antinutrient	*J. cathartica*
Phytate	2.945.96±6.48
Tannin	419.92 ±2.01

food component that is considered to be an antinutrient by virtue of its ability to chelate divalent minerals and prevent their absorption (Oboh *et al.*, 2003), but it has also been shown to have anticancer and antioxidant activity. It forms an iron chelate that suppresses lipid peroxidation by blocking iron-driven hydroxyl radical generation (Sudheer *et al.*, 2004).

Tannins are complex polyphenolics found widely in the plant kingdom. The tannins bring about antinutritional influence largely by forming complexes and thus precipitating dietary proteins and digestive enzymes (Oboh and Akindahunsi, 2003). The tannin content of Jatropha cathartica was 0.41%. This value is far lower than what Agbede and Aletor reported for the leaves of *Leuceania leucocephala* and *Glyricidia sepium* (Agbede and Aletor, 2004) and that reported for *Struchium sparganophora* Leaves (0.6%) by (Oboh, 2006). Moreover, the level of tannins present in this seeds is far below the recommended deleterious dose of 0.75-0.95 % (Aletor, 1993).

Conclusion: From the results of this study the seed is a good source of carbohydrate, protein, oil and minerals with tolerable antinutrient level. The seed of *Jatropha cathartica* which is currently underutilized/ unexplored in most regions of the world is nutritionally promising and could solve the problem of protein malnutrition which is a major public health problem in the developing world, where diets in these parts are predominantly starchy, the major food crops being roots and tubers. Furthermore in light of the current bird flu epidemic ravaging many parts of the world, this seed could be a good substitute for animal manures due to high levels of Nitrogen, Phosphorus and Potassium (NPK) observed.

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