

Characteristic and Sensory Acceptability of Lubas (*Spondias pinnata*) as Table Wine

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Abstract - *The Philippines has colossal quantity of raw materials that can be made into endless choice of a vast array of food products. This study developed wine from lubas fruit which aimed to identify the processes involved in wine making; determined the quality of the lubas wine in terms of its pH and alcohol content; and evaluate the acceptability in terms of taste, aroma, appearance, and marketability. The descriptive method and research development process were used in the study. Findings showed that the processes involved in Lubas wine making were: preparation and selection of fruit, blending and extraction of must, cooking and cooling of mixture, inoculating of the yeast, fermenting, and racking/aging/clarifying. Treatment 3 with refined sugar yielded the highest alcohol content but lowest pH level. Treatment 1 with muscovado sugar and treatment 2 with coconut sugar yielded 8.63% and 8.50% of alcohol content and pH level of 3.90 and 3.80 respectively. Lubas wine is classified as table wine since it contains 8-12 % alcohol and pH level of 3.35- 3.9. Similarly, treatment 3 described as sweet, hot and moderately bitter while treatments 1 and 2 were least sour, less bitter, less hot while treatment 3 was described as hot. All variables were perceived as candylike in aroma and as hazy in appearance. Also, treatment 1 was moderately marketable while treatment 2 and 3 were marketable and had the highest acceptability in terms of marketability. As a result, the underutilized lubas fruit can be introduced in the market through production of wine, preserves and other products that can augment family income and contribute to economic development.*

Keywords: *Refined sugar, muscovado, coconut sugar*

INTRODUCTION

The Philippines has colossal quantity of raw materials that can be made into endless choice of a vast array of food products. As a tropical country, the Philippines abound in the different kinds of fruits.

However, their economic potentials have never been fully exploited. During their season of production, a considerable percentage of their fruits are not harvested due to lack of demand. Some of these fruits are processed for preserves like jams and candies, some are utilized for cooking and baking pastries, but most of them can be eaten raw. Some fruits are also made into wine. Philippines can become known as a wine producing country in Asia with its abundance of fruit bearing trees.

In the Philippines, according to Sanchez [1], the most common fruits being utilized for wine making are duhat, bignay, cashew, banana, and pineapple. Minor fruits like bignay, calumpit, mansanitas, passion fruit, and wild variety of bananas have been found to yield high quality wines. Trimmings from fruit jams, jelly and preserve production can also be used for wine making [2]-[7].

As there is an abundance of other tropical fruits in the different parts of the Philippines, a variety of fruit wines produced either for home consumption or commercial purposes may be found throughout the country, especially now that the Filipinos have become more and more aware of the culture of wine drinking. Trade liberalization has even caused an influx of foreign wines into the local market and further aroused the curiosity particularly among the youth. This new passion plus the growing popularity of fruit wines fuelled the enthusiasm of the modern Filipino wine makers to take the challenge and aspire to be at par with the fine wine makers of the western world.

In a tropical country like the Philippines, fruits unavailable to western nations come abundantly and without much effort in our nutrient- enriched and sun-drenched soil. Fruits like the Philippine mango, pineapple, and papaya are just a few of the many highly valued fruits imported by other countries from the Philippines [8]. Export demands continue to increase due to this; however, local demands fall quite short behind.

The researcher decided to conduct a study about lubas fruit to be produced into wine out of its fruit juice. Its health benefits may bring opportunities to many consumers that need not worry about consuming a bottle of wine but to enjoy. This study will lead to give an additional livelihood venture to those who have an abundant production of lubas fruit. Being a native food product, this can be sold at a low price and can become a Bikol pride. In some provinces in the country, lubas fruit is just ignored and used as play stuff and they do not give importance to the lubas fruit. This study will lead to awareness and recognition of lubas fruit. Lubas can be exploited in the market and become a valuable fruit. Further, studies on lubas can be done to come up with other food products that will provide health benefits, and solve health problems and financial crisis. Moreover, students, researchers, and households may gain useful information about the fruit.

