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Study of Satisfaction towards Herbal Soap Products Containing Extracts from Herbal Extracts Zingiber Cassumunar Roxb. and Thunbergia Laurifolia Lindl.

Sirisorot Sriautthaphan[1], Supakiat Supasin[2] and Arthitaya Kawee-AI[1]*

[1]Division of Cannabis and Medicinal Plants for Local Development, Graduate School, Payap University, Chiang Mai 50000, Thailand
[2]Faculty of Engineering, Rajamangala University of Technology Lanna, Chiang Mai 50300, Thailand
Email: kaweeai@gmail.com
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A B S T R A C T

This research aimed to study the extraction of active compounds from the herbs Plai and Rang Chuet by electric field pulse technique to produce herbal soap. The results showed that the extraction using an electric field pulse technique with an electric field intensity of 6 kV/cm, frequency of 1 Hz, and 300 pulses could extract phenolic compounds from Plai at 0.48±0.04 mg gallic acid/gram sample, which is equivalent to the extraction efficiency of 11.94%. Rang Chuet extracted 0.30±0.03 mg gallic acid/gram sample. The extracts from Plai had the antioxidant activity of 51.33% while Rang Chuet had 20.80%. Compared with the herbal powder, it showed that using an electric field pulse caused the active compounds in Rang Chuet to be lost during extraction. In the test of phenolic compounds and antioxidant activity in the produced herbal soaps, although the analysis results of phenolic compounds were lower, the extracts were selected because of their better appearance. The soaps made from the extracts were clear yellow square blocks without any foreign matter. When tested for physical and chemical properties, it was found that: The pH, hardness, solubility, and foaming were not significantly different from the standard herbal soap. The acceptance test results showed that the developed soap received higher scores in terms of appearance, color, scent, feeling after use, and overall liking than the standard soap, at the very like to most like (8-9 points). This may be because the test period was during the summer, between April and May. This indicates that the developed soap mixed with extracts from Zingiber cassumunar and Thunbergia laurifolia has the potential to be produced for sale.

Keywords: Herbal soap, Zingiber cassumunar, Thunbergia laurifolia, Pulsed electric field extraction

1. Introduction

Herbs have been an integral part of Thai culture since ancient times, used in various forms such as food, medicine, and everyday objects (Kittiyanont et al., 2023). For example, soap is a daily necessity, essential for cleansing the face and body (T Wahyuni, 2021). Since the skin is constantly exposed and susceptible to foreign elements, the risk of skin-related issues is high (Shah et al., 2014). Moreover, environmental factors like dust, smoke, and daily life stress contribute to skin health problems, fostering a growing interest in natural products derived from local herbs to revitalize and nourish the skin (Sarisa, 2021). In today's market, consumers seek not only effective cleansing but also products that combat dullness, wrinkles, and aging, and nurture the skin. Given Thailand's rich biodiversity, numerous local herbs can be utilized as ingredients in soap production (Parichat and Sonchai, 2023)

Such as Plai and Rang Chuet, known for their antioxidant, antiviral, allergy protection, skin conditioning, and anti-inflammatory properties. These beneficial properties are believed to strengthen and enhance skin health, making them valuable in soap production.

2. Materials and Methods

2.1 Samples in the Research Study

2.1.1 Herbal Samples and Sample Preparation Methods

The herbs used in the research were sourced from the herbal plantation of the Sutussonthep Farm Community Enterprise in Mueang District, Lampang Province. Samples of Plai rhizomes (Figure 1a) and fresh leaves of Rang Chuet vines (Figure 1b) were collected, cleaned to remove impurities and damaged parts, and then air-dried. The Plai herbs were sliced into thin pieces (2-5 mm), while the fresh leaves of Rang Chuet vines were dried whole. Once completely dry, the herbs were ground using a multi-purpose grinder and sieved to obtain herbal powder with uniform particle size or surface area, as depicted in Figure 1c and Figure 1d.

(a) (b)

(c) (d)

Figure 1 Characteristics of (a) Plai, (b) Rang Chuet leaf vine and finely ground herbal powder, (c) Plai powder, and (d) Rang Chuet powder used in the research.

2.2 Instruments used for extraction and analysis

The herbal extraction machine using pulsed electric field energy as shown in Figure 2 is a prototype of a Herbal extract machine using combined energy of pulsed electric field and ultrasonic. Mobile, low-cost for community enterprises from the Payap University Innovation Office, Payap University, Chiang Mai, Thailand.

