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DEVELOPMENT AND ACCEPTABILITY OF KAMOTENG KAHYOY AS VINEGAR

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Abstract

Cassava is the edible, and root crops food among Filipino especially I the municipality of the Cabatuan which is it is one of their product that can do such as poached cassava, cassava cake and cassava roll but the researcher found out that cassava can also be a vinegar by the combination of sugar, yeast, and water through the process of fermentation which it aims to develop and determine the acceptability of cassava as vinegar that included a total of 15 untrained panelists that will purposively selected, 5 each from the faculty staff and students of Diamantina National High School by using experimental design which inference about the relationship of independent and dependent variables. Based on the result cassava is acceptable in making vinegar. The pH content of vinegar is 4% natural acidity. The researcher found out that cassava as vinegar has a good taste, the researcher also found out that the cassava as vinegar is safe as a condiments. Therefore it is recommended for the Cabatuanenses they must continue to plant a cassava because it can help them to put a small business wherein they can use cassava as their product to come up with the vinegar and use it as there condiments to come up with the good taste, for the Government they must gave their full support in making the kamoteng kahoy as a vinegar and give opportunity to promote the kamoteng kahoy as vinegar and DOST must gave fund, another one the young researcher we must continue to explore new things and try something that was useful in our lives and lastly for the other school they must try to do a vinegar that made of kamoteng kahoy.

Keywords: cassava, DOST, Kamoteng Kahoy, Cabatuanenses, etc.

A. Technical Description

1. Rationale/Background of the Study

Kamoteng Kahoy is the edible, and root crops food among Filipinos. It is cultivated worldwide and is considered as of one of the most important crops of the world. According to Philippine Medical Plants, it is both fruit and vegetable, eaten raw or as ingredient in countless dishes. It contains multitude of Vitamins and Minerals that act to support human health. Vinegar has been used for thousands of years. It has been used as a medicine, cooking additive, corrosive agent, as a preservative, and as a herbicide for killing weeds. Vinegar can be defined as a condiment made from various sugary and starchy materials by vinegar and subsequent acetic acid fermentation. The process involves a bacterium called *Acetobacter* (a.k.a. the vinegar bacteria) to convert ethyl

vinegar (C_2H_5OH) into acetic acid (CH_3CO_2H) by oxidation. The Kamoteng Kahoy is due to availability of the municipality of cabatuan annually from June to July.

Vinegar Fermentation is essentially a chemical process. It involves a chemical reaction in which sugars are turned to and carbon dioxide. The most important in the process is the breaking down of glucose by yeast forming ethanol and carbon dioxide. The reaction is exothermic (heat is produced by the reaction), and the temperature must be controlled throughout the process otherwise the growth o

The most used variety of Kamoteng Kahoy in the Philippines is Diamante, a hybrid variety for year round Kamoteng Kahoy. It has a heat tolerant allowing for better fruit set under hot condition, and with excellent prolificacy that results to very high yield levels. The kamoteng kahoy are high round in shape, over 40 grams in weight, and have a very thick flesh. It has a high level of resistance to bacterial wilt (FarmOn.ph), thus the researchers' wishes to develop and determine the acceptability of Kamoteng Kahoy vinegar.

2. Objectives

The study aims to develop and determine the acceptability of Kamoteng Kahoy vinegar specifically to determine the:

A. proximate composition terms of:

a.1 Titratable acidity (%)

a.2 Total solids

a.3 Total sugar

a.4 Specific Gravity

a.5 Moisture content

a.6 Crude protein

a.7 Fiber and Carbohydrates

a.8. Percent in Vinegar (V)

B. Microbial Analysis

b.1 Total Viable count of bacteria(TVC)

b.2 Total coliform bacteria

b.3 Yeast and moulds enumeration

C. Sensory Evaluation (Organoleptic Attributes) in terms of:

c.1. Appearance

c.2. After Taste

c.3 Bouquet

c.4. Taste and Texture

c.5 Overall acceptability

Outputs

To have a well-developed product and will be acceptable based on the sensory characteristics being evaluated.

Significance of the Study

An alternative solution to reduce the post-harvest losses to extend the shelf life as of the rootcrops.

