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Comparitive Nutritional Analysis Of Sweet Yam Bean (Jicama) Milk With Soya Milk -- A Review

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Abstract

The current research focuses on conducting a comprehensive nutritional comparison between sweet yam bean milk and soy milk. Sweet yam bean, also known as Jicama, is an ancient Mexican root vegetable akin to potatoes or turnips. It is safe for consumption, possesses a slightly sweet taste, and has low sugar content, making it a suitable carbohydrate source for individuals with diabetes or those pursuing a low-sugar diet. On the other hand, soy has been a staple ingredient for thousands of years. The study involved an examination of the proximate composition, mineral content, protein fractions, antinutritional elements, and rotenoids in the seeds of Pachyrhizus erosus, the sweet yam bean. In comparison to other legumes, soy seeds exhibited high levels of proteins, lipids, iron (Fe), and calcium (Ca). The predominant protein fraction was mainly composed of globulins, followed by glutelins. Minimal amounts of antinutritional compounds, such as tannins, hemagglutinating activity, and trypsin inhibitory activity, were detected in the sweet yam bean seeds. By conducting this comprehensive comparative analysis, we aim to provide valuable insights into the nutritional benefits and potential applications of sweet yam bean (Jicama) milk, especially in relation to soy milk, which has been a longstanding nutritional staple.

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Keywords: Yam Bean milk, Soya milk, lactose-intolerance, Nutritional–composition, digestibility

Introduction:

Traditional Asian cuisine has embraced soy as a fundamental ingredient for centuries, and soybeans have been a dietary staple in the region for thousands of years. However, soybeans were only introduced to Western countries about a century ago, and in recent times, they have become primarily cultivated for use as substitutes in various food products. Due to its high protein content and versatility in creating meat and dairy alternatives, soy and soy-based foods have become popular nutritional choices, especially among vegetarians (Bolarinwa *et al*., 2016)

Nevertheless, there are ongoing debates and research regarding potential health effects associated with soy consumption. These effects range from its potential to lower cardiovascular risk to concerns about its impact on thyroid function and sexual hormones. Of particular focus in scientific studies are isoflavones, which are polyphenolic compounds with estrogenic properties and are found abundantly in soybeans (Igyor *et al*., 2011) Given that both sweet yam bean milk and soy milk are plant-based and free from lactose, it is of interest to compare their nutritional profiles. The nutritional analysis of these two milk alternatives can shed light on their respective health benefits and potential concerns. Soy milk, due to its long history of consumption and extensive research, serves as a valuable point of comparison for understanding the nutritional attributes of sweet yam bean milk (Adewale *et al*., 2012).

In summary, the study aims to provide a comparative analysis of the nutritional content and potential health effects of sweet yam bean milk and soy milk, taking into account their protein content, isoflavone levels, and other essential nutrients. This analysis can contribute to a better understanding of the nutritional value of these plant-based milk alternatives (Obiakor – Okeke *et al*., 2014)

Processing of Soybean Flour:

The process began with sorting, washing, and blanching one kilogram of soybeans in a water bath using a Gryphon and George BJL-400-110F model at a temperature of 85 degrees Celsius. After this step, the soybeans were dehulled, washed, and then dried in an oven (specific model not mentioned) for 48 hours at 50°C.Prior to drying, the soybeans were soaked in 3 liters of water for 24 hours, with a water change performed every 6 hours to prevent fermentation. Following the drying process, the soybeans were milled using a Corona model, and the resulting powder was sifted to obtain fine flour with a pore size of 500 micrometers. Finally, the fine flour was stored in an airtight container, following the appropriate instructions for storage (Odu NN *et al.*, 2012)

