SCIENTIFIC CULTURE
www.sci-cult.com

SCIENTIFIC CULTURE, Vol. 12, No. 4, (2026), pp. 5404-5413
Open Access. Online & Print

DOI: 10.5281/zenodo.20458453

DEVELOPMENT OF CALAMANSI BATH SOAPS ENHANCED WITH TOMATO, CUCUMBER AND ALOE VERA EXTRACT

Lorna C. Ildefonso, DPA

Ifugao State University, Lamut, Ifugao Philippines

Received: 11/12/2025
Accepted: 22/02/2026

Corresponding author: Lorna C. Ildefonso, DPA
(anrol_ildefonso@yahoo.com)

ABSTRACT

Crops can never be shelved in, when it comes to product development. This study aimed to develop calamansi bath soaps enhanced with tomato, cucumber and aloe vera extract. Specifically, identified the suitable formulation of calamansi bath soaps enhanced with tomato, cucumber and aloe vera extracts; assessed the microbial activity of the enhanced calamansi bath soap; evaluated the acceptability of the physical attributes and perceived skin effects of the developed and enhanced calamansi soaps; and compared the profitability of producing different enhanced calamansi bath soaps. The process of making bath soap comprises the following steps: preparation of water with salt and caustic soda; calamansi, tomato, cucumber extracts and aloe vera gel, palm oil, fresh milk, honey and mixing these ingredients to produce a thick solution, pouring the solution into the molder, cooling and solidifying the solution at a room temperature, curing, and packaging the finished product. The developed and enhanced CALAMATIS (Calamansi & Tomato), CALAPINO (Calamansi & Cucumber) and CALAVERA (Calamansi & Aloe vera) samples were brought to the DOST- Tuguegarao City for microbial analysis. After which, it was subjected to evaluation of acceptability on the physical attributes and perceived skin effects. Laboratory tests results revealed that Calamatis and Calavera soaps have active inhibition to fight *Staphylococcus aureus* bacteria while Calapino is partially active. Likewise, the enhanced calamansi bath soaps were found to have a Very High Acceptability in its overall physical attributes –texture, color, odor, hardness and size. It was also found out that Calamatis, Calapino and Calavera were rated much effective on the different skin effects as to non-experience of skin irritation, skin glowing, skin whitening, skin moisturizing and anti-pimple. Enhanced calamansi bath soaps act also as moisturizer, stain remover and minimize perspiration. Therefore, the developed calamansi-based bath soaps have competitive advantage to the high-priced commercialized bath soaps with anti-bacterial, anti-irritation, skin moisturizing skin benefits. It is then recommended, that pilot testing to wider consumer groups, to further test the market potentials should be done before commercialization.

KEYWORDS: Mixture, calamatis, calapino, calavera, Staphylococcus aureus

1. INTRODUCTION

1.1. Rationale

Bath soaps are indispensable household needs. Bath soaps are being used daily by consumers which could be in the form of bar or liquid. Through the ages, soap has been used to cleanse and to cure skin problems. At present, it is an observation that all bath soaps available in the merchandise are promising skin benefits and mainly made from fruits and vegetables.

Fruits and vegetables contain vitamins and antioxidant nutrients which enhance beauty by rejuvenating, moisturizing, lightening and glowing human skin. It also heals wounds and soothes skin. These benefits of fruits and vegetables was taken advantage through introducing enhanced calamansi soaps with the entrance of the suitable formulation following the process of developing bath soaps utilizing the locally grown, oversupplied; low graded and ignored plants in the municipality – the calamansi, tomato, cucumber and aloe vera. The power and benefits of these plants for the skin were combined to produce affordable and less expensive bath soaps.

1.2. State of the Art

Formulation and process of bath soaps utilizing the locally grown agricultural products – Calamansi, Tomato, Cucumber and Aloe Vera.

1.3. Analysis of the Problem

The municipality of Alfonso Lista is one of the eleven municipalities of Ifugao gifted with fertile soil. Variety of plants were grown and variety of commodities were harvested and most of it according to the Municipal Agriculture Office (MAO) agricultural profile (MAO, 2016) are rice, corn, cassava, banana, dragon fruits, vegetables and fruits. Among these commodities, it was an observation, fruits are actually not given high importance as far as marketing is concern. Bigger part of the fruits harvested is for household consumption such as calamansi. MAO (2016) reported that an average of three trees of calamansi planted per household. In which if harvest time comes, households sell calamansi, but if a surplus of which comes where price decreases, they usually ignore calamansi in their backyard, and they are wasted. With this situation, the researcher took the potentials of the calamansi fruit in developing a product which is used daily by the household – a bath soap! However, calamansi bath soaps flooded the merchandise, but if it is enhanced with other fruits and vegetables extracts, it is now the birth of new product, with a potential outcome of enterprise development and or developing livelihood alternative.