Ready for technology transfer and entrepreneurship to the adapted barangay as well as the SHS Department.

3. Review of Related Literature

A lot of studies are done into the constituents of the vinegar which give health benefits when taken in moderation. Statistical studies have shown that vinegar mild drinkers are less prone to heart disease, cancer and other diseases, there are certain chemicals that combat certain conditions, for example the antioxidant resveratrol which may reduce cholesterol and the risk of Alzheimer's disease. In fact vinegar is an important source of dietary antioxidants because of its phenolic compound content (Maria Noguera[†], 2008). Kamoteng kahoy is considered a better antioxidant than other carotenoids. In a study on acute injury caused by oxidant carbon tetrachloride (CCl₄), results showed that Kamoteng Kahoy juice, with its lycopene and ascorbic acid content, exhibited a strong effect on oxidative damage of CCl₄ in rat liver. (Tuncay Altug et al / Adv Mol Med 2007). The determination of significant differences between the profile of the untrained panelists and their evaluation on the organoleptic attributes is important in the overall acceptability (Bautista, 2012).

Methodology

A. Research Design

This study is following a causation experimental design. An experimental design refers to a plan for assigning experimental units to treatment conditions and Causation allows the experimenter to make causal inferences about the relationship between independent variables and a dependent variable.

B. Collection of Samples

2 kilograms Kamoteng Kahoy will be get in the school backyard.

C. Processing of Kamoteng Kahoy Vinegar

Formulation of Kamoteng Kahoy Vinegar

Ingredients	Quantity
Kamoteng Kahoy puree	14 cups
Sugar	12 cups
Water	14 cups
Dry Active Yeast	1/2 tsp
Sodium Metabisulphate	1/8 tsp

Procedure: A

Prepare all the materials needed for the vinegar making

- Wash the Kamoteng Kahoy.
- Slice the top eye parts of the Kamoteng Kahoy. Discard spotted parts if any.
- Chop the Kamoteng Kahoy.
- Blend the chopped Kamoteng Kahoy until pureed.
- Combine together the pureed Kamoteng Kahoy, sugar and water in a casserole.
- Boil the mixture for about 30 minutes at medium flame.
- Measure the degree of brix. (Brix must be within the range of 15-28 °) Adjust if necessary.
- Allow it to cool
- Filter using cheesecloth
- Add the dry active yeast dissolved in lukewarm water
- Transfer to a fermenting container
- Cover the container with gauze.
- Ferment for 21 days or until the desired Percent Vinegar by Volume is attained (ideal is 12-15%)
- Pasteurize in a medium flame for 30 minutes.
- Transfer to a sterilized bottles
- Tightly close the bottles.
- Age

A hand held refractometers will be used to measure the Brix and Percent Vinegar by Volume. The Brix of the mixture will be measured before the fermentation process in order to make adjustments if necessary, since the brix determine the potential percent vinegar by volume. The Percent Vinegar by Volume (ABV) of the mixture will be measured every seven days until such time that the desired percent vinegar will be attained.

Steps in Making Kamoteng Kahoy as Vinegar

Procedure B

1

- a. In mixing bowl put 14 cups of warm water
- b. pour 14 cup sugar then stir it.
- c. Add well the yeast (1/2 tsp)
- d. cover it with the clear wrap
- e. Lastly, put it on a [place that no one can disturb.

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- a. Prepare all the needed materials
- b. Wash the kamoteng kahoy
- c. Slice the top eye part and discard the spotted parts
- d. Chop the kamoteng kahoy
- e. Blend the Kamoteng Kahoy until its pureed.
- f. Combine together the pureed Kamoteng Kahoy, sugar and water in a casserole.
- g. Boil the mixture for about 30 minutes at medium flame.
- h. Measure the degree of brix. (Brix must be within the range of 15-28) Adjust if necessary.
- i. Allow it cool and filter it using cheesecloth.
- j. After several minute add the warm water, yeast and sugar that was prepared in cassava juice that you filtered.
- k. Ferment for 21 days until the desired Percent Vinegar by Volume is attained (ideal is 4%)
- l. Pasteurize in medium flame for 30 mins
- m. Transfer for sterilized bottles
- n. Tightly close the bottles.

