

Shelf Life, Consumers Acceptability and Palatability of Fortified Kangkong (*Ipomoea Aquatica*) Cookies

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Abstract— *The study focused on the shelf-life and acceptability of spinach cookies with three types of food processing. It will be an alternative to junk foods and unhealthy foods for children and adults. In addition, utilizing the abundant Kangkong vegetable resource in the area can help lift the economic situations of external stakeholders. The researcher's study focused on Shelf life and level of acceptability in overall appearance, taste, smell, grain, and widespread consumer acceptance. The deliciousness of the three types of Kangkong cookies is the best indicator of their acceptability. There was no significant difference in shelf-life and acceptability among respondents, particularly among elementary pupils, high school and college students, faculty, and staff. The more delicious processed food is the dried mixture between boiled and blended variations. The shelf-life of Kangkong Cookies and the level of acceptability in the group of respondents in Cold and Normal Temperatures were significantly correlated. The correlation between the group and the shelf-life of cookies at cold temperatures was significant (sig.-tallied) values were 0.00 less than the 0.05 standard significance level. School A respondents had the highest acceptable level of boiled spinach cookies with all the sensory characteristics of the analysis. In contrast, School C respondents had the lowest adequate level of dried spinach cookies. This study will serve as the basis for extension services to the community as a livelihood program.*

Keywords— *Kangkong, Shelf-life, Acceptability, Palatability, Fortification.*

I. INTRODUCTION

Vegetables are emerging fast as the most economical and nutritious global foods. They were declared healthy foods of the millennium and described as nutraceutical foods of the century to their health benefits [1]. In addition, green leafy vegetables are a rich source of several micronutrients and phytochemicals, and it was the phytochemicals that appeared to provide much of the disease-fighting power [2][3]. Aside from that, green leafy vegetables occupy an essential place among food crops as these provide adequate amounts of crude fiber, carotene, a precursor of Vitamin A, Vitamin C, Riboflavin, Folic acid, and mineral salt Calcium, Iron, and Phosphorus. [4][5].

Moreover, *Ipomoea Aquatica* is one of the most popular green leafy vegetables. It is commonly called aquatic, morning glory, Chinese morning glory, water convolvulus, and water spinach [6][7][8][9][10][11]. It is a rich source of vitamins, minerals, protein, fiber, carotenes, and flavonoids with many health benefits. [1]. This plant is used medicinally in Southeastern Asia. It is effectively used against nosebleeds

and high blood pressure [12] [13]. The juice of *Ipomoea Aquatica* is used as an emetic in cases of opium and arsenic poisoning [13]; dried juice has purgative properties [14] [15]. It is used for anthelmintic, leukoderma, leprosy, jaundice, and liver complaint [15].

Therefore, Kangkong (*Ipomoea Aquatica*) can be the main ingredient in making cookies. Aside from that, developing a cookie will be a part of the fortification vehicle in the bakery industry with a high level of acceptability, mainly for children, due to their attractive features [16]. The bakery industry is growing fast, and ready-to-eat snack products are becoming increasingly popular among consumers worldwide [22]. On the contrary, overweight and obesity are epidemics in many parts [25]. Furthermore, much evidence suggests that the increases in obesity and overweight were related to the increases in fat and caloric intake [26] [27] [28]. Correspondingly, replacing dietary fat with fruits and vegetable-based ingredients will reduce the fat intake and add additional health benefits [29]. Although, fat is an essential ingredient in baked products and contributes to the flavor, taste, texture, and product acceptability [30] [31] [32] [33]. Therefore, choosing the appropriate fat substitute for a product or recipe is critical in replacing the fat.

Developing a new food product fortifying massive consumption of foods involve test in which sensory and statistical methods play an essential role [16] [17] [18]. Cookies are a fortification vehicle because of their long shelf life [19] [23]. Cookies are widely consumed, and generally, they are rich in carbohydrates, fats, and calories but low in fiber, vitamins, and minerals. However, the fortification of cookies has evolved to improve their nutritional and functional quality [20] [21]. In addition, an acceptability test was carried out to determine whether the target consumers accepted the sensory features of the prototype samples. The attributes of odor, color, flavor, crunch, and the IC50 value of the cookies were determined [20]. The direct method to access the acceptability of cookies is through sensory evaluation. Sensory evaluation methods are more effective, require a small sample size, less time, and do not require a trained panel [23]. The researchers compared the cookies with equivalent commercial products to establish their potential introduction into the local market [14] [17].

Consumers evaluate baked products based on their physical appearance and color, texture and flavor, sweetness, moistness, and chewiness [34]. In addition, the shelf-life

studies revealed that cookies could be stored for six months without affecting their keeping qualities [35], the excellent stability in storage time, depending on the type of packaging used, temperature, and storage time [20]. Likewise, the theoretical reference indicates it is necessary to prolong the useful life of cookies using the metalized biaxially oriented polypropylene (BOPP) since the container has an excellent barrier to water, vapor, light, and oxygen [24]. Thus, the focus of the study is the shelf-life and acceptability of Kangkong (Ipomoea Aquatica) Cookies.

II. MATERIALS AND METHODS

The study used a descriptive-evaluative survey design through sensory evaluation of the kangkong cookies to assess their days of shelf-life and the level of acceptability. The sensory assessment used the human senses (sight, taste, touch, and hearing) to determine the shelf life and acceptability—three variations of the experiment during the formulation and development of kangkong cookies. The study used a panel of food evaluators or respondents to assess the acceptability of kangkong cookies with three variations. As to School A, the principal recommended 1 section for Grade IV and advised to have the parent’s consent. At the high school level, the principal recommended 1 section of Grade 9 pupils consisting of 40 students. It is a random sampling of the faculty, staff, and students at the college level. It has a total of 120 respondents. The questionnaire was adopted in the study of Layno (2004) and Labastilla (2017) to gather the responses of respondents. The instrument in the form of modified and revised five face rating scale scorecards for sensory evaluation and the Hedonic scale for general acceptability. There was a food tasting and launching of the questionnaire to ensure its success.

2.1 Raw Materials

The composition of fortified Kangkong Cookies has three varieties: boiled kangkong leaves, dried kangkong, and blended kangkong. Some of the ingredients used are cake flour, sugar, salt, vanilla, baking powder, and butter. Also, the kitchen utensils are a stainless-steel bowl, measuring cup and spoons, blender, oven, cookie molder, cookie sheet, and pan. Aside from that, the packaging of the three varieties was a disposable food container.

2.2 Process

It has the same process but different measurements and ingredients in making kangkong cookies. First, mix the cake flour, sugar, baking powder, and salt. Next, add the vanilla and butter slowly; next is the kangkong. Make it a dough. Put it in the refrigerator for 15 – 20 minutes. After refrigeration, cut the dough into tiny pieces and put it on the cookie sheets. Put the cookie sheets in the oven for at least 20 to 30 minutes at 150 Celsius.

2.3 Shelf – Life

The shelf-life studies revealed that cookies could be stored for six months without affecting their keeping qualities [35], the excellent stability in storage time, depending on the

packaging used, temperature, and storage time [20]. Moreover, the shelf-life of three varieties of kangkong cookies was monitored, and evaluated the longevity to test the deterioration stage.

III. RESULTS AND DISCUSSIONS

3.1 Shelf-life as to Temperature

Kangkong cookies is a product development and innovation of food with three variations. First, it implies that more young respondents tasted the different mixtures such as boiled, blended, and dried kangkong cookies as to sensory qualities of the baked product. The shelf life of kangkong cookies is cold temperature with three variations: boiled, blended, and dried.

TABLE 1. Shelf Life of Kangkong Cookies as to Temperature

Shelf-life	Boiled		Blended		Dried		Total Mean	
	Mean		Mean		Mean			
	Cold	Normal	Cold	Normal	Cold	Normal	Cold	Normal
General Appearance	9.29	7.71	9.43	7.86	7.43	4.36	8.72	6.64
Taste	9.29	7.71	9.43	7.86	7.43	4.36	8.72	6.64
Odor	9.29	7.71	9.43	7.86	7.43	4.36	8.72	6.64
Texture	9.29	7.71	9.43	7.86	7.43	4.36	8.72	6.64
General Acceptability	9.29	7.71	9.43	7.86	7.43	4.36	8.72	6.64
OVERALL TOTAL MEAN							8.72	6.64

The shelf life of kangkong cookies as to cold temperature with blended kangkong mixture last for nine days, while dried kangkong cookies last only for 8 to 9 days. However, the three kangkong mixture will last for 8 to 9 days with the sensory qualities of the baked products. The blended kangkong cookies last for 7 to 8 days to general appearance, taste, odor, texture, and public acceptability, while the dried kangkong last only for four days at an average temperature.

