

Volume 19, Number 5, Pages 11 – 19

# Proximate Analysis and Sensory Evaluation of Processed Lubeg (Syzygynium lineatum (Roxb.) Merr. & Perry) Fruit Wines

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## Abstract

Lubeg tree thrives in tropical climatic conditions, such as in the northern part of the Philippines. Lubeg fruit is characterized as highly perishable and has a sour taste, hence, many fruits were wasted during its peak season. Developing and processing the fruits is considered to maximize the full potential of Lubeg fruits. With this, the study sought to enhance the quality of the developed three Lubeg wines through determining the proximate analysis and sensory evaluation. The Lubeg wines differ in sweeteners being added. The first sample is Lubeg wine with sugar; the second sample is wine with honey; and the third sample has wine with both honey and sugar. Based on the result, the proximate analysis of the Lubeg wine products shows moisture content ranging from 92.86% to 98.54%, ash (0.03%-0.04%), calories (78 kcal-112 kcal), carbohydrates (2 g-10.80 g), and sugar (10.50 g-2.00 g). The total fat of 1% is present in sample 2. The alcohol content of the wine samples ranged from 5.92%-9.17% and was categorized as low-alcohol fruit wine. In terms of sensory evaluation, there was no significant difference between the appearances of the three Lubeg wine samples. However, there were substantial moderate differences between the ratings of the samples for aroma, taste/texture, aftertaste, and overall impression and there was a significant large difference in their totality. Sample 1 consistently received higher ratings for aroma, taste/texture, aftertaste, overall impression, and totality compared to Sample 2. Sample 3 was not significantly different from Sample 1 in all the dimensions, except for taste/texture. All the Lubeg wine samples were accepted by the respondents, but Sample 1 is the most likable among the three samples. The return above the variable cost (12.96% to 20.45%) of the Lubeg wine samples can be a viable income-generating activity. Further studies on the fermentation process of the Lubeg fruit wines, the determination of other parameters of proximate analysis, and other laboratory activities should be conducted to have comprehensive data on the health benefits, vitamins, and mineral components of the produced Lubeg fruit wines.

Keywords: Lubeg wines, proximate analysis, alcohol content, sensory evaluation

Article history: Received 11 January 2023, Revised 08 October 2024, Accepted 08 October 2024

# 1. Introduction

Wine is a well-known alcohol beverage in the community. Fruits such as grapes, bananas, berries, oranges and calamansi are commonly used in winemaking. Wine is also considered as part of the culture and tradition among Filipinos. The most common wines in the Philippines are processed from rice, sugarcane and tropical fruits. Lubeg tree (Syzygiumlineatum (Roxb.) Merr. & Perry) is lesser known species that thrives in a tropical environment such as in northern Philippines. The Lubeg tree belongs to the family of Myrtacea that contains vitamin c

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and antioxidant contents [7]. Flavonoids, tannins and saponins are present in both the leaf and fruit extracts of Lubeg [11]. The secondary metabolites found in the Lubeg extracts are thought to possess several health-promoting attributes, including antioxidants, blood sugar reduction, antiinflammatory, anti-cancer, heart health, skin protection, bone health, and immune system stimulation. Moreover, Lubeg fruit has anti-oxidant and anti-inflammatory properties and it can lower cholesterol level and reduce the risk of heart disease.

Preserves. beverages. fruit and concentrate are products that can be derived from Lubeg fruits [14]. Places like Lallo, Cagayan is already processing Lubeg fruits into preserves and beverages as part of their one town one product project. But in Isabela province, it is observed that not many Lubeg tree species are well known, and many locals do not appreciate the sour taste of the fruit. The Lubeg fruits are also highly perishable. During peak season, fruits are simply discarded, leaving a mess behind and frequently serving as a breeding ground for flies and other dangerous insects and bacteria. To maximize the nutritional and economic value of Lubeg fruits, processing the said fruit into wine is conducted in this study.