2. CONCEPTUAL FRAMEWORK

Bath soaps are indispensable household need. Soap product promotions flood the media promising different skin effects. Unknown to the soap users, various chemicals are actually utilized in the production of those soaps. This situation is one of the encouragements to introduce soap alternatives coming from the gifts of nature- the plants. The potentials in the usage of the gifts of nature are really a great help in producing a bath soap that has similar benefit to the chemically-based ones.

The abundance of calamansi in the municipality of Alfonso Lista, Ifugao especially in its peak season, prompted the researcher to study and developed calamansi bath soaps. The availability and guaranteed literature about the use of fruits, vegetables and herbs such as cucumber, tomato and aloe vera in protecting skin, were also considered to enhance the calamansi soap.

Tomato is one of the popular vegetable fruits produced by farmers in Alfonso Lista, Ifugao. However, it is a fact that when a surplus of tomatoes, market prices tends to drop down and only with good quality was bought. The wasted and overripe tomatoes were actually thrown to the garbage - a depressing incident to the farmers; the same with the cucumber. Low graded and poor quality cucumber as to appearance were actually not displayed for sell, rather the fruits were dumped for free.

Aloe vera to speak, is one of the ignored herbs nowadays. Households actually make use of them as ornamental plant. Youths and children are not actually familiar with this kind of plant and its benefit to the skin and scalp once the gel is applied.

To take advantage on the abundance and utilization of the low graded and unsold agricultural products and to give importance to the ignored and beneficial herb that the municipality has, the researcher developed and enhanced calamansi bath soaps.

3. OBJECTIVES

Generally the research was conducted to develop calamansi bath soaps enhanced with tomato, cucumber and aloe vera extracts.

Specifically the researcher:

a) identified the suitable formulation of calamansi bath soaps enhanced with tomato, cucumber and aloe vera extracts;
b) evaluated the acceptability of the physical attributes and perceived skin effects of the developed and enhanced calamansi soap;

c) assessed the microbial activity of the enhanced calamansi bath soap; and
d) compared the profitability of producing different enhanced calamansi bath soaps.

4. MATERIALS AND METHODS

4.1. Methods of Research Used

The research was experimental in nature. There were a total of one hundred twenty (120) volunteer-respondents. Forty volunteer-respondents per product- Calamatis (calamansi & tomato); Calapino (calamansi and cucumber); and Calavera (calamansi and aloe vera). The forty volunteer-respondents were grouped according to age. The five (5) groupings as suggested by the evaluators during Agency In-house Review were as follows: thirteen to nineteen (13-19); twenty to twenty seven (20-27); twenty eight to thirty five (28-35); thirty six to forty three (36-43) and above forty four (44) years old.

From the pool of volunteers they reacted on the acceptability as to the physical attributes: texture, color, odor, hardness and size; and effectiveness on the perceived skin effects as to: to skin irritation (non-experience), skin glowing, skin whitening, skin moisturizing and anti-pimple. These skin effects / reactions were recorded in a score card per week in the span of two months. The research aide visited the residence of the volunteer-respondents to gather data and comments.

4.2. Experimental Design:

4.2.1. Preparation of supplies and materials

The basic soap ingredients - milk, honey, soda, salt, water, palm oil, calamansi, tomato, cucumber, aloe vera; and kitchen utensils/kitchen equipment - molder, mixing bowl, weighing scale and stirring rod used were prepared and set at the hot and cold laboratory of the Ifugao State University- Potia Campus. Calamansi, tomatoes, cucumber and aloe vera were washed with clean running water. Calamansi were sliced ready for extraction. Seeds disregarded. For cucumber and tomato, they were sliced into smaller pieces and blended and juice was extracted using a piece of clean cheese cloth while for aloe vera, the aloe gel was removed, blended and extracted.

4.2.2. Enhanced Calamansi Bath Soap Product Formulation

4.2.2.1. Bath Soap Formulation

Measured quantity of extracts and the other ingredients were utilized for the four trials.

Table 1: Enhanced Calamansi Bath Soaps Trial Formulations

Raw Materials	Trial 1	Trial 2	Trial 3	Trial 4
Water	3 liters	3 liters	3 liters	3 liters
Caustic Soda Flakes	1 kilo	1 kilo	1 kilo	1 kilo
Calamansi Extracts	4 ounces	4 ounces	3 ounces	3 ounces
Other fruit Extracts	1 ounce	2 ounces	1 ounce	2 ounces
Salt	20 grams	20 grams	20 grams	20 grams
Honey	1 ounce	1 ounce	1 ounce	1 ounce
Milk	4 ounces	4 ounces	4 ounces	4 ounces
Palm Oil	4 liter	4 liters	4 liters	4 liters

4.2.2.2 Procedure and Product Development

1. Dissolve salt and caustic soda flakes in three liters of water by continuously stirring until completely dissolved and cooled;
2. Add calamansi and tomato/cucumber/aloe-vera gel extract separately and continue stirring the solution for 20 minutes;
3. Add the 4 ounces of milk, 1 ounce of honey and oil and mix in a single direction for 45 minutes;
4. Pour the solution into the molders; and leave to cool and harden for 24 hours. This is now the cooling and solidifying stage;
5. After which, remove the soap from the molder and age the soap for 4 weeks or 28 days. The process will remove the irritation effects of caustic soda;
6. Finally, the soaps were packed for laboratory testing, distribution and evaluation.

