Study of chemical properties, sensory test and antioxidant activity of Tamarind wine

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ABSTRACT

This purpose of this study wsa to evaluate the chemical properties, sensory test and antioxidant activity of tamarind wine produced from tamarind 5 cultivars (Srithong, Srichompoo, Prakaythong, Yaks Fak Dab and Kradan). The chemical properties of wine, including soluble solids (^{0}Brix), Total sugar, pH, alcohol content (%), and antioxidant activity (%). The sensory test of wine was analyzed by Hedonic scale method and evaluated by affective test of clarity, color, aroma, taste and overall acceptability. The pH values ranged from 3.47-3.79. Sugar content ranged from 9-12 ^{o}Brix and total sugar ranged from 415-583 mg/l. It was found that, wine was produced from Kradan cultivar had alcohol percentage of 11.28 which was the highest among wine and wine was produced from Prakaythong cultivar had alcohol percentage of the 8.40 which was the lowest alcohol content. Wine produced from Yaks Fak Dab cultivars had the highest antioxidants activity, the radical scavenging was 84.63%, and wine produced from Kradan cultivars had the lowest antioxidants activity, the radical scavenging was 53.49%. The study of sensory test of tamarind wine showed difference significantly ($P \leq 0.05$). Tamarind wine was produced from Prakaythong cultivars had the highest overall acceptance, the values was 7.21 ± 1.24 that mean like moderately. Tamarind wine was produced from Srithong cultivars had the lowest overall acceptance, the values was 6.14 ± 1.68 that mean like slightly.

Keywords: wine; antioxidants; Srithong; Prakaythong; Srichompoo; Yaks Fak Dab; Kradan.

INTRODUCTION

Wine is a beverage which is rich in biological material from the plant, example ascorbic acid and phenolic compound, which has the ability to inhibit free radicals. Phenolic compound was found in the skin and seeds of some fruits like tamarind. Phenolic compounds in wine are composed of varieties compounds example flavonoids, anthocyanins so that these compounds have the ability to inhibit free radicals. Current research shows that antioxidants in wine can inhibit the growth of some types of cancer, wine is a drink that is beneficial to the body. If we drink in moderation will help to make food more appetizing. Enhance food flavor and allows the blood vessels to expand in patients with low blood pressure. Tamarind is considered

healthy fruits that are high in nutritional value and the properties used to treat diseases. In the medical is used a pulp to cure many diseases, such as expectorants. Relieve diarrhea and Constipation. Tamarind are also rich in vitamin C, vitamin B*2*, vitamin A, and calcium, phosphorus, iron, protein and carbohydrates that are beneficial to the body.

The aim of this study was to determine the influence of tamarind cultivars on chemical properties (sugar content, alcohol content, pH, antioxidant activity and total sugar) and sensory evaluation of tamarind wine was produced from tamarind 5 cultivars.

Objective

1 To study the wine was produced from tamarind 5 cultivars include Srithong, Srichompoo, Prakaythong, Yaks Fak Dab and Kradan varieties.

2 To study the chemical properties of wine, including pH, soluble solids content, total sugar and alcohol percentage.

3 To study the antioxidant activity of wines which made from tamarind 5 cultivars.

4 Study sensory evaluation by 9-pointed Hedonic scale.

MATERIALS AND METHOD

Yeast, plant material and fermentation

Wine yeast powder *Saccharomyces cerevisiae* (Lalvin EC1118). Tamarind pulps were obtain from Srithong, Srichompoo, Prakaythong, Yaks Fak Dab and Kradan varieties. (The experiment tamarind orchard in phetchabun in Thailand.) by treatment of crushed fruits and water in a ratio of 1: 3 adjust pH (up to 4.0) using lime water, then sugar (up to 22 ^{0}Brix) and the musts were pasteurized for 30 min at 60 ^{0}C. Alcoholic fermentation was conducted for 7 day at room temperature in plastic vessels containing 3 L of tamarind must inoculated with yeast (1.5 g dry weight per litre). After fermentation, the young wine was separated from the sediments by carefully pouring it into glass bottle, after that wine were pasteurized for 30 min at 60 ^{0}C and then clarification for 45 day at 10 ^{0}C.

Chemical properties analysis

1. Measure soluble solid content by hand refractometer and pH using pH meter.

2. Total sugar by phenol sulfuric method

500 µl of each wine sample was mixed with 500 µl of 5% phenol solution, then shake and add 2.5 ml of conc. sulfuric acid shake them about 10 minutes and the absorbance was measured at 490 nm with a spectrophotometer (Spectronic 20 Genesys) compares with standard curve of glucose solutions (0-250 µl/ml).

