

UTILIZATION OF SOURING LEAVES CONCENTRATE IN COOKING ADOBO

MICHAEL VINCENT C. BARRERA, MAIED

Capiz State University, Roxas City, Capiz, Philippines

Abstract: This study aimed to find out the acceptability of Utilizing Sourcing leaves concentrate in cooking Adobo in a bottle. Specifically, it sought to: (1) describe the sensory qualities of the three treatments of utilizing souring leaves concentrate in cooking adobo in terms of appearance, aroma, taste, and texture; (2) determine the general acceptability of souring leaves concentrate in cooking adobo in terms of appearance, aroma, taste, and texture; (3) find out if there is a significant difference in the sensory qualities of three treatments in terms of appearance, aroma, taste, and texture; (4) find out if there is significance difference in the acceptability of souring leaves concentrate in cooking adobo in terms of appearance, aroma, taste, and texture; (5) Conduct Shelf- life test of the product, and; (6) Conduct microbial analysis of the best product.

This study used the Completely Randomized Design (CRD) using the three (3) treatments. 100 evaluators who evaluated the product in the sensory qualities and general acceptability of the product in terms of appearance, aroma, taste and texture. The 9-Point Hedonic Scale was utilized to rate the products. The statistical tools to analyze the results were the mean, Analysis of Variance One Way (ANOVA) and the Post-Hoc Test.

The findings revealed that the sensory qualities and general acceptability was in favor to Adobo with Tamarind Leaves Concentrate in terms of appearance, aroma, taste and texture.

There was significant difference in the sensory qualities of adobo with leaves concentrate in terms of appearance, aroma and taste, while there was no significant difference in terms of texture.

There was significant difference in the general acceptability among the three treatments of adobo with souring leaves concentrate in terms of appearance, aroma, taste and texture.

The shelf-life of adobo with labog leaves concentrate has a shelf-life up to three weeks. Adobo with tamarind and libas leaves concentrate has four weeks shelf life.

In accordance with the microbial analysis it was found out that the adobo with souring leaves concentrate was safe for human consumption.

Keywords: Agriculture, Food, Science, Developmental Research

I. INTRODUCTION

The food industry in the Philippines has continued to adapt with the growing demands of the dynamic consumers. With the rapid changes in the taste preference, style and presentation of different cuisines the food industries are also in the haste to provide the product that will suit the taste buds and the appetite of the Filipino people.

Philippine, as a third world and developing country, wherein there is a strong demand for working Filipinos to spend more time in the office the food industries have provided solution in making sure that each of the workers can eat a decent meal. The answer to this demand- canned goods.

Canned goods have been available in the market as old as the industrialization. But what is good about this food canning industry is that they continue to innovate in order to meet the needs of the people. Grocery stores will show you that canning industries have perfected the products from the simple vegetables to the high-class fine meats. Filipinos have also unique taste. This also the reason why more and more innovation in the food preparation and food production is also evolving. Local products have been canned for household consumption and export. We have bagoong, laing, tinapa and many more local products bottled and made ready for purchase.

The researcher saw this demand as an opportunity in applying skills in order to have profit and meet the needs of all working Filipino people. Aside from local products, why not put a twist in a Filipino cuisine. This is why the researcher has thought to innovate the number one favorite viand in the Philippines the adobo dish. Utilizing souring leaves concentrate in cooking Adobo is very economical and practical.

This study aimed to find out the acceptability of Bottled Adobo in a bottle. Specifically, it sought to: (1) describe the sensory qualities of the three treatments of utilizing souring leaves concentrate in cooking adobo in terms of appearance, aroma, taste, and texture. (2) determine the general acceptability of souring leaves concentrate in cooking adobo in terms of appearance, aroma, taste, and texture. (3) find out if there is a significant difference in the sensory qualities of three treatments in terms of appearance, aroma, taste, and texture. (4) find out if there is significance difference in the acceptability of souring leaves concentrate in cooking adobo in terms of appearance, aroma, taste, and texture. (5) Conduct Shelf- life test of the product (6) Conduct microbial analysis of the best product.