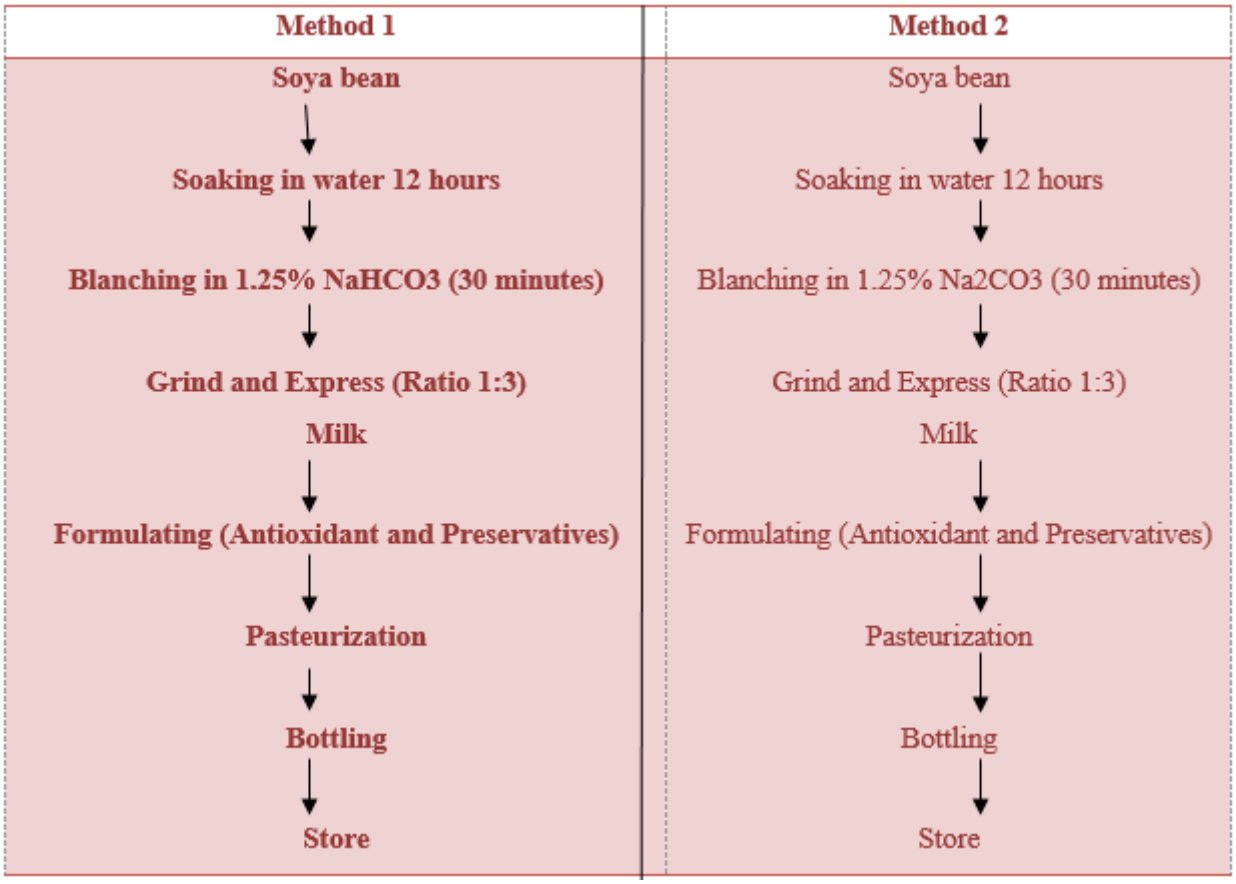

Fig: Methods of extraction of Soya Milk

Processing sweet yam bean milk :

To facilitate rapid germination, the cleaned African yam beans were soaked in water at a ratio of 1:3 (beans to water) for a duration of 24 hours, all at room temperature. After this steeping period, the beans were spread out on a jute bag and left to germinate naturally at room temperature for 72 hours. Following germination, the beans were manually dehulled, removing the outer layer. The dehulled beans were then

thoroughly washed with tap water to further clean them.
Next, the beans were subjected to an oven drying process using a Model PP 22 US oven manufactured by Genlab in England. This drying process was carried out at a temperature of 70°C for a total duration of 24 hours. Once adequately dried, the beans were ground into flour using a Corona model grinder. The flour was subsequently sieved to obtain a fine texture, utilizing a mesh with a pore size of 500 micrometers. Finally, the sifted flour was stored in an airtight container, ensuring it was well-packaged to maintain freshness. (Odu NN *et al*., 2012)