Wine is considered to be a high- value product of which the Lubeg fruits can be processed into wine [14]. In this study, Lubeg wines containing sugar and honey as additional ingredients were developed. Sugar is commonly added to fruit wines as it can influence the quality of wine, such as concentration, maturation and blending [10]. Furthermore, honey is also used in wine making such as mead and sweet wines. Honey also affects the color and composition variations of wines [4]. The developed Lubeg wines were compared using sensory evaluation, proximate and mineral analysis and cost of return analysis. The use of Lubeg fruits into fruit wines may encourage the growth of local wine production and may reduce the imports of alcohol-based drinks.

## **1.1 Research Objectives:**

This study aims to develop wines from Lubeg fruit products and conduct proximate analysis and sensory evaluation. Specifically, it aims to:

- 1. Develop three samples of Lubeg wines and determine their proximate analysis in terms of crude protein, crude fat, moisture, ash, calories, calories from fat, total fat, total carbohydrates, sugars and protein.
- Determine the alcohol content (% v/v) of Lubeg wine samples;
- Determine the cost and return analysis of developed Lubeg wine samples;
- 4. Conduct sensory evaluation of the Lubeg Wine samples in terms of appearance, aroma/bouquet, taste/texture, aftertaste and overall impression.

5. Compare the three Lubeg wine samples in terms of appearance, aroma/bouquet, taste/texture, aftertaste and overall impression.

#### 2. Materials and Methods

#### 2.1 Materials

The main ingredients used for the three Lubeg wine samples are ripe Lubeg fruit extracts, water, sugar, honey and yeast. Measuring cups, measuring spoons, basin, clean cheesecloth, sterilized bottles/jar, casserole, wooden ladle and gas stove are also used in the study.

#### 2.2 Preparation of Lubeg Wines

The preparation of Lubeg wine involves the following steps: Regular size of ripe Lubeg fruits were harvested. Only ripe violet fruits are chosen. The fruits were sorted, washed and the seeds were removed. They were then chopped into small pieces. Sugar and honey were used as a sweetener. The sweetened extract was boiled and were placed in a stopper (with cotton plug) container and cooled. For every 20 liters of Lubeg extract, the added sweeteners are as follows: sample 1 is 803.45 grams, sample 2 is 946 ml of honey and for sample 3, 402 grams of sugar and 473 ml of honey were added. 14.25 grams of yeast to every 20 liters of Lubeg extract for fermentation was also added. The products was set aside after for two weeks to complete fermentation. When fermentation was finished, the wines were poured into another container and were heated to kill undesirable organisms. The wines were aged for a period of one year in jars. In this research, the subsequent products were designated as Sample 1 (Lubeg wine with sugar), Sample 2 (Lubeg wine with honey) and Sample 3 (Lubeg wine with honey and sugar).

#### 2.3 Proximate Analysis

The proximate analysis of the Lubeg wine samples was conducted at the Department of Agriculture RO2- Regional Food Technology and Incubation Center, Carig, Tuguegarao City, Cagayan. Proximate analysis was carried out according to the procedures of the Association of Official Analytical Chemist (AOAC) official methods 984.13, 934.01, and 942.05 to determine the moisture, ash, calories (kcal), total carbohydrates, sugar and protein of the Lubeg wine samples.

#### 2.4 Alcohol Content

The determination of alcohol content was conducted at the Department of Science and Technology- Regional Laboratory Services, RO2, Tuguegarao City, Cagayan. A 50 ml sample volume was steam distilled to about 50 ml of distillate. The distillate was diluted to 50 ml in a volumetric flask. The apparent specific gravity of the distillate was obtained using the pycnometer method. Percent alcohol by volume 13

was determined using the AOAC 920.57 procedure.

### 2.5 Cost and Return Analysis

After determining the gross income, production cost, and net income of each wine sample products, the return above the variable cost was calculated by multiplying the ratio of the net income and production cost by 100 percent.

#### 2.6 Sensory Evaluation

A sensory evaluation was conducted using the 20-point scale wine evaluation chart of the Wine Society (AWS). American The parameters include appearance, aroma. taste/texture, aftertaste, and overall impression of the wine samples. Thirty (30) respondents were selected based on the following criteria: having experience in bartending, being a wine maker, and being knowledgeable various alcoholic beverages.

