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Picture: The cherry blossoms are blooming in Japan. Traditionally, sakura (cherry blossoms) are seen as symbols of the fragility and beauty of life, because they fall so quickly after blooming. The trees must be a very poignant symbol for the Japanese people.

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Sensory and Chemical Compositions of Butterfly Pea with Lime Juices in Thailand

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Abstract

The objective of this research was to study the sensory and chemical compositions of butterfly pea with lime juices in Thailand. Mixed lime juices and herbal butterfly pea flowers (*Clitoria ternatea* or *Dok Anchan* in Thai) were studied for sensory evaluation, pH, total acidity, total soluble solid and ascorbic acid contents. The sensory evaluation was carried out by panels on the basis of appearance, colour, flavour, sour taste and overall acceptability using 9-point hedonic scale method. The panelists accepted the idea of using Thai herbs as an ingredient or mixed in beverage. Thai herb, the butterfly pea with lime juices is a sort of vitamin C content unique sour taste and natural colour. It was observed that storage 4°C, the juices still had a good colour and quality throughout the storage time; however ascorbic acid content was reduced. The sensory results showed no significant differences in the scores of flavour, sour taste and appearance attributes. However the score of colour and overall acceptability showed significant ($p < 0.05$). Butterfly pea with lime juice had total soluble solid 10.33 ± 0.14 brix, pH 2.96 ± 0.04 , titrable acidity (as citric acid) 0.63 ± 0.01 and ascorbic acid 13.18 ± 0.15 mg/100 ml.

Keywords: Lime juices, Butterfly Pea, Chemical composition, Sensory, Thailand

Introduction

Butterfly pea (*Clitoria ternatea*) is one of Thai herbal plant. The flower's has long been used as an ancient colour Thai beverages, three different colors white, blue, and purple. The flower's purple colour is attributable to anthocyanin, which has antioxidant properties. Not only beautiful, Butterfly pea first gained its reputation as a powerful hair strengthener in the traditional Thai medicine. leaves, flowers, seeds, and roots are all used as medicinal herbs. In Thailand, a syrupy blue drink called Nam Dok Anchan, it is sometimes consumed with a drop of sweet lime juice to increase acidity and turn the juice into pink-purple. Consumption of Butterfly pea with lime juices is recommended, natural juices providing a high percentage of vitamins C in daily dose. The content of vitamins C is an important parameter for assuming the nutritional value of the juices as it reduced during storage (Thailand Institute of Scientific and Technological Research, 2004).

Lime (*Citrus aurantifolia*) is one of important products in Thailand. Lime is an excellent source of vitamin C. Consumption of this vitamin has been correlated with a reduction in the incidence of certain cancers (Vinson *et al.*, 2002).

Although there had some commercial Butterfly pea with lime juices in local market, but they are not data about sensory and chemical compositions of Butterfly pea mixed with lime Juices in Thailand. The purpose of this work was to determine the chemical and sensory properties of the juice samples obtained from Thailand.



Figure 1. Raw materials. Butterfly pea (*Clitoria ternatea*)

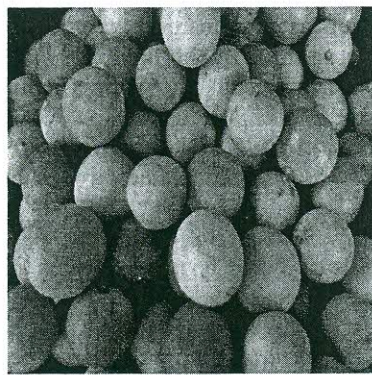


Figure 2. Raw materials, Lime (*Citrus aurantifolia*)

The Objectives

The objective of this research was to survey the attitude of Butterfly pea mixed with lime Juices in Thailand. Study sensory and chemical composition of butterfly pea with lime juices.

Materials and Methods

Raw materials

Butterfly pea flowers (*Clitoria ternatea*) were obtained from the local market. Sample was added into 1000 ml boiling water and kept boiling for 5 min after that filtered into sterile bottle.

Lime juice was prepared from fresh. Samples were obtained from a local market in Thailand during the harvest season. Squeezed juice from fresh limes with stainless press. The lime juice was filtered to remove its pulp. Samples of the filtered juice was placed in a sterilized bottle and kept for all the experiments in this study. The basic formula Butterfly pea with lime juice was prepared by mixed Butterfly pea juice: lime juice, 50:20 based on

previous research. The formulation was developed from the basic formula of Uthai Thani community.