OBJECTIVES OF THE STUDY

The general objective of the study is to produce wine from lubas (*Spondias pinnata*) fruit. The study aimed to identify the processes involved in wine making; determine the quality of the lubas (*Spondias pinnata*) fruit wine in terms of its pH and alcohol content; and evaluate the acceptability of the lubas (*Spondias pinnata*) fruit wine in terms of: taste, aroma, appearance, and marketability.

MATERIALS AND METHODS

The main objective of the study was to produce wine from lubas (*Spondias pinnata*) fruit. The descriptive method, experimental method and research and development method were used to show how lubas (*Spondias pinnata*) fruit developed into wine.

The descriptive method was used to find out the level of acceptability of the products in terms of taste, aroma, physical appearance and marketability. A score sheet is given to the respondents for sensory evaluation. The responses were gathered and analyzed to describe how the products are acceptable. The experimental method was used to show the experimental procedures involved in the preparation of lubas (*Spondias pinnata*) fruit wine making. Trials were conducted to test the acceptability of the products in terms of taste, aroma, physical appearance and marketability. Research and development method includes literature review, planning, developing the product, and validation of its acceptability.

The related studies review gave insights on the feasibility of lubas (*Spondias pinnata*) fruit for wine production. It helped determine the best procedure for wine making. It also gave information of lubas fruit and its importance to health and potentials to the market, potentials of lubas tree, nutritional information of lubas fruit, wine and its components, wine making process and Philippine fruit wines.

Planning. The planning stage includes the identification of the materials and steps involved in wine making. It also considered the time frame for the completion of the study.

Developing the product. The development stage focused on the preparation of the wine following the standard procedure. It involves preparation of ingredients including selection of lubas fruit, cleaning and cutting of lubas fruit, blending and extraction of must, cooking of the mixture, cooling of the cooked mixture, inoculating of yeast, fermenting, and racking/aging/clarifying. Three trials were conducted with three treatments each.

Validation of the acceptability. The study was supplemented by a survey questionnaire to determine its acceptability. The survey instrument was answered by 25 respondents. 5 respondents were bartenders or wine connoisseurs, 10 female and 10 male alcohol drinkers. They evaluated the acceptability level of lubas (*Spondias pinnata*) wine in terms of taste, aroma, physical appearance and marketability. The evaluation instrument includes the taste such as sweet-means tasting like sugar or similar substance containing a relatively amount of sugar; sour- if it implies the presence of acetic acid plus excess acid component; bitter- having a sharp strong unpleasant taste; and hot- is applied to spicy or strongly flavored wines. For aroma it includes: candy like- refers to the perfumed fresh fruits aromas and flavors; flowery- it suggests of aroma of a flower; rotten egg- a decided flaw; and earthy- refers to the unpleasant odor of damp soil that is perceived in the mouth. Physical appearance includes cloudiness- visually clear; brilliant-very clear and transparent; and hazy-slightly clear and transparent. For marketability, respondents evaluated the lubas wine as to marketable or non-marketable. The Likert scale was used in the preparation of results. Average weighted mean 1.00-1.5 is unacceptable, 1.51-2.5 is slightly acceptable, 2.51-3.5 is moderately acceptable, 3.51-4.5 is acceptable and 4.51-5 is highly acceptable. Table 1 shows the evaluation characteristics of lubas (*Spondias pinnata*) wine.

Table 1. Evaluation Characteristics of Lubas (*Spondias pinnata*) Wine

Taste	Aroma	Physical Appearance	Marketability
Sour	Candylike	Cloudy	Marketable
Sweet	Flowery	Brilliant	Not
Bitter	Rotten	Hazy	Marketable
Hot	Egg Earthy		

RESULTS AND DISCUSSION

This section presents the results and experimental procedures along the four basic specific objectives. It discusses the processes involved in lubas wine processing, analysis of the quality of the wine made from lubas (*Spondias pinnata*) fruit in terms of taste, aroma, appearance and marketability.