Table 2: Enhanced Calamansi Bath Soaps Composition

Products (P)	Extracts Composition
P1 – Calamatis Soap	Calamansi and Tomato
P2 – Calapino Soap	Calamansi and Cucumber
P3 – Calavera Soap	Calamansi and Aloe Vera

4.3. Representative Soap samples were brought to DOST- Tuguegarao City for antibacterial analysis.

4.4. Test and Evaluation

1. **Sensory evaluation** – The formulated bath soap were evaluated by the pool of volunteers as to level of acceptability on physical attributes and effectiveness to skin effects .Below is the rating

scale used by the volunteer respondents.

Table 3: Rating Scale for physical attributes and skin effects

Point Value	Range	Descriptive Rating	
		Physical Attributes	Skin Effects
5	4.21-5.00	Very Highly Acceptable	Very Much Effective
4	3.41- 4.20	Highly Acceptable	Much Effective
3	2.61 – 3.40	Acceptable	Effective
2	1.80 – 2.60	Moderately Acceptable	Less effective
1	1-1.79	Not Acceptable	Not Effective

2. **Sampling tools and technique.** The 120 volunteer-respondents to evaluate the developed and enhanced calamansi bath soaps came from the IFSU faculty, staff, students and community members of Barangay Potia & Barangay Sta. Maria. Eight for every group to test the each product (Calamatis, Calapino & Calavera). The age groupings were as follows: thirteen to nineteen (13-19); twenty to twenty seven (20-27); twenty eight to thirty five (28-35); thirty six to forty three (36-43) and forty four (44) and above years old. The evaluations and comments were recorded into designed score card. Visitations were done weekly (Monday morning) to record the skin effects and it was done in two months. It was suggested that the soap will be used at least twice a day to arrive fair and just evaluation.

The quality attributes or criteria for evaluation were:

4.4.1. Physical Attributes

1. Texture
2. Color
3. Odor
4. Hardness
5. Size

4.4.2. Skin Effects

1. Skin Irritation (non-experience)
2. Skin Glowing
3. Skin Whitening
4. Skin Moisturizing
5. Anti-pimple Benefit

4.5. Data Gathering Procedure

In response to research ethics, the following were humbly followed:

1. The researcher prepared a letter addressed to the Campus Director and Barangay Captains to seek permission for the conduct of the study as well as to float the evaluation / score sheet particularly designed for the study.
2. Upon approval, the Research Aide (RA) personally distributed the soaps accordingly. The RA systematically grouped them and visited them for skin effects weekly regarding to the experiences / feedbacks of the volunteers. Results were all recorded in the score sheets.
3. From the accomplished score sheets, the scores were tallied, classified, organized and presented in a tabular form to facilitate an in-depth analysis and interpretation of data.

4.6. Treatment of Data

The data gathered were treated with use of the following statistical tools:

1. Simple frequency and mean were used for the physical evaluation and skin effects
2. Laboratory test for microbial analysis
3. Cost and return analysis for profitability

5. RESULTS AND DISCUSSION

5.1. Part I – Physical Attributes Evaluation of Enhanced Calamansi Bath Soaps

As shown in table 4, Hardness has the highest weighted mean of 4.73 described as Very Highly Acceptable. Among the physical attributes, Odor garnered the lowest evaluation with 3.77 mean with a description of Highly Acceptable. But generally, results indicated that the developed and enhanced calamansi bath soaps as far as the physical attributes are concerned, the soaps were Very Highly Acceptable. The evaluation on the five physical attributes - texture, color, odor, hardness and size of the developed and enhanced calamansi bath soaps considering the local materials used are indicative that the soap is acceptable.