#### 2.7 Data Analysis

Descriptive statistics such as mean (M) and standard deviation (SD) was used in sensory evaluation. The mean scores for appearance and aftertaste were described objectionable if 0 to .49, poor if .50 to 1.49, good if 1.50 to 2.49, and excellent if 2.50 to 3.00. The mean scores for aroma and taste/texture were characterized objectionable if 0 to .49, poor if .50 to 1.49, deficient if 1.50 to 2.49, acceptable if 2.50 to 3.49, good if 3.50 to 4.49, excellent if 4.50 to 5.54, and extraordinary if 5.50 to 6.00. In terms of overall impression, a mean score of 0 to .49 was poor; .50 to 1.49, good; and 1.50 to 2.00 was excellent.

The total scores were calculated in order to assess the overall description of the samples. Based on the standard scoring for the AWS, a total score of 0 to 5 is poor and objectionable; 6 to 8 is deficient; 9 to 11 is commercially acceptable; 12 to 14 is good; 15 to 17 is excellent; and 18 to 20 is extraordinary. Further, the qualities of the three (3) Lubeg samples in terms of appearance, aroma, taste/texture, aftertaste, overall impression, and totality were compared by conducting a oneway between-groups analysis of variance. For significant results, the effect sizes or magnitude of differences were estimated using Partial eta squared, which were interpreted as small if .03; medium/moderate if .06; and large if .14 [6]. A post hoc analysis using Tukey HSD was also done to detect which samples significantly differed in the criteria where the difference existed. The software used for data analysis is the Statistical Package for the Social Sciences (SPSS).

#### 3. Results and Discussions

#### 3.1 On Proximate Analysis of Lubeg Wines

Table 1 reveals that the moisture content of the wine samples ranged from 92.86% to 98.54%. Sample 2 has the highest moisture content. The moisture content of a sample determines the stability of the product and the overall nutritional value of the samples. The high moisture content of beverages makes them refreshing and quench-thirsting products [13]. It was observed that the high moisture contents of fruit wines are related to the perishable nature and short shelf life of the fruit under normal storage conditions [16].

The ash content ranged from 0.03% to 0.04% and sample 2 has the highest ash content, therefore indicating the presence of mineral components in the wine. The result is in consonance with earlier reports that fruit juices have minimal ash content [1].

Crude fiber was not observed in the wine samples while a minimal total fat was observed

in sample 2. The wine making process affects the absence of other parameters such as crude fiber and total fat but it further demonstrates the desirable nutritive quality of the produced Lubeg wines. Moreover, the absence of fats suggests that the wine could provide protection against excess body lipids (cholesterol) [3] as well as contributed to the shelf life of the products [5].

The calories of the wine samples ranged from 78 kCal to 112 kCal and sample 1 obtained the highest calorie content. These show that the wine samples are good sources of calories. High caloric values in wines are associated with high alcohol content [17].

Moreover, the wine samples contained total carbohydrates that ranged from 2g to 10.80 g. Similar observations were reported [3], [17]. A decrease in amount of carbohydrates present in the Lubeg wine samples was observed. The sugar content of the Lubeg wine samples ranged from 10.50 g to 2.00 g. The decrease in carbohydrate contents of the Lubeg wine samples might be due to a decline in the sugar content as well. It is a result of rapid and effective utilization of the sugar available in the wine must by the yeast cells leading to the fermentation of the wine must [1] [16].

Fermentation affects the protein content of wines [17]. In this study, no protein content was recorded and it can be regarded in the wine process such as fermentation of Lubeg wines. It was reported that low protein content of the wine is good for maintaining cellular organization [3] [17]. In addition, the absence of protein shows that the wine is gluten free [12] and is good for people on a low-gluten diet [5].