Processes Involved In Lubas Wine Making

A. Extracting the Juice

The process started from the gathering of the raw materials, cleaning of lubas fruits, peeling the fruits, washing of peeled fruits, cutting into smaller pieces, blending, and squeezing to extract the juice. Matured lubas fruits were gathered. Then, cleaning of the fruits was done. After that, peeling of the fruits followed using a paring knife. Then the peeled fruits were cut into smaller pieces to remove the seed and to be easily crushed by the blender. The fruits were crushed in a blender and squeezed using cheesecloth to get the juice extract. Figure 1 shows the flow chart that illustrates the processes in extracting the lubas juice.

B. Lubas Wine Preparation

1. Preparation of all ingredients

Ingredients were weighed and measured following the recipe of 2 cups water, 2 cups lubas extract, $\frac{3}{4}$ cup sugar and $\frac{1}{2}$ teaspoon yeast.

2. Extraction of must

The 500g of cut lubas fruit were crushed in a blender. Two cups of lubas must were extracted by squeezing using cheesecloth.

3. Dilution of water

The two (2) cups of distilled water was boiled in 5 minutes. Then $\frac{3}{4}$ Cup of sugar is added, stirred and dissolved.

4. Dilution of the must

The two (2) cups of lubas must was then added and boiled for 5 minutes. The diluted must was cooled, strained and poured on sterilized bottle. Dilution of water adjusts the pH level and increase the volume of the must.

5. Inoculation

The diluted must was inoculated aseptically with yeast.

6. Fermentation

The diluted must was fermented for 4-6 weeks. The process of fermentation in winemaking turns lubas juice into an alcoholic beverage. During fermentation, yeasts transform sugars present in the juice into ethanol and carbon dioxide (as a by-product). Fermentation is complete if the mixture has stopped releasing air bubbles.

7. Racking, Aging, and Clarification of the fruit wine

Racking is the process of decantation of clearing wines from the deposit of dead yeast cells and other insoluble matter called lees, which can gradually built up during the fermentation of the must and subsequent steerage of new wine. The simplest method of racking is to siphon the clear wine through the plastic tube from the original containers into another clean container. The wine will continue to improve for several months or years. Fining agents can be used to clarify the wines to produce brilliant and clear wines. Commercial fining agents like bentonite, metatartaric acids and egg albumen can be used as a fining agent. But wines will clarify as it age. When selecting a fining agent, the main factors to consider are the type of wine you are making, the tannin concentration of the wine, and desired results relative to color.

Lubas (*Spondias pinnata*) wine used the same recipe with the three treatments. It only differed with the type of sugar used. Treatment 1 used muscovado sugar (made from unrefined evaporated cane juice); Treatment 2 used coconut sugar (natural and healthier alternative to refined sugar made from 100% natural coconut sap); and treatment 3 used refined sugar (table sugar). Two cups of lubas extract was used with two cups of distilled water and half teaspoon of yeast.

Three (3) types of sugar were used as variables in making the lubas wine. Treatment 1 used muscovado sugar. Muscovado sugar is made from unrefined evaporated cane juice. The sugar is not separated from the natural molasses which helps it retain most of its essential nutrients, vitamins, and minerals. Muscovado sugar is made by heating cane juice and in its traditional cooking process lime juice is added while the cane juice is being heated. Muscovado also contains about .2% coconut milk. It retains several nutrients such as potassium, calcium, magnesium, and iron, among other useful compounds. Treatment 2 used coconut sugar which is a natural and healthier alternative to refined sugar and muscovado sugar. It is

derived from 100 % natural sources. It is made from 100% all natural watery sap from cut flower buds of fresh and organically grown coconuts in the Philippines. It is minimally processed without any chemicals or any other synthetic adulterants. It is largely unrefined sugar since it is boiled coconut tree sap. Coconut sugar contains more nutrients compared to muscovado. Treatment 3 used refined sugar. It is technically considered a natural sweetener since it is a sugar cane based or a by-product of cane sugar. To produce refined sugar involves washing, filtering, and chemical bleaching which removes the nutrients. Refined sugar is bleached with chlorine. Table 2 shows the treatments of Lubas (*Spondias pinnata*) Wine.