Jicama and soy milk offer distinct nutritional profiles:
Jicama
Higher in fiber and vitamin C compared to soy milk. Provides 22% more of your daily vitamin C requirements than soy milk. Contains a significantly lower amount of polyunsaturated fat compared to soy milk (0.043g vs. 0.961g). Contains less sugar than many other fruits (Oludumila *et al*., 2017)

Soy Milk
Higher in copper, selenium, manganese, and polyunsaturated fat compared to jicama. Contains significantly more calcium (+108.3%), magnesium (+108.3%), phosphorus (+188.9%), copper (+166.7%), and zinc (+33.3%) than jicama, comprises 3.27% protein, 1.75% fat, 6.28% carbohydrates, and 88.05% water per 100 grams (Obiakor – Okeke *et al*., 2014).

Sweet Yam Bean Milk (noted as jicama milk here):
Contains more potassium (+27.1%) compared to soy milk.
Contains less sodium (-92%) compared to soy milk, Comprises 0.72g protein, 0.09g fat, 8.82g carbohydrates, and 90.07g water per 100 grams.
These differences highlight the unique nutritional attributes of jicama, soy milk, and sweet yam bean milk, making them suitable for various dietary needs and preferences.

Table 1: Comparative nutritional analysis of soya milk with sweet yam bean milk (per 100gm)

NUTRIENT	SOYA ILK	SWEET YAM BEAN MILK
NET CARBS	5.68 gm	3.92 gm
PROTEIN	3.27 gm	0.72 gm
FATS	1.75 gm	0.09 gm
CARBOHYDRTE	6.28 g	8.82 gm
CALORIES	54 kcal	38 kcal
SUGAR	3.99 gm	1.8 gm
FIBER	0.6 gm	4.9 gm
CALCIUM	25 mg	12 mg
IRON	0.64 mg	0.6 mg
MAGNESIUM	25 mg	12 mg
PHOSPHOROUS	52 mg	18 mg
POTASSIUM	118 mg	150 mg

Benefits of Sweet Yam Bean Milk:
Low Glycemic Index: Sweet yam bean milk has a low glycemic index, making it a favorable choice for individuals concerned about blood sugar levels. It can potentially help reduce the risk of diabetes.
Lactose Intolerance: It is an excellent option for individuals with lactose intolerance since it is naturally devoid of lactose.
Low in Fat: Sweet yam bean milk contains minimal fat content, approximately 0.09g, making it a healthier choice for those watching their fat intake.
Cholesterol-Free: Like soy milk, sweet yam bean milk is free from cholesterol, which is advantageous for individuals with conditions such as atherosclerosis and heart disease.
Lower Sugar Content: Sweet yam bean milk has lower sugar content compared to soy milk, with a difference of approximately 2.19g. This makes it a suitable choice for those aiming to reduce sugar intake (P. Akubor, 2008).

Discussion:

Comparison of Macronutrients between Soya milk and Sweet yam bean (Jicama) milk : Soya milk contains

3.27 % protein, 1.75 % fat, 6.28% carbohydrate and 88.05% water, where, Sweet yam bean milk contains 0.72 g protein, 0.09 g fat , 8.82 g carbohydrate 90.07gm water per 100 gm of milk. Eventually, more protein (3.27 %), more fat (1.75 %), and other nutrients (116.7%), where sweet yam bean contains more carbohydrates (40.4%) (Odu NN *et al*., 2012).