	Lubeg Wine with Lubeg Wine with		Lubeg Wine with		
	Sugar	Honey	Sugar and Honey		
	(Sample 1)	(Sample 2)	(Sample 3)		
Moisture (%)	92.86	98.54	98.09		
Ash (%)	0.03	0.04	0.03		
Crude Fiber (%)	0.00	0.00	0.00		
Total Fat (%)	0.00	0.10	0.00		
Calories (kcal)	112.00	78.00	81.00		
Total Carbohydrates (g)	10.50	2.00	2.80		
Sugar (g)	10.50	2.00	2.80		
Protein (g)	0.00	0.00	0.00		

Table 1. Proximate analysis of Lubeg wine samples

#### 3.2 Alcohol Content of the Lubeg Wines

After the fermentation process, sample 1 got the highest alcohol content of 9.17% followed by sample 2 (5.92%) and sample 3 (8.96%) (Table 2). Alcohol in wine is significant in the aging, stability and organoleptic characteristics of wine [10], [15]. Fruit wines are undistilled alcoholic beverages that usually have an alcoholic content ranging between 5 and 13 percent [15]. Wine is categorized as low alcohol wine (below 10%), medium-low alcohol wine (10-11.5%), medium alcohol wine (11.5-13.5%), medium-high alcohol wine (13.5-15%), and high alcohol wine (over 15%) [9]. Therefore, the three samples are categorized as a low-alcohol wine.

The results of the study can be compared with the study of wines in starfruit and dalanghita [9]; apple tea wine [10]; dragonfruit wine [8]; and coconut water and zobo wine [1].

Table 2. Alcohol content of Lubeg wine samples

	<u> </u>		
	Lubeg Wine with Sugar	Lubeg Wine with	Lubeg Wine with Sugar
Parameter	(Sample 1)	Honey	and Honey
		(Sample 2)	(Sample 3)
% Alcohol	9.17	5.92	8.60

# **3.3 On Cost and Return Analysis of the Lubeg Wines**

Table 3 provides a cost and return analysis for Lubeg wine samples. Sample 1 received the largest return. It is noteworthy that the Lubeg wine sample products exhibit a return above the variable cost ranging from 12.96% to 20.45%, rendering it a viable source of income. Wine has been commercialized over the years and investing in wine could be a beneficial elective venture choice [4].

Product	Gross	Production	Net	Return above
	Income	Cost	Income	variable cost
	(Php)	(Php)	(Php)	(%)
Lubeg Wine with Sugar (Sample 1)	220	180	45	20.45%
Lubeg Wine with Honey	270	205	35	12.96%
(Sample 2)				
Lubeg Wine with Sugar and Honey	260	225	35	13.46%
(Sample 3)				

Table 3. Cost and return analysis of processed Lubeg wine samples

# 3.4 On Sensory Evaluation of the Lubeg Wines

Table 4 shows the qualities of the Lubeg wine samples as assessed by 30 individuals (13 males and 17 females). Sample 1's appearance was good; its aroma, taste/texture, aftertaste, and overall impression qualities were all excellent. In total, Sample 1 got an excellent rating. Sample 2 got a good rating in terms of all the dimensions (appearance, aroma, taste/texture, aftertaste, overall impression) and in general. Sample 3 was excellent as to overall impression, but had a good appearance, aroma, taste/texture, and aftertaste. Overall, Sample 3 was good. It was observed that the appearance of Lubeg wine looked better to the evaluators than the other fruit wine samples [14]. Based on table 1, all the Lubeg wine samples were considered likely to be accepted by the respondents.