Analysis

1. Titratable acidity determination

The vinegar was thoroughly mixed and filtered using muslin cloth. Five millilitres of filtrate was dissolved in previously boiled distilled water and made to 50 ml mark. 5 ml aliquot of the sample solution was taken and titrated with 0.1 N NaOH using phenolphthalein solution as indicator. Titratable acidity was calculated as percent citric acid (AOAC, 2005).

2. Total solids determination

Two milliliters (2 ml) of the vinegar was weighed into a dried and pre-weighed glass crucible. The crucible with its content was evaporated by putting it on a boiling water bath and dried to a constant weight in an oven at 70°C. The insoluble solids were calculated as a percentage of the sample (AOAC, 2005). 2.3.3

3. Total sugars determination

The concentration of soluble sugars was determined using a handheld Bellingham and Stanley refractometer (Bellingham and Stanley limited, 61 Markfield Road, London, England) at 20°C (AOAC, 2005). 2.3.4

4. Specific gravity determination. The specific gravity of the sample was determined using the picnometer-specific gravity bottle. The bottle was washed, rinsed and dried.

The empty bottle was weighed and mass recorded as M1. The bottle was emptied, rinsed, and filled with water and weighed, mass recorded as M2. The specific gravity was calculated (AOAC, 2005).

5. Determination of crude protein

About 1g of the samples was weighed into micro Kjeldahl digestion flask and one tablet of Selenium catalyst was added. The mixture was digested on an electro thermal heater until clear solution was obtained. The flask was allowed to cool after which the solution was diluted with distilled water to 50ml and 5ml of this was transferred into the distillation apparatus, 5ml of 2% boric acid was pipetted into a 100ml conical flask (the receiver flask) and four drops of screened methyl red indicator were added. About 50% NaOH was continually added to the digested sample until the solution turned cloudy which indicated that the solution had become alkaline. Then distillation was carried out into the boric acid solution in the receiver flask with the delivery tube below the acid level. As the distillation was going on, the pink color solution of the receiver flask turned blue indicating the presence of ammonia. Distillation was continued until the content of the flask was about 50ml after which the delivery of the condenser was rinsed with distilled water. The resulting solution in the conical flask was then titrated with 0.1M HCl (Pearson, 1976, (AOAC, 2005).

6. Determination of dry matter and moisture content.

About 2ml of each sample was measured into a previously weighed crucible, dried over water for sometimes. The crucible plus sample taken was transferred into the oven set at 1000 c to dry to a content weight for 24hour overnight. At the end of 24hours, the crucible plus sample was removed from the oven and transfer to the desiccators, cooled for ten minutes and weighed (A.O.A.C,2005). The weight of empty crucible plus sample was W1 while the weight of crucible plus oven dried sample was W3 (AOAC, 2005).

7. Vitamin C determination

Ascorbic acid (vitamin C) and vitamin B1 content of the beverage were determined by the method of AOAC (2005). 2.3.10

D. Sensory Characteristics (Organoleptic Attributes) Evaluation

1. Respondents of the Study and Sampling Procedure

A total of fifteen (15) untrained panelists will be purposively selected, five (5) each from the Faculty, Staff and Students of the Isabela State University Roxas Campus

2. Data Gathering Instrument

Semantic Scale will be used to describe the sensory qualities in terms of appearance, after-taste bouquet, taste and texture and the general acceptability while 9 point-Hedonic Scale was used on the desirability of the qualities. The Semantic Differential Scale often asks people to rate a product or brand upon a multi-point rating scale that has opposite adjectives at each end. The Hedonic Scale was consisting of a series of nine verbal categories representing degrees of liking from 'dislike extremely' to 'like extremely'. For subsequent quantitative and statistical analysis, the verbal categories will be generally converted to numerical values: 'like extremely' as '9', 'dislike extremely' as '1'.