Table 2. Treatments of Lubas (*Spondias pinnata*) Wine

Treatments	Ingredients			
	Water	Sugar	Lubas must	Yeast
1	2 cups	¾ cup Muscovado Sugar	2 cups	½ tsp
2	2 cups	¾ cup Coconut Sugar	2 cups	½ tsp
3	2 cups	¾ cup Refined Sugar	2 cups	½ tsp

Trials were conducted to produce the desired quality of the lubas (*Spondias pinnata*) wine. Among the trials of treatment 1 (muscovado), trial 1 had a different findings in terms of aroma, taste and appearance. These poor characteristics were due to the external factors that caused unfavorable effects on the quality of wine. The cork of the bottles was ruined by ants that caused the air to enter the bottle affecting the anaerobic fermentation. Trials 2 and 3 were the same due to the modifications applied by securing the corks

to prevent from insect damage. The aroma was candy like due to the sugar content of the wine. It is also sweet, sour and hot because of the alcohol content and other ingredients of the wine. It as hazy because of the dead yeast or the lees present in the wine. Tables 3 shows the comparison of trials of lubas (*Spondias pinnata*) wine.

Trials of treatment 2 (coconut sugar) had the same findings in terms of aroma, taste and appearance. It is candy like in aroma because of the sugar added in the wine and due to the aroma of lubas fruit itself. It is sweet, sour, bitter and hot because of the alcohol produce by the fermentation. Sweetness, sourness, bitterness, and hotness gave the taste of a real wine. The wine is hazy because of the sediments present in the wine. It is expected that as the wine aged, clarification will occur naturally.

Trials of treatment 3 (refined sugar) had the same findings in terms of aroma, taste and appearance. It is candy like in aroma because of the sugar content of the wine. In terms of taste, treatment 3 had a good taste. Its sweetness, hotness, sourness and bitterness were due to suitability of the refined sugar in wine making. It is commonly used sugar in wine making because it is easily consumed by the yeast to produce alcohol. It is also hazy due to the lees present in the wine.

Qualities of Lubas Wine in Terms of Its pH(Acidity) and Alcohol Content

The results of the alcohol analysis conducted by Department of Science and Technology (DOST), Legazpi City revealed that treatment 1 (muscovado sugar) has 8.63% alcohol content with 3.90 pH level , treatment 2 (coconut sugar) has 8.50% alcohol content with 3.80 pH level %, and treatment 3 (refined sugar) has the highest alcohol content of 12.28% with 3.35 pH level.

Table 3. Comparison of Trials of Lubas (*Spondias pinnata*)Wine

Trials	Process	Findings/Observations		
		Aroma	Taste	Appearance
1	1. Preparation of ingredients including selection of fruit 2. Cleaning and cutting of fruit 3. Blending and Extraction of must 4. Cooking of the mixture	earthy	sour	Cloudy
		Modification: The cork in the openings of the bottles were secured from ants to prevent insect damage.		
2	5. Cooling of the cooked mixture 6. Inoculating of yeast 7. Fermenting	Candy like	sour, sweet, hot	Hazy
		Modification: Bottles were stored in darker room to improve fermentation environment for better result.		
3	8.Racking/Aging/ Clarifying	Candy like	sour, sweet, hot	Hazy

The result of the analysis shows that lubas wine falls under the classification of table wine with 7-15 % alcohol content by volume. Table wines are also called still or natural wines, which are made from juice that is pressed. The juice is allowed to ferment naturally sometimes with the addition of controlled amounts of sugar and yeast. Table wines come in three basic colors: white (often yellow to golden), red, or rose (a pale pink). They range in taste from sweet to very dry, without being bitter.

The definition of fruit wine varies, but generally fruit wine is made from the juice of sound, ripe fruit, fruit juices or concentrate, without containing any grape products. The alcohol content in wine can vary, according to certain regulations; fruit wine has to be greater than a minimum of 7.1 percent alcohol. If greater than 14.9 percent alcohol by volume, it can be labelled as a 'dessert' wine or 'aperitif.'