3. Determination of alcohol by gas chromatography-Flame Ionization (GC-FID).

The GC-FID analysis was performed on shimadzu model GC-2014. The tested components were separated on capillary column type Rtx-wax. (The length of the column was 30 m., the diameter of column was 0.25 mm., and the thickness of film was 0.25 µm.). The detector and injector temperature was 150 ^{o}c and the column was heated using the following temperature program: 40 ^{o}c for 1 min and an increase in the rate of 10 ° C / min to 100 ° C maintaining a constant temperature for 1 min. The carrier gas was helium 99.7 ml / min flow.

4. Antioxidant activity

Scavenging free radical potential were tested in ethanolic solution of 1,1-diphenyl-2-picrylhydrazyl (DPPH). The degree of

decoloration of the solution indicated the scavenging efficiency of the added substance. In its radical from, DPPH has an absorption band at 517 nm. 1.5 ml of DPPH solution (DPPH 0.004 g dissolved in ethanol and adjust to 100 ml) was mixed with 1.5 ml of wine samples. After that react the solutions about 20 min. (Brand-Williams et. al, 1995).

$$\text{Scavenging (\%)} = \frac{(A_{DPPH} - A_{sample})}{A_{DPPH}} \times 100$$

A_{DPPH} is the absorbance of DPPH control

A_{sample} is the absorbance of the sample after reaction with DPPH

Sensory analysis

The sensory evaluation of tamarind wine was performed using 9-point hedonic scale by using 30 untrained panelist. Test quality of wine was evaluated by affective test of color odor taste and overall acceptance.

Statistical analysis

To verify the statistical significance of the studied parameters, means ± SD of minimum three measurements in one way anova were determined. The P-values of <0.05 were considered significant.

RESULTS AND DISCUSSION

Chemical properties of tamarind wine

The fermentation of tamarind wine which was produced from tamarind 5 cultivars by *Saccharomyces cerevisiae*, was analyzed the chemical composition of the fermentation between day 0-7 to change the amount of alcohol. We found that on the 7th ,wine was produced from Kradan cultivar had the highest alcohol content, the alcohol percentage was 11.28, the soluble solids content was 9.05 ± 0.07 and wine was produced from Prakaythong cultivar had the lowest alcohol content, the alcohol percentage was 8.40, the soluble solids content was 12. Analysis of the chemical properties from tamarind wine from tamarind 5 cultivars between fermentation 7 day. It was found that alcohol content increased between day 1-7 in all samples because yeast converted sugar into alcohol. As shown in Table 1, Table 2, Fig 1 and 2.

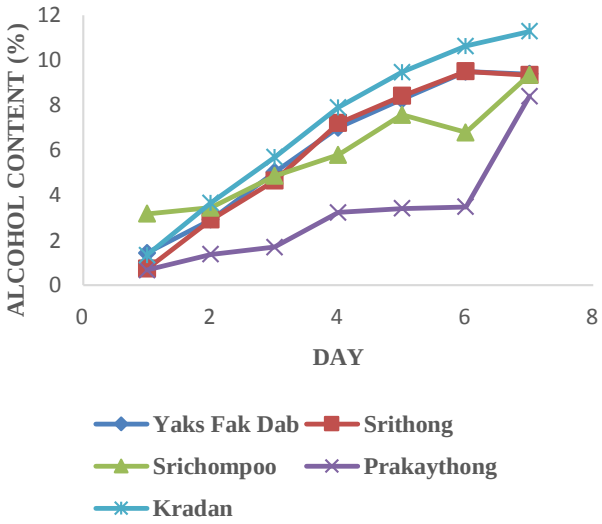

Fig 1. Change of alcohol content of tamarind wine fermented by different tamarind cultivars.

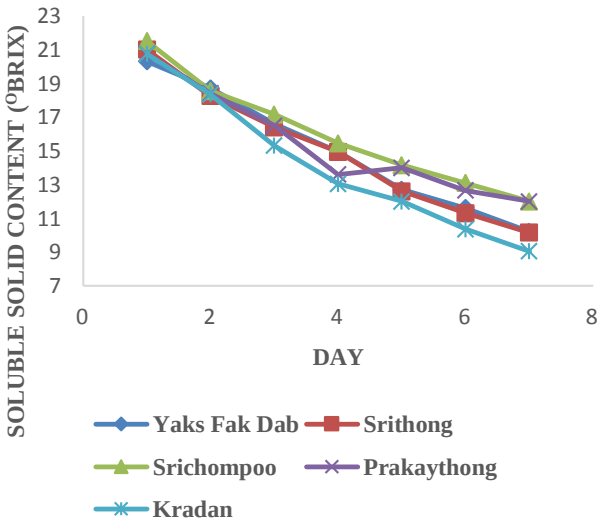

Fig 2. Change of soluble solid content of tamarind wine fermented by different tamarind cultivars.