Table 4: Mean distribution on physical attributes of Calamansi and Enhanced Calamansi Bath Soaps

Soap	Texture	Color	Odor	Hardness	Size
P0 (Calamansi)	4.50	4.90	5.00	4.89	4.50
Enhanced Soaps	**Texture**	**Color**	**Odor**	**Hardness**	**Size**
P1(Calamatis)	4.30	4.35	3.90	4.70	4.80
P2 (Calapino)	4.20	4.20	3.50	4.80	4.65
P3 (Calavera)	4.70	4.50	3.90	4.70	4.80
Mean	4.40	4.35	3.77	4.73	4.75

	Very Highly Acceptable	Very Highly Acceptable	Highly Acceptable	Very Highly Acceptable	Very Highly Acceptable

5.2. Part II. Skin Effects Evaluation of Calamansi-based bath soaps

As gleaned in Table 5, Calamatis soap is generally Much Effective on the perceived skin effects where non-experience of skin irritation gained the highest mean of 4.67 for trial 1 and 4.66 for trial 2 and skin whitening with the lowest mean of 3.34 and 2.75. It means that Calamatis soap dominantly carries its vegetable fruit natural potentials / characteristics where no painful reactions will be experienced unto the skin. Between ages, 20-27 years old had the highest mean computed as 4.08.

Also, based from the collective responses from the volunteer-respondents (VolRes) relative to other skin effects observed were the following:

VolRes P1A commented that the soap can remove stains, as stated *"Makaikkat ti mantsa"*. It means that the Calamatis soap has an active ingredient in removing stains which indicates, that the soap too has potential to whiten clothes.

VolRes P1B observed that the Calamatis soap could make the cheeks rosy as stated by the volunteer respondent *"Rosy Cheeks"*. It means that the Calamatis soap could make the cheeks as red as the roses. The lycopene nutrient of tomato is still active in the development of enhanced calamansi bath soap as it reduces free radicals and dirt in the face.

VolRes P1C also commented that the Calamatis soap could dry wounds as stated *"Nadlaw ko nga nagmaga diay sugat diay anakko"(I noticed that it dries my son's wounds).* This comment was supported also by VolRes P1D where reduction of oiliness in face including blackheads and white heads were observed. This means that the antioxidant content of fruits and vegetables is preserved in the Calamatis soap. Another comment from VolRes P1E which shows interest in the production of Calamatis soap as stated in the comment box *"Surwan da kami nga agaramid ta adu kalamansi mi. Isu pay nga gatangen".* This statement is a challenge to share the technology on the formulation and process of calamatis soap. The interest of the community to learn the technology carries the entrepreneurial spirit which dictates that they wish to engage in production and soon to commercialization.

Table 5: Mean distribution of Calamatis on perceived skin effects

TRIAL 1						
PERCEIVED SKIN EFFECTS	**13-19**	**20-27**	**28-35**	**36-43**	**44 and above**	**Mean**
Skin Irritation (non-experience)	4.13	5.00	4.63	4.97	4.63	4.67
Skin Glowing	3.69	3.09	3.63	3.31	3.72	3.49
Skin Whitening	3.53	2.81	2.95	4.00	3.41	3.34
Skin Moisturizing	4.34	4.31	4.48	3.97	4.34	4.29
Anti-pimple	3.81	4.25	4.60	3.97	4.31	4.19
Mean	3.90	3.89	4.06	4.04	4.08	4.00
TRIAL 2						
PERCEIVED SKIN EFFECTS	**13-19**	**20-27**	**28-35**	**36-43**	**44 and above**	**Mean**
Skin Irritation (Non- experience)	4.92	4.93	4.38	4.13	4.96	4.66
Skin Glowing	3.67	4.05	2.97	2.43	3.42	3.31
Skin Whitening	3.13	3.45	2.75	2.08	2.32	2.75
Skin Moisturizing	4.67	4.70	4.41	4.00	3.96	4.35
Anti-pimple	4.68	4.28	3.91	2.50	3.92	2.86
Mean	4.21	4.28	3.68	3.03	3.71	3.59
Weighted Mean	4.06	4.08	3.87	3.54	3.90	3.80
Descriptive Rating	**Much Effective**	**Much Effective**	**Much Effective**	**Much Effective**	**Much Effective**	**Much Effective**

Table 6 mirrors the mean distribution on perceived skin effects of Calapino bath soap. It was recorded that for Trials 1 and 2, skin irritations was not experienced with the highest mean of 4.75 and 4.88 and a description of Very Much Effective. The perceived skin whitening effect has the lowest mean of 3.09 and 3.02 described as Effective. It means that the skin lightening benefit of cucumber was not achieved and will not experience once it is mixed with calamansi under the proportion of 60/40.

