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Proximate, Mineral, Vitamin and Phytochemical Analysis of Toasted Ethanolic Seed Extract of *Mucuna Sloanei* (Hamburger Bean)

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Abstract

Mucuna sloanei seeds are popularly used in the Eastern part of Nigeria as soup thickener and the immature seeds eaten as vegetable. This study was aimed at analyzing the proximate, mineral, vitamin and phytochemical compositions of the seeds to ascertain whether the seed meal could be included in animal feed. The evaluation was done using standard procedures. The results showed that *M. sloanei* seeds had a proximate composition of moisture (5.20%), ash (3.50%), crude protein (22.75%), crude fat (7.20%), crude fiber (2.20%), and carbohydrate (59.15%). The mineral analysis showed that *M. sloanei* contained sodium (146.35 mg/100 g), potassium (252.80 mg/100 g), calcium (44.80 mg/100 g), magnesium (125.80mg/100g), iron (9.60 mg/100g) and zinc (3.00 mg/100 g). The vitamin analysis of *M. sloanei* showed that it contained thiamine (2.14 mg/100g), Vitamin A (4.75 mg/100 g), vitamin C (14.40 mg/100 g), vitamin E (0.15 mg/100 g) while phytochemical analysis showed that *M. sloanei* seeds contained alkaloid (0.16%), hydrogen cyanide (0.07 mg/kg), saponin (0.06%), flavonoids (0.20%), tannins (0.03%), oxalate (0.40%) and phenol (0.02%). This study concluded that the toasted ethanolic seed extract of *M. sloanei* contained highest amount of carbohydrate followed by protein and lowest amount of crude fibre. Similarly, among the minerals tested, *M. sloanei* seeds contained highest amount of potassium and lowest amount of zinc and for the vitamin content, vitamin C was highest and vitamin E the lowest. The seed also had oxalate as the highest anti-nutrient and phenol as the lowest in composition. The analyses therefore showed that these seeds could be used to supplement the carbohydrate and protein contents of feed while adding extra calcium to take care of the high oxalate content of the seeds.

Keywords: proximate, mineral, vitamin, phytochemical, *M. sloanei* seeds.

Introduction

Mucuna sloanei is a climbing shrub that is widely spread in Africa being occasionally cultivated in Nigeria especially in the Eastern region near wet localities in swamp forests, at borders of rivers and lakes. It is a high-climbing woody vine which produces pods that contain several beans that are extremely buoyant and well adapted for ocean dispersal. It has twining stems that can be 6 - 8 m long climbing over tall trees. The plant is often harvested from the wild for local use as food, medicine and source of dye and oil (Ken, 2014). The fruit is a flattened-cylindrical pod 10–14 cm × 4–5 cm × 1 cm, blackish, with 12–15 transverse deep furrows, bearing yellowish stinging hairs that are readily dislodged and can contaminate clothes or other objects, with the fruit being 2–3-seeded. (Burkill, 1995) The name Hamburger Bean is because the seeds look like little hamburgers.

The dried seeds contain 3% of the amino acid L-dopa (levodopa), which stimulates the formation of the neurotransmitter dopamine in the brain thus; they are excellent raw materials for indigenous Ayurvedic drugs which provide relief in Parkinson's disease (Prakash and Tewari, 1999). The immature pods and leaves serve as vegetable while the mature seeds serve as part of main dish in some parts of Nigeria (Adebawale and Lawal, 2003).

Few works have been done on *M. sloanei* seeds such as the one done by (Igwenyi and Azoro, 2014) which showed the nutritional and phytochemical contents to be Moisture 4.07%, protein 12.52%, crude fat 6.25%, crude fiber 2.99%, ash 3.46%, carbohydrate 70.71%, alkaloid 165.85mg/100g, flavonoid

165.93 mg/100 g, cyanide 0.72 mg/100 g, tannins 70.86 mg/100 g and saponins 0.56 mg/100 g. However, (Opara and Okolie 2015) showed that boiled *M. sloanei* seeds contain crude protein 19.6%, ether extracts 8.3%, crude fibre 5.3%, ash 4.5% and nitrogen free extract 62.3%.

Thus this present study was carried out to investigate the proximate, mineral, vitamin and phytochemical compositions of *M. sloanei* to know whether it can be used as a nutritional supplement in animal feed.