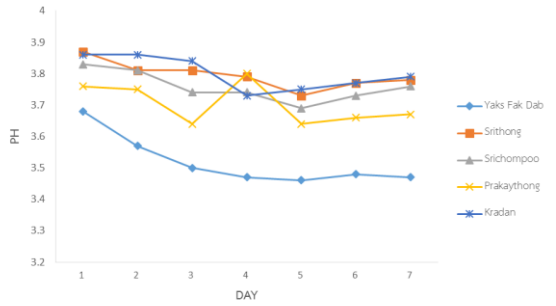

Fig. 3 pH during fermentation of Tamarind wine.

The pH was similar for all wine samples (Fig 3). The initial pH of wine was quite high (around 3.87) and at the end of fermentation, changed of pH level varied about 3.47-3.79. The pH of tamarind wine was produced from Kradan cultivar had the highest pH, the pH values was 3.79 $\pm$ 0.02 and tamarind wine was produced from Yaks Fak Dab cultivar had the lowest pH, the pH values was 3.47 $\pm$ 0.01 As shown in Table 3 and Fig 3. Tamarind each cultivars were composed of different organic acids so they were a nutrient for yeast to use in fermentation processes. The decrease in pH may be related to utilization of soluble solid by yeast cell during fermentation during fermentation.

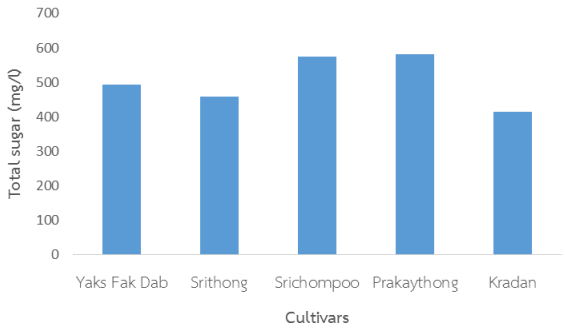

Fig. 4 Total sugar of Tamarind wine.

Total sugar of tamarind wine

The results of total sugar of tamarind wine are given in Table 4. Prakaythong wine possessed the highest total sugar (582.38 mg/l) among wines. Our data were similar to Sriplang K. and Chareunkun D. (2007) who produced nata de coco by added sweet tamarind Prakaythong juice that was the highest sweetness formula and whereas the wine from Kradan had the lowest total sugar (415.29 mg/l) As shown in Table 4 and Fig 4.

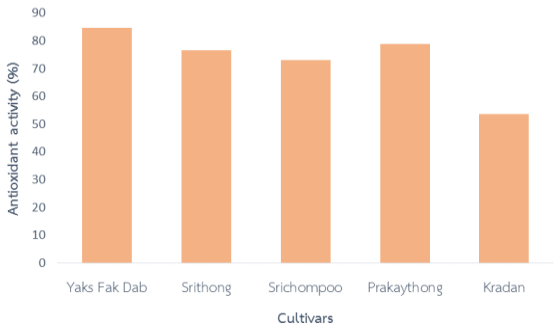

Fig. 5 Antioxidant activity of tamarind wine.

Antioxidant activity of tamarind wine.

Antioxidant activity of tamarind wine made from different 5 cultivars during fermentation and aging wine for 45 day were presented in Table.5 and fig.5 Yaks Fak Dab wine possessed the highest antioxidant activity (84.63%) among wines because the vitamin C content of tamarind wine had the highest values when compared with other micronutrients (I.E. Mbaeyi-Nwaoha and C.N. Ajumobi, 2015). Vitamin C play an important role in cellular oxidative stress and scavenging radical species. (Hawa N Siti et al,2015)

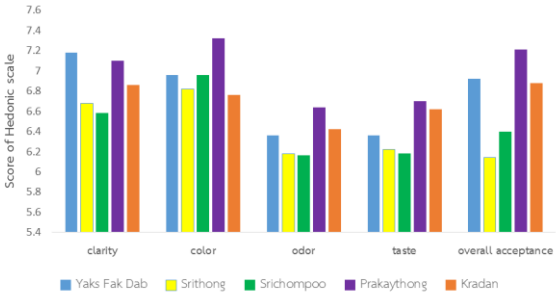

Fig. 6 sensory evaluation of Tamarind wine.

Table 1 alcohol content during fermentation of Tamarind wine.