Figure 2 Herbal extract machine using combined energy of pulsed electric field and ultrasonic. Mobile, low cost

2.3 Research Methodology

2.3.1 Study of the extraction of phenolic compounds and antioxidants from herbal powders using a pulsed electric field herbal extractor

The process of extracting herbal powders involves weighing 10 grams of the powder and placing it in the treatment chamber of a pulsed electric field. Then, a 10:100 ratio of 95% ethanol solution is added (10 grams of herbal powder per 100 ml of ethanol) and mixed thoroughly. The mixture is left to soak for 10 minutes. The extraction is performed using the pulsed electric field technique at an electric field intensity of 6 kV/cm, a frequency of 1Hz, and 300 pulses (Kamboj et al., 2022). Subsequently, the obtained samples are filtered through filter paper and subjected to analysis.

1. Total phenolic content

The total phenolic content of the extract was determined using the Folin-Ciocalteau reagent method outlined by Singleton et al. in 1999. In brief, the extract was combined with water and Folin-Ciocalteau reagent, followed by shaking and incubation. After incubation, the absorbance was measured at 765 nm, and the results were expressed as milligrams of gallic acid equivalent (GE) per gram of sample.

2. Determination of antioxidant activity using the DPPH method

The antioxidant activity of the extract was assessed using the DPPH method. The extract was diluted and combined with a DPPH solution, followed by an incubation period of at least 30 minutes in the dark. The decrease in color absorbance at 517 nm was determined using a spectrophotometer, and the findings were expressed as micromoles of Trolox equivalents (TE) per gram of sample.

3. Acidity-alkalinity (pH value)

The pH was measured using a pH meter, specifically the pH 700-Eutech model from Eutech in Singapore.

2.3.2 Study the production of soap from herbal plant extracts using the pulse electric field technique

1. The steps for making soap from herbal plant extracts, Plai (Zingiber cassumunar Roxb.) and Rangjuet (Thunbergia laurifolia Lindl.) are as follows (adapted from Nopporn Buekwean and others, 2021)

Table 1 Chemicals used in soap production

Chemicals	**Quantity used**	**Unit**
Clear glass Glycerin	100	Gram
Zingiber cassumunar Extract	0.5	Milliliter
Thunbergia laurifolia Extract	0.5	Milliliter
Menthol	1	Gram
Perfume	1	Milliliter

Commence by melting 100 grams of glycerin in a beaker at 70 degrees Celsius, then lower the temperature to 60 degrees Celsius. Incorporate 1 gram of menthol, followed by 0.05% each of Plai (Zingiber cassumunar Roxb.) and Rangjuad (Thunbergia laurifolia Lindl.) extracts, stirring until the mixture is smooth. Add 0.1% of the perfume, then pour the mixture into a mold, eliminating air bubbles with alcohol to enhance the soap's appearance. Allow it to set for 15-30 minutes at room temperature before removing it from the mold and conducting a quality check.

2. Soap testing

The finished soap will be tested for pH levels, hardness, solubility, and foaming ability using the standard method for herbal soaps available in the market (Atolani et al., 2016).

3. Analysis of consumer acceptance data for products

By taking data from questionnaires, categorizing and analyzing data by converting opinions or variables to be studied into quantitative data, and calculating statistics. When considering the results, summarize the results of data analysis by displaying a diagram to show comparative data using a statistical program. Compare between experimental groups using t-test statistics, evaluated with Duncan's test at a significance level of $p<0.05$.

3. Results and Discussion

3.1 Study of the extraction of phenolic compounds and antioxidants from herbal powder using a pulsed electric field herbal extractor.

When extracting both herbal powders by pulsed electric field technique, it was found that phenolic compounds of Plai were able to extract 0.48±0.04 mg gallic acid/gram sample. The pulsed electric field technique was effective in extracting phenolic compounds of Plai at 11.94%. The extracted compounds had antioxidant activity efficiency as high as 51.33% when compared to the unprocessed herbal powder. As for the extracts of Rang Chuet extracted by pulsed electric field technique, it was found that phenolic compounds of Rang Chuet were able to extract 0.30±0.03 mg gallic acid/gram sample. The extracted compounds had an antioxidant activity efficiency of 20.80% from Rang Chuet powder. This indicates that the use of a pulsed electric field caused the loss of important compounds in Rang Chuet during the extraction process. The results are shown in Table 3.1

Table 2 Results of extraction of phenolic compounds and antioxidant activities from Plai and Rang Chuet powders by pulsed electric field technique.