Likewise, aged 36-43 years old evaluated Calapino Very Much Effective in all perceived skin effects. Busy people belongs to this age bracket, thus the market of Calapino are the busy and active people. For the age bracket of 13-19, 20-27, 28-35 and 44 years old above, they evaluated the Calapino soap Much Effective to all perceived skin effects

On the other hand volunteer respondents (VolRes) experienced the following effects of Calapino bath soap:

VolRes P2A observed the potential of Calapino to remove stains as stated *"Stain remover".* The same with the developed Calamatis soap, the Calapino has an active ingredient in removing stains which indicates, that the soap too has potential to whiten clothes. Another observation from VolRes P2B was, the Calapino has a cooling effect and it could reduce perspiration as stated by the VolRes P2B *"Nalammiis ti rikna. Madi ak unay nga naglingling-it".* This observation reflects the cool natural property of cucumber that could still experience even mixed with calamansi extract. VolRes P2C observed that when the calapino soap was used, skin benefit expectations were not achieved. The pimples came out and the soap is not foamy as expected. The statement *"Parang dumami ang pimples ko at hindi sya mabula"* from VolRes P2C was taken positively and it was noted that based from the anti-bacterial laboratory test, the Calapino soap is partially active to fight bacteria that causes skin infections such as blisters, abscesses, redness and swelling. The occurrence of the bacteria can be minimized if users regularly use the soap. The foaming problem to the soap is controllable; a certain chemical once poured to the mixture could improve the foaming problem. The developed Calapino soap is dependent only to its natural foaming property. The observation of VolRes P2C was opposite from the observation of VolRes P2D *"Nawala yong baho ng paa ko."* It means that Calapino soap could eradicate bad body odors. VolRes P2D cited also in the suggestion box the interest in buying the product since it is affordable as stated *"Kayat ko gumatang ta nalaka".*This statement is a sign that prospective buyers of Calapino in the municipality exist.

Table 6: Mean distribution on skin effects of CALAPINO

TRIAL 1						
PERCEIVED SKIN EFFECTS	**13-19**	**20-27**	**28-35**	**36-43**	**44 and above**	**Mean**
Skin Irritation(non-experience)	5	4.53	4.32	5	4.88	4.75
Skin Glowing	3.41	3.97	2.96	4.09	2.56	3.40
Skin Whitening	3.50	3.22	2.84	3.44	2.47	3.09
Skin Moisturizing	3.81	4.56	4	4.56	3.81	4.15
Anti-pimple	3.91	3.84	3.20	4.44	3.69	3.82
Mean	**3.93**	**4.02**	**3.46**	**4.31**	**3.48**	**3.84**
TRIAL 2						
PERCEIVED SKIN EFFECTS	**13-19**	**20-27**	**28-35**	**36-43**	**44 and above**	**Mean**
Skin Irritation (non-experience)	4.88	4.98	4.85	4.83	4.88	4.88
Skin Glowing	3.19	3.83	3.18	3.79	3.97	3.59
Skin Whitening	2.44	3.50	2.53	2.96	3.66	3.02
Skin Moisturizing	4.72	4.58	4.48	4.79	4.69	4.65
Anti-pimple	3.75	4.13	3.85	4.64	4.53	4.18
Mean	**3.80**	**4.20**	**3.78**	**4.20**	**4.34**	**4.06**
Weighted Mean	**3.86**	**4.11**	**3.62**	**4.26**	**3.91**	**3.96**
Descriptive Rating	**Much Effective**	**Much Effective**	**Much Effective**	**Very Much effective**	**Much Effective**	

As gleaned in table 7, mean distribution for Calavera soap for trials 1 and 2 generally evaluated as Much effective description in all age brackets. As to skin effects, non-experience of skin irritation and skin moisturizing wade a remarkable effect compared to other perceived skin effects while skin whitening got the lowest rating of 2.97 and 2.57 for the two trials. It indicates that the moisturizing skin benefit or property of aloe-vera retained even mixed with calamansi extracts, while the bleaching or whitening property of calamansi was not observed.

On the other hand volunteer respondents (VolRes) mentioned other comments to Calavera soap. And based from the shared comments VolRes P3A cited the fear in using the Calavera because of the promoted hair-growing property of the aloe vera as stated "*Natatakot akong gumamit sa legs ko baka lalong dadami ang buhok"* which differs to the observation of VolRes P3B of *"Para akong naka apply ng lotion".* The observation of VolRes P3B reflects that aloe vera moisturizes the skin, that even minimal or no application of body lotion, the skin still feels soft as attested to the comment of VolRes P3C *"Even naka aircon ako sa office, hindi ko nafeel ang dryness in my skin".*The observation of VolRes P3D was on the antibacterial effect as commented *"Naawan diay BO ko",* which was confirmed in the laboratory test result of the soap, that calavera soap is active to fight bacteria, also product orientation should be promoted especially in the calavera soap it is because

from the comment of VolRes P3E *"Pwede palang sabon ito, kala ko pangshampoo lang".*The curiosity of the public could be a sign, that once the Calavera soap will be promoted and available in the market, people will be surprised and surely try the product.

Table 7: Mean distribution on skin effects of CALAVERA

TRIAL 1						
PERCEIVED SKIN EFFECTS	13-19	20-27	28-35	36-43	44 and above	Mean
Skin Irritation (non-experience)	4.95	4.94	4.50	4.66	5.00	4.81
Skin Glowing	3.05	3.13	3.69	3.41	3.13	3.28
Skin Whitening	2.73	2.88	3.38	2.91	2.94	2.97
Skin Moisturizing	4.15	4.13	4.34	4.59	4.25	4.29
Anti-pimple	4.25	3.66	3.66	4.44	4.16	4.03
Mean	**3.83**	**3.75**	**3.91**	**4.00**	**3.90**	**3.88**
TRIAL 2						
PERCEIVED SKIN EFFECTS	13-19	20-27	28-35	36-43	44 and above	Mean
Skin Irritation (non-experience)	4.81	4.90	4.97	4.56	4.88	4.82
Skin Glowing	3.50	3.25	2.81	3.63	3.13	3.26
Skin Whitening	2.31	2.73	2.44	3.00	2.38	2.57
Skin Moisturizing	4.58	4.29	4.22	4.71	4.59	4.48
Anti-pimple	4.09	4.04	3.78	4.04	4.63	4.12
Mean	**3.86**	**3.84**	**3.64**	**3.99**	**3.92**	**3.85**
Weighted Mean	**3.84**	**3.80**	**3.78**	**4.00**	**3.91**	**3.87**
Descriptive Rating	**Much Effective**	**Much Effective**	**Much Effective**	**Much Effective**	**Much Effective**	**Much Effective**

5.3. Part III. Antibacterial Analysis

Laboratory tests results revealed that Calamatis and Calavera soaps have active inhibition to fight *Staphylococcus aureus* bacteria while Cala-pino is partially active. The table below was extracted from the laboratory test results document released by DOST-Tuguegarao City.

Table 8: Antibacterial Analysis of Enhanced Calamansi Bath Soaps

Sample Code	Sample Description	Zone of Inhibition (mm)	
		Staphylococcus aureus	*Candida albicans*
MIC-0976	Cala-Vera Soap	14	6
MIC-0977	Cala-Pino Soap	13	6
MIC-0978	Cala-Matis Soap	17	6
Negative Control		6	6

5.4. Part IV. Sales and Expense Summary

Based from the actual cost spent and actual sales in its first entrance in the market and promoted during the IFSU Foundation Day 2018, it was computed that in one cycle of production spending P1,051 to produce 55 calamatis soap and selling at P35.00 per bar, could earn P874.00. But for, Calapino with a total expense of P1046.00 and selling the produce at P35.00 each could earn P704.00, the same with Calavera. It means that, production of calamansi-based bath soap is profitable. It is also a reminder that marketing strategies be applied during commercialization stage as we consider the opportunities and threats in the market especially competition.

Table 9: Summary of Expenses, Sales and Net Income

Cost	P1 (Calamatis)	P2 (Calapino)	P3(Calavera)
Main Ingredients(P1- Calamansi & Tomato; P2 – Calamansi & Cucumbe;r P3 – Calamansi & Aloe Vera)	Php 65.00	PhP 60.00	PhP 60.00
Raw Materials (salt,milk,oil,honey,soda)	396	396	396
Supplies (bond paper, printing, cellophane, tape, cheese cloth)	70	70	70
Rent Expense (molder)	100	100	100
Repair & Maintenance Expense	20	20	20
Labor	400	400	400
Total Expenses	**PhP 1051.00**	**PhP 1046.00**	**PhP 1046.00**
Production	**55 bars**	**50 bars**	**50 bars**
Selling Price	Php 35.00	Php 35.00	Php 35.00
Total Sales	**Php 1925.00**	**Php 1750.00**	**Php 1750.00**
Net Income / Profit	**PhP 874.00**	**PhP 704.00**	**PhP 704.00**

6. SUMMARY AND CONCLUSION

6.1. Summary

Based on the research objectives and results, the following were the summary of findings:

a. The suitable formulation in the production of the calamansi bath soaps enhanced with tomato, cucumber and aloe vera extracts are:

Table 10: Suitable Formulation for Enhanced Calamansi Bath Soaps

Raw Materials	P1 -Calamatis	P2 - Calapino	P3 –Calavera
Water	3 liters	3 liters	3 liters
Caustic Soda Flakes	1 kilo	1 kilo	1 kilo
Calamansi Extracts	3 ounces	3 ounces	3 ounces
Other fruit Extracts	2 ounces	2 ounces	2 ounces
Salt	20 grams	20 grams	20 grams
Honey	1 ounce	1 ounce	1 ounce
Milk	4 ounces	4 ounces	4 ounces
Palm Oil	4 liters	4 liters	4 liters

The best formulation of calamansi extract to other fruit extracts shows to be 60/40.

b. The acceptability of physical attributes as to Texture, Color, Hardness, and Size of the developed calamansi bath soaps enhanced with tomato, cucumber and aloe vera extracts were rated within the range of 4.21-5.00 which is interpreted as very high while odor was rated high within 3.41-4.20 range. As to perceived skin effects, the calamansi bath soap enhanced with tomato (Calamatis), cucumber (Calapino) and aloe vera (Calavera) were rated by the respondents to be much effective (within 3.41-4.20) among the different age brackets.

c. The Calamatis (calamansi & tomato) and Calavera (calamansi and aloe vera) bath soaps have active inhibition (within 14-19mm) to fight *Staphylococcus aureaus* bacteria while Calapino (calamansi and cucumber) is partially active (within 10-13mm).

d. One mixing for the calamatis costing P1,051.00 could produce 55 soap bars with a net income of P874.00. While one mixing for calapino and calavera costing P1046.00 could produce 50 soap bars and earning a net income of P704.00

6.2. Conclusions

Based on the summary and findings, the best suitable formulation of calamansi bath soaps enhanced with tomato, cucumber, and aloe vera is 60/40. The physical attributes of the developed calamansi bath soap enhanced with tomato, cucumber, and aloe vera are highly acceptable and perceived to be much effective in skin care. It is also good and safe to skin for it actively fights against *Staphylococcus aureaus* bacteria. Producing calamansi bath soap enhanced with tomato is more profitable than producing calamansi bath soap enhanced with cucumber and aloe vera.

7. IMPLICATIONS AND RECOMMENDATIONS

7.1. Implications

The results of the findings on the developed calamansi bath soaps enhanced with tomato, cucumber and aloe vera extracts implicates that it is feasible to venture as business products. It also suggests that the local farmers producing calamansi, tomato, cucumber, and aloe vera could earn more by processing their products as calamansi bath soaps especially during over production.

7.2. Recommendations

After systematic and thorough analysis of this research, the following were then forwarded:

1. Fund should be allocated in the production of Calamatis, Calapino and Calavera bath soaps for pilot testing to wider consumer groups, to further test the market potentials before commercialization.
2. It is also recommended that the odor and packaging of the developed Calamatis, Calapino and Calavera bath soaps should be improved.
3. The soap package should include labels as to skin effects. Calamatis as an Anti-bacterial Soap, Calapino for Sensitive Skin and Calavera a Skin Moisturizer.

8. LITERATURE CITED

Soap (Hunger, 2000) is a chemical compound resulting from the reaction of an alkali (commonly sodium or potassium hydroxide) with a fatty acid. When mixed with water during bathing or washing, they help people and clothes get clean by lowering the chance of dirt and oil to get to the skin or fabric. Soaps are made from animal fats or vegetable oils. Soap is a combination of animal fat or plant oil and caustic soda. When dissolved in water, it breaks dirt away from surfaces. Through the ages, soap has been used to cleanse, to cure skin sores, to dye hair and as a salve or skin ointment. But today we generally use soap as a cleanser or perfume.

Early soap manufacturers simply boiled a solution of wood ash animal fat. A foam substance formed at

the top of the pot. When cooled, it hardened into soap. Around 1790, French soap maker Nicolas Leblanc developed a method of extracting caustic soda (sodium hydroxide) from common table salt (sodium chloride). As time goes on, modernization in soap making were being discovered and crops were mostly utilized as scents and main ingredients. At this point in time, the researcher developed a bath soap utilizing plants with skin effect potentials. These are cucumber, tomato and aloe vera and calamansi as the based ingredient.

Calamansi *(Citrofortunella microcarpa***)** has vitamin C which enhances beauty, by rejuvenating skin from within and thus bringing a glow on face. One of the natural benefits of calamansi is it acts a natural skin bleaching agent. It is good for treating dark spots or discoloration of the skin; it helps erase scars and other blemishes for a more even tone. The extract reduces oiliness in skin, thus clearing up skin problems such as pimples, acne, blackheads and freckles. It also moisturizes and increases skin hydration.

Similarly, tomato (*Solanum lycopersicum*), gives various skin benefits. Tomatoes have high vitamin content and are a rich source of the antioxidant nutrient, lycopene. Lycopene counters the ageing effects on the skin, by cutting out the number of free radicals in your body. Tomato helps get rid of pimples and acne through its gentle exfoliating action and this also results to getting your cheeks a rosy and your body a fair glow. It is believed that consuming tomato and tomato products will give you a healthy and beautiful skin. Its beauty benefits are gaining popularity with every passing day. Saraos (2009)enumerated some of the benefits of tomatoes for skin which includes the following: (1)Treat Open Pores; (2)Glowing Skin; (3)Prevent Signs Of Aging; (4)Act As A Natural Sunscreen; (5) Natural Bleaching Agent; (6)Smooth Skin and (7)Remove Dead Skin Cells. These will only be gained if tomatoes were consumed and applied naturally. Saraos (2009) found out also, that when tomato extract was used as an ingredient of soap, the effects were: it smoothens and lightens the skin. Saraos (2009) concluded that the product is effective on people who want their skin to become whiter and to remove the dark spots on their skin.

Cucumber (*Cucumis sativus*) to speak is one of the healthiest vegetables. It's a soft and warm-season veggie which could be eaten cooked or uncooked. Mallik, J et al found out that some of the skin benefits of cucumber are(1) Revitalizes Skin; (2) Reverses Skin Tannin; (3) Controls Puffiness Of The Eyes; (4) Helps Soothe Sunburn; (5)Rejuvenates Skin; (6)Treats Open Pores;(7) Fights Cellulite; (8) Reduces Dark Circles;(9) Treats Blemishes; (10)Reduces Eye Wrinkles;(11) Removing Excess Water and (12) Under Eye Bags. Observed skin benefits of cucumber are: anti-acne, moisturizer, skin lightening and a shiny glowing skin by extracting the juice and applying it to the skin, the same with aloe vera.

Aloe vera (*Aloe barbadensis miller)* is a cactus plant. Aloe leaves secrete a clear gel that when broken off from the rest of the plant that can be applied topically to heal wounds and soothe skin. Aloe gel prevents aging and wrinkles, helps in healing the skin and reducing scars. Aloe vera is one of the best things that do for the skin. Aloe plant has long been revered as a medicine for various skin ailments ranging from dryness to burns. The powerful moisturizing properties of the plant's sap help to prevent the skin, scalp, and hair from drying out. Mohammadi et al (2011) concluded that one of the best reasons to use aloe vera as soap, is for its richly emollient, moisturizing properties. It can help to make skin look and feel suppler and younger. Many studies have also shown that aloe vera can help to speed up healing for cases such as burns. This is why some cultures actually apply the sap from the plant to scrapes or burns on the skin, in an effort to help the wound heal without a scar. There are also cultures where it is used to prevent itchiness from allergies, rashes, insect bites, and the like. Regular application is also known to prevent scarring and stretch marks and acting as skin moisturizer.

But applying the gel and juices of these different crops are tedious to do and some may dislikes it especially the busy people. So instead of extracting and applying the juice or gel to the skin, a more convenient bar soap was produced – a Bath Soap. By just using it every time you will take a bath the skin effects results are surely enjoy.

APPENDIX

*Significance of Findings (Research Category)

Contribution to new knowledge/S&T advancement

This research identified the suitable formulation and process in developing enhanced calamansi bath soaps utilizing the locally grown agricultural products – calamansi, tomato, cucumber & aloe vera. The formulation and process are as follows:

a. Gathering of:

*Half kilo of ripe calamansi and 3 pieces of overripe tomato or ¼ kilo ripe tomato for CALAMATIS Bath Soap

*Half kilo of ripe calamansi and 2 regular size cucumber or 4 small size cucumber for CALAPINO Bath Soap

*Half kilo of ripe calamansi and 5 regular sized aloe vera leaf for CALAVERA Bath Soap

b. washing the whole fruit with clean water;
c. slicing the calamansi into halves and squeeze to extract a three (3) ounces of calamansi juice;
d. TOMATO - slicing and deseeding the tomatoes and blend to extract two (2) ounces of tomato juice;

CUCUMBER – slicing and blending to extract two (2) ounces of cucumber juice

ALOE VERA – slicing, removing and blending the sap to extract two (2) ounces

e. mixing the 20 grams of salt and 1 kilo of caustic soda into 3 liters of water in pail;
f. stirring the mixture to cool by using a wood or plastic wand for about 20 minutes;
g. pouring the 3 ounces of calamansi extracts, 2 ounces of extracted tomato/cucumber/aloe vera, 4 ounces of fresh milk and one ounce of honey to the cooled mixture gradually and mix it using the stirrer for another 20 minutes;
h. pouring and mixing the 4 liters of oil to the mixture until dense or thickened, it could only achieve by stirring continuously for 45 minutes;
i. pouring the thickened soap mixture into the soap molder;
j. hardening the soap for 24 hours;
k. removing of the soap from the soap molder;
l. curing the soap for 30 days by placing them in a clean room at room temperature.

Relevance to regional thrusts

This research is relevant to the regional thrusts as the locally grown oversupplied and low priced fruits were utilized in the production of bath soaps. Significant products developed were: CALAMATIS Bath Soap; CALAPINO Bath Soap; and CALAVERA Bath Soap

Relevance to national thrusts

In the road to AmBisyon Natin 2040, this research is significant and relevant to Technology Transfer under Industry, Energy and Emerging Technology. It is because the products developed: CALAMATIS Bath Soap; CALAPINO Bath Soap; and CALAVERA Bath Soap could now be entered and be promoted to the market. The formulation and its process are now identified ready for community extension to sustain its marketability and commercialization.

Likewise, production of the enhanced calamansi bath soaps can be another source of income of the community members. Thus, it could be then an avenue for enterprise development and creation of employment.