



Research Article

“PRODUCT POTENTIALS OF AN IMPROVED SWEET POTATO KETCHUP IN IFUGAO”

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ABSTRACT

This experimental study is focused in the evaluation of the product potentials of sweet potato ketchup in Ifugao. It seeks to determine the acceptability of its appearance, smell/aroma, taste, texture and shelf life span. The experiment consists of eight treatments using four different varieties of sweet potato and two production process to assess the best sweet potato ketchup. Questionnaires were randomly distributed to the evaluators to assess its potentials. Using the mean to evaluate each of the treatments acceptability and marketability the study arrived at these findings. It reveals that the dry white sweet potato has the longest shelf life span and that dried sweet potato has a longer shelf life span than the boiled potato. However, boiled sweet potato has the highest extent of acceptability or the highest overall liking of the sweet potato ketchup treatments. It also reveals that boiled sweet potato obtains the highest marketability rate than dried sweet potato.

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INTRODUCTION

Ifugao is one of the six provinces in the Cordillera Administrative Region (CAR) situated in the North Central Luzon. About 69% of the labour force is involved in agriculture. Most of the municipalities of Ifugao are engaged in gardening and farming as their main source of living. Some of their products include the cultivation, farming and production of root crops such as *Bila*, *Abba*, *Kamote* and other root crops. These mentioned root crops are often eaten plain cooked but rarely prepared into some variations. However because of the increase of daily needs of the families these root crops are being commercialized in the market to augment the daily demand of expenses. Kamote (Sweet potato) or locally known as gattuk. Its scientific name is *Ipomoea batatas*. In the colonial period, this Kamote is introduced in the Philippines as well as in Ifugao by the Spaniards. In history and up to this time, some municipalities in Ifugao have this Kamote as their staple food. It varies into different color, size and shape and it taste sweet. Its colors are white, red pink, violet, yellow, orange and purple. Besides its simple starches, Kamote is rich in carbohydrates, dietary fiber, beta carotene (Vitamin A equivalent nutrient), Vitamin C, and Vitamin B6.

Several studies were conducted to assess a marketability or acceptability of a newly or unique produced products in a certain places. Some are effective and are successfully conducted. A concept test was conducted to assess local awareness of traditional root crops and to study the market potential for value-added products made from taro. The test design was a self-evaluating survey that was used to explore the level of consumption of chips and baked/fried foods and to determine the interest level of foods made from root crops, The most popular type of value-added product was sweet potato chips, followed by sweet potato bread, cassava cake, cassava pudding and cassava tamales. In addition, a survey was administered to 130 persons, 72% had consumed sweet potato within the past three months, while more than 60% had eaten cassava and 55% had eaten taro. Results suggest that there is a market potential for valueaddedfoods made from these tropical root crops.

According to a Journal of Agriculture and Social Research (JASR) VOL. 10, No. 2, 2010, sweet potato roots were used as base for the preparation of confectioneries namely crisps, doughnuts, strips, chin-chin, bread, cakes biscuits, pancake, crunch and muffins. Sweet potato starch was used to produce salad cream and the leaves were used to prepare stew and soup. Traditional foods including abacha, nacho, wrap, morn, balls and fufu were produced from the roots.

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All the products were subjected to sensory evaluation and were acceptable to consumers. The study has revealed the high potential of sweet potato as base food for preparing confectioneries, salad cream and assorted traditional foods. An aggressive exploitation of the crop is recommended to ensure good nutrition for all and national food security. Another study by the Food and Nutrition Research Institute of the Department of Science and Technology (FNRI-DOST) determined the effects of local root crops in lowering cholesterol levels among humans with moderately-raised cholesterol levels. The study showed that eating kamote and cassava significantly decreased the total cholesterol levels of adults. Specifically, cassava was shown to have significantly decreased LDL-cholesterol levels. The study concluded that root crops, due to their dietary fiber content, could have a significant role in the reduction of lipid biomarkers. Due to the nutritious contents of these root crops, it is very much recommended to promote these root crops by producing it into new processed product that will attract and cater the food production industry and other potential consumer of the product. Considering the factors of consumer behavior for food products in Ifugao the improvement of its appearance, aroma, taste and texture and its nutritious content of an improved root crop should be tested to increase the products competitiveness in the market. These improve sweet potato product variables would lead to a greater influence in the improvement of the production process of root crop production in Ifugao. Thus, this study.