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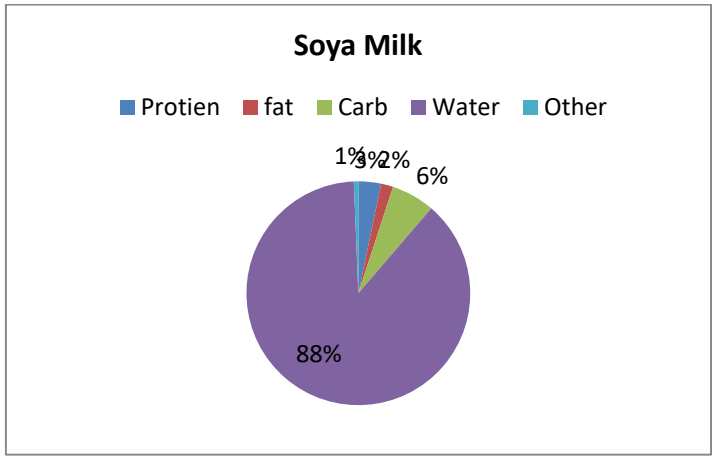
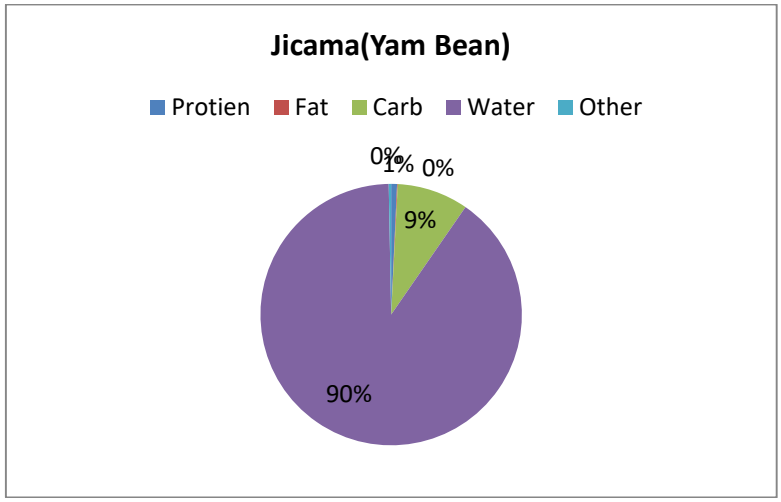
PROTEIN	3.27 g
FAT	**1.75 g**
CARBOHYDRATE	**6.28 g**
WATER	**88.05 g**
OTHER	**0.65 g**

Contains more Protein +354.2%
Contains more Fat +1844.4%

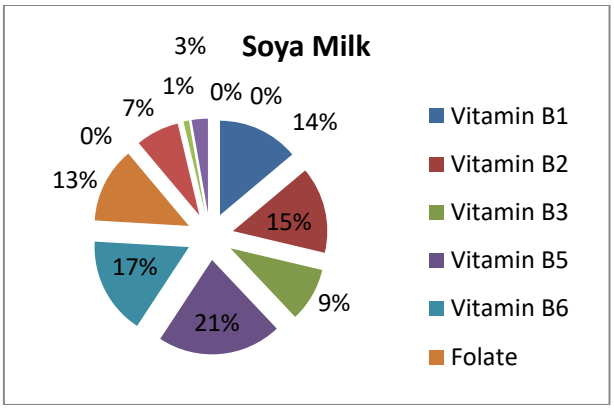


PROTEIN	**0.72 g**
FAT	0.09 g
CARBOHYDRATE	8.82 g
WATER	90.07 g
OTHER	0.3 g

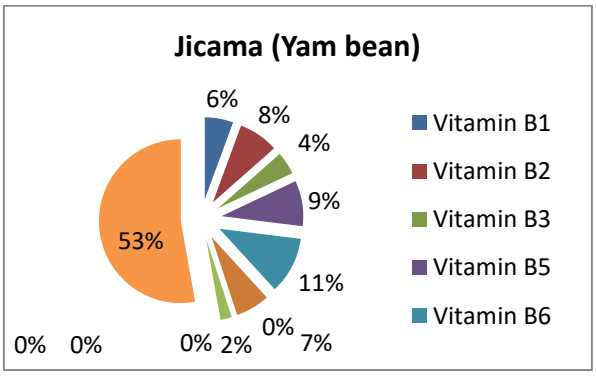
Contains more other nutrients +116.7%
Contains more Carbohydrate +40.4%



Comparison of Vitamins between Soya milk and Sweet yam bean(Jicama) milk:
Soya milk contains more vitamin B1(252.9%),vitamin B2(146.4%),vitamin B3 (170%), vitamin B5(208.3%), vitamin B6(92.5%) and folate (125%),where Sweet yam bean milk contains more vitaminA(533.3%) and vitamin C (Odu NN *et al*., 2012).