The Butterfly pea with lime juice keep at 3 different storage temperatures 4, -18°C and at room temperature (25°C). Subsequently, the juice was analyzed for chemical properties.

Methods

1. Survey the attitude of Butterfly pea with lime juices production and consumer behavior in some Thailand communities, do intensive interview using questionnaires, statistical analysis by percent, means and present in descriptive report. Consumer survey questionnaires which two parts, general and specific information about Butterfly pea with lime juices with 300 consumers in some Thailand communities. The general information was gender, age, education, career and income. For the specific information were all question about Butterfly pea with lime juices include type of products and frequency of consuming. The consumer was selected by random sampling

Consumer survey was performed at public places in Chiang Mai and Uthai Thani community. The participation of the consumers was voluntary and no monetary compensation was given. The consumers were served with Butterfly pea with lime juices, respectively, in clear cup (25mL), at 4 °C.

2. The research was conducted to study sensory and chemical composition of Butterfly pea with lime juice.

Chemical composition analysis. Total soluble solids (TSS) of Butterfly pea with lime juices were measured by a hand refractometer (Atago, Japan) and corrected to the equivalent reading at 20°C (AOAC, 1995). The titratable acidity (TA) was measured by diluting 10 g of the juice with 250 mL distilled water and titrated against 0.1 N NaOH to a pH 8.1 as the end-point by using a pH meter (AOAC, 1995) and expressed in g acid per 100 mL based on citric acid. Ascorbic acid were determined by the methods of (AOAC, 2000). Measurements were done in triplicate

Sensory evaluation. The panelists are served with 25 mL juice samples at 4°C in plastic cups that are coded with 3-digit random numbers. The panelists described the sensory characteristics of the juices, including colour, flavour and taste. Performed a preference test using a 9-point hedonic scale (9=like extremely, 7=like moderately, 5=neitherlike nor dislike, 4=dislike slightly, 3=dislike moderately, 1=dislike extremely).

Statistical analysis. The statistical design for sensory analysis was conducted using Randomized complete block design (RCBD).

Results and Discussion

Survey the attitude of Butterfly pea with lime juices

The consumers answered demographic questions (gender, age, education, occupation and income); buying behavior (frequency and amount of buying, quality of juice); and their attitudes of consumers for juices. From the preliminary survey the background of Butterfly pea with lime juices production and consumer behavior in some Thailand communities, the current finding from the consumer survey with three hundred juice consumers, 135 males and 165 females, participated in this study. The 55% of consumer was female and 45% of consumer had bachelor degree they had income 10,000-15,000 Bath per month. The majority was in the age range from 21 to 60 years (51%), indicating that most of the juice drinkers

were teenagers and adults. Butterfly pea with lime juices is usually purchased in plastic bag, glass jars, bottle or flexible containers that are kept in refrigerators or in boxes containing ice cubes or at room temperature. The addition of butterfly pea flower extract resulted in purple colouration of the juice. Result from the survey showed that almost half of the consumers consumed juices 2-3 times per week (44%). Most of the juice consumers preferred Butterfly pea with lime juices and lime juices (42.5 and 40.5%, respectively). The buying behavior of juice consumers was also investigated. It was recognized that the consumer buying behavior was mainly influenced by the quality of the product, in which the most important attribute was product's taste followed by nutritional value, colour, and price. This implied that most consumers buy juice due to its taste rather than other qualities. The reasons that consumer decided to purchase because of its high vitamin C content and desirable colour.

Part 1: Demographic Data of Respondents

The demographic data of the respondents was analyzed by gender, age and educational level (as presented in Tables 1, 2 and 3).

Table 1. Amount and Percentage of Respondent's Samples by Gender

Gender	Amount	Percentage (%)
Male	135	45
Female	165	55
<i>Total</i>	300	100

As shown in Table 1, the highest number and percentage of respondents based on gender was female (165 persons [55%]) male (135 persons [45%]), respectively.

Table 2. Percentage of Respondents by Age

Age	Amount	Percentage (%)
61 years old and over	45	15
21-60 years old	153	51
Below 20 years old	102	34
<i>Total</i>	300	100

As shown in Table 2, the respondent samples in highest number (153 persons [51%]) between 21-60 years of age ; followed by respondents representing 20 years of age or below were (102 persons [34%]); and lastly, ages older than 61 years were ; (45 persons [15%]).