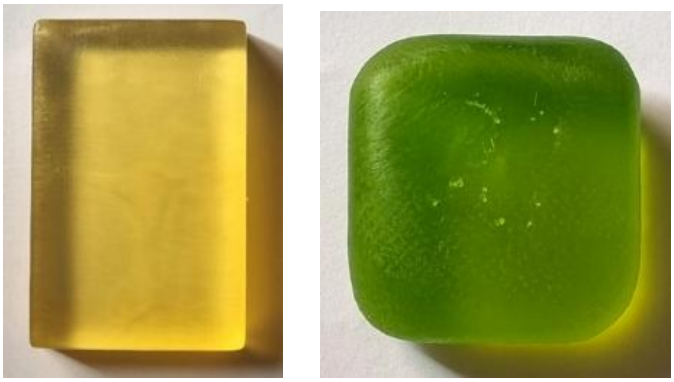
	Herbal powder Samples		**Sample Extract**		**Extraction Efficiency (% w/w)**	
	Plai	RangChuet	Plai	RangChuet	Plai	RangChuet
Compound Phenolic group (mg gallic acid/g sample)	4.02±0.31	4.46±0.15	0.48±0.04	0.30±0.03	11.94%	6.73%
Antioxidant activity (mg ascorbic acid/g sample)	1.13±0.04	2.26±0.08	0.58±0.03	0.47±0.05	51.33%	20.80%

From Table 2, it shows that the Plai powder contains phenolic compounds at 4.02±0.31 mg gallic acid/gram sample and has antioxidant activity measured by DPPH method at 1.13±0.04 mg ascorbic acid/gram sample. The Rang Chuet powder contains phenolic compounds at 4.46±0.15 mg gallic acid/gram sample and has antioxidant activity measured by DPPH method at 2.26±0.08 mg ascorbic acid/gram sample. The test of phenolic compounds and antioxidant activity in the produced herbal soaps, although the analysis results of phenolic compounds were lower, the extracts were selected because of their better appearance.

3.2 Study of soap production from herbal plant extracts processed using pulsed electric field technique

The presentation of data analysis results is presented in 2 parts as follows: Part 1: Characteristics of soap and soap testing

From section 3.1, extracts from Plai and Rang Chuet are obtained. The extracts are used in the production of herbal soap. The soap produced will be in the form of rectangular bars as shown in Figure 3



(a) (b)

Figure 3 Characteristics of the produced herbal soap (a) and the herbal soap sold in the market used as a testing standard (b).

From Figure 3.1a, the characteristics of the herbal soap produced will be yellow color, which comes from the color of the herbal extracts of Plai and Rang Chuet. When looking with the naked eye, it will be seen that the soap is clear and has no foreign matter, by the industrial standard S THAI SMEs STANDARD, TIS S 13-2562, herbal bar soap, and the herbal soap produced does not have a cloudy appearance like the herbal soap brand Citra, which is sold in the market, which is used as the testing standard, Figure 3.1b, which has a more opaque appearance.

The produced soaps were then tested for acidity-alkalinity (pH), hardness, solubility, and foaming ability using standard methods according to the method of Atolani et al. (2016). The results are shown in the following table 3

Table 3 Soap test results

Testing	**Soap mixed with Plai and Rang Chuet extracts**	**Standard soap**
Acidity-alkalinity (pH value)	8.00±1.00[a]	8.00±1.00[a]
Hardness (mm)	12.50±1.00[a]	10.83±0.57[a]
Melting time (min)	11.25±1.02[a]	10.96±0.79[a]
Foaming (cm)	11.00±0.00[a]	11.50±1.00[a]

The letter a indicates no difference between the two experimental groups at the 95% significance level, compared using the t-test.

The test results table, it was found that the acidity-alkalinity, hardness, solubility, and foaming ability of the soap mixed with Plai and Rang Chuet extracts were not different from the standard herbal soaps sold in the market. Therefore, the herbal soap produced here can be used and sold.

Part 2 Consumer Acceptance of Product

The first phase of testing found that the soap mixed with extracts from Plai and Rang Chuet had no different properties from general herbal soaps. Therefore, a consumer acceptance test of the product was conducted.

Satisfaction of herbal plant extract soap products from Plai and Rang Chuet compared to standard soap