Objectives

The study generally aims to determine the Product potentials of an improve sweet potato ketchup product in Ifugao. Specific objective includes the following:

- To determine the most preferred variety of sweet potato used as raw materials for an improve sweet potato ketchup products
- To determine and rank the most preferred type of an improve sweet potato products in eight treatments in terms of its;
 - Appearance
 - Smell/ aroma
 - Taste
 - Texture
 - Shelf life span
- To determine the best production process of the sweet potato ketchup in 8 different mixtures.
- To determine the overall acceptability of the improve sweet potato ketchup product.
- To determine the extent of marketability of an improve sweet potato ketchup product?

METHODOLOGY

Research Method

It is the objective of this study to evaluate and determine the extent of Acceptability, Marketability, and the product potentials of an Improve sweet potato ketchup Products in Ifugao Experimental research design is used in this research since its goal is to determine and evaluate how the products are being produced from the production process until the products is been ready for consumption.

On the other hand, descriptive research was used in this research to analyze the acceptability and marketability of the products. Gay and Sevilla (1998) defined descriptive research as involves the collection of data in order to test a hypothesis or to answer questions concerning the current status of the subject of the study. While, experimental research is an experiment where the researchers manipulates one variable, and control/randomizes the rest of the variables. It has a control group, the subjects have been randomly assigned between the groups, and the researcher only tests one effect at a time. It is also important to know what variable(s) you want to test and measure. It is also described as a collection of research designs which use manipulation and controlled testing to understand causal processes. These methods and designs were used to develop, test and evaluate the acceptability and marketability of an improve sweet potato products.

Research Instruments

The data will be gathered by means of a structured questionnaire patterned from several models and from the intensive reading of the researcher. Interview is used as a secondary instrument, the structured interview to be conducted at random to cross check the data to be gathered through the questionnaire aside from strengthening and amplifying them.

Data Gathering Procedure

To arrive at a specific and systematic flow of the procedure of gathering data and information the researcher will prepare the products in 8 treatments. After the preparation of the products it will be tested and assessed by the respondents for further evaluation of the overall product. The researcher will personally conduct together with his research aide the administration of the instrument to ensure speedy and significant return. In terms of language barrier the respondents will encounter in providing the correct data the researcher will interpret the question in his/her native dialects.

Respondents of the Study

The respondents of the study were 30 food technologist taken randomly from the different restaurants and teachers of food technology courses in Ifugao.

Procedures

Peel the different varieties of sweet potato and slice it into thin pieces. After peeling and slicing the peeled potato will be dried through the heat of the sun while the other test will be boiled for at least 20-30 minutes. For boiled camote, mash the boiled sweet potato before blending. For dried camote, grind and sift the camote flour before blending. Mash/ blend all the ingredients in 4-5 minutes or until fine. Cook the blended ingredients. Fill mixture into sterilized bottles while hot. Half seal bottles then pasteurize for 30 minutes and seal bottles tightly.

The following are the different production mixtures and tests used in the study

- | | |
|----------------------------------|-------------------------------|
| T1 - boiled white camote | T5 - dry white camote |
| T2 - boiled violet camote | T6 - dry violet camote |
| T3 - Red camote | T7 - dry red camote |
| T4 - boiled yellow orange camote | T8 - dry yellow orange camote |

Statistical Treatment

As soon as the adequate data are gathered, the researcher will tabulate, analyze and interpret them. In order for the researcher to give full meaning of the data to be gathered, the following statistical treatments will be used:

In determining the overall acceptability of the improve sweet potato product the four point Likert scale is used in scoring the data. The legend of which is:

Points	Scale	Descriptive Value
4	3.50- 4.00	very acceptable
3	2.50-3.49	Acceptable
2	Acceptable	not acceptable
1	1.00-1.49	not at all

In the evaluation of the products likability, acceptability and its marketability in terms of its appearance, aroma, taste and texture the rating scale is as follows:

6.50 –	7.00 like very much
5.50 –	6.49 like moderately
4.50 –	5.49 like slightly
3.50 –	4.49 Neither like nor dislike
2.50 –	3.49 dislike slightly
1.50 –	2.49 dislike moderately
1.00 –	1.49 dislike very much

- Very high.
- Moderately high level of marketability.
- High level
- Fair.
- Slightly fair possibility
- Poor marketability
- No possibility of the product to be marketed.

Weighted Mean and Ranking. This will be used to treat the data evaluation of the products. The formula is as follows:

$$\text{Formula: } W = \frac{\sum fx}{N}$$

Where:

- W= Weighted Mean
- fx = Weight given to the respondents
- N = total number of respondents

Presentation, Analysis and Interpretation of Data

The following section presents a discussion and interpretation of the data gathered pertinent to the present study.

Appearance

The evaluators would first look into and observe the appearance of the product. The appearance of the ketchup from boiled and dry sweet potato was subjectively dark and heavy dark in color. The flesh color of the sweet potato variety has a great influence in the appearance of the end product. The colored variety were of a dark color and a heavy dark color specifically when made from violet flesh of sweet potato. The ketchup from boiled camote looks sticky while ketchup from dry camote looks watery.

Based on the table below, result shows that regardless of the appearance/color of the sweet potato ketchup the respondents like slightly the product appearance with an average mean of 5.34. The ketchup from treatment 1 (the boiled white sweet potato) obtain a mean of 5.90, treatment 7 (the dry white violet) obtained 5.67 and were rated as moderately like by the evaluators and the rest of the treatments were rated slightly liked. However, treatment 8 (the dried yellow orange) obtain the lowest mean of 4.96 as like slightly. The boiled white sweet potato obtained the highest mean because of its color as pure unlike the other variety of sweet potato the color greatly affects its final appearance to a much darker color.

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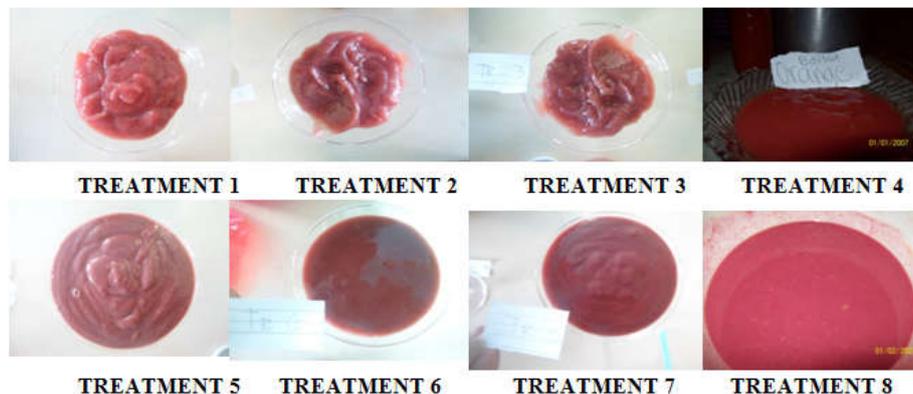


Figure1. Appearance/Color of Produced Camote Ketchup Product

Table 1a. Appearance of Camote Ketchup

TREATMENTS	MEAN	SD	DESCRIPTIVE INTERPRETATION
1 Boiled White Camote	5.90	.960	Like Moderately
2 Boiled Violet Camote	5.17	1.577	Like Slightly
3 Boiled White & Violet Camote	5.13	1.224	Like Slightly
4 Boiled Yellow Orange	5.25	1.236	Like slightly
5 Dry White Camote	5.17	1.367	Like Slightly
6 Dry Violet Camote	5.43	1.612	Like Slightly
7 Dry White & Violet Camote	5.67	1.269	Like Moderately
8 Dry Yellow Orange Camote	4.96	1.241	Like slightly
TOTAL	5.34		Like Slightly