II. METHODOLOGY

Methodology:

Experimental developmental research (Richey, et al, 2017) was employed in the study. The researcher used three (3) treatments that manipulates variables. This three (3) treatments were Treatment A (labog leaves concentrate), Treatment B (libas leaves concentrate) and Treatment C (tamarind leaves concentrate) as applied to adobo. This was evaluated according to the sensory qualities and general acceptability in terms of their appearance, aroma, taste and texture. The shelf life of the product was done using observation for 4 weeks of formation of building up of molds in the liquid concentrate and in the adobo when stored under room and chilling temperature. Microbial analysis was send to the Department of Science and Technology (DOST) Regional Laboratory, Iloilo City.

Table 1 shows the ingredients used by the researcher in utilizing leaves concentrate in cooking adobo as a product. The ingredients include: pork, whole pepper corn, bay leaf, ginger, chili, garlic, soy sauce, sugar, water and leaves souring concentrate.

The experiment was carried out in the three treatments. Treatment A Abobo with wild sour leaves concentrate, Treatment B Adobo with Hog Plum leaves concentrate and Treatment C Adobo with tamarind leaves concentrate.

Table 1. Treatment in the study in making adobo

Ingredients	Treatments/Product		
	Treatment A (Labog)	Treatment B (Libas)	Treatment C (Tamarind)
Pork	200 grams	200 grams	200 grams
Pepper Corn	1 gram	1 gram	1 gram
Bay Leaf	1 gram	1 gram	1 gram
Ginger	2 grams	2 grams	2 grams
Chili	1 piece	1 piece	1 piece
Soy Sauce	1 tablespoon	1 tablespoon	1 tablespoon
491Sugar	1 tablespoon	1 tablespoon	1 tablespoon
Leaves concentrate	250 ml	250 ml	250 ml
Water	100ml	100ml	100ml

Table 2 shows the profile of evaluators who evaluate the product in three (3) treatments of adobo with souring leaves concentrate.

Table 2. Profile of the Products Evaluators

Category	Place	Number of Respondents
Expert (Teachers in Foods, Culinary, TLE)	College of St. John	10
Household Cook	College of St. John	10
Canteen Vendor	College of St. John	10
Junior High School Students of College of St. John-Roxas	College of St. John	70
TOTAL		100

Collection of Data

The instrument used in the study was a score card for sensory evaluation and the general acceptability. It dealt with the quality attributes of the product as evaluated by experts in terms of appearance, aroma, taste, and texture when applied to adobo.

One hundred (100) evaluators composed of ten (10) expert (Teacher in foods, culinary and TLE), Ten (10) canteen vendor, Ten (10) household cook and seventy (70) students of College of St. John-Roxas.

After the evaluation of the finished products, the evaluation sheets were gathered, tallied, summarized and prepared for computation and statistical analysis.

The mean was used to determine the sensory qualities and level of acceptability of souring leaves concentrate as applied to adobo in terms of appearance, aroma, taste and texture. The level of significance was set to 99 percent or 0.01 because the product is food and had been consumed.

Scoring the Variables

In scoring the variables, the researcher used the Hedonic Nine-Point Rating Scale. To have a better understanding of the result, the researcher also give the equivalent interpretation for each scale that corresponds to the Nine-Point Hedonic rating Scale. In determining the sensory qualities and level of acceptability of the product the following scale was use.

Appearance of the product

Score	Mean Score	Adjectival Description
9	8.12 – 9.00	Extremely Appealing
8	7.23 – 8.11	Very Much Appealing
7	6.34 – 7.22	Moderately Appealing
6	5.45 – 6.33	Slightly Appealing
5	4.56 – 5.44	Neither appealing nor unappealing
4	3.67 – 4.55	Less Appealing
3	2.78 – 3.66	Moderately Unappealing
2	1.89 – 2.77	Very Much Unappealing
1	1.00 – 1.88	Extremely Unappealing

Aroma of the product

Score	Mean Score	Adjectival Description
9	8.12 – 9.00	Extremely Pleasant
8	7.23 – 8.11	Very Much Pleasant
7	6.34 – 7.22	Moderately Pleasant
6	5.45 – 6.33	Slightly Pleasant
5	4.56 – 5.44	Neither Pleasant nor unpleasant
4	3.67 – 4.55	Less Pleasant
3	2.78 – 3.66	Moderately Pleasant
2	1.89 – 2.77	Very Much Pleasant
1	1.00 – 1.88	Extremely Pleasant

Taste of the product

Score	Mean Score	Adjectival Description
9	8.12 – 9.00	Extremely Delicious
8	7.23 – 8.11	Very Much Delicious
7	6.34 – 7.22	Moderately Delicious
6	5.45 – 6.33	Slightly Delicious
5	4.56 – 5.44	Neither Delicious nor not delicious
4	3.67 – 4.55	Less Delicious
3	2.78 – 3.66	Moderately Delicious
2	1.89 – 2.77	Very Much Delicious
1	1.00 – 1.88	Extremely Delicious

Texture of the product

Score	Mean Score	Adjectival Description
9	8.12 – 9.00	Extremely Soft and Intact
8	7.23 – 8.11	Very Much Soft and Intact
7	6.34 – 7.22	Moderately Soft and Intact
6	5.45 – 6.33	Slightly Soft and Intact
5	4.56 – 5.44	Neither Soft and Intact nor not Soft and Intact
4	3.67 – 4.55	Less Soft and Intact
3	2.78 – 3.66	Moderately Soft and Intact
2	1.89 – 2.77	Very Much Soft and Intact
1	1.00 – 1.88	Extremely Soft and Intact

Consumers Summary of General Acceptability in terms of appearance, aroma, taste and texture

Score	Mean Score	Qualitative Description
9	8.12 – 9.00	Liked Extremely
8	7.23 – 8.11	Very Much liked
7	6.34 – 7.22	Moderately liked
6	5.45 – 6.33	Slightly liked
5	4.56 – 5.44	Disliked
4	3.67 – 4.55	Less liked
3	2.78 – 3.66	Quite liked
2	1.89 – 2.77	Not liked
1	1.00 – 1.88	Least liked

Statistical Tools and Analysis

The data were tabulated and statistically analyzed using the Arithmetic Mean and the Analysis of Variance (ANOVA). Using the SPSS for data processing and analysis.

The Analysis of variance (ANOVA) was used to determine the significant difference among the four treatments A, B, and C (Larson, 2008).

The ANOVA set at 0.01 alpha levels was used to determine the significant difference on the appearance, aroma, taste and texture.

Cost Analysis

Table 3 shows the cost of all the ingredients in making Adobo with souring leaves concentrate.

Table 3. Cost Analysis

Qty.	Unit	Description	Value	Remarks
100	grams	Wild sour	15.00	purchased
100	grams	Tamarind	-	available
100	grams	Libas	15.00	Purchased
200	grams	Pork	50.00	Purchased
1	Piece	Bay leaf	1.00	Purchased
1	gram	Pepper corn	1.00	Purchased
2	grams	Ginger	2.00	Purchased
1	Piece	Chili	1.00	Purchased
1	Tbsp.	Sugar	2.00	Purchased
250	ML	Leaves Concentrate	10.00	Purchased
		Miscellaneous	30.00	
TOTAL			₱107.00	

If the 40% is labor and it is added to the cost of materials the total cost of the product therefore is:

$$\begin{aligned}
 \text{Labor} &= \text{P}42.80 \\
 \text{Cost of materials} &= \text{P}107.00 \\
 \text{Project Cost} &= 107.80/ 3 \text{ serving} \\
 \text{Cost per serving} &= \text{P } 35.93
 \end{aligned}$$

III. RESULTS AND DISCUSSION

This chapter presents the analyses and interpretation of the data gathered. Textual discussion precedes the tabular data on the acceptability of the adobo utilizing souring leaves concentrate among three treatments such as Treatment A- adobo in with wild sour leaves concentrate, Treatment B- adobo with hog plum leaves concentrate, Treatment C adobo with tamarind leaves concentrates in terms of quality attributes such as appearance, aroma, taste, and texture.

Sensory Qualities of Adobo with Souring Leaves Concentrate in Cooking Adobo

Table 4 shows the sensory qualities of adobo utilizing souring leaves concentrate among three treatments as evaluated by panel of experts.

In terms of appearance, Treatment C (Adobo with tamarind leaves concentrate) was “Extremely Appealing” with a mean score of 8.40 followed by the treatment A (Adobo with labog leaves concentrate) and treatment B (Adobo with libas leaves concentrate) were describe as “Very Much Appealing” as they obtained the mean score of 8.10 and 7.26. The grand mean for the level of sensory qualities in terms of appearance was 7.92 with an adjectival description of “Very Much Appealing”. Data revealed that the product with tamarind leaves concentrate (Treatment C) was highly preferred in terms of appearance among three treatments.

As to its aroma, result showed that Treatment C had the highest mean rating of 8.20. This was closely followed by Treatment A with the mean score of 8.10. The lowest rating was on Treatment B with the mean score of 8.03. Both treatment A and C were describe as “Extremely Pleasant”. Treatment B were describe as “Very Much Pleasant”. The findings of the study appeared that treatment C and A were highly accepted by experts in terms of aroma.

As to the level of taste, evaluators found that Treatment C (Adobo with tamarind leaves concentrate) as “Extremely Delicious” with the mean score of 8.26. Meanwhile treatment A and B only had a mean score of 7.80 and 7.43 as described as “Very Much Delicious”

Data on the sensory texture evaluation of the 10 experts on utilizing souring leaves concentrate data showed that treatment C (adobo with tamarind leaves concentrate) as “Very Much Soft and Intact” with a mean score 8.03 while Treatment A and B had only mean score of 7.40 and 7.63 respectively, describe as “Very Much Soft and Intact”.

Comparing the mean results of the product level of texture, evaluators tended to support the product treatments.

The researcher believed that there is still room for improving and developing the product development of utilizing souring leaves concentrate in cooking adobo.

Table 4. Sensory qualities of utilizing souring leaves concentrate in cooking adobo

Sensory Qualities	Treatment A		Treatment B		Treatment C	
	MEAN	AD	MEAN	AD	MEAN	AD
Appearance	8.10	VMA	7.26	VMA	8.40	EA
Aroma	8.10	EP	8.03	VMP	8.20	EP
Taste	7.80	VMD	7.43	VMD	8.26	ED
Texture	7.40	VMSI	7.63	VMSI	8.03	VMSI
QD	Very Much Liked		Very Much Liked		Liked Extremely	

Legend:

<i>Mean Score</i>	<i>Adjectival Description (Appearance)</i>	<i>Adjectival Description (Aroma)</i>
8.12 – 9.00	<i>Extremely Appealing (MA)</i>	<i>Extremely Pleasant (EP)</i>
7.23 – 8.11	<i>Very Much Appealing (VMA)</i>	<i>Very Much Pleasant(VMP)</i>
6.34 – 7.22	<i>Moderately Appealing (MA)</i>	<i>Moderately Pleasant (MP)</i>
	<i>Adjectival Description (Taste)</i>	<i>Adjectival Description (Texture)</i>
8.12 – 9.00	<i>Extremely Delicious (ED)</i>	<i>Extremely Soft & Intact (ESI)</i>
7.23 – 8.11	<i>Very Much Delicious(VMD)</i>	<i>Very Much Soft & Intact (VMSI)</i>
6.34 – 7.22	<i>Moderately Delicious (MD)</i>	<i>Moderately Soft & Intact (MSI)</i>

General Acceptability Utilizing Souring Leaves Concentrate in Cooking Adobo

Table 5 shows the general acceptability utilizing souring leaves concentrate in cooking adobo among three treatments as evaluated by consumer in terms of appearance, aroma, taste and texture.

The data shows that in terms of appearance, aroma, taste and texture all was “Liked Extremely” however, Treatment C had the highest mean of 8.63 (appearance), 8.51 (aroma), 8.61 (taste) and 8.68 (texture) respectively. Therefore, among the three (3) treatments, Treatment C was the most acceptable as souring agent in cooking adobo. This conform to the study of Diallo, et.al. (2017) that the sour greens tamarind leaves when combined with the dal lend the dish a pleasingly wonderful flavour with a delicate undertone of sourness without overpowering the earthy comforting flavour. Fresh leaves should be refrigerated and consumed within a week. While the dried ones can be stored in an air tight container and used for months (Diallo, et al, 2017). Also, Conlu (2018) that the souring leaves concentrate from tamarind leaves was the most acceptable

Table 5.General acceptability of souring leaves concentrate in cooking adobo

Sensory Qualities	Treatment A		Treatment B		Treatment C	
	MEAN	AD	MEAN	AD	MEAN	AD
Appearance	8.25	LE	8.21	LE	8.63	LE
Aroma	8.27	LE	8.26	LE	8.51	LE
Taste	8.38	LE	8.22	LE	8.61	LE
Texture	8.20	LE	8.22	LE	8.68	LE
AD	Liked Extremely		Liked Extremely		Liked Extremely	

Legend:

<i>Mean Score</i>	<i>Adjectival Description (AD)</i>
8.12 – 9.00	<i>Liked Extremely (LE)</i>
7.23 – 8.11	<i>Very Much liked (VML)</i>
6.34 – 7.22	<i>Moderately liked (ML)</i>
5.45 – 6.33	<i>Slightly liked (SL)</i>

when evaluated. Thus, it was been recommended as a souring agent in making adobo or any dishes alike.

**Difference Significant Difference
In the Sensory Qualities of
Utilizing Souring Leaves
Concentrate in Cooking Adobo**

Table 6 disclose that three were significant difference significant difference in the sensory qualities of utilizing souring leaves concentrate in cooking adobo as evaluated by the expert in terms of appearance, aroma, taste and texture, taste and aroma when grouped according to three (3) treatments because the –values of 22.088, .667, 97.717, and 173.250 had p-value of .000,.000,.514 and .000 were less than 0.01 alpha.

The result implied that the sensory qualities of utilizing souring leaves concentrate in cooking adobo as evaluated by expert in terms of appearance, taste and aroma were not the same when grouped according to three (3) treatments except texture.

In terms of appearance there were significant difference because the F-value of 22.088 and had p-value of .000 which was less than 001 alpha. The result implied that the appearance of utilizing souring leaves concentrate in cooking adobo were not the same when grouped according to three (3) treatments. Therefore the null hypothesis of the study that there is a significant difference in the appearance of the three (3) treatments was rejected. This implies that the result of the product per treatment in terms of appearance were the same.

In terms of aroma there were significant differences because the F-value of 173.250 and had p-value of .000 which was less than 0.01 alpha. The result implied that the aroma of utilizing souring leaves concentrate in cooking adobo is the same when grouped according to (3) treatments.

Table 6. Difference in the sensory qualities of utilizing souring leaves concentrate in cooking adobo

Variables	Source of Variation	Sum of Squares	df	Mean Square	F-value	P-value	Remarks
Appearance	Between Groups	22.18	2	11.093	22.088	0.000	s
	Within Groups	149.16	297	0.502			
	Total	171.347	299				
Aroma	Between Groups	146.347	2	73.173	173.25	0.000	s.
	Within Groups	125.440	297	0.422			
	Total		299				
Taste	Between Groups	123.380	2	61.690	97.717	0.000	s.
	Within Groups	187.500	297	0.631			

	Total	310.880	299			
Texture	Between Groups	0.727	2	0.363	0.667	0.514 n.s.
	Within Groups	161.870	297	0.545		
	Total	162.597	299			

Legend: *Level of significance = 0.01*
n.s.=not significant;
s-significant

This implies that the result of the product per treatment in terms of aroma were the same.

In terms of taste there were significant difference because the F-value of 97.717 and had p-value of .000 which was less than 0.01 alpha. The result implied that the taste of utilizing souring leaves concentrate in cooking adobo were comparable when group according to (3) treatments. This implies that the result of the product per treatment in terms of taste were the same.

In terms of texture there were no significant difference because the F-value of .667a= and had p-value of .514 which was less than .001 alpha. The result implied that the texture of adobo in a bottle were not the same when group according to (3) three treatments. This implies that the result of the product per treatment in terms of texture were not the same.

Difference in the General Acceptability of Utilizing Souring Leaves in Cooking Adobo

Table 7 shows the test in the consumers’ general acceptability of the three treatments of utilizing souring leaves concentrate in cooking adobo.

Results revealed that in terms of appearance, aroma taste and texture, there were significant differences among treatments because the p-values of 0.000 was lower than the 0.01 alpha level of significance thus the hypothesis was rejected in all treatments.

To determine which treatments differ in terms of appearance Tukey Post Hoc test was utilize (Appendix H, page 89) and found out that the combination of Treatment A vs. B (p-value=0.800) was no significant, Treatment A and C (p-value=0.000) was significant and treatment B vs. C was Significant, Therefore, Treatment C differ among the treatments in terms of appearance.

In terms of aroma, the data in Tukey Post Hoc test reveal that Treatment A vs. B has no significant difference because the p-value of 0.942 was higher than 0.01 level of significance, while there was a significant difference between Treatment A vs. C (p-value=0.000) and Treatment B vs. C (p-value of 0.000). Therefore, the hypothesis is rejected between Treatment A and B vs. C. Thus, Treatment C differ in aroma.

Table 7. Difference in the acceptability of souring leaves concentrate in cooking adobo.

Variables	Source of Variation	Sum of Squares	df	Mean Square	F-value	P-value	Remarks
Appea-rance	Between Groups	10.747	2	5.373			
					27.210	.000	s
	Within Groups	58.650	297	.197			
	Total	69.397	299				
Aroma	Between Groups	14.747	2	7.373			
					39.874	.000	s
	Within Groups	54.920	297	.185			
	Total	69.667	299				
Taste	Between Groups	7.687	2	3.843			
					17.694	.000	s.
	Within Groups	64.510	297	.217			
	Total	72.197	299				
Texture	Between Groups	4.007	2	2.003			
					9.305	.000	s.
	Within Groups	63.940	297	.215			
	Total	67.947	299				

Legend: $P < .01$, significant at 1%(s) $P > .01$; not significant at 1%(ns)

In terms of taste the Tukey Post Hoc test shows that there was no significant difference between Treatment A and B with p-value of 0.042 which was higher than 0.01 level of significance, while there was a significant difference between Treatment A vs. C (p-value=0.002) and Treatment B vs. C (p-value=0.000) therefore the hypothesis is rejected between Treatment A and B vs. C. Thus, Treatment C differ among treatments in terms of taste.

Tukey Post Hoc test of texture was found out that there was no significant difference in Treatment A vs. B (p-value=0.987), while there is a significant difference between Treatment A vs. C (p-value=0.000) and Treatment B vs. C (p-value=0.001). Therefore, hypothesis was rejected between Treatment A and B vs. C. Thus, Treatment C differ in texture when applied as souring agent in cooking adobo.

Shelf life of Utilizing Souring Leaves Concentrate in Cooking Adobo under Room Temperature

Table 8 reveals the shelf life of Utilizing Souring Leaves concentrate in cooking adobo when stored at room temperature. Storage was made for 30 days. The first and second week of storage showed no change in the quality attributes of the products. Likewise, on its third and

Table 8.Shelf-life of Utilizing Souring Leaves Concentrate in Cooking Adobo.

Variant	1-2 weeks (molds formation)	2-3 weeks (molds formation)	3-4 weeks (molds formation slimy, production of spot)
Room Temperature			
Adobo with labog leaves concentrate	-	-	+
Adobo with libas leaves concentrate	-	-	-
Adobo with tamarind leaves concentrate	-	-	-
Chilling Temperature			
Adobo with labog leaves concentrate	-	-	+
Adobo with libas leaves concentrate	-	-	-
Adobo with tamarind leaves concentrate	-	-	-

Legend:

Negative (-) no mold formation

Positive (+) mold formation is observe

fourth week, the adobo with souring leaves concentrate was found no changes in the appearance, aroma, taste and texture. The shelf life of utilizing souring leaves concentrate in cooking adobo when stored at chilling temperature. Storage was made for 30 days. The first and second week of storage showed no change in the quality attributes of the products. Likewise, on its third week, the adobo in a bottle was found no changes in the appearance, aroma, taste and texture.

IV. CONCLUSIONS

Based on the findings of the study, the following conclusions were drawn:

Treatment C (Adobo with Tamarind Leaves Concentrate) was the best treatment in terms of sensory qualities.

Treatment C was the most acceptable among treatment in terms of appearance, aroma, taste and texture.

There was a significant difference among treatment in terms of appearance, aroma and taste and there was no significant difference in terms of texture.

There was a significant difference in the general acceptability in favor of Treatment C in terms of appearance, aroma, taste and texture.

Based on the result it is concluded that out of three leaves concentrate libas and tamarind leaves concentrate has the longest shelf-life.

The result of the microbial analysis of the DOST it was found out that the product was safe for human consumption.

RECOMMENDATIONS

Based on the findings and conclusion of the study, the following recommendations are suggested:

Tamarind was the best souring agents in cooking adobo and other related dish.

Further study of organic/natural souring agent maybe used in cooking adobo should be taken into consideration.

Further analysis in nutritional facts/values of adobo and souring leaves of the product so that consumer will know if it benefit their health and provide a label for ingredients.

Proper product handling, storing and labelling should be guided accordingly to avoid contamination of the product to improve the shelf life and safe to eat.

Due to unavailability of the proximate analysis machine, the researcher was recommended to test the proximate analysis to ensure the nutritional facts of the product.

Further study may be conducted considering other variables not included in this study.

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