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DEVELOPMENT OF CHARCOAL – BASED BAKED PRODUCTS

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Keywords	*Abstract*
Bamboo charcoal, Charcoal, Additives.	Charcoal, a carbon – based fuel produced through the incomplete combustion of wood or other carbon – containing material, has various applications. It is primarily used for cooking, deodorizing refrigerators, and as a growing medium in orchids, anthuriums and other plants. Historically, charcoal has been utilized in medicine for centuries and continues to be used by doctors today as a healing agent, antidote for poisons and treatment for ingestion and gas. Additionally, charcoal is capable of removing ammonia from diluted sulfur acid. This study is conducted to develop baked products using bamboo charcoal, specifically aiming to evaluate the acceptability level of charcoal – based products. The findings indicate that adding 1 tablespoon bamboo charcoal resulted in the highest sensory ratings for Chiffon Cake and Chocolate Moist Cake while T0 (the control – no added charcoal) resulted in the highest sensory ratings for Chocolate Chiffon Cake and Chocolate Moist Cake. However, the control sample (without added charcoal) remained the best for Chocolate Muffin.

1. RATIONALE

Bamboo (Bambusa vulgaris), the most extensively cultivated bamboo species in Southeast Asia and is found across tropical regions, standing out as the only Asian species widespread in the New World. This plant is both fascinating and highly advantageous. Although bamboo resembles a tree, it is actually classified as a grass. In a time characterized by global warming, resource depletion and

deforestation, bamboo is essential for maintaining ecological balance.

Executive Order No. 879 created the Philippine Bamboo Industry Development Council (PBIDC) in May 2010. According to this directive, 25% of bamboo must be utilized for desks in all public lementary and high schools nationwide, and 20% must be utilized for replanting. It seeks to advance research on bamboo production and use while also bolstering the bamboo industry. The significance of bamboo for socio-economic growth, environmental improvement and electricity generation is demonstrated by this Executive Order.

Charcoal is used in industry to cleanse, decolorize and deodorize solutions. Because of its absorbent qualities, charcoal may draw in and hold onto other substances. It has the ability to absorb toxins, heavy metals, hazardous gasses and other substances. Charcoal is utilized in agriculture in addition to industry. Fresh fruit and vegetables can be cleaned of pesticides, bacteria, heavy metals, pathogens and other contaminants using charcoal.

Bamboo Charcoal, sometimes referred to as “Black Diamond”, is made from trees and plants. Although wood charcoal is used, it is prohibited because of environmental concerns and deforestation. Thus, bamboo charcoal has been made available as an alternative to wood charcoal.

Nowadays, charcoal-based products are becoming popular in the market. Due to its detoxifying effects, charcoal is currently one of the most trusted ingredients as alternative food color in food and cosmetics industry. Charcoal has become synonymous with its detoxifying properties and effect on the body.

Baking in the Philippines has grown and the passion in baking contributes to the MSME’s success as provides business and employment opportunities. Filipinos love cakes and other baked products, and in every occasion, cake is always present and in any special occasion, cake is the most ideal present to the celebrant.

2. OBJECTIVES

This study intended to develop products using bamboo charcoal as an ingredient in baked products. Specifically, it is intended to determine degree of acceptance of baked good made with charcoal in terms of followings:

- Taste
- Aroma
- Texture
- Appearance

3. LITERATURE REVIEW

Bamboos are the most widely known non-wood forest product (NWFP) of the Philippines, being ubiquitous and the most highly urban of them all. It has also received the greatest attention from government in the last two decades, with at least three top government agencies advocating the resource to promote community livelihood and environmental protection. Institutional arrangement i.e., Philippine Bamboo Industry Development Council has been established to oversee the Philippine bamboo industry, and a Bamboo Industry Roadmap was formulated to guide its development. Although bamboo is legally considered as a forest product, bamboo has also been declared as a high value crop, which makes initiatives on bamboo research and businesses eligible for various government assistance programs. As a priority species, bamboo is also used in government greening programs as an alternative to wood and to support community-based enterprises. In research, bamboo was used as a novel source of chemicals, while innovative structural applications such as the development of novel bamboo connectors, the fabrication of engineered bamboo, and the architectural use of bamboo for typhoon-resistant houses and as sports venue had been demonstrated. Bamboos are also projected to help economic recovery from the Covid-19 pandemic with its potential to spur income and job-creating enterprises in bamboo-rich regions of the country. Limited knowledge, supply and

market information gaps needs to be addressed through intensified research, policy changes to enhance the investment climate, and increased marketing efforts. (Razal, 2022)

In the study of Mustafa et. Al (2022), bamboos are gaining increased attention as an alternative crop with multiple uses and benefits, providing human beings with various living resources. They are intermixed with the tradition and culture of rural and tribal populations and are an integral part of their cultural, social, and economic conditions. The increasing trends of health consciousness among consumers have stimulated the field of functional foods and bamboo shoots can be one of them. Bamboo fiber is now a common ingredient in breakfast cereals, fruit juices, bakery and meat products, sauces, shredded cheeses, cookies, pastas, snacks, frozen desserts, and many other food products. In South Asian countries, bamboos have been utilized for traditional medicine treatments to relieve hypertension, sweating, and paralysis. Some studies show that bamboo extract may have antioxidant activities and provide anti-inflammatory effects. Furthermore, bamboo-derived functional bio-components like pyrolysates have been proposed to have antimicrobial and antifungal activities. Diet plays a pivotal role to maintain the functions of human body as well as fulfilling the basic requirements of hunger. Demand for high quality food products is increasing day by day. New technologies and ingredients are introduced in the world for fulfilling the nutritional needs. Now modern world is turning towards functional foods from drugs. Functional foods provide the strength and can cut the risk of diseases beyond providing basic nutrition, including maintenance of gut health. In China, bamboo juice produced by pressure-cooking, is used to make beverages and specific liquors, apart from medicines. With a characteristic bamboo aroma and beer flavor, bamboo juice beers show a good number of health benefits by lowering blood lipids and fighting heart ailments.

In the study of Samarawickrama, D. S et. Al (2020), Charcoal and activated carbon production is one of the most important developing manufacturing practice of bamboo across the bamboo growing regions in the globe. Adsorption, separation and capture of various greenhouse gases using charcoal and activated carbon is an emerging technology [1, 2,3, 4, 5, 6,). There is a high potential of charcoal use in domestic water purification and filtration, environment purification system by capturing CO2 emission and advanced industry application. Functions of deodorization, dehumidifying, prevent mildew formation, antibacterial and anti-dust, mites and insects, release far infrared rays and negative ions and absorbs electromagnetic waves to promote blood circulation and metabolism, water purifying and release natural minerals, skin care and body beauty products development are key areas to promote bamboo charcoal. As the global industrialization accelerates, the issues of air and water pollution are becoming increasingly serious. Bamboo charcoal is a new environmentally friendly material which has greater potential and demand in the world due to declining of wood resources to produce high quality charcoal, fast growing ability and short in harvest cycle, renewability. Properties of bamboo charcoal are similar to those of charcoal made from hardwood and ideal substitute for to quality wood charcoal.

Nowadays, charcoal-based products are becoming popular in the market. Due to its detoxifying effects, charcoal is currently one of the most trusted ingredients as alternative food color in food and cosmetics industry. Charcoal has become synonymous with its detoxifying properties and effect on the body.

4. PROCEDURE/METHODOLOGY

4.1 Project Location

The study was conducted at Bachelor of Science in Hospitality Management Food and Beverage Services Laboratory at Apayao State College – Luna, Apayao.

4.2 Treatments Preparations

Bamboo charcoal was utilized in the study, being incorporated with various ingredients to prepare three baked products: (1) Chocolate Moist Cake, (2) Chocolate Chiffon Cake, and (3) Chocolate

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Muffin. Standard baking procedures were followed for all three products. The treatments were prepared as follows:

T0: control (no bamboo charcoal added)

T1: with 2 tablespoons of bamboo charcoal

T2: with 1 ½ tablespoons of bamboo charcoal

T3: with 1 tablespoon of bamboo charcoal

4.3 Process Flow Chart

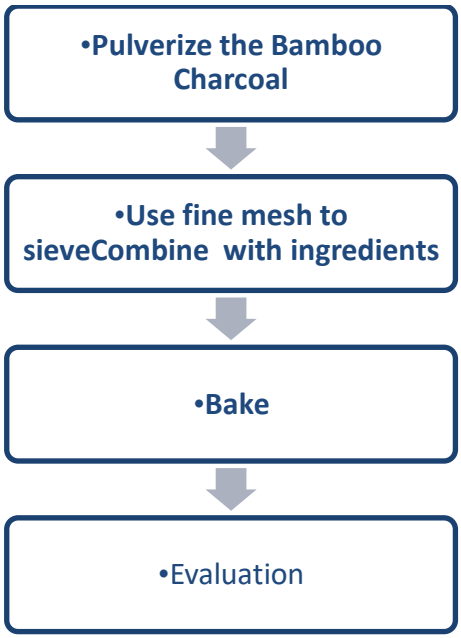

Figure 1. Schematic Diagram of the processes involved in the study.

4.4 Data Gathering Procedure

Samples were coded and underwent sensory evaluation. A panel of 20 assessors, comprising both students and staff form the college evaluated the samples. Each sample was assessed based on its color, aroma and taste. Samples were coded and underwent sensory evaluation. A panel of 20 assessors, comprising both students and staff from the college, evaluated the samples. Each sample was assessed based on its taste, texture, aroma and color.

4.5 Statistical Analysis of Data

The Hedonic Scale was used to examine the data.

Table 1: Hedonic Scale and its verbal interpretation

SCALE	LIMITS OF DESCRIPTION	VERBAL DESCRIPTION
9	8.13 – 9.00	Like Extremely
8	7.24 – 8.12	Like Very Much
7	6.35 – 7.23	Like Moderately
6	5.46 – 6. 34	Like Slightly
5	4. 57 – 5.45	Neither Like or Dislike
4	3. 68 – 4. 56	Dislike Slightly
3	2. 78 – 3. 67	Dislike Moderately
2	1.89 – 2.77	Dislike Very Much

1	1.00 – 1.88	Dislike Extremely

5. DISCUSSION OF RESULTS

Table 2: Preference test of Chocolate Chiffon Cake

SUMMARY	T0	T1	T2	T3	Verbal Description
Taste	6.78	7.07	7.62	8.08	Like Very Much
Texture	6.73	6.13	7.20	7.20	Like Moderately
Aroma	7.10	6.71	8.14	8.00	Like Very Much
Appearance	5.79	6.27	8.36	7.63	Like Very Much
	26.39	26.18	31.32	30.91	
	6.60	6.55	7.83	7.73	Like Very Much

The table shows the respondents' analysis on the produced Chocolate Chiffon. In terms of Taste, T3 registered the highest mean of 8.08 which is described as Like Very Much. In terms of Texture, T2 and T3 both showed a mean rating of 7.20 which is interpreted as Like Moderately. In terms of Aroma, T2 is considered as the highest having a mean of 8.14, described as Like Very Much and in terms of Appearance, T2 also marked the highest mean rating of 8.36 which is described as Like Very Much. The overall impression of the 20 respondents showed that T2 is the best among the four (4) treatments as reflected by the average mean score of 7.83, described as Like Very Much.

Table 3: Preference test of Chocolate Muffin

SUMMARY	T0	T1	T2	T3	Verbal Description
Taste	7.25	5.75	7.25	7.05	Like Moderately
Texture	7.60	5.75	7.30	7.10	Like Very Much
Aroma	7.85	6.50	7.85	7.95	Like Very Much
Appearance	7.40	6.20	7.50	7.60	Like Very Much
	30.10	24.30	29.90	29.70	
	7.53	6.08	7.48	7.43	Like Very Much

Reflected in the table above are the responses of the 20 respondents in the acceptability of Chocolate Muffin in terms of taste, texture, aroma and appearance. It was recorded that T0 and T2 are both preferred by the respondents in terms of Taste. It was shown in the mean rating of 7.25 which is described as Like Moderately. The texture of the muffin showed that T0 has the most appreciated value being the first choice of the respondents as seen in the mean value of 7.60 and described as Like Very Much. The respondents agreed that T3 is the most preferred in terms of Aroma as seen in the mean value of 7.95, Like Very Much. In terms of appearance, T3 still registered the highest mean value of 7.60 which is described as Like Very Much. The respondents believed that T0 is the most acceptable as shown in the computed mean value of 7.53 which is described as Like Very Much.

Table 4: Preference test of Chocolate Moist Cake

SUMMARY	T0	T1	T2	T3	Verbal Description
Taste	7.05	6.80	7.75	7.70	Like Very Much
Texture	6.70	6.80	8.05	6.55	Like Very Much
Aroma	7.60	7.05	8.15	7.60	Like Very Much
Appearance	7.40	6.55	8.25	7.90	Like Very Much
	28.75	27.20	32.20	29.75	
	7.19	6.80	8.05	7.44	

As viewed in the table, the acceptability level of Chocolate Moist Cake in terms of Taste reflected mean value of 7.10 for T3 which is also considered as the highest. This value verbally described as Like Very Much. T2 registered the highest mean score in terms of Texture, Aroma and Appearance having a score of 8.05, 8.15 and 8.25 respectively. All of which have a verbal description of Like Very Much. With these, the respondents agreed that the acceptability level of Chocolate Moist Cake fall under T2 as specified by the mean value of 8.05 and described as Like Very Much.

6. CONCLUSION

Based on the findings of the study, the researchers concluded that an addition of 1 ½ tablespoon of bamboo charcoal to chocolate moist cake and chocolate chiffon cake produced the best sensory evaluation, while the control (T0) no added bamboo charcoal) is still the best treatment for Chocolate Muffin

7. RECOMMENDATIONS

The following suggestions are made in light of the facts and conclusion that were suggested:

1. Making chocolate chiffon and chocolate moist cake in large quantities should be one of the college's revenue-generating initiatives.
2. The Institution may have linkages or partnership with other National Line Agencies such as DENR and DA to support the production of Bamboo through trainings and provisions of livelihood programs to farmers.
3. The College may extend the product to the community through livelihood trainings and seminars.
4. Further study for its marketability should be conducted.

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9. AUTHOR(S) CONTRIBUTION

The authors agreed to have no connections or engagements with any group or body that provides financial and non-financial assistance for the topics and resources covered in the article.

10. CONFLICT OF INTEREST

The authors declared that no potential conflicts of interest concerning the research, authorship, and/or publication of this article.

11. PLAGIARISM POLICY

The authors declare that any kind of violation of plagiarism, copyright, and ethical matters will be handled by all authors. Journalists and editors are not liable for the aforesaid matters.

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