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Organoleptic Evaluation of Mixed Powdered Cotton Fruit (Sandoricum Koetjape) and Rattan Fruit (Calamus Manillensis) as Souring Agent

Haycel C. Vargas[1], Catherine M. Aggabao[2]
[1,2]College of Education, Isabela State University, Philippines

ABSTRACT: The study focused on the development, organoleptic evaluation, and marketability of Mixed Powdered Cotton Fruit and Rattan Fruit as Souring Agent. This Product development research included two major phases: (1) Vacuum/Sun Drying and Preparation and (2) Recipes Preparation. To further appreciate the mixed powdered cotton fruit and rattan fruit as souring agent, the study undergoes proximate analysis for its nutritive content and also determining its pH level for the human level consumption. It also determined the organoleptic evaluation of mixed powdered cotton fruit and rattan fruit as souring agent in three (3) different recipes namely pork sinigang, fish sinigang, and beef sinigang in terms of appearance, aroma, and taste by conducting sensory evaluation of the finished product anf the marketability in terms of consumer demand and production cost.

The 40 evaluators consisted of varied age groups 10 teenagers and 10 adults from from selected household members of Purok 5, Baligatan City of Ilagan, Isabela, and 10 Food Experts from Food Technology Faculty, Staff and the Canteen operator of Isabela State University Ilagan City Campus and 10 Restaurant owners in the selected restaurants in the City of Ilagan Isabela.

The statistical tools used in the study were the mean (M), Standard Deviation (SD) and One-Way between Groups analysis of Variance (ANOVA). A five-point Likert scale was used in the determination of its marketability and nine-point hedonic scale for its organoleptic evaluation.

Results of the study revealed that mixed powdered cotton fruit and rattan fruit as souring agent used in different sinigang recipes in terms of appearance, aroma, and taste were extremely aggreable across group of teenagers, adults, food experts and restaurant owners. Significant difference was also established in the general organoleptic evaluation and marketability of the different sinigang recipes such as pork sinigang, fish sinigang, and beef sinigang across the groups of respondents were found that there was no significant difference in the general organoleptic evaluation and marketability of mixed powdered cotton fruit and rattan fruit as souring agent.

KEYWORDS: organoleptic evaluation, cotton fruit, rattan fruit, mixed powdered, souring agent, marketability

INTRODUCTION

Food taste differs with seasoning and souring agents. It unravels the natural flavour of the viand we are looking forward to preparing and cooking. Seasoning is about improving the flavour of your food including salt, pepper, and herbs. It serves as a building block of flavour which stimulates the appetite, texture of food and creates visual appeal to meals. Seasoning intense the flavour of food and is also a help to overcome the strong taste like sweet, bitter, or sour taste. The seasoning comes from a variety of resources including leaves, fruits, and stems. Seasoning includes fruit drying such as lime, lemon, mangoes, and tamarind. Herein, fruit drying is being done to prevent or reduce spoilage and thereby create a product that is edible for a long period. All fruit is prone to spoilage and processing them to preserve its abundance is another way to cope with the trend of food scarcity.

A souring agent comes from the fruit drying process. With the increasing population, there is a need to explore alternative food sources and raw materials for a commercial product with fewer preservatives and additives. The nutrient content from fruit and knowing their character is a way to identify the fruit-bearing plants which need a thorough study to know their potentiality for commercial use.

For these reasons, there is a need to explore ways by which fruits are gathered from growing plants in the backyard and in the wild that can be processed into a commercial product so they can be available not only during the fruiting season. The researcher focuses on an organic souring agent because of its natural sources of flavours and colours, which can be used in different sinigang recipes.

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Nutrients crucial for flourishing life and movement are by and wide collected from quelled or irately made plants or animals. In the Philippines, were different edible and lesser-known inborn natural products that bound within the community are underutilized due to their unknown highlights and characteristics. With the Global scarcity and current push for the use of indigenous food sources for conservation and potential product development, there is a need to look at some indigenous fruits that aren't well-known or eaten. (Quevedo et al., 2013)

Santol Fruit (sandoricum koetjape), also known as lolly fruit, sayai, Visayan, and wild mangosteen, is a fruit native to Indochina, including the Philippines, according to Haider (2015). Santol fruit, also known as Sandoricum koetjape in botanical terms, is one of two edible fruits of the Meliaceae, or Mahogany, family. The fleshy fruits are recognized for their sweet and sour flavour and are widely farmed throughout Southeast Asia's tropical lowlands, where they are marketed as a raw snack at fresh markets. One Santol tree can produce over 20,000 fruits in one year, and there are two main types of Santol fruits generally labelled as yellow or red varieties.

Santol fruits are best enjoyed raw, as their sweet and sour flavour shines through when eaten fresh and out-of-hand. The meat of the seeds can be sucked out to eat raw, but be careful not to swallow the seeds, as they are inedible. The flesh can also be salted and spiced and eaten as a snack, or it can be soaked in fruit juices and combined into a drink. Santol fruits can also be cooked into jellies, jams, and syrups, preserved for long-term storage, boiled into chutney, or candied as a sweet treat. The rind and flesh are also used in cooking to add a slightly bitter flavor to curries, sauces, and soups. In Filipino cuisine, santol is grated and cooked in coconut milk in a dish known as Sinantolan. Coconut, citrus, lemon, lime, ginger, sugar, and tamarind are all good combinations for santol fruits. The fruits will keep up to three weeks when stored whole at room temperature. (Health Benefits Time 2021).

On the other hand, Littuko/Away is one of the local Filipino names of sour rattan fruit whose scientific name is Calamus manillensis, In the center (kind of northern) section of Luzon, it's known as Rattan fruit. In the Visayan region, it is known as kayapi, while in other parts of Southeast Asia, such as Indonesia and Malaysia, it is known as salak or snake fruit. Alimuran fruit is a sour fruit that is frequently eaten with salt or pickled for consumption. The pangolin-like skin peel is very distinctive. Rattan is a palm-like plant that grows in the tropical regions of Africa and Asia. The palm is a climber and is very dependent on the support of another plant, like a tree. Furniture, ornaments, and baskets are all made from this climbing palm. It is the same vine that bears these edible rattan fruits or “littuko”. (Layog Country Farm 2015)

Here in the Philippines, cotton fruit and rattan fruit are of the same fruiting season. The end result is eaten bot uncooked or dipped in salt and vinegar. It can be used as a souring agent for sinigang recipes, a popular Filipino dish. Thus, the utilization of cotton fruit and rattan fruit as functional food instead of allowing it to spoil in our backyards and throwing it away as waste seems an interesting research study. Its fruit-bearing is seasonal, accordingly processing it into dried powder shape is carried out to make it to be had 12 months-spherical and reduce harvest losses. Therefore, the study aims to explore the utilization of powdered cotton fruit and rattan fruit as an organic souring agent to be used in different sinigang recipes.

It is believed that cotton fruit and rattan fruit can be made into a new food product that comes with numerous health benefits and provides income to local entrepreneurs and farmers.

METHODS

Materials

In order to perform the study, the following instruments, supplies, and ingredients shall be used. As shown on the table below, preparation tools, measuring tools, mixing tools, cutting tools, and equipment are used during the study.

Table 1. Equipment and tools used to make powdered cotton fruit and rattan rruit as an organic souring agent.

DESCRIPTION				
Preparatory Tools	Measuring Tools	Mixing Tools	Cutting Tools	Equipment
Basin	Measuring Spoon	Spoon	Sterilized Knife	Blender
Utility Tray	Measuring Cup	Mixing Bowl	Chopping Board	Cabinet Dryer
Colander	Weighing scale			
Strainer/ Sifter				

Ingredients

The following are ingredients used in preparing powdered cotton fruit and rattan fruit:

Table 2. Ingredients used in preparing mixed powdered cotton fruit and rattan fruit as souring agent.

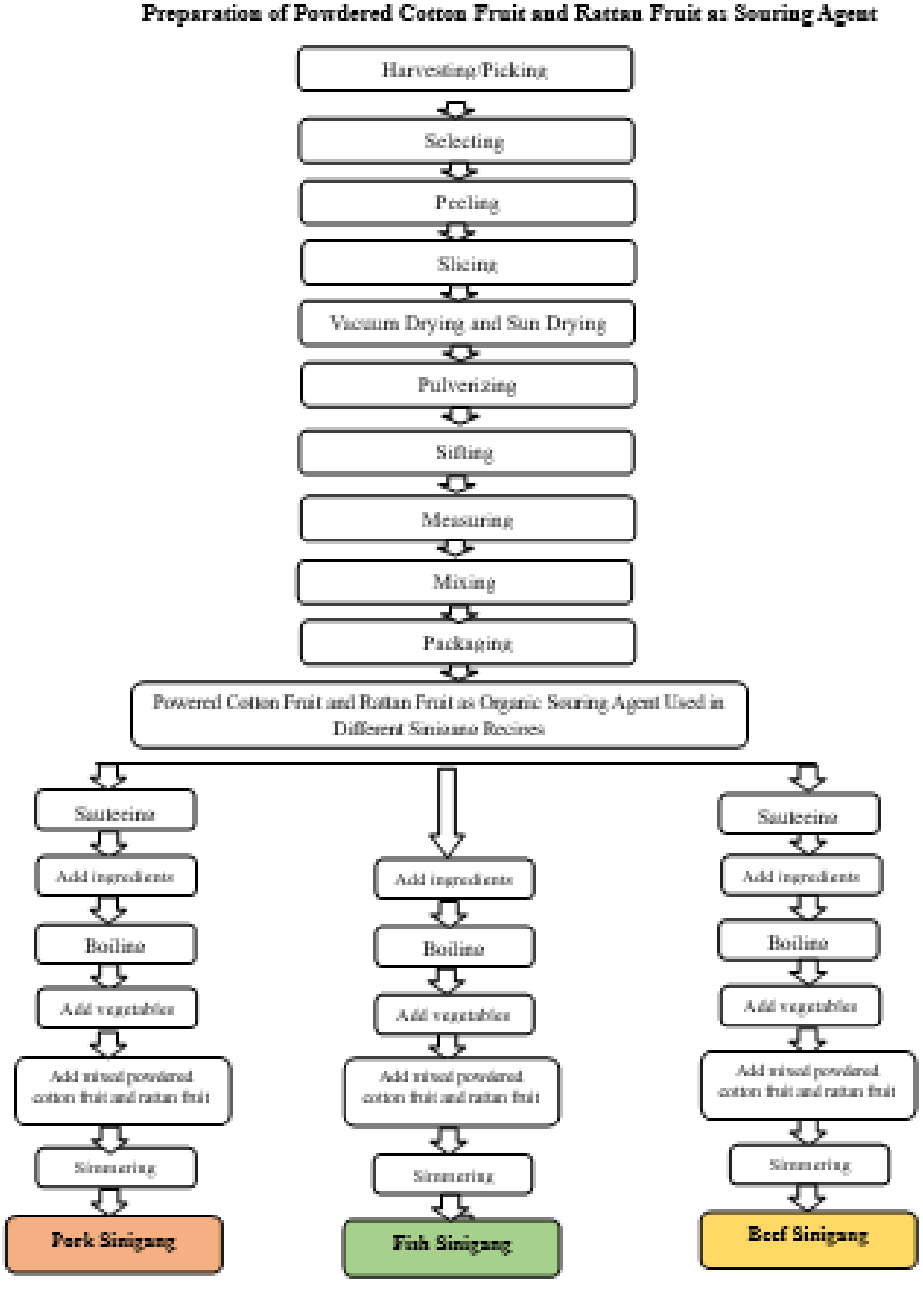
Ingredients	Raw Materials	Fruit Powder
Rattan Fruit	1.36 (kg)	100 (g)
Cotton Fruit	1 (kg)	50 (g)
Garlic powder		10 (g)
Whitepepper		6 (g)
Onion		10 (g)

Developmental Procedure

The flowchart of the procedure for making Powdered Cotton Fruit and Rattan Fruit as Organic Souring Agent used in different sinigang recipes shall be followed to conduct the research properly. Cotton fruit and rattan fruit are to be used in this study.

Cotton fruit and rattan fruit preparation begins with the collection and peeling of the fruits. After picking, peeling, and slicing the fruits, they will be dried in the cabinet before being ground in a blender. Sifting is to be done to get rid of the particles, and then mixing was done. Finally, the items are to be placed in a dry container for storage.

The commodity shall be ready to use in various sinigang recipes after all of the processes are completed.



Flow Diagram of Powdered Cotton Fruit and Rattan Fruit as Organic Souring Agent

Organoleptic Evaluation of Mixed Powdered Cotton Fruit (Sandoricum Koetjape) and Rattan Fruit (Calamus Manillensis) as Souring Agent

Preparation of Powdered Cotton Fruit and Rattan Fruit as Organic Souring Agent

The preparation of cotton fruit and rattan fruit begin with the fruit collection. After picking, peeling, and slicing the fruits, they shall be dried in the cabinet before being ground in a blender. Sifting is done to get rid of the particles followed by mixing. Finally, the items shall be placed in a dry container for storage.

RESULTS

Product Evaluation

Organoleptic Evaluation of Mixed Powdered Cotton Fruit and Rattan Fruit as Souring Agent

The level of organoleptic evaluation of mixed powdered cotton fruit and rattan fruit as souring agent used in different recipes is shown in Table 3.

In terms of appearance, fish sinigang received the highest mean 8.67 with a qualitative description of extremely agreeable while pork and beef sinigang got the same mean of 8.33 with a description of very agreeable.

As to aroma, fish sinigang got the highest mean of 8.63 with a qualitative description of extremely agreeable. Both beef sinigang and pork sinigang obtained a very agreeable description with means of 8.48 and 8.42 respectively though beef sinigang had slightly higher mean than pork sinigang.

Table 3. Level of organoleptic evaluation of mixed powdered cotton fruit and rattan fruit as souring agent used in different recipes.

Product	Criteria	Mean	Description
Pork Sinigang	Appearance	8.33	Very Agreeable
	Aroma	8.42	Very Agreeable
	Taste	8.60	Extremely Agreeable
Fish Sinigang	Appearance	8.63	Extremely Agreeable
	Aroma	8.63	Extremely Agreeable
	Taste	8.67	Extremely Agreeable
Beef Sinigang	Appearance	8.33	Very Agreeable
	Aroma	8.48	Very Agreeable
	Taste	8.52	Extremely Agreeable

In terms of taste, all three recipes obtained extremely agreeable description with fish sinigang having the highest mean of 8.67 followed by pork sinigang (8.60) and beef sinigang (8.52).

Overall, the level of acceptability of mixed powdered cotton fruit and rattan fruit as souring agent used in different recipes such as pork sinigang, fish sinigang, and beef sinigang in terms of appearance, aroma and taste was extremely agreeable. This implies that in all three recipes, mixed powdered cotton fruit and rattan fruit as souring agent is very much liked by the respondents.

Nutritive Value of Mixed Powdered Cotton Fruit and Rattan Fruit

The nutritive value of mixed powdered cotton fruit and rattan fruit is presented in Table 4. The data was obtained from reports analysis made by the Regional Food Technology Development and Incubation Center of the Department of Agriculture Regional Field Office No.2 based in Tuguegarao City, Cagayan.

Based on the report, mixed powdered cotton consists of the following nutritive components: crude protein (3.61%), crude fiber (3.29%), crude fat (4.20%), moisture (19.28%) and ash (5.87%). The test methods used for laboratory analysis were: Crude protein (Semi-automatic Kjeldahl method), Crude fiber & Fat (ANKOM Filter Beg Technique), Moisture (Gravimetric Method), and ash (Gravimetric Method). This information shows that the mixed powdered cotton and rattan fruit has good nutritive value to be used as souring agent for various food recipes. Moisture content is an important feature of powder that is connected to drying efficiency, according to Prangpru, et al. (2017). The moisture content of a product has a significant impact on its storage stability.

Table 4. Reports of analysis on the nutritive value of mixed powdered cotton fruit and rattan fruit

Lab No.	Sample Description	Crude Protein	Crude Fiber	Crude Fat	Moisture	Ash
		%	%	%	%	%
FT-2021-0198	Mixed Powdered (Cotton+Rattan Fruit)	3.61	3.29	4.20	19.28	5.87

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As to acidity and pH value, reports analysis from the Regional Feed Chemical Analysis Laboratory showed that the powdered rattan had a pH level of 2.96 which is within the regulated acidity level of a food in order to be preserved (Table 4.1). According to John E. Rushing of the Department of Food Science, in order that foods with acidity could be preserved, it should meet the regulation requiring the pH to be 4.6 or below. Foods at these levels are safe from formation of deadly organism causing botulism.

Table 4.1 Reports of analysis on the acidity and pH level of powdered Rattan

Lab No.	Sample Description	pH
FT-2021-0261	Mixed Powdered Cotton Fruit and Rattan Fruit	2.96

Level of Marketability of the Developed Souring Agent

Table 5 presents the level of marketability of mixed powdered cotton fruit (Sandoricum koetjape) and rattan fruit (Calamus manillensis) as souring agent. The level of marketability of the developed products was evaluated by the respondents according to two aspects: consumer demand and production cost.

Under consumer demand, all three recipes of pork sinigang, fish sinigang and beef sinigang had very high potential to meet the demand of market supply and consumers and satisfy the consumers because of nutritive value. All recipes also showed very high potential to be sold commercially, to be joyed by people across age groups, and to provide people many health benefits.

Table 5. Level of marketability of mixed powdered cotton fruit (Sandoricum koetjape) and rattan fruit (Calamus manillensis) as souring agent.

Marketability	Pork Sinigang		Fish Sinigang		Beef Sinigang	
	Mean	Description	Mean	Description	Mean	Description
Consumer Demand						
1. The recipe meets the demand of market supply and consumers.	4.58	Very High Potential	4.63	Very High Potential	4.65	Very High Potential
2. The recipe can satisfy the consumers because of its nutritive value.	4.68	Very High Potential	4.68	Very High Potential	4.70	Very High Potential
3. The recipe can be sold commercially.	4.63	Very High Potential	4.75	Very High Potential	5.00	Very High Potential
4. The recipe could be enjoyed by people of all ages.	4.65	Very High Potential	4.75	Very High Potential	4.73	Very High Potential
5. The recipe can give consumers much health benefits.	4.73	Very High Potential	4.80	Very High Potential	4.65	Very High Potential
Production Cost						
1. The ingredients of the recipe cost less.	4.45	High Potential	4.70	Very High Potential	4.57	Very High Potential
2. Less effort is needed in the production of the recipe using mixed powdered cotton fruit and rattan fruit.	4.47	High Potential	4.63	Very High Potential	4.60	Very High Potential
3. The recipe can be prepared in your own kitchen using mixed powdered cotton fruit and rattan fruit.	4.80	Very High Potential	4.78	Very High Potential	4.80	Very High Potential
4. Little manpower is needed to make the recipe using mixed powdered cotton fruit and rattan fruit.	4.70	Very High Potential	4.65	Very High Potential	4.70	Very High Potential
5.It needs little capital to produce different recipes using mixed powdered cotton fruit and rattan fruit.	4.80	Very High Potential	4.78	Very High Potential	4.67	Very High Potential

With regard to cost of production, both fish sinigang (4.70) and beef sinigang (4.57) had very high potential for less expensive ingredients while pork sinigang only had high potential. The same situation was true in terms of less effort needed in the production of recipe using mixed powdered cotton fruit and rattan fruit where pork sinigang (4.47) had only high potential while fish sinigang (4.63) and beef sinigang (4.60) both had very high potential. While pork sinigang requires less effort in production, the two other recipes are easier to prepare.

Meanwhile, all the three recipes (pork sinigang, fish sinigang, and beef sinigang) showed very high potential to be prepared in one's own kitchen using mixed powdered cotton fruit and rattan fruit, with little manpower needed and little production capital.

Comparison in Respondents' Organoleptic Evaluation of Mixed Powdered Cotton Fruit and Rattan Fruit

The comparison in the respondents' organoleptic evaluation of mixed powdered cotton fruit and rattan fruit as souring agent between and within groups is presented in Table 6.

As indicated by the data, there was significant difference in the respondents' organoleptic evaluation of pork sinigang between groups and within groups (p-value= 0.010 < 0.05) which led to the rejection of the null hypothesis.

Respondents' organoleptic evaluations on fish sinigang between groups and within groups also significantly differed as indicated by p-value = 0.23 < 0.05. Hence, the null hypothesis is rejected.

Finally, significant difference was likewise established in the respondents' organoleptic evaluation of beef sinigang in both between groups and within groups (p-value = 0.003 < 0.05) resulting in the rejection of the null hypothesis.

Table 6. Comparison in the organoleptic evaluation of mixed powdered cotton fruit (Sandoricum koetjape) and rattan fruit (Calamus manillensis) as souring agent across age groups

		Sum of Squares	Df	Mean Square	F	p-value
Pork Sinigang	Between Groups	5.100	3	1.700	4.399	.010
	Within Groups	13.911	36	.386		
	Total	19.011	39			
Fish Sinigang	Between Groups	2.431	3	.810	3.601	.023
	Within Groups	8.100	36	.225		
	Total	10.531	39			
Beef Sinigang	Between Groups	6.608	3	2.203	5.520	.003
	Within Groups	14.367	36	.399		
	Total	20.975	39			

The results indicate that the respondents across age groups have different evaluations of the three recipes namely pork sinigang, fish sinigang, and beef sinigang prepared with mixed powdered cotton fruit and rattan fruit in terms of appearance, aroma, and taste. Although the respondents differed in their evaluations, the three recipes are well acceptable to them.

Comparison in the Marketability Level of Mixed Powdered Cotton Fruit and Rattan Fruit as Souring Agent

Table 7 below shows comparison in the marketability level of mixed powdered cotton fruit (Sandoricum koetjape) and rattan fruit (Calamus manillensis) as souring agent used in three recipes: pork sinigang, fish sinigang and beef sinigang. Based on respondents' perception across age groups, there was significant difference in the marketability level of pork sinigang as to **consumer demand** with the p-value (0.021) being less than alpha of 0.05. Contrastingly, no significant difference was found in the respondents' perceptions of marketability level of fish sinigang (p-value=>0.05) and beef sinigang (p-value= 0.305.>0.05).

Table 7. Comparison in the marketability level of mixed powdered cotton fruit (Sandoricum koetjape) and rattan fruit (Calamus manillensis) as souring agent as perceived by respondents across age groups.

Marketability		F-value	p-value	Remark
Consumer Demand	Pork Sinigang			significant*
		3.654	0.021	
	Fish Sinigang			not significant**
		1.983	0.134	

	Beef Sinigang			not significant**
		1.253	0.305	
Production Cost	Pork Sinigang			significant*
		5.071	0.005	
	Fish Sinigang			significant*
		3.077	0.04	
	Beef Sinigang			significant*
		4.066	0.014	

*Difference is significant since p-value < 0.05

**difference is not significant since p-value > 0.05

With respect to **production cost**, respondents' perceptions of marketability level differed significantly in pork sinigang (p-value=0.005<0.05), fish sinigang (p-value=0.04<0.05), and beef sinigang ((p-value=0.014<0.05). This resulted in the rejection of the null hypothesis.

CONCLUSION AND FUTURE WORKS

Based on the above findings, it can be concluded that the developed mixed powdered cotton and rattan fruit as souring agent is very acceptable in recipes like pork sinigang, fish sinigang and beef sinigang across ages. Used as souring agent in different food recipes, mixed powdered cotton and rattan fruit is nutritious. Finally, it has high potential for marketability as it adequately meets consumer demand and has less production cost.

ETHICAL CONSIDERATIONS

To make sure that the researchers do their job properly. The research was done in a way that was respectful to everybody involved to the participants and anybody else who might be interested.

The steps involved in research are influenced by the research method were carried out in accordance with the rules and regulations the norms of the University in which the panelist was involved.

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