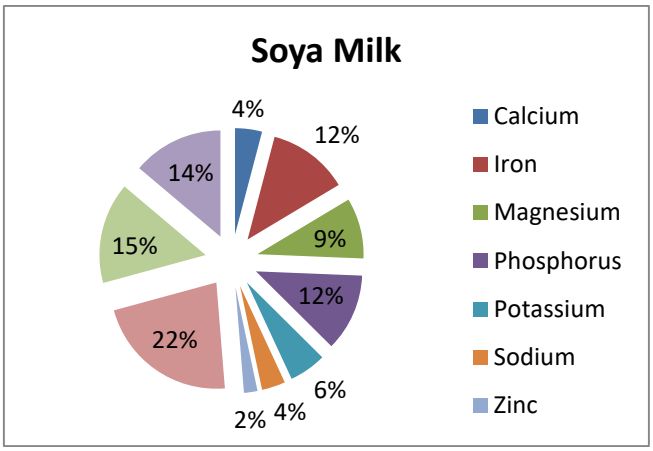


Contains more Vitamin B1 + 252.9%
Contains more Vitamin B2 + 146.4%
Contains more Vitamin B3 + 170%
Contains more Vitamin B5 +208.3%
Contains more Vitamin B6 +92.5%
Contains more Folate +125%

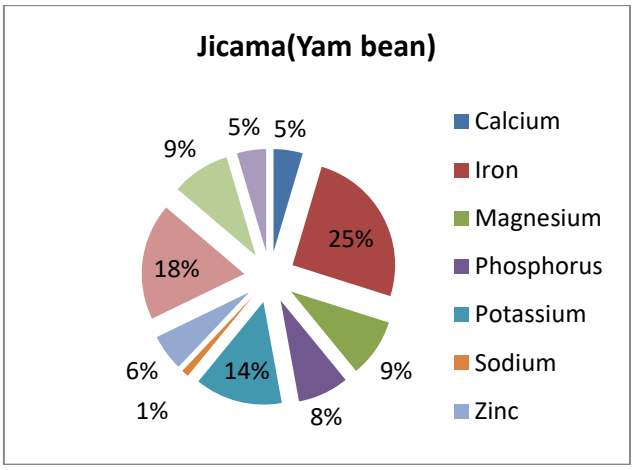


Contains more Vitamin A +533.3%
Contains more Vitamin C

Comparison of Minerals between Soya milk and Sweet yam bean(Jicama) milk:
Soya milk contains more Calcium (+108.3%), more Magnesium (+108.3%), more Phosphorus (+188.9%), more Copper (+166.7%). where, Sweet yam bean milk contains more Potassium (+27.1%), contains less Sodium (-92%) and contains more Zinc (+33.3%.) (Odu NN *et al*., 2012).



Contains more Calcium +127.3%
Contains more Iron +12.3%
Contains more Magnesium +127.3%
Contains more Phosphorus +225%
Contains more Copper +178.3%
Contains more Manganese +291.2%
Contains more Selenium +585.7%



Contains more Potassium +14.4%
Contains less Sodium -92.2%
Contains more Zinc +25%

Conclusion:

Soy milk and sweet yam bean milk are both lactose-free, vegan alternatives to traditional dairy milk. They offer numerous benefits for individuals of all age groups, especially those dealing with conditions like hypercholesterolemia (high cholesterol levels). Given these attributes, sweet yam bean milk shows promise as a valuable alternative to traditional milk sources in future food formulations. It provides a lactose-free, low-fat, low-sugar, and cholesterol-free option that can benefit a wide range of individuals, particularly those with specific dietary requirements or health concerns.

Future scope:

This research aims to encourage a comparative examination of sweet yam bean milk and soy milk. Both of these options are suitable for vegan diets and are beneficial for individuals with lactose intolerance. They represent healthier dietary alternatives due to their lower calorie content, which may potentially decrease the risk of heart-related problems. We hope to see their widespread adoption in the food industry, food processing, food formulation, and the development of innovative food products in the years ahead.

Conflict of Interest: There is no conflict of interest between the authors in publication of this paper.

Author's Contribution: Shreya Ash undertook the entire literature review. Priti Saha was responsible for creating all the figures and handling the references. Dr. Rupali Dhara Mitra conceptualized the idea and title of this paper and also provided comprehensive editing for the entire manuscript.

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