Table 2b.Smell/Aroma of Camote Ketchup

TREATMENTS	MEAN	SD	DESCRIPTIVE INTERPRETATION
1 Boiled White Camote	5.40	1.303	Like Slightly
2 Boiled Violet Camote	5.23	1.470	Like Slightly
3 Boiled White & Violet Camote	5.37	1.295	Like Slightly
4 Boiled Yellow Orange	5.21	1.394	Like slightly
5 Dry White Camote	5.36	1.422	Like Slightly
6 Dry Violet Camote	5.48	1.525	Like Slightly
7 Dry White & Violet Camote	5.67	1.093	Like Moderately
8 Dry Yellow Orange	5.39	1.087	Like Slightly
TOTAL	5.39		Like Slightly

Table 3c.Taste of Camote Ketchup

TREATMENTS	MEAN	SD	DESCRIPTIVE INTERPRETATION
1 Boiled White Camote	5.60	1.354	Like Moderately
2 Boiled Violet Camote	5.23	1.547	Like Slightly
3 Boiled White & Violet Camote	5.53	1.155	Like moderately
4 Boiled Yellow Orange	5.35	1.246	Like slightly
5 Dry White Camote	5.47	1.634	Like Slightly
6 Dry Violet Camote	5.37	1.974	Like Slightly
7 Dry White & Violet Camote	5.40	1.664	Like slightly
8 Dry Yellow Orange	5.29	1.259	Like Slightly
TOTAL	5.41		Like Slightly

Table 4d.Texture of Camote Ketchup

TREATMENTS	MEAN	SD	DESCRIPTIVE INTERPRETATION
1 Boiled White Camote	5.77	1.478	Like Moderately
2 Boiled Violet Camote	5.37	1.769	Like Slightly
3 Boiled White & Violet Camote	5.47	1.532	Like Slightly
4 Boiled Yellow Orange	5.39	1.234	Like Slightly
5 Dry White Camote	5.17	1.440	Like Slightly
6 Dry Violet Camote	5.20	1.810	Like Slightly
7 Dry White & Violet Camote	5.33	1.676	Like Slightly
8 Dry yellow orange	4.78	1.425	Like slightly
TOTAL	5.31		Like Slightly

Table 5e. Shelf life span of Camote Ketchup

TREATMENTS	Shelf life span/ no. of days
1 Boiled White Camote	13
2 Boiled Violet Camote	14
3 Boiled White & Violet Camote	8
4 Boiled Yellow Orange	10
5 Dry White Camote	26
6 Dry Violet Camote	21
7 Dry White & Violet Camote	23
8 Dry yellow orange	18

Table 5. Extent of Acceptability of Camote Ketchup

TREATMENTS	MEAN	SD	DESCRIPTIVE INTERPRETATION
1 Boiled White Camote	3.57	.898	to a great extent
2 Boiled Violet Camote	3.13	.776	to a moderate extent
3 Boiled White & Violet Camote	3.20	.761	to a moderate extent
4 Boiled yellow orange	3.04	.814	to a moderate extent
5 Dry White Camote	2.80	.805	to a moderate extent
6 Dry Violet Camote	3.23	.858	to a moderate extent
7 Dry White & Violet Camote	3.47	.855	to a moderate extent
8 dry yellow orange	2.85	.841	to a moderate extent
TOTAL	3.16		Like Slightly

Table 7. Perceived Marketability of the Product

TREATMENTS	MEAN	SD	DESCRIPTIVE INTERPRETATION
1 Boiled White Camote	5.83	1.262	Moderately High level
2 Boiled Violet Camote	5.23	1.431	High Level
3 Boiled White & Violet Camote	5.40	1.221	High Level
4. Boiled yellow orange Camote	5.45	1.273	High Level
5 Dry White Camote	5.00	1.365	High Level
6 Dry violet camote	5.36	1.458	High Level
7 Dry White & Violet Camote	5.47	1.655	High Level
8 Dry yellow orange camote	5.29	1.223	High Level
TOTAL	5.38		High Level

However, treatment 8 (the dried yellow orange) obtain the lowest mean of 4.96 as like slightly. The boiled white sweet potato obtained the highest mean because of its color as pure unlike the other variety of sweet potato the color greatly affects its final appearance to a much darker color.