Table 3. Respondents by Educational Level

Educational level	Amount	Percentage (%)
Higher than bachelor degree	63	21
Bachelor degree	135	45
High school	102	34
<i>Total</i>	300	100

As shown in Table 3, the highest number of respondents was 135 persons (45%) having bachelor degrees; second highest respondent group was 102 persons (34%) having high school degrees; and lastly, 63 persons (21%) having higher degrees than bachelor degrees.

Study sensory and chemical composition of butterfly pea with lime juices.

Table 4. Chemical composition of Butterfly pea with lime juice

Chemical analysis	Assay
Total soluble solid (brix)	10.33± 0.14
pH	2.96± 0.04
Titration acidity (as citric acid)	0.63± 0.01
<i>Ascorbic acid</i> (mg/100ml)	13.18± 0.15

Note: Values are means ± standard deviations.

Butterfly pea with lime juice had total soluble solid 10.33± 0.14 brix, pH 2.96± 0.04, titration acidity (as citric acid) 0.63± 0.01 and ascorbic acid 13.18± 0.15 mg/100ml (as presented in Tables 4).

Table 5. Sensory evaluation of Butterfly pea with lime juice.

Attributes	Colour	Flavour	Sour taste	Appearance	Overall acceptability
Butterfly pea with lime juice	8.03 ^a	6.40	7.30	7.30	7.90 ^a
lime juice	5.00 ^c	6.16	7.20	7.03	6.40 ^b
Butterfly pea juice	6.80 ^b	6.36	7.66	7.26	6.13 ^b
		NS	NS	NS	

Note: Values are means.

a,b,c Means in the same column with different superscripts are different ($p < 0.05$)

NS non-significant

Sensory evaluation test was done to determine the quality and consumer acceptance of the juice. Sensory evaluation of mixed juices compared with lime juice and Butterfly pea juice showed in Table 5. The sensory results showed no statistically significant differences ($p > 0.05$) in the scores of flavor, sour test and appearance attributes. However the sensory score of colour and overall acceptability showed significant ($p < 0.05$). Panelist preference on Butterfly pea with lime juice score 7.90 was evaluated by using a 9-point hedonic scale (9=like extremely, 7=like moderately, 5=neitherlike nor dislike, 4=dislike slightly, 3=dislike moderately, 1=dislike extremely). Results show that product of Butterfly pea with lime juice with tasted satisfaction of consumers.

Table 6. Composition of ascorbic acid (mg/100ml) in Butterfly pea with lime juice

Storage time(day)	Storage temperature (-18° C)	Storage temperature (4° C)	Storage temperature (25° C)
0	13.18	13.18	13.18
1	13.13	11.49	9.67
2	13.10	9.21	ND
3	13.03	6.16	ND
6	11.20	4.78	ND
9	9.21	5.54	ND
12	8.45	1.44	ND
15	8.29	ND	ND
18	4.72	ND	ND
21	2.65	ND	ND
24	2.18	ND	ND
27	1.68	ND	ND
30	1.10	ND	ND

Note: Ascorbic acid in lime juice (mean from 3 replicates)

ND = Not detectable



Composition of ascorbic acid (mg/100ml) in Butterfly pea with lime juice was observed at 3 different storage temperatures 4, -18°C and at room temperature (25°C). Subsequently (as presented in Tables 6), the juice was analyzed for ascorbic acid (mg/100ml). It was found that the vitamin C content decreased during storage of lime juices. It was observed that 4°C and -18°C, the juice still had a good quality throughout the storage time; however ascorbic acid content was reduced.

It was found that the end of storage time at each temperature condition should be in 1 day at room temperature and more than 30 days at -18°C. Unfortunately, the concentration of this vitamin was reduced during storage of the juices (Li *et al.*, 1989; Lee and Coates, 1999; Johnston and Bowling, 2002).

Conclusion

Thai herb, the butterfly pea with lime juices is a sort of vitamin C content unique sour taste and natural colour. It was observed that storage 4°C, the juices still had a good colour and quality throughout the storage time; however ascorbic acid content was reduced. The sensory results showed no significant differences in the scores of flavour, sour taste and appearance attributes. However the score of colour and overall acceptability showed significant ($p < 0.05$). Butterfly pea with lime juice had total soluble solid 10.33 ± 0.14 brix, pH 2.96 ± 0.04 , titrable acidity (as citric acid) 0.63 ± 0.01 and ascorbic acid 13.18 ± 0.15 mg/100 ml. Storage temperature was the prime limiting factor for shelf life of juice. However various effects of low temperatures on the keeping quality of the juices can be considered to make freshly juice economically feasible to local market. Their safety and shelf life were considered in terms of microbiological regulation and their chemical changes.

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