Table 4. Qualities of the Lubeg wine samples

Lubeg Wine	Criteria	М	SD	Description
Sample 1	Appearance	2.36	.71	Good
	Aroma	4.76	.89	Excellent
	Taste/Texture	4.66	.99	Excellent
	Aftertaste	2.56	.62	Excellent
	Overall Impression	1.80	.55	Excellent
	Total	16.16	2.58	Excellent
Sample 2	Appearance	2.13	.62	Good
	Aroma	3.76	1.16	Good
	Taste/Texture	3.53	1.35	Good
	Aftertaste	2.03	.85	Good
	Overall Impression	1.23	.67	Good
	Total	12.70	3.96	Good
Sample 3	Appearance	2.33	.80	Good
	Aroma	4.23	1.04	Good
	Taste/Texture	3.93	1.17	Good
	Aftertaste	2.20	.66	Good
	Overall Impression	1.50	.62	Excellent
	Total	14.20	3.72	Good

# 3.5 Comparing the Sensory Evaluation of Lubeg Wines

There was no significant difference between the appearances of the three samples, F = .922, p > .40. On the other hand, there were significant moderate differences between the ratings of the samples as to aroma (F = 6.94; p < .01; = 13.76%), taste/texture (F = 7.07; p <.01; = 13.97%), aftertaste (F = 4.31; p < .02; = 9%), overall impression (F = 6.23; p < .01; = 12.52); and there was a significant large difference in their totality (F = 7.49; p < .01; = 14.68%).

As compared to Sample 2, Sample 1 consistently got a significantly higher rating in terms of aroma, taste/texture, aftertaste, overall impression, and totality. Sample 3 was not significantly different from Sample 1 in all the dimensions except for taste/texture i. e. Sample 1 (M = 4.66) got a greater rating for taste/texture than Sample 3 (M = 3.93).

In general, sample 1 (Lubeg wine with sugar) is much liked by the respondents. The added sweetener, honey and sugar have affected the quality of the Lubeg wine, especially in taste and aroma. Fruit wine flavours are well accepted by consumers all over the world because of their attractive colors, pleasant flavors and aroma [2] [4] and fruit wines, if consumed properly, are also known for their beneficial effects on health.

3.53<sup>b</sup>±1.35

2.03<sup>b</sup>±0.85

 $1.23^{b}\pm 0.67$ 

 $12.70^{b} \pm 3.96$ 

3.93<sup>b</sup>±1.17

2.20<sup>ab</sup>±0.66

 $1.50^{ab}\pm 0.62$ 

14.20<sup>ab</sup>±3.72

Attributes	Lubeg Wine Samples				
	1	2	3		
Appearance	2.36±0.71	2.13±.62	2.33±0.80		
Aroma	$4.76^{\rm a}\pm0.89$	$3.76^{b}\pm1.1.6$	$4.23^{ab}\pm 1.04$		

4.66<sup>a</sup>±0.99

2.56<sup>a</sup>±0.62

 $1.80^{a}\pm0.55$ 

16.16<sup>a</sup>±2.58

Table 5.	Comparison	between	the ]	Lubeg	wine	samp	oles
	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0						

### 4. Conclusion

Taste/ Texture

**Overall Impression** 

Aftertaste

Total

Lubeg trees thrive in some parts of the northern Philippines. Lubeg fruits are characterized as highly perishable and sour in taste. To maximize its potential values, Lubeg fruit wine samples were processed specifically Lubeg wine samples with sugar as the main ingredient, Lubeg wine with honey as sugar substitute and Lubeg wine with honey and sugar that aid in the wine-making process. Moreover, this study aims to determine the proximate analysis, alcohol content, cost of return analysis, and sensory evaluation of Lubeg wine samples.

Based on the results, the Lubeg wine samples have a high moisture content and a minimal ash content. The wine samples are also good sources of calories. Carbohydrates and sugar are also present in the wine samples. However, crude fiber and protein were not observed in the wine samples and a minimal amount of total fat was only present in sample 2. The components of fruits may be affected when processed such as when fermented. In addition, the wine samples were categorized as low alcohol wines. The Lubeg wine sample products have a return above variable cost, which makes the wine samples a viable source of income.

During the assessment of the respondents, the Lubeg wine samples were generally accepted and liked in terms of appearance, aroma, taste/texture, aftertaste, and overall impression. Sample 1 (Lubeg wine with sugar) was the most highly liked of the three wine samples across all dimensions.