Smell/Aroma

The data reveals that the smell/aroma of the finished product from treatment 1 to 6 and 8 are slightly liked while treatment 7 (dry white and violet sweet potato) obtains the highest mean with 5.67. Treatment 4 (boiled yellow orange) obtained the lowest mean of 5.21 as like slightly. This table also reflects that dried sweet potato are much closely related in terms of odor than boiled because dried sweet potato have long shelf life span while boiled sweet potato were being affected by the water additives during the boiling stage that affects its aroma. However, the overall total mean of 5.39-slightly like which means that the smell of the sweet potato ketchup products is liked slightly by the respondents.

Taste

The data reveals how the evaluators assess the taste of the sweet potato ketchup. It shows that treatment (1 boiled white sweet potato) and treatment 3 (boiled white violet) obtains 5.60 and 5.53 respectively with a description of like moderately. Taste is the flavor of the product as it is taken in. The results show that regardless of the taste, each treatment obtains an overall mean of 5.41 which means like slightly. As commented by the evaluators, the taste is good especially the boiled one but it tastes spicy. This is because of the spices and ingredients that serve as an additive on the product to prolong its shelf life span.

It further concludes that boiled sweet potato has the most acceptable taste especially treatment 1 (boiled white sweet potato) than dried potato. This means that during the sift stage some parts of the dried potato are still hard that it cannot be blended and be mixed during the cooking stage while the boiled potato is easier and soft to mash. However, all the treatment came very close to the flavor of control.

Texture

One of the characteristics of ketchup is based on its texture. This will serve as one of the basis of the evaluator to assess the quality of the product. To assess the texture, the evaluator will be allowed to drip each of the mixtures in order to assess the products texture whether it's sticky or watery or just right. Ketchup from boiled camote is sticky while the ketchup from dry camote is easy to drip but not as that as watery. Based on the observation, the ketchup from boiled camote, when it stocks longer in its bottle after a month, it became somewhat gelatin while ketchup from dry sweet potato remains the same. However, the finding of the study shows that treatment 1 (boiled white sweet potato) obtained the highest mean of 5.77 as like moderately. Treatment 8 (dry yellow orange) obtain the lowest mean in terms of texture with 4.78 as like slightly by the evaluators. It also reveals that the boiled sweet potato treatments obtain higher mean than the dry sweet potato. It further concludes that boiled sweet potato especially the white variety obtains the best quality in terms of texture than the rest of the treatments.

Shelf life Span

The table shows the shelf life span of the sweet potato ketchup. Qualitative analysis is used in assessing since its objective is to

analyze how long each of the treatments maintains its appearance, taste, texture and smell/aroma in days. The treatments were being checked daily to validate whether each of the treatments varies from its first appearance, taste, texture and smell/ aroma. It reveals that the dry white sweet potato has the longest shelf life span that can stay for more than 26 days followed by the dry white violet sweet potato with 23 days. However the boiled white and violet sweet potato obtains the shortest shelf life span with only 8 days.

The odor of the boiled sweet potato treatments varies in a shorter shelf life span because it was soaked and boiled with water and the sweet potato absorbs the water that will soften the sweet potato. It is also revealed that the longer the time of the boiled sweet potato treatments the stickier it become while the dried potato maintains its structure. It further concludes that dried sweet potato has a longer shelf life span than the boiled potato.