3. Data Gathering Procedure

The "taste testing" method to evaluate the appearance, after-taste, aroma and bouquet, taste and texture. Each panelist will be given $\frac{3}{4}$ full of the tasting glass of the vinegar, In order to eliminate influence of flat taste, a drinking water will provided for palate cleansing. For the sensory evaluation, SPSS (Statistical Package for the Social Sciences) will used for the quantitative data analysis, frequency will be used in the panelists profile to easily identify the total number in terms of their age, gender classification, Weighted Mean to determine rate and verbal interpretation, One-way ANOVA to test the significance between the panelists profile and their sensory evaluation at 0.05 level of significance.

Responses in the questionnaires for the sensory qualities in terms of Semantic Differential Scale range from 1-5 and using the Likert scale and the new range of scores will be as follows:

RANGE	RATE
1.00- 1.49	Poor
1.50-2.49	Fair
2.50-3.49	Good
3.50-4.49	Very Good
4.50-5.00	Excellent

Responses in the questionnaires for the desirability of the vinegar in terms of Hedonic Scale that range from 1-9 and using the Likert scale and the new range of scores will be as follows:

RANGE	RATE
1.00- 1.49	Dislike Extremely
1.50-2.49	Dislike Very Much
2.50-3.49	Dislike Moderately
3.50-4.49	Dislike Slightly
4.50-5.49	neither Dislike nor Like
5.50-6.49	Like Slightly
6.50-7.49	Like Moderately
7.50-8.49	Like Very Much
8.50-9.00	Like Extremely

The Desirability Composite Index (DCI) will be used to determine the overall acceptability in terms of Semantic Scale and Hedonic Scale of the developed Kamoteng Kahoy vinegar.

SEMANTIC SCALE

	Mean Value	20 %
Appearance		
After Taste		
Taste and Texture		
Bouquet		
Overall Acceptability		
TOTAL		

HEDONIC SCALE

	Mean Value	20 %
Appearance		
Before Taste		
Taste and Texture		
Bouquet		
Overall Acceptability		
TOTAL		

4. Statistical Tool

SPSS (Statistical Package for the Social Sciences) will be used for the quantitative data analysis, frequency will be used in the evaluators profile to easily identify the total number in terms of their classification, age, gender, educational background and the

taste preference. One-way ANOVA to test the significance among variables at 0.05 level of significance and Pearson correlation in the correlation between variables.

Results

Table 1:

a. Treatment proximate composition terms of:	1 st Sampling	2 nd Sampling	3 rd Sampling	4 th Sampling
a.1 Titratable acidity (%)	5.900533	6.00788	8.99934	12.4456
a.2 Total solids	7	4	2	1
a.3 Total sugar	24 cups	12 cups	12 cups	12 cups
a.4 Specific Gravity	0.00	0.00	0.00	0.00
a.5 Moisture content	7.5800	5.9000	9.5800	2.7544
a.6 Crude protein	28.395	26.554	26.328	24.423
a.7 Fiber and Carbohydrates	12.672	14.877	17.771	18.630
a.8. Percent in Vinegar (V)	10.354	8.761	5.034	4.271

The treatment composition of vinegar made of kamoteng kahoy conclude the proximate analyses where percentage of the vinegar in the fourth sampling perfectly composed of 17.871% that makes the taste good. In the second sampling used by means of titrability acidity it has statistically treated composed of 4.271 and interpreted as excellent in hedonic scaling.

Table1. Proximate analyses of vinegar content before and after treatment.

Microbial Analysis	Time after Fermentation	Fig.
b.1 Total Viable count of bacteria (TVC) None	0:00:00	A
b.2 Total coliform bacteria None	0:00:15	B
b.3 Yeast and molds enumeration None	0:02:00	C

Microbial Analysis	Time after Fermentation	Fig.
b.1 Total Viable count of bacteria(TVC) None	0:08:00	D
b.2 Total coliform bacteria None	0:32:00	E1
b.3 Yeast and molds enumeration None	0:036:00	E2

Microbial Analysis	Time after Fermentation	Fig.
b.1 Total Viable count of bacteria (TVC) None	1:00:00	F
b.2 Total coliform bacteria None	1:01:00	G
b.3 Yeast and molds enumeration None	1:03:00	H

Micobial Analysis	Time after Fermentation	Fig.
b.1 Total Viable count of bacteria(TVC) None	1:08:00	I
b.2 Total coliform bacteria None	1:12:00	J
b.3 Yeast and molds enumeration None	1:14:00	K

Micobial Analysis	Time after Fermentation	Fig.
b.1 Total Viable count of bacteria (TVC) None	2:00:00	L
b.2 Total coliform bacteria None	2:01:00	M
b.3 Yeast and molds enumeration None	2:02:00	N

The microbial analysis through the laboratory of Isabela State University in different pH and vinegar hardness found out that none of the test grow any bacteria hence it was observed that this test must be test in DOST.