### 5. Recommendations

In order to enhance the processing of Lubeg fruit wines and their marketability, further studies on the fermentation process of Lubeg fruit wines should be given emphasis. Determine also other parameters of proximate analysis such as pH and acidity, vitamins and other mineral contents, phenolic and antioxidant activity to give more comprehensive data on the components of produced Lubeg wines. In addition, further nutritional evaluation of the products should be conducted to enhance nutritional labeling which can be used later as marketing and promotion tools.

# 6. References

 Ajogun, C.O, Achinewhu, S.C., Kiin-Kabari, D.B. & Akusu, O.M. (2020).
 Physicochemical, Sensory and Microbiological Quality of Table Wine Produced from Coconut water, Honey and Zobo. European Journal of Agriculture and Food Sciences, 2:5

[2]Antonio, M., Jordao, A. & Cosme, F. (2015). From Sugar of Grape to Alcohol of Wine: Sensorial Impact of Alcohol in Wine. Beverages 2015, 1, 292-310; doi:10.3390/beverages1040292

[3]Awe, S , Eniola, K.I.T and Kayode-Ishola, T.M (2013). Proximate and Mineral Composition of Pawpaw and Banana Wine. American Journal of Research Communication

[4]Baua, M. (2021). Development and acceptability of mead wine with calamansi fruit flavor. Plant Science Today, 8(3): 451– 455

[5]Cacatian, S. & Guittap, J. (2022).
Production, Proximate Analysis and
Functional Properties of Dragon Fruit Peel
Powder. Retrieved from
https://www.researchgate.net/publication/3592
09516

[6]Cohen, J. (1988). Statistical power analysis for the behavioral sciences. Hillsdale, NJ: Erlbaum.

[7]Columna, N. (2019). Morphological characterization and chemical composition of Lubeg (Philippine cherry). Journal of Biodiversity and Environmental Sciences (JBES), 14:5(27-30)

[8]Dimero, F. N., & Tepora, T. F. (2018). Processing and Development of Dragon Fruit Wine. International Journal of Environment, Agriculture and Biotechnology, 3(5), 1943– 1947. https://doi.org/10.22161/IJEAB/3.5.49

[9]Fiscal, R. & Chavez, A. (2015). Wine Potential of Different Philippine Fruits. International Journal of Science and Research (IJSR)

[10]Joshi, V. & Kumar, V. (2017). Influence of different sugar sources, nitrogen sources and inocula on the quality characteristics of apple tea wine. Wiley Online Library DOI 10.1002/jib.417

[11]Manicad, M.C., (2016). Phytochemical analysis of Lubeg (Syzygium lineatum (dc). merr & l.m. perry) species in Apayao. International Journal of Novel Research in Life Sciences, 3:6 (1-5).

[12]McCulloch, M. (2019). Is wine gluten free?. Article from https://www.healthline.com/nutrition/is-winegluten-free

[13]Mo, Ji, & Ca, (2020). Proximate, Chemical Compositions and Sensory Properties of Wine Produced from Beetroot (Beta vulgaris). Chemical Science Review and Letters

[14]Ocampo, R. & Usita, N. (2015).Development of lubeg (Syzygiumlineatum (roxb.) merr.& perry) processed products. Asia Pacific Journal of Multidisciplinary Research, 3:4 (118-123).

[15]Swami, S., Thakor, N.J., & Divate, A.D.(2014). Fruit Wine Production: A Review.Journal of Food Research and Technology, 2:3(93-100)

[16]Yabaya, A., Bobai, M., & Adebayo, L.R.(2016). Production of wine from fermentation of vitis vinifera (grape) juice using saccharomyces cerevisiae strain isolated from

palm wine. International Journal of Information Research and Review, 3:10 (2834-2840)

[17]Zainab, Amos, Datsugwai, & Mathew
(2018). Quality Assessment of Water Melon
(Citruluslanatus) Wine Produced Using
Saccharomyces cerevisiae Isolated from Palm
Wine. Journal of Biomaterials. Vol. 2, No. 2,
2018, pp. 65-73. doi:
10.11648/j.jb.20180202.17