TABLE 2. General Acceptability of Kangkong Cookies

School	Boiled	Blended	Dried	Total Mean	Interpretation
	Mean	Mean	Mean		
TPES (School A)	4.75	4.77	4.40	4.64	Very like
JPENHS (School B)	4.72	4.57	4.42	4.57	Very like
SDSSU (School C)	4.17	4.25	4.37	4.21	Very like
Total mean	4.54	4.53	4.39	4.48	Very like
OVERALL WEIGHTED MEAN				4.47	Very like

Legend: 5.00 – extremely like 3.0 – 3.99 moderately like 1.00-1.99 – dislike
 4.00 – 4.99 – very like 2.0 – 2.99 – slightly like

3.2 General Acceptability

The acceptability and rejection of the food product emphasized that man’s process of accepting or rejecting food

is a multi-dimensional nature [16]. For example, in Table 2, the boiled kangkong cookies have the highest acceptability as to general acceptability in School A (Tandag Pilot Elem. School) respondent's evaluation. In contrast, the dried kangkong cookies got the lowest acceptability among School C (Surigao del Sur State University) respondents.

3.2 Palatability of Kangkong Cookies

The positive feedback improves the palatability of new foods [16]. Palatability means a relationship between a food's flavor and nutrient and toxin content [20]. For example, figure 1 shows the deliciousness of kangkong cookies in the three variations: boiled, blended, and dried mixtures. It indicates that School A respondents rated highest with 4.7 or very desirable in the three combinations, while School B placed second in all varieties of kangkong cookies. In contrast, respondents of School C rank the lowest rating. Out of the three mixtures, dried kangkong cookies ranked one of the most palatable.

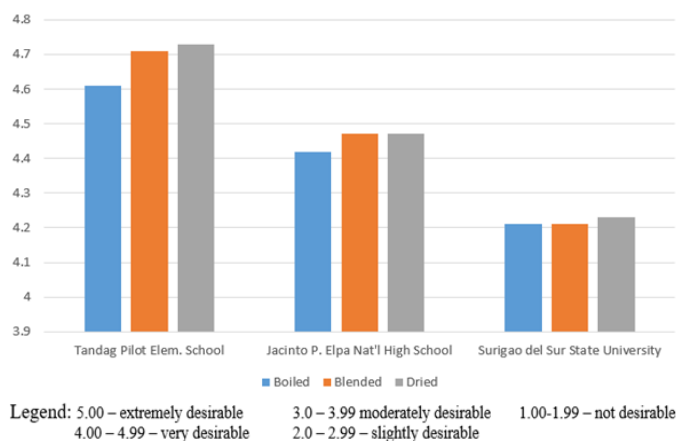


Fig. 1. Palatability of Kangkong Cookies

IV. CONCLUSIONS

Based on the findings of the study, the following conclusions are formulated. The shelf-life of kangkong cookies to cold temperature with blended kangkong added in the mixture lasts nine days, while dried kangkong added in the mix lasts for seven days. It is indicated that composite kangkong cookies last for 7 to 8 days while dried kangkong last for four days. The shelf-life and level of acceptability of kangkong cookies among the group respondents in the cold and every day has a significant relationship to the boiled, blended, and dried kangkong cookies with the sensory qualities. However, there is no significant difference in shelf-life and level of acceptability of kangkong cookies. As evaluated and tested with the sensor, the three variations, the boiled, blended, and dried, have a significant relationship to the boiled, blended, and dried kangkong cookies with the sensory qualities. However, there is no significant difference in shelf-life and level of acceptability of kangkong cookies. The three variations, boiled, blended, and dried, were evaluated and tested with the sensory qualities.

The researchers evaluated the palatability through the sensory qualities of three kangkong variations. The more

palatable the boiled, blended, and dried kangkong cookies are the dried kangkong cookies. The respondents with the highest palatability rate are School A, while School C has the lowest.

Recommendation

The study is subjected to nutritional analysis, modern packaging trends and labeling, and marketability. It is only the first phase of the study. However, it will be used as a technology transfer to the adapted barangays/community of the university for the livelihood project of the author.

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