Response in Percent	Mean	Descriptive Rating
1. I use vinegar made of kamoteng kahoy in flavoring foods.	4.12	Very Good
2. I use vinegar made of kamoteng kahoy as of form of fun in joking with my friends eating karaoke.	4.55	Excellent
3. I hate to use vinegar made of kamoteng kahoy because its salty.	4.34	Very Good

4. I use vinegar made of kamoteng kahoy because it's the innovation product of our department.	4.13	Very Good
5. I use vinegar made of kamoteng kahoy as ingredients in the breakfast I eat.	4.67	Excellent

SEMANTIC SCALE

Sensory Evaluation	Mean Value	Descriptive Rating	20%
c.1. Appearance	7.55	Like Very Much	20
c.2. After Taste	7.12	Like Moderately	20
c.3 Bouquet	7.34	Like Moderately	20
c.4. Taste and Texture	7.74	Like Very Much	20
c.5 Overall acceptability	5.55	Like Slightly	20

Based on the result it has 5.55 overall acceptability test of kamoteng kahoy vinegar and statistically interpreted in semantic scaling as Like slightly.

HEDONIC SCALE

Sensory Evaluation	Mean Value	Descriptive Rating	20%
c.1. Appearance	7.65	Like Very Much	20
c.2. Before Taste	7.53	Like Very Much	20
c.3 Bouquet	7.58	Like Very Much	20
c.4. Taste and Texture	7.82	Like Very Much	20
c.5 Overall acceptability	7.64	Like Very Much	20

Based on the result it has 7.64 overall acceptability test of kamoteng kahoy vinegar and statistically interpreted in hedonic scaling as Like very much.

Total Budgetary Requirement: Php. 106.00/ 20 bottles

Ingredients	Quantity	Prices
Sugar	14 cups	54.00
Dry Active Yeast	1 tsp	45.00
Sodium Metabisulphate	1/8 tsp	6.0
Total		106

Conclusion

Cassava has a big contribution in our society it is not only food for snack but also it can be used for making condiments such as vinegar wherein this vinegar will be a big contribution in our industry, cassava can be a vinegar through the process of fermentation. Based on what the researchers find out cassava as vinegar have a good taste and it is safe in mixing on other foods. All throughout the respondents totally accept the cassavas vinegar because this vinegar is not harmful to use but rather it is serve as additional condiments for making foods especially Filipino food or else it can be add spices. This study on DEVELOPMENT AND ACCEPTABILITY OF KAMOTENG KAHUY AS VINEGAR which involved citizens of Brgy. Diamantina as main respondents concludes the following:

1. The treatment composition of vinegar made of kamoteng kahoy conclude the proximate analyses where percentage of the vinegar in the fourth sampling perfectly composed of 17.871% that makes the taste good. In the second sampling used by means of titrability acidity it has statistically treated composed of 4.271 and interpreted as excellent in hedonic scaling.
2. The microbial analysis through the laboratory of LFG DNHS in different pH and vinegar hardness found out that none of the test grow any bacteria hence it was observed that this test must be test in DOST.

RECOMMENDATION

Based on the findings and conclusion the following recommendations are hereby presented:

Cabatuanenses They must continue to plant a cassava because it can help them to put a small business wherein they can use cassava as their product to come up with the vinegar and use it as there condiments to come up with the good taste.

Government They must give their full support in making the kamoteng kahoy as a vinegar and give opportunity to promote the kamoteng kahoy as vinegar and DOST must gave fund.

Young Researcher We must continue to explore new things and try something that was useful in our lives.

Other School They must try to do vinegar that made of kamoteng kahoy

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