Acceptability and Marketability of Camote Ketchup

Acceptability /Overall liking of the Product

The table shows extent of acceptability or the overall liking of the sweet potato ketchup. The data reveals that among the 8 treatments using different variety of sweet potato treatment 1 (boiled sweet potato) obtained the highest rank with a mean of 3.57 which means that the product is acceptable to a great extent followed by treatment 7 (the dry white violet) with 3.47 mean and is described to a moderate extent. Treatment 5 (dry white sweet potato) and 8 (dry yellow orange) obtained the lowest acceptability with a mean of 2.80 and 2.85 respectively, however it is still described as moderately acceptable by the evaluators. One of the reasons why this treatment obtains the lowest score because of its appearance as yellowish and dark in color.

Marketability of the Product

The marketability of the sweet potato product is the extent to which the sweet potato ketchup is perceived to be marketed. Consumers have different tastes, behavior and perspective in buying food products. One of the factors that will entice customers to buy food products is its nutrition content. The sweet potato contains the following vitamin content carbohydrates, dietary fiber, beta carotene (Vitamin A equivalent nutrient), Vitamin C, and Vitamin B₆.

The data below shows that treatment 1 (boiled white camote) has the highest marketability with 5.83 mean as moderately high followed by treatment 1 (dry white violet sweet potato) with 5.47 mean. The dry white and violet sweet potato has a moderate combination that provides a natural ketchup color. The dry white sweet potato obtained the lowest mean with 5.00. It further concludes that boiled sweet potato regardless of its variety has a high marketing potentials than dry sweet potato ketchup, this includes the overall assessment of its taste, appearance, texture and smell/ aroma.

Summary, Conclusion and Recommendation

This chapter provides the conclusive statements and appropriate recommendations made by the researcher which is purely based from the findings of the study.

Summary findings and conclusion

- The appearance of the ketchup concludes that the colored variety of sweet potato were of a dark color specifically when made from violet flesh of sweet potato. The ketchup from boiled potato looks sticky while ketchup from dry sweet potato looks watery. The boiled white sweet potato obtained the highest acceptability rating in terms of its appearance because of its color as pure unlike the other variety of sweet potato the color greatly affects its final appearance to a much darker color.
- The dry white and violet sweet potato obtains the highest acceptability in terms of odor while the boiled yellow orange has the lowest acceptability. It also concludes that dried sweet potato are much closely related in terms of odor than boiled because dried sweet potato have long shelf life span while boiled sweet potato were being affected by the water additives during the boiling stage that affects its aroma.
- The findings shows that boiled sweet potato has the most acceptable taste especially treatment 1 (the boiled white sweet potato) than dried potato.
- The result of the study shows that treatment 1 (boiled white sweet potato) obtained the highest acceptability rating. It also reveals that sweet potato ketchup from boiled sweet potato is sticky while the ketchup from dry sweet potato is easy to drip but not as that as watery. It further concludes that boiled sweet potato especially the white variety obtains the best quality in terms of texture than the rest of the treatments.
- It reveals that the dry white sweet potato has the longest shelf life span. It further concludes that dried sweet potato has a longer shelf life span than the boiled potato.
- The finding reveals that the extent of acceptability or the overall liking of the sweet potato ketchup, among the 8 treatments using different variety of sweet potato treatment 1 (boiled sweet potato) obtained the highest rank while treatment 8 (the dry yellow orange) obtained the lowest acceptability.
- The extent to which the sweet potato ketchup is marketable concludes that boiled sweet potato regardless of its variety has a high marketing potentials than dried sweet potato.

Recommendation

In the light of the findings arrived the recommendations are as follows:

- A well designed package and label should be develop in order to sustain a high marketing potentials in terms of its promotions and advertising campaigns.
- A well design marketing strategy on how to market the product that will allow entrepreneurs to be benefited in the selling and production of root crop pan cake products.
- In order to provide healthy and safe products, proper machineries, facilities or equipment that will facilitate the production process shall be utilized.
- An in debt feasibility study or marketing research should be done and be incorporated to identify the marketing needs and demand of consumers in line with the product.
- The researcher recommends that a more in debt experiment will be done to extend its shelf life span.

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