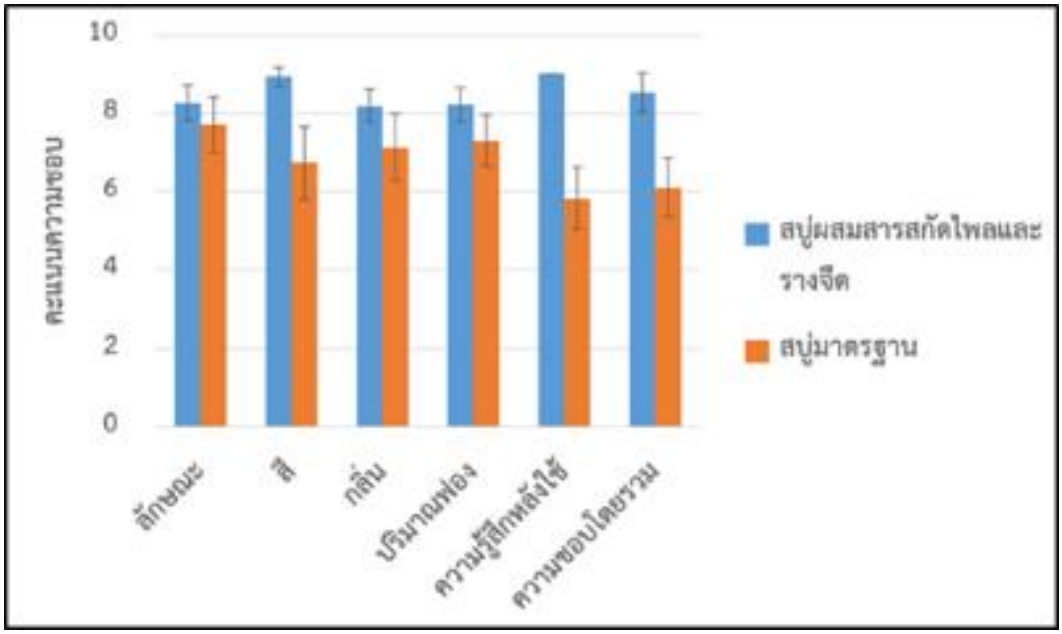


Figure 4 Consumer acceptance of soap mixed with extracts of Plai and Rang Chuet compared with standard soap.

From Figure 4, it was found that the acceptance score of consumers towards soap mixed with extracts from Plai and Rang Chuet in terms of appearance, color, scent, and feeling after use such as cool, clean, refreshing, and overall liking, received a higher liking score than the standard soap and had a liking score in the range of 8-9 points, which is at the level of liking very much and liking the most. This may be because the testing period was during the summer, i.e. between April and May, causing the produced soap to have a higher overall liking than the standard soap, indicating that the soap mixed with extracts from Plai and Rang Chuet can be sold.

Discussion

The research on the production of soap from herbal plant extracts, Plai and Rang Chuet, using the pulsed electric field technique is a study in the development of products with health and beauty value from nature, which is important in an era when consumers are more interested in natural and safe products. This research aims to study the method of extracting active ingredients from herbal plants and producing quality soap. The analysis of the results of the study in many aspects, which can be divided into two main parts: the study of the extraction of phenolic compounds and antioxidant activities, and the study of the production of soap from the obtained extracts.

The use of the pulsed electric field technique to extract active ingredients from herbal plants is an interesting method because it can increase the efficiency of extracting active ingredients, especially phenolic compounds that have antioxidant properties (Ranjha et al**., 2020**), which are important for skin health. Therefore, this study is important in supporting the use of modern techniques in the development of natural products. In terms of soap production from the obtained extracts, the researchers tested various properties of the produced soap, such as acidity-alkalinity, hardness, solubility, and foaming ability. The test results showed that the soap produced from Plai and Rang Chuet extracts had properties that were no different from standard soaps sold in the market, which shows the ability to produce high-quality soap.

4. Summary

Summary of the study of soap production from herbal plant extracts, Plai and Rang Chuet, obtained by using the electric field pulse technique, found that the extraction of substances by the electric field pulse technique was effective in extracting phenolic compounds of Plai by 11.94%, which was higher than that of Rang Chuet, which was only 6.73%, and the efficiency of antioxidant activity of Plai was as high as 51.33% and 20.80% from Rang Chuet, indicating that the use of the electric field pulse technique caused the loss of important substances in Rang Chuet during the extraction process. Testing of phenolic compounds and antioxidant activity in the produced herbal soaps, although the analysis results of phenolic compounds were lower, the extracts were selected because of their better appearance. The appearance obtained was yellow bar soap, clear, and free of foreign matter, by the

Thai SMEs STANDARD, TIS 13-2562, herbal bar soap, and the produced soap had no different properties from herbal soaps available in the market when tested for acidity-alkalinity, hardness, solubility, and foaming ability. When surveying the satisfaction of soap products from herbal plant extracts of Plai and Rang Chuet compared to standard soaps accepted by 30 consumers, it was found that the developed soap received higher scores in terms of appearance, color, scent, feeling after use, and overall liking than the standard soap, at the very like to most like level (8-9 points). This may be because the testing period was during the summer, i.e. between April and May, which resulted in the overall liking of the developed soap being higher than the standard soap. This indicates that the soap that was developed, mixed with extracts of Plai and Rang Chuet, has the potential to be produced for sale.

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