The pH is a measure of the strength of acidity. Treatment 1 has 3.90, treatment 2 has 3.80 and treatment 3 has 3.35. Most wines have 3 to 3.9 pH level. The three treatments fall under the average range of pH level of wines. Solutions (such as wine) can have a pH in the range 0 to 14. A pH of 0 represents a strong acid solution, while a pH of 14 represents a strong alkaline solution. Distilled water has a theoretical pH of 7, and wines are in the range of 3 to 4. More specifically, the pH level of musts and wines should be within the following recommended ranges for a desired style of wine [9].

Generally, the lower the pH there is a tendency to have higher level of acidity in the wine. Treatments 1 to 3 have pH levels ranging from 3.35-3.9. This is due to high acid contained by the unripe lubas fruit. Unripe lubas fruits have high acidity. As it ripens the acid levels decrease. This makes sense as white wines are generally better with higher acid (lower pH) and sweet dessert wines would necessarily have a lower acid (higher pH) due to the ripeness of the fruit at the time of pressing [10].

Acidity greatly influences the taste of wine. Therefore, winemakers need to understand the roles of the various acids, their occurrence in common bases for making wines, their tastes, their sufficiency, how to measure them, and the principles for adjusting acids when necessary. Acids give wines their characteristic crisp, slightly tart taste. Alcohol, sugars, minerals, and other components moderate the sourness of acids and give wines balance. Some acids are naturally present in the base ingredients of wines, while others are by products of fermentation [11].

The thing to remember about pH is that the higher the pH, the lower the acidity, and the lower the pH, the higher the acidity. So a wine with a pH of 4.0 is less acidic than one with a pH of 3.6. Although total acid and pH are related, they represent different ways of measuring acidity of wine. The pH can be measured with a pH meter, an instrument that determines pH quickly and easily. It represents the active acidity of the wine. If the pH of a wine is too high, say 4.0 or above, the wine becomes unstable with respect to microorganisms. Low pH inhibits microorganism growth [12].

With the result of the analysis performed by the Department of Science and Technology (DOST), Legazpi City, Region V, treatment 1(muscovado) and 2(Coconut sugar) had 8.63 and 8.50 alcohol content and 3.9 and 3.8 pH level, respectively. While treatment 3(refined sugar) had 12.28 alcohol content and 3.35 pH level. Treatments 1 and 2 produced lower alcohol content due to the macronutrients contained by muscovado and coconut sugar. These sugars contain higher amount of nutrients that led to low alcohol content produced during fermentation. The nutrients reacted to yeast during fermentation. Yeasts don't do well if there is too much sugar in the environment. While treatment 3 with refined sugar had the highest alcohol content among the treatments because refined sugar is a washed sugar. It underwent washing, filtering and chemical bleaching which removes the nutrients. The yeast consumed the sugar and converted to alcohol.

Sugar is essential constituent of all wine because it is fermented to alcohol by yeast. Sucrose or refined sugar is the most commonly used sugar in wine making. It is cheap, readily available, and easily utilized by the yeast. Table 4 shows the result of the laboratory test on alcohol content and acidity of lubas wine.

Table 4. The Alcohol Content and Acidity (pH) of Lubas (*Spondias pinnata*) Wine

Treatment	Alcohol Content	pH (Acidity)
1(Muscovado Sugar)	8.63 %	3.90
2(Coconut Sugar)	8.50 %	3.80
3(Refined Sugar)	12.28 %	3.35

Source: Department of Science and Technology, Region V, Legazpi City

The computed F- value was 23.96 which was greater than the critical value of 4.303 at 5% level of significance, interpreted as significant. There is significant difference between the alcohol content

among treatments. Furthermore, this explains the different alcohol content of treatments using muscovado, coconut sugar and refined sugar had significant difference statistically. The significant difference can be attributed to the higher alcohol content of the treatment using refined sugar. Table 5 shows the significant difference between alcohol content among treatments of lubas (*Spondias pinnata*) wine.

