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Operations Research on Product Development, Sensory Evaluation, Consumer's Acceptability of Coco Sweet Jam

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Abstract— *The paper presented in this study is based on operations research on the product development of Coco Sweet was made up of grated coconut with mashed banana as a flavor. The ingredients such as sugar, salt, and honey are added to the mixture of mashed banana and grated coconut. The mixture is cooked in the carajay with direct heat. Constant stirring of the mixture until thick. The researchers prepared the packing materials while the combination gave cooling time until done. Packed in the plastic Tupperware and covered tightly. The Coco Sweet were utilized as a spread or eaten directly for snacks. Results showed that the developed coco sweet with different ripe bananas used as flavoring differ in their general appearance, taste, odor, aroma, texture, and public acceptability. Out of three types of ripe bananas added to the grated coconut, it was found that sample two (2) with a mixture of four (4) cups of sugar, four (4) cups of mashed cardava, four (4) cups of grated coconut and two tbsp. Salt results from a highly desirable general appearance, very hot as to taste. Delightful as to odor or aroma, very smooth as to texture, and very much like public acceptability. While sample one (1) has the lowest rating out of six (6) models with a mixture of four (4) cups of sugar, four (4) cups of grated coconut, and four (4) cups of mashed banana litungdan, and one (1) tbsp. Salt is slightly desirable as to general appearance and taster, moderately pleasant as to odor or aroma, somewhat smooth as to texture, and moderately like public acceptability. Therefore, the Cardava banana is highly recommended for Coco Sweet.*

Keywords— *Cardava, Coco Sweet, Organic Jam, Operations Research, Sensory Evaluation.*

I. INTRODUCTION

Coconut is essential for the Philippine economy. It is the Philippines' largest agricultural land and labor employer [1]. Coconut has been eaten as a primary food for thousands of years by millions of people in Asia, the Pacific islands, Africa, and Central America [2]. Besides, the coconut tree is widely grown in tropical regions, especially in South Asia, Africa, South America, Australia, and other tropical countries [3]. It is an important source of a refreshing drink called coconut water [4]. A coconut tree produces inflorescence throughout the year, and coconut sap is collected from the unopened spadix of the coconut tree [5] [6][7] [8]. Several traditional foods containing coconut products are being prepared and processed using newer processing techniques and tested for their acceptability, quality, and commercial viability [9]. Besides, the Banana is one of the world's most important fruit crops, widely cultivated in tropical countries for its useful application in the food industry [10]. It is one of the largest herb groups in the world [11]. It is a source of fiber, foods, textile ornaments, and food alternatives. [12] [13] [14]. Moreover, Coconut and Banana can be used as the main ingredient in making an alternative organic jam as a product development [15] [16]. A diverse range of food products has been prepared from coconut that satisfies the human nutrition and health requirements [17] [18][19][20][21][22], and value-added products developed from coconut includes beverage, yogurt, jam, jelly, chips [23].

Aside from that, Jam is a traditional high sugar coconut food product, commonly consumed as a dessert, bread spread, and rice cake topping [2]. In addition, the production of Jam is one of the oldest food preservation techniques that allow people to enjoy all kinds of fruits during the off-season [24]. Nonetheless, the development of Coco Sweet is a mixture of grated coconut, mashed ripe banana, brown sugar, and salt. The physical and chemical properties of coconut pulp make this food suitable for consumption in natural conditions. In addition, coconut pulp is an excellent raw material for the jam industry [25]. However, little research has been conducted on coconut jam.

In contrast to the statements, increasing threats of diabetes, hypertension, and heart diseases have become real concerns due to the high consumption of sugar in food, beverage, and confectionery products [26]. Four hundred fifty-one million people live with diabetes, and about 43% of total death under 70 are diabetic patients [27]. Nowadays, many of these are considered unsafe and unhealthy, as these products can cause side effects such as weight gain, brain tumor, and balder cancer [28] [29] [30]. Though low sugar, sugar–free, and synthetic sugar products are abundantly available in food markets [31].

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Consumers' demand for high-quality foods that are delicious, nutritious, and processed neatly so that the functionality and bioavailability of their bioactive components are maintained to the maximum has created great interest in developing a new approach to food processing. There are novel and emerging food processing technologies that make it possible to keep food ingredients intact [35] [36]. In addition, farmers have experienced problems such as low coconut and banana prices. The income of the farmer is not enough for their family's needs. Therefore, merchants buy their products at low prices. Bananas and coconuts are abundant in the province of Surigao del Sur. Some farmers rely on these products as their livelihood. Bananas that are not sold and have become ripe can be used for Coco Sweet and can help farmers take part in entrepreneurial activities, especially in the current situation of our country facing the COVID 19 crisis. Thus, the study aims to advance the product development of Coco Sweet as the alternative organic Jam they make for a livelihood.

II. Materials and Methods

Raw Materials

The composition in the development of Coco Sweet includes three (3) types of ripe bananas such as Lakatan, Cardava, and Litungdan. It also has grated coconut, brown sugar, honey, and salt. Some of the kitchen utensils are a spoon, fork, knife, coconut grater, basin, ladle, firewood, carajay, plastic Tupperware for packaging, aluminum tray, De husker, jar, and bowl.

Coco Sweet Procedure as to Various Ingredients

Developing Coco Sweet includes the following; Remove coconut husk from the coconut shell using a de husker. Open the coconut shell and pour the coconut water into the jar. Grate the coconut kernel from the coconut shell using the electric grater. Measure cups of grated coconut in a bowl/basin. Peel off the ripe banana. Mash the flesh of the banana using a fork. Measure four (4) cups of mashed banana and mix with grated coconut. Add four (4) cups of sugar to the mixture and 2 tbsp salt. Mix thoroughly. Prepare the Carajay. Pour the mixture into the carajay and stir until it becomes thick. Cool the mixture until done. Pack the Coco Sweer in the transparent food container and seal completely. Three ripe bananas were being tested following the same procedure with different measurements and ingredients.

Sensory Evaluation

Sensory evaluation offers the opportunity to obtain a complete evaluation of the various characteristics of food as seen by the human senses. Sensory evaluation is an important and best way to evaluate the newly developed products that provide quality measurement and production control. The sensory evaluation of jam was made using the five-point hedonic scale. A panel of 10 semi-trained members examined the prepared coconut and banana-based organic jam-packed in glass bottles and plastic containers stored in the room and temperatures cooled to and between 30 days for 72 days.

Consumer's Acceptability

Consumers' demand for high-quality foods that are tasty, wholesome, nutritious, and processed so that the functionality and bioavailability of their bioactive components are retained to the maximum have created considerable interest in developing new food processing techniques [35] [36]. Table 1 below shows the ingredients in six samples.

TABLE 1. Six Samples Ingredients

Sample 1	**Sample 2**	**Sample 3**
4 cups ripe Lakatan	4 cups ripe Cardaba	4 cups ripe Litungdan
4 cups sugar	4 cups sugar	4 cups sugar
4 cups grated coconut	4 cups grated coconut	4 cups grated coconut
2 tbsp,salt	2 tbsp.salt	2 tbsp.salt

Sample 4	**Sample 5**	**Sample 6**
3 cups ripe Lakatan	3 cups ripe Cardaba	3 cups ripe Litungdan
2 cups sugar	2 cups sugar	2 cups sugar
3 cups grated coconut	3 cups grated coconut	3 cups grated coconut
½ honey	½ honey	½ honey
1 tbsp salt	1 tbsp salt	1 tbsp salt

III. Results and Discussions

General Acceptability of Coco Sweet with different flavors

The researchers observed that the jam prepared from tender coconut and pineapple pulp showed good sensory acceptability after six months of storage under room and refrigerated conditions [29]. Therefore, the data indicate that sample 2 has the most desirable to the consumers. Sample 2 consists of 4 cups ripe Cardava, 4 cups sugar, 4 cups grated coconut, and 2 tbsp. Salt.

