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Acceptability and Socio-Economic Desirability of Breadnut (*Artocarpus camansi*) Seeds Brew

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Abstract: The study focused on the utilization of Breadnut (*Artocarpus camansi*) seeds as a coffee brew, involving the identification of their phytonutrient composition, preparation procedures, most favorable quantities, and the determination of their acceptability and socio-economic desirability. Descriptive and Research and Development methods were employed, with data analyzed using percentages and weighted means. Findings showed that breadnut seeds are rich in carbohydrates, protein, fats, calories, sodium, and various minerals, and vitamins, and contain no cholesterol. The preparation involved oven drying, roasting, grinding, and brewing. Sensory evaluation revealed that the most favored quantity of breadnut seed brew was ½ tablespoon, which had the highest average weighted mean compared to 1 ½ tablespoon and 2 tablespoons quantities. The study concluded that breadnut seed brew is an excellent alternative to commercial coffee due to its nutritional benefits. The proper preparation process ensured high-quality output, and the product was rated as very highly acceptable, indicating an exceptional coffee brew quality. Furthermore, breadnut seed brew has socio-economic potential, offering a nutritious and affordable alternative, serving as a source of income, meeting basic needs, supporting new livelihood opportunities, and helping reduce food wastage through recycling.

Keywords: *Acceptability, Socio-Economic Desirability, Breadnut (Artocarpus camansi) Seeds Brew*

I. INTRODUCTION

Coffee is one of the most consumed beverages worldwide, widely accepted and enjoyed as a major commodity. Every country has its own unique coffee culture, especially in the way it is prepared and consumed. In the Philippines, people enjoy a variety of beverages prepared with both hot and cold water. As part social activities, this beverage is often explored creatively through artistic presentations, the addition of flavors, and enjoyed while resting, walking, or working. Coffee is also good to be taken together with friends and relatives during casual conversations and storytelling. For coffee lovers, coffee is not just an ordinary drink, it becomes their love language and more than a beverage, it is a moment. There are a lot of things and many ways Filipinos can do to pamper themselves and find relaxation, especially coffee lovers. They are an adventurous souls who love to explore different types of coffee brews but are often unaware of the potential health effects. The coffee trends have supported millions of jobs, especially for local farmers, uplifted communities, reduced unemployment rates, and helped diversify income sources. Many consumers today seek high-quality, nutritious brews that offer health benefits and support a healthy lifestyle.

In this study, a coffee brew was developed using the ripe and matured breadnut seeds that had fallen to the ground and were considered as waste, in an effort to reduce food wastage through food recycling. In line with this, the study supports the 2030 Agenda for Sustainable Development Goal 12 (SDG 12), which aims to ensure sustainable consumption and production patterns, emphasizes:

> *"Sustainable Development Goal 12 (SDG 12) aims to ensure sustainable consumption and production patterns; focuses on using natural resources more efficiently, reducing waste, and minimizing environmental impact from human activities; encourages sustainable management of resources across industries, reducing food loss and waste, and promoting recycling and eco-friendly practices. It also highlights the importance of responsible business practices, sustainable lifestyles, and educating people on how consumption choices affect the planet. A key part of SDG 12 is helping countries develop sustainable policies and encouraging companies to report their environmental and social impacts."*

Coffee consumption statistics show that around 30-40% of the world's population consumes coffee every day. According to statistics, people prefer to drink coffee two to three times a day. Not a single coffee addict can imagine the morning without a cup of espresso or cappuccino. Indeed, most people who drink coffee do so mainly in the morning. A large percentage of people also drink coffee during breaks at work, between meetings, and at the end of the workday. In general, up to three cups (200 ml

each) is considered safe daily dosage. Not everyone, however, sticks to this amount, which may result in certain health problems and gradual, imperceptible addiction (Hudyakova, 2020).

Breadnut is a well-known vegetable worldwide; it is now grown in almost 90 countries. In Bicol, there are many fruit-bearing trees, one of which is the Breadnut or "Ogob", well adapted to the Bicol soil and climate conditions. It is a seasonal, fruit-bearing tree commonly found in backyards. Many people are accustomed to eating the young breadnut, while the matured and ripened ones and go to waste. The seeds of these fruits are edible and has the potential to produce coffee. This can help reduce food waste and provide an alternative source of coffee production.

Breadnut seeds have a rich-nutrient profile, offering numerous health benefits. They are highly valued as an excellent source of plant-based protein and essential amino acids. A serving of breadnut seeds provides significant amounts of protein, dietary fiber, and healthy fats. They are also rich in minerals such as calcium**,** potassium**,** iron, and magnesium, making them nutrient-dense. Breadnut seeds also contain B vitamins like thiamine, riboflavin, and niacin, which are essential for energy production and maintaining overall metabolic health. These nutrients help improve heart health, boost energy levels, supports bone and digestive health, and are rich in antioxidants (Sanchez, 2024).

Breadnut seeds contain various important nutrients that offer numerous health benefits, supporting Sustainable Development Goal (SDG 3), also known as the Global Goal for Good Health and Well-being. This goal focuses on ensuring healthy lives and promoting well-being for all, including the provision of safe and nutritious food (Food and Sustainable Development Goals, 2018). It is essential that consumers are educated on how to protect themselves and maintain a healthier lifestyle, which is possible through the support of various socio-economic sectors. These sectors influence everything from what food is available and affordable, to the quality of healthcare and information people receive, to the safety of the environments they lived in. When these sectors work together, they can create a system that makes healthy choices easier and more accessible for everyone.

In line with this, Republic Act No. 11223, also known as the "Universal Health Care Act", declares the policy of the State to protect and promote the right to health of all Filipinos and instill health consciousness among them. This law was signed on February 20, 2019, and states that:

> *"The state shall adopt: (a) An integrated and comprehensive approach to ensure that all Filipinos are health literate, provided with healthy living conditions, and protected from hazards and risks that could affect their health; (b) A health care model that provides all Filipinos access to a comprehensive set of quality and cost-effective, promotive, preventive, curative, rehabilitative and palliative health services without causing financial hardship,, and prioritizes the needs of the population who cannot afford such services; (c) A framework that fosters a whole-of-system, whole-of-government, and whole-of-society approach in the development, implementation, monitoring, and evaluation of health policies, programs and plans; and (d) A people-oriented approach for the delivery of health services that is centered on people's needs and well-being, and cognizant of the differences in culture, values, and beliefs."*

Coffee is one of the most popular drinks among many Filipinos and their consumption has shifted from moderate to heavy levels. Nowadays, there are several coffee brands are being introduced commercially and into the market. Some of these products contain healthy ingredients, combining coffee with various indigenous foods or are made as naturally brewed herbal coffee. There are coffee products that benefit consumers not only by providing mental relaxation but also by promoting physical wellness, helping individuals become fit and slim, enhancing skin glow, and improving sleep quality. Indigenous foods are used as ingredients and undergo various processes to validate their value and ensure that these natural alternatives are safe and non-harmful to consumers.

In this light, Republic Act No. 10611, also known as the "Food Safety Act of 2013", aims to strengthen the Food Safety Regulatory System in the country to protect consumer health and facilitate market access for local foods and food products. This law was signed on August 23, 2013, and states that:

> *"To strengthen the food safety regulatory system in the country, the State shall adopt the following specific objectives: (a) Protect the public from food-borne and water-borne illnesses and unsanitary, unwholesome, misbranded or adulterated foods; (b) Enhance industry and consumer confidence in the food regulatory system; and (c) Achieve economic growth and development by promoting fair trade practices and sound regulatory foundation for domestic and international trade."*

It is already known that seeds from indigenous materials like breadnut do not pose any harm to people. In this study, breadnut seeds were used to make a coffee brew, which showed no negative effects on human health. The resulting coffee consumed freely, as breadnut seeds brew is naturally made and considered a healthy alternative. It is important to explore other options that promote better health and contribute to a longer, happier life. People are encouraged to give more attention to their well-being, as excessive intake of substances like caffeine and nicotine can have harmful effects on the body and disrupt its natural systems.

Knowing the side effects of some commercial coffee due to its chemical components, this study intended to produced a healthier coffee that can be consumed more frequently than the typical recommended amount. Compared to well-known branded and commercialized herbal coffees, breadnut seeds can be one of the solutions, as it is not only more affordable but also higher in nutritional content and value. Breadnut trees are abundant, especially in Barangay Concepcion Grande, where most of the

matured and ripened fruits fall to the ground, go to waste, and are eventually discarded. The matured and ripened seeds of the breadnut were used in this study to help reduce food wastage and to support the sustainable use of the earth's limited resources for future food production. Thus, the study aspires to contribute to the development of a new coffee brew made from indigenous materials that promote economic resilience and well-being.

II. MATERIALS AND METHODS

Raw material: Ripe and matured seeds of Breadnut were used and collected from Barangay Concepcion Grande, Naga City.

The study utilized descriptive and Research and Development (R&D) methods. The descriptive method was used to determine the phytonutrient composition of breadnut seeds, the procedure for preparing breadnut seed brew, the most favored quantity, the acceptability of the coffee produced in different amounts in terms of the aroma, color, taste and after taste, and socio-economic desirability of the product. The R&D method was applied to discover new ingredients from breadnut seeds and the processes involved in making the brew. This approach explored how different quantities of breadnut seed brew affect its aroma, color, taste and after taste. The study was conducted during the third quarter, specifically from August 2024 to October 18, 2024. Data were obtained from 30 respondents, selected according to age and grouped into five categories based on the following age ranges: A- Six (6) were with age below 20, B- twelve (12) with age 20-30, C- three (3) with age 31-50, D- six (6) with age 51-60, and E- three (3) with age 61 and above. An evaluation checklist was provided to assess the acceptability of the breadnut seeds brew in terms of the aroma, color, taste, and after taste. Results were statistically treated using percentage and weighted mean.

III. RESULTS AND DISCUSSION

The phytonutrients composition of the seed was determined to ensure consumer safety in the use of the product as a coffee alternative. All parts of the breadnut, including its seeds, contain essential phytonutrients that offers numerous health benefits. The richness of these phytonutrients serves as evidence that breadnut seed brew is a viable and healthy alternative. Furthermore, the potential integration of breadnut seed into food products can enhance nutritional value and promote better health, making it an excellent choice for developing coffee alternatives. The quantitative phytonutrient composition of the breadnut seed is presented in Table 1.

Table 1: Quantitative Phytonutrient Composition of Breadnut Seed

Phytonutrients	Amount Per Serving (100g)
Carbohydrates, total	29g
Dietary Fiber (per old FDA rule)	5g
Dietary fiber	5g
Total Sugars	3g
Include 0g Added Sugars	
Sugar Alcohol	0g
Protein	7g
Fats, total	5.59g
Polysaturated Fat	3g
Saturated Fat	1.5g
Monosaturated Fat	0.5g
Trans Fat	0g
Calories	191kcal
Sodium	25mg
Cholesterol	0mg
Minerals	
Potassium	940mg
Phosphorus	180mg
Magnesium	55mg
Calcium	40mg
Iron	3.7mg
Copper	1.1mg
Zinc	0.9mg
Selenium	0.5mg
Manganese	0.1mg
Vitamins	
Vitamin C	7mg

Panthotenic Acid	0.9mg
Thiamin	0.5mg
Riboflavin	0.3mg
Niacin	0.4mg
Vitamin B6	0.3mg
Vitamin A	80mcg
Folate	55mcg DFE

(Source: Seeds, Breadnut seeds, raw-Nutrition Facts | Calories in Seeds, breadnut seeds, raw-USDA database (NBD ID: 12001))https://www.nutritionvalue.org/ (2025)

The seeds underwent several processes before they were transformed into coffee brew. Based on the results, it can be deduced that the process of formulating coffee brew from breadnut seeds involves a series of critical steps, including drying, roasting, and brewing. Careful preparation is essential, starting with the selection of high-quality seeds, and accurate measurement of ingredients is required to achieve the best possible outcome. The seeds underwent processing to transform the raw material into a product that exhibits desirable characteristics, including aroma, color, taste and after taste. Figure 1 illustrates the procedural flow in the preparation of breadnut seed brew.

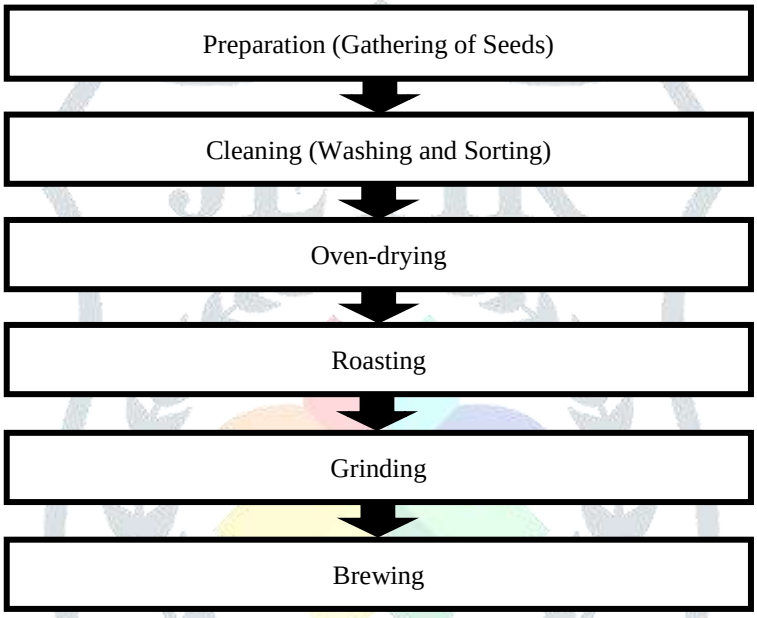

Figure 1. Flowchart of Procedure in Preparation of Breadnut seeds brew

The seeds were dried using an oven toaster until they became dark brown and crispy. The drying process lasted for almost one hour until the seeds turned dark golden brown. After oven drying, they underwent pan frying until the seeds became crunchier, followed by grinding before brewing. A filter pouch or coffee drip bag was used to remove unwanted particles. Three glasses were labeled with three different measurements of coffee powder, each containing the same amount of hot water. A total of thirty (30) respondents tasted and evaluated the coffee brew made from breadnut seeds to determine which quantity was the most preferred according to their individual coffee preferences. The number of respondents who favored the breadnut seeds brew based on the different quantities, along with the corresponding data, is presented in Table 2 which shows the observations on the various coffee powder measurements used in the brew.