Tamarind wine was produced from tamarind 5 cultivars	**Alcohol content (Percentage)**							
	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Yaks Fak Dab	0	1.44	2.91	5.02	7.00	8.26	9.49	9.38
Srithong	0	0.73	2.92	4.64	7.20	8.41	9.50	9.33
Srichompoo	0	3.18	3.45	4.86	5.79	7.57	6.79	9.34
Prakaythong	0	0.68	1.37	1.70	3.23	3.41	3.48	8.40
Kradan	0	1.34	3.66	5.69	7.90	9.47	10.62	11.28

Table 2 Soluble solids content during fermentation of Tamarind wine.

Tamarind wine was produced from tamarind 5 cultivars	**Soluble solids content (^{0} Brix) $\bar{x}$ ±S.D**							
	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Yaks Fak Dab	22	20.30 ± 0.00	18.70 ± 0.42	16.60 ± 0.42^{a}	14.95 ± 0.21	12.70 ± 0.42^{b}	11.60 ± 0.57^{b}	10.20 ± 0.14^{b}
Srithong	22	21.00 ± 0.00	18.25 ± 0.07	16.40 ± 0.14^{a}	14.95 ± 0.07	12.60 ± 0.28^{bc}	11.30 ± 0.42^{bc}	10.15 ± 0.21^{b}
Srichompoo	22	21.50 ± 0.70	18.55 ± 0.78	17.15 ± 0.07^{a}	15.45 ± 0.78	14.15 ± 0.21^{a}	13.10 ± 0.14^{a}	12.00 ± 0.00^{a}
Prakaythong	22	20.75 ± 0.49	18.40 ± 0.00	16.50 ± 0.42^{a}	13.60 ± 1.98	14.00 ± 0.00^{a}	12.65 ± 0.49^{a}	12.00 ± 0.00^{a}
Kradan	22	20.75 ± 0.78	18.35 ± 0.07	15.30 ± 0.14^{b}	13.05 ± 0.07	12.00 ± 0.00^{c}	10.35 ± 0.07^{c}	9.05 ± 0.07^{c}

Values with different superscript roman letters in the same column are significantly different according to the Duncan test ($p<0.05$)

Sensory evaluation

The results of sensory evaluation of tamarind wine samples are given in Table 6 and fig.6. Sensory evaluation was performed by Hedonic scale method. The scores of preferences of clarity, color, odor, taste and overall acceptance. Mean overall acceptability score of wine made from Prakaythong was the highest among wines samples. The overall acceptability was 7.21±1.24 that mean like moderately in hedonic scale score. The panelist liked wine made from Prakaythong

Table 3 pH during fermentation of Tamarind wine.

Tamarind wine was produced from tamarind 5 cultivars	pH $\bar{x}$ ±S.D							
	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
Yaks Fak Dab	4	3.68 ± 0.01^{c}	3.57 ± 0.00^{d}	3.50 ± 0.03^{d}	3.47 ± 0.00^{b}	3.46 ± 0.01^{d}	3.48 ± 0.02^{c}	3.47 ± 0.01^{c}
Srithong	4	3.87 ± 0.06^{a}	3.81 ± 0.01^{b}	3.81 ± 0.01^{a}	3.79 ± 0.05^{a}	3.73 ± 0.03^{a}	3.77 ± 0.42^{a}	3.78 ± 0.04^{a}
Srichompoo	4	3.83 ± 0.01^{ab}	3.81 ± 0.02^{b}	3.74 ± 0.01^{b}	3.74 ± 0.03^{a}	3.69 ±0.00^{b}	3.73 ± 0.01^{ab}	3.76 ± 0.00^{a}
Prakaythong	4	3.76 ± 0.01^{b}	3.75 ± 0.00^{c}	3.64 ± 0.05^{c}	3.80 ± 0.21^{a}	3.64 ± 0.01^{c}	3.66 ± 0.06^{b}	3.67 ± 0.04^{b}
Kradan	4	3.86 ± 0.01^{a}	3.86 ± 0.21^{a}	3.84 ± 0.02^{a}	3.73 ± 0.00^{a}	3.75 ± 0.00^{a}	3.77 ± 0.00^{a}	3.79 ± 0.02^{a}

Values with different superscript roman letters in the same column are significantly different according to the Duncan test ($p<0.05$)

Table 4 Total sugar of Tamarind wine.

Tamarind wine was produced from tamarind 5 cultivars	**Total sugar (mg/l)**
Yaks Fak Dab	494.04
Srithong	458.21
Srichompoo	574.88
Prakaythong	582.38
Kradan	415.29

cultivar over other wines because it may be sweet and not bitter.

CONCLUSION

Tamarind wine was produced from different cultivars were characterized by variation in alcohol content, total sugar, sensory evaluation and antioxidant activity. Tamarind fruits showed good potential for use in the production of fermented beverages, especially wine was produced from Prakaythong cultivar because it had high score in both sensory test and antioxidant activity.

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