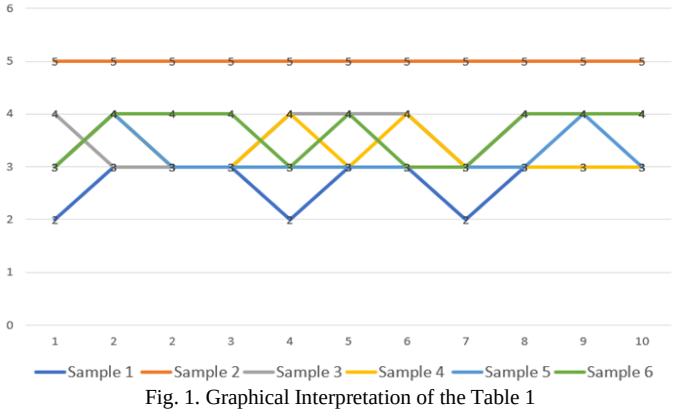

Fig. 1. Graphical Interpretation of the Table 1

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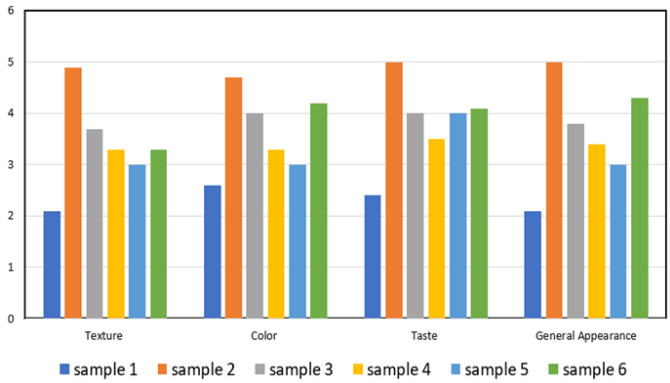

Fig. 2. Graphical Interpretation of 6 Samples

Sensory Evaluation

The mean scores of colors and appearance, flavor, consistency, taste, and overall acceptability are given in Figure 2. It shows that Sample 2 has high sensory scores for texture, color, taste, and general appearance.

Consolidated Results of Testing Coco Sweet with Different Flavors and Measurements

Table 2 shows that out of six samples of Coco Sweet (coconut with banana flavors), sample 2 stands out with the total mean as to the general appearance of 5.0, the Texture is 5.0, Odor/Color is 4.7, Texture is 4.9, and the widespread acceptance of 5.0 which describes as highly desirable to the respondents.

TABLE 2. Consolidated Result of 6 samples

Types of Sample	General Appearance	Taste	Odor/ Color	Texture	General Acceptability	TOTAL Mean
1	2.1	2.4	2.6	2.7	2.8	**2.46**
2	5.0	5.0	4.7	4.9	5.0	**4.92**
3	3.8	4.0	4.0	3.7	4.0	**3.9**
4	3.4	3.5	3.3	3.3	3.3	**3.36**
5	4.3	4.1	4.2	3.3	3.5	**3.88**
6	2.8	3.1	3.0	3.3	3.2	**3.08**

TABLE 3. The corresponding adjective description

Scale	Adjectival Description				
	General Appearance	Taste	Odor/Color	Texture	General Acceptability
5	Extremely desirable	Extremely desirable	Extremely pleasant	Extremely smooth	Extremely like
4	Very desirable	Very desirable	Very pleasant	Very smooth	Very like
3	Moderately desirable	Moderately desirable	Moderately pleasant	Moderately smooth	Moderately like
2	Slightly desirable	Slightly desirable	Slightly pleasant	Slightly smooth	Slightly smooth
1	Not desirable	Not desirable	Not pleasant	Not pleasant	Dislike

IV. Conclusion

In recent years, the emphasis has been on product diversity through the use of products and the development of value-added coconut products to improve the coconut economy. So, the organic jam prepared in the optimal conditions of soft coconut pulp and Cardava Banana showed good sensory acceptability. After two months of storage in glass bottles and plastic containers in room and refrigerator conditions based on physicochemical and sensory properties with no preservatives added. A great advantage to its preparation is that it can prepare in a single operation. In addition to the pleasing taste of Coco Sweet organic-based jam, they possess high nutritional value, safe, and are suitable for consumption. Lastly, operations research plays an essential role in a successful business, especially product development.

Recommendation

Coco Sweet an alternative organic jam mix with coconut and banana to attain the sensory qualities for the consumer's acceptability. The study suggests for a series of nutritional analyses each sample. This product development is subjected to shelf-life, packaging, and marketability. It will be a technology transfer to the community as part of extension services to enhance their economic income. Thus, this study will be part of the community's livelihood program.

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