Table 2. Observation on Different Coffee Quantities

Respondents	No. of Respondents	Coffee Quantities		
		Coffee 1 (1/2 tbsp.)	Coffee 2 (1 1/2 tbsp.)	Coffee 3 (2 tbsp.)
A- Below 20	6	4	2	-
B- Age 20-30	12	9	3	-
C- Age 31-50	3	3	-	-
D- Age 51-60	6	5	1	-
E- 61 and below	3	3	-	-
TOTAL	30	24	6	-
%	100	80	20	-

Based on the results, most of the respondents, depending on age group, liked the coffee brewed in a cup of water using 1/2 tablespoon, compared to coffee brewed with 1 ½ tablespoons; no one preferred the coffee brewed with 2 tablespoons. The majority favored the ½ tablespoon brew, with most coffee lovers belonging to the 20-30-years-old age group. In line with the study of Burce (2016), hot water is an essential element in coffee brewing, and another factor in flavor development is the contact time between water and coffee grounds. It is implied that the respondents who tasted the breadnut seed brew preferred the one with ½ tablespoon, as it was already aromatic, medium brown in color, and bitter like the other well-known coffee brands, with an aftertaste that lingers in the mouth. The other two brewed quantities were too bitter for them and had a stronger aroma, deeper color, more intense taste, and a harsher aftertaste.

The three coffee quantities were placed in glasses and served to the evaluators. Each respondent evaluated all three quantities individually. The coffee brewed with ½ tablespoon was first served for evaluation. After ten minutes, the 2 tablespoon brew was assessed. They rated the characteristics of each coffee brew based on benchmark criteria using the evaluation checklist. The scores were tabulated and statistically treated to obtain the weighted mean. Table 3 shows the summary of the evaluators' assessment of the characteristics of the breadnut seeds brew.

Table 3. Level of Acceptability of Breadnut Seeds Brew

Characteristics	Coffee Quantity 1 (1/2 tbsp.)	Coffee Quantity 2 (1 1/2 tbsp.)	Coffee Quantity 3 (2 tbsp.)
Aroma	3.63 **(VHA)**	2.77 (HA)	2.73 (HA)
Color	3.4 **(VHA)**	3.0 (HA)	2.63 (HA)
Taste	3.6 **(VHA)**	2.37 (MA)	1.9 (MA)
Aftertaste	3.53 **(VHA)**	1.97 (MA)	1.9 (MA)
AWM	**3.54 (VHA)**	**2.53 (HA)**	**2.29 (MA)**
Rank	**1**	**2**	**3**

Legend:

Mean Range	Interpretation	Rubrics
3.26-4.00	Very Highly Acceptable (VHA)	This means that the respondents very much liked the coffee formula.
2.51-3.25	Highly Acceptable (HA)	This means that the respondents much liked the coffee formula.
1.76-2.50	Moderately Acceptable (MA)	This means that the respondents moderately liked the coffee formula.
1.00-1.75	Fairly Acceptable (FA)	This means that the respondents slightly liked the coffee formula.

The breadnut seeds brew benefits not only the researchers but also the consumers within the community. When coffee made from the breadnut seeds was introduced to the community, it created a sense of belonging and connection, where members could provide feedback on product design, suggest potential improvements, or even generate ideas for new products that breadnut can offer. These community members then become advocates, helping spread the word about the newly developed breadnut seeds brew. The coffee benefits consumers in that it contains essential nutrients, is affordable, and is organic. The product raises awareness that breadnut, as one of the country's indigenous resources, can be a valuable ingredient for creating useful products and should not be treated as waste. Moreover, this innovation serves as an eye-opener, encouraging consumers to plant more breadnut trees, which can contribute to disaster mitigation and sustainability efforts, while also offering a new coffee alternative. Coffee farmers play a significant role in planting and cultivating crops, and this product will raise their awareness of alternative crops that could serve as an additional source of income for their families. Coffee business owners will also benefited from this product, as it introduces a healthier alternative to commercial coffee brands that often contain harmful chemicals. Additionally, it provides employment opportunities, offering people the chance to improve their financial status, which in turn leads to an enhanced quality of life.The formulation of breadnut seeds brew represents a bold and innovative approach introducing a new product made from indigenous ingredients, while still honoring traditional methods of coffee preparation. It aims to meet the growing demand for healthier and more sustainable alternatives.

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