Materials and Methods

The seeds of *M. sloanei* were collected from Amokwo Ugwu Nkpa in Bende L.G.A of Abia State, Nigeria and identified as *M. sloanei* seeds in College of Crop and Soil Science, Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria. The seeds were prepared by toasting the seeds for 45 minutes; they were then shelled and milled into powder after which they were stored in an air tight container. 500g of the powder was then soaked in 96% ethanol for 24 hours being shaken intermittently and then filtered using filter paper. The filtrate was concentrated using hot air oven at a temperature of 41°C and then packed into a sample bottle and stored at -4°C until required for experiment. The samples were analyzed for proximate compositions using standard methods. The mineral analysis was done by the dry ash extraction followed by Atomic Absorption Spectrophotometric methods of Harborne. The vitamin analysis was done using the official spectrophotometric methods of AOAC. Generally, the spectrophotometric methods were used in the analysis of the phytochemical compositions.

Results and Discussion

Table 1 shows that *M. sloanei* seeds have a total carbohydrate of 59.15%, crude protein of 22.75%, crude fat 7.20%, crude fibre 2.20%, moisture 5.20% and ash 3.50%. This shows that *M. sloanei* seeds can be incorporated into animal feeds to yield lean meat due to its relatively high protein and low fat content. The low moisture percent of 5.20% probably is due to the preparation method used which was toasting of the seeds.

Table 2 shows the mineral content of *M. sloanei* seeds showing potassium as the highest with 252.80% followed by magnesium content of 125.80 mg/100 g while zinc is the least with 3.00%. The seeds also have a high sodium content of 146.35 mg/100g while having calcium to be 44.80 mg/100 g. *M. sloanei* seeds is rich in major minerals needed by the body such as calcium, phosphorus, potassium, sodium, and magnesium in adequate quantity. These minerals help to maintain fluid balance, nerve transmissions and a healthy blood pressure. Magnesium also helps transport both calcium and potassium across cell membranes and serves as a co-factor in many enzyme reactions. (Stacy, 2015)

Table 1: Proximate composition of toasted *Mucuna sloanei* seeds

Nutrients	Composition (%)
Moisture	5.20
Ash	3.50
Crude protein	22.75
Crude fat	7.20
Crude fibre	2.20
Total carbohydrates	59.15

Table 2: Some mineral contents of toasted *Mucuna sloanei* seeds

Minerals	Composition (mg/100g)
Sodium	146.35
Potassium	252.80
Calcium	44.80
Magnesium	125.80
Iron	9.60
Zinc	3.00

Table 3 shows some of the vitamins contained in *M. sloanei* seeds has vitamin C as the highest with a composition of 14.40 mg/100 g followed by Vitamin A with a composition of 4.75 mg/100 g then Thiamine 2.14 mg/100 g and Vitamin E 0.15 mg/100 g being the least in the composition. Vitamin C, also known as L-ascorbic acid, is a water-soluble vitamin (Li and Schellhorn, 2007) required in protein metabolism and also known as an important physiological antioxidant (Carr and Frei, 1999) and has been shown to regenerate other antioxidants within the body, including alpha-tocopherol (vitamin E) (Jacob and Sotoudeh, 2002). *Mucuna sloanei* seeds have this vitamin as the highest in composition thus a good source to prevent the deficiency.

Table 4 shows some of the phytochemical components of toasted *M. sloanei* seeds. It was seen that *M. sloanei* seeds had oxalate as the highest component of 0.40% followed by flavonoids of about 0.20% then alkaloids of about 0.16%, hydrogen cyanide 0.07 mg/kg and saponin 0.06%. Phytochemicals are chemicals produced by plants through primary or secondary metabolism. They are non-nutritive plant chemicals that have protective or disease preventive properties. It is well-known that plant produce these chemicals to protect themselves but recent research demonstrated that they can also protect humans/animals against diseases like the saponins found in beans interfere with the replication of cell DNA, thereby preventing the multiplication of cancer cells. (Molyneux *et al.*, 2007; Harborne *et al.*, 1999)

Table 3: Some vitamin contents of toasted *Mucuna sloanei* seed

Vitamins	Composition (mg/100g)
Thiamine	2.14
Vitamin A	4.75
Vitamin C	14.40
Vitamin E	0.15

Table 4 Some Phytochemical components of toasted *Mucuna sloanei* seeds

Parameters	Compositions
Alkaloid	0.16%
Hydrogen cyanide	0.07 mg/kg
saponin	0.06%
Flavonoids	0.20%
Tannins	0.03%
Oxalate	0.40%
Phenol	0.02%

Conclusion and Recommendation

Mucuna sloanei seeds are indeed rich in carbohydrates and proteins and can be used to supplement animal feed. These seeds can also be used to fight free radicals since they are rich in antioxidant vitamins which help in the maintenance of the vital organs of the body. Since they are high in oxalate and low in calcium, they should be combined with feed high in calcium especially for pregnant and lactating animals.

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