Table 5. Significant Difference between Alcohol Content Among Treatments of Lubas (*Spondias pinnata*) Wine

Alcohol Content Among Treatments	F-Value	Critical Value at 5%	Interpretation
	23.96	4.303	S

Note: S – Computed value > critical value
 NS- Computed value ≤ critical value

Acceptability of Lubas Wine

The acceptability of lubas wine in terms of taste, aroma, physical appearance and marketability was determined based on the evaluation instrument given to 25 respondents. The respondents were distributed into 10 female and 10 male alcohol drinkers, and 5 bartenders.

Taste

The evaluators determined the acceptability of the lubas wine in terms of taste qualities such as sour, sweet, bitter and hot. There are three taste characteristics we normally can identify in wine: sweet, sour (or acid) and bitter. Wines rarely have a salty taste. Each is sensed in a different part of the mouth: sweet at the tip of the tongue; sour or acid along both sides of the tongue, and bitter in the back center of the tongue. This is why it is important that you roll the wine around in your mouth -- so it contacts all the taste sensors. The sweet taste in wines is due primarily to sugar. Sweetness is not necessarily a virtue nor is it a fault; it depends entirely on the character of the wine and the preference of the consumer.

The quality and taste of wine solely depend on how it is processed. Sweet wines, for example, are made from riper fruits. Shorter fermentation period results to lower alcohol content granting sweeter wine, while longer fermentation period results to higher alcohol content. In relation, substrate acidity produces

sourness in wine, while too much alcohol can produce a strong alcohol taste.

In terms of sweetness, female and male alcohol drinkers, and bartenders had the same perception on the sweetness of the lubas wine treatments. The sweetness of a wine is determined by the interaction of several factors, including the amount of sugar in the wine, but also the relative levels of alcohol, acids, and tannins. Sugars and alcohol enhance a wine's sweetness. Treatment 1 was described as less sweet, treatment 2 was described as moderately sweet and treatment 3 was described as sweet by the evaluators. Among the treatments, treatment 3 with refined sugar, was said to be sweet. Refined sugar is the most commonly used sugar in wine making because it can be easily utilized by the yeast. It interacts well with the other components of wine to produce quality wine including sweetness.

Sourness of wine is due to the acid content of the fruits. A wine with high levels of acid may taste tart or sour. Acid is natural to wine, an essential flavor component. With too little acid, it will taste flat, or flabby. It is said that an acidic wine is lemony or crisp. Treatments 1 (muscovado) and treatment 2 (coconut sugar) were described as least sour by the evaluators. While treatment 3 (refined sugar) was described as less sour. This means that the lubas fruit contains right amount of acid for wine making. If your wine has a sour taste it could simply be from the fact that the fruit used to make the wine was too tart. In other words, the wine has too much fruit acid from the fruit, itself and it is considered as a flaw.

In terms of bitterness, treatment 1 (muscovado sugar) and treatment 2 (coconut sugar) were described by the three groups of evaluators as less bitter, while treatment 3 (refined sugar) was described as moderately bitter. Bitterness is due to the tannin present in the skin, stems and seeds of the fruits. Although lubas fruits were peeled, there are still remaining tannins in the flesh of the lubas fruit when they were crushed. Tannin is one of the components of wine where it gives the natural color of wine especially in red wines. But in white wines they do not undergo too much contact with the lubas skin when they were made. Lubas wine contained a bit of bitterness because lubas fruits were peeled and contain less tannin. This means that bitter taste from lubas wine is just right for a fruit wine.

Hot taste of wine is associated with the alcohol content of wine. The hotter the wine, there is a possibility the higher the alcohol content. Alcohol in

wine is predominantly ethanol, the 2-carbon alcohol which is the primary by-product of the anaerobic metabolism of sugar by yeast. This gives the hot sensation on the mouth when you drink a wine. Treatment 1 and 2 were described by the evaluators as less hot. This is due to the lower alcohol content of the treatments. While treatment 3 was described as hot by the female drinkers and less hot by the male drinkers and bartenders.

Evaluating wine is often done in peer groups letting you know how wