The Nutritional Properties of *Mucuna* Bean Species as affected by Moisture Variation

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Abstract
This study examined the nutritional values of Mucuna Pruriens and Veracruz seeds. The seeds were grown in Nigeria with moisture contents ranging from 6.04 to 15.82% (wb), The moisture content falls from 15.82 to 6.04% while quality indicators including the amount of crude protein, lipids, and ash tested all show an improvement. For both species, the crude protein varies from 29.10 to 39.21% and 29.91 to 37.01%, respectively. For both species, the lipid concentrations range from 3.80 to 4.80% and 4.20 to 5.90%, respectively. For both species, the ash concentration varied between 5.22 and 5.62% and 3.41 and 4.61%, respectively. For both species, the crude fiber content ranged from 1.71 to 1.96% and 1.69 to 1.87 percent, respectively. It is consistent with previous analyses conducted by prior researchers, such as [6]. For both species, the carbohydrate varied between 42.84 and 47.78% and 42.98 and 43.69%, respectively. It displayed a trend toward increment as the moisture content declined. This is consistent with the [1], observation that lower moisture content improves bio-material quality by slowing down the biochemical and microbiological breakdown of the materials. It is advised that more research be done using a wider range of moisture to determine its influence on the examined attributes.

Keywords: *Mucuna Prureins, Mucuna Veracruz, Moisture Content, Nutritional Properties, Carbohydrate and fiber content*

Introduction

Mucuna (Pruriens* and *Veracruz) Agbara, an annual climbing legume of the Fabaceae family, a subfamily of the papilionaceous, is well-known among the Igbo people in Eastern Nigeria. This tropical legume is also known as velvet bean, cowage, or cowitch. In over 200 locally made medicine combinations, it is one of the most popular medicinal plants in Asia and Africa. The Indian plains are where it is situated [1]. The demand for ***Mucuna*** has increased dramatically in India and on international medicine markets, however, this is only because ***Mucuna*** seeds contain the pharmaceutical L3, 4-Dihydroxyl Phenyl Alamine (L-DOPA), which is used to treat Parkinson's disease (PD) [2].

The genus ***Mucuna,*** a member of the Leguminosae family, has more than 100 species of climbing shrubs and vines. The genus, named for the plant Mucuna, is found in tropical woods, especially in the Caribbean, tropical Africa, and tropical India. ***Mucuna*** is a twining annual crop that may reach a length of 15 meters. As the plant ages, it nearly fully loses its fuzzy hair, which covered it almost entirely when it was younger. The leaves are trifoliate, alternating, or spiraling, and the petioles are long and silky, measuring between 6.3 and 11.3 cm in length. While lateral leaflets range greatly in size, membranous terminal leaflets are smaller.

The blooms are dark purple, white, or lavender, and they droop in racemes. The flowers resemble peas, but they are larger and have distinctly coiled petals. The oval-shaped, glossy black or brown seeds are 12 mm in length [3]. It has also been shown to have neuro-protective, analgesic, and anti-inflammatory qualities as well as to act as a male reproductive agent. ***Mucuna*** bean seeds are considered a possible source of dietary proteins due to their high protein content and easy digestion. Its nutritional qualities are similar to those of other pulses, and its protein level varies from 23 to 35%.

Legume proteins are mostly used as ingredients in food products that are intended to enhance nutritional quality and offer a variety of useful attributes, such as the perfect structure, texture, taste, and color. The many forms and accessions of ***Mucuna*** are in high demand in the culinary and medicinal industries.

The moisture content of bio-materials has a major impact on their quality, stability, and safety. Freshly harvested products sometimes include high levels of water, which speeds up the deterioration process. Despite having less water than fresh foods, baked or dried agricultural products are more stable than fresh ones, even if they may have lost part of their nutritious value during the drying process [4]. As per [5], roasting cashew nuts caused the nut to decrease in both size and moisture content. This is because the moisture content of the cashew nuts decreased during roasting, causing the nut's size to decrease along with its moisture content.

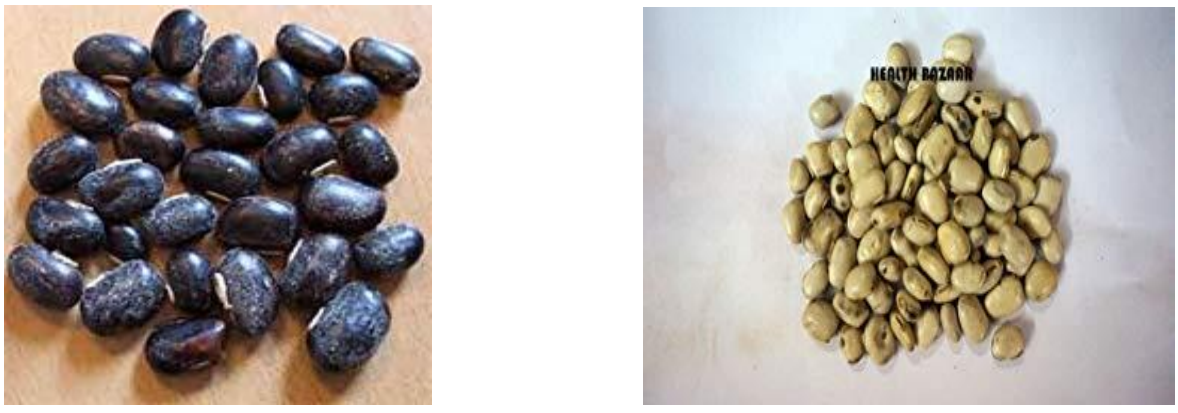
Customers favor significantly dehydrated nuts, which expands the product's market. Another effect that arises when a bio-material's moisture content is drastically reduced is case-hardening. Case-

hardening occurs when the agricultural material's protective epiporous structure (epicarp) collapses. During the drying process, this phenomenon tends to limit the amount of moisture that may be absorbed through the material's surface layer. Casehardening affects agricultural materials because it stops moisture from evaporating from them to the outside, where it would otherwise attain an equilibrium moisture content. This accelerates the deterioration or degradation of the agricultural materials.

Mucuna seeds have a well-established nutritional value and are a significant source of protein for diet and animal feed [6]. Due to previous studies and findings, these pulses may now be utilized commercially for both nutrition and medicinal purposes. Few details are known about how the two types of Mucuna's nutritional value differ depending on their moisture level. Data on the effects of moisture fluctuations on ***Mucuna Pruriens*** and Veracruz variations might be useful in designing and building machinery for harvesting and post-harvest handling and processing. It will thus be advantageous for those who design processing, storage, and general handling equipment to be aware of these attributes.

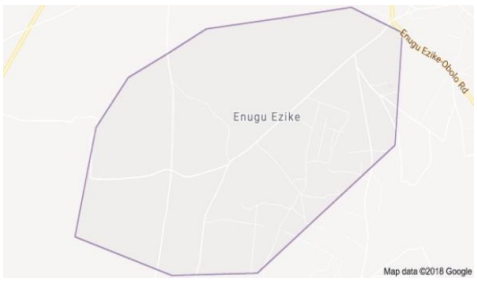
Materials and Method

Sample Collection: The matured seeds of ***Mucuna Pruriens*** were harvested directly from a farm at Orba in Udenu Local Government Area of Enugu State, Nigeria. Its geographical coordinates are $6^0 59' 0''$ North and $7^0 27' 0''$ East. While ***Mucuna Veracruz*** seeds were harvested from a farm in Enugu Ezike, Igboeze North Local Government Area of Enugu State, Nigeria. Its geographical coordinates are North and $7^0 27' 0''$ East. The samples were manually cleaned to remove all foreign materials like pieces of stone, immature seeds, and chaff.



(A) (B)

Figure 1: ***Mucuna*** seeds varieties (a = ***Pruriens*** and b = ***Veracruz***)



Orba in Udenu LGA

Enugu Ezike in Igboeze LGA

Fig .2a: Map of Orba GPS

Fig. 2b: Map of Enugu- Ezike

Sample Preparation

By handpicking, the samples of ***Mucuna*** seeds were cleaned and assessed to distinguish the excellent from the flawed ones. The divided seed samples were placed in airtight polythene bags to keep them at their original moisture level. Using the oven technique outlined in [1, 3], the moisture content of ***Mucuna*** seeds was assessed. To examine how moisture content affects the physical and mechanical qualities, samples were dried in an oven set at 105°C for six hours at each of three different moisture levels. By conditioning the samples according to the procedure described in [1, 3], seed samples with the necessary moisture levels were created. This required one to four hours of soaking each sample in clean water. After soaking, the samples were spread out thinly and allowed to dry in the open air for around eight hours. The samples were then placed in polyethylene bags and kept there for an additional 24 hours. This made it possible to obtain a steady and uniform moisture content for the samples. The samples were then brought to the lab to be tested for nutritional value.

Experimental Procedure

Samples of ***Mucuna*** (Pruriens and Veracruz) flour were made using the technique suggested by [8, 9]. 1 kg of the clean ***Mucuna*** Pruriens seeds was steeped for ten hours at a temperature of 250°C + 20°C in clean water before being manually dehulled. Ten hours were spent drying the cotyledons at 105 °C After being sieved through a 0.50mm mesh and ground in a hammer mill, the dry seeds were stored at 4°C in an airtight container until they were needed.

Proximate Analysis

The fundamental nutritional composition of bio-materials is described by proximate analysis in terms of crude protein, moisture content, fat, ash, fiber, and carbohydrates. Using Approved Methods of [9], the flour samples' moisture content, crude protein, crude fiber, fat, ash, and carbohydrate content were examined. Analytical concentrations were used for all of the substances.

Determination of Moisture Content of The Samples.

The kind of food, age or maturity, variety, and geographic location are typically impacted by the moisture content, which measures the quantity of water present in a food sample. The moisture level of the food material upon harvest provides a clue as to its capacity to be stored. The method outlined by [3] was used to calculate the moisture content of the samples. By measuring 5g of the flour sample into an aluminum can, the moisture content was calculated. The sample was then dried to a constant weight of $105℃ \pm 2℃$

The Moisture Content = (Weight of empty Can Sample) - $\frac{Weight\ of\ empty\ Can}{Weight\ of\ Sample}$ ×100% (1)

Determination of Crude fiber

The portion of a nutrient known as "crude fiber" comprises the components of food that are difficult to digest. The [3] Method was used to determine the crude fiber. This calls for pouring 2g of the sample into a conical flask that holds 1 liter. After boiling 100ml of water, it was poured into the conical flask containing the samples. The combination then continued to boil for another 30 minutes. The mixture was filtered using a Muslin cloth placed in a funnel after 30 minutes of boiling. The leftover material was extensively washed until it lost its alkali content. The remaining material was then added to a dry crucible and heated to 600 degrees. Equation 2 was used to assess the crude fiber.

The Crude fiber = $\frac{Weight\ of\ the\ Crucible}{Weight\ of\ Sample}$×100% (2)

Determination of the Ash Content

The mineral or organic remnant of a bio-material is represented by the ash content. It provides a general sense of the overall quantity of minerals in the dietary item. The amount of ash was calculated using [3, 8]

Ash Content (%) = $\frac{Weight\ of\ Ash}{Weight\ of\ Sample}$×100% (3)

Determination of Crude Fat Content

Materials soluble in an organic solvent, such as ether, hexane, etc., are often referred to as fat. By employing a Soxhlet extractor and hexane, the method suggested by [8] was used to determine the crude fat content. To extract the fat from 1g of the samples, a thimble extractor was put in an extraction chamber and some hexane was added. Equation 4 was utilized to assess the fat.

% Lipid content = $\frac{W_2 - W_3}{W_2 - W_1}$ **x 100%** (4)

Where W1 = Weight of empty extraction thimble
W2 = Weight of extraction thimble plus sample extraction
W3 = Weight of extraction thimble plus sample residue after extraction.

Determination of Crude Protein

Protein is made up of amino acids linked together by peptides. They contain necessary substances like carbon, hydrogen, oxygen, nitrogen, and other components. [3, 8] approach was used to assess the crude protein utilizing foss Desiccators, Protein Digester, and KJECTEC2200 Distillation equipment.

$$\textbf{The crude protein} = (\textbf{Titre Value of the Sample- Blank}) \times \frac{0.01 \times 14.007 \times 6.25 \times 100}{1000 \times Weight\ of\ Sample} \quad (5)$$

Determination of Carbohydrate

As the nitrogen-free extract, carbohydrates are calculated by adding together the percentages of ash, moisture content, crude fiber, crude fat, and crude protein and deducting from 100%. Tables 1 and 2 below give the values of the nutritional qualities:

Table.1: Results of Nutritional Qualities of *Mucuna Prureins*

Moisture Content (%)	Crude Protein (%)	Fat Content (%)	Ash Content (%)	Crude Fiber (%)	Carbohydrate (%)
15.82	29.10	3.80	5.22	1.71	42.84
10.06	33.14	4.19	5.53	1.85	45.44
6.04	39.21	4.30	5.62	1.96	47.78

Table.2: Results of Nutritional Qualities of *Mucuna Veracruz*

Moisture Content (%)	Crude Protein (%)	Fat Content (%)	Ash Content (%)	Crude Fiber (%)	Carbohydrate (%)
15.82	29.91	4.20	3.41	1.69	42.98
10.06	33.05	5.22	4.33	1.74	43.12
6.04	37.01	5.90	4.61	1.87	43.69

Discussion of Results

Tables 1 and 2 displayed the nutritional characteristics of the Veracruz and ***Mucuna Prureins*** samples at various moisture content levels. The study's findings indicated that the bio-material's nutritional characteristics were impacted by moisture content (Tables 1 and 2). The measured

quality indicators, such as crude protein, lipid, and ash content, usually rise for both species when the moisture content drops from 15.82 to 6.04% (wb).

Crude Protein: For both species, the crude protein varies from 29.10 to 39.21% and 29.91 to 37.01%, respectively.

Lipid Content: For both species, the lipid concentrations vary from 3.80 to 4.80% and 4.20 to 5.90%, respectively.

Ash Content: For both species, the ash concentration varied between 5.22 and 5.62% and 3.41 and 4.61%, respectively.

Crude Fiber: For both species, the crude fiber content varied from 1.71 to 1.96% and 1.69 to 1.87 percent, respectively. It is consistent with previous analyses conducted by prior researchers, such as [6].

Carbohydrate: For both species, the carbohydrate varied between 42.84 and 47.78% and 42.98 and 43.69%, respectively. It displayed a trend toward increment as the moisture content declined. It supports the finding of [1], which stated that dried grains' carbohydrate content falls as moisture content rises.

Conclusion

Studies on the nutritional value of Veracruz and ***Mucuna Pruriens*** species showed that moisture content had a substantial impact on the bio-material's nutritional value. The concentration of the nutritious characteristics increases as the moisture content decreases, as evidenced by all the nutritional qualities showing a positive connection with a decline in moisture content.

Recommendations

It is suggested that more studies be conducted using a broader range of moisture to ascertain its impact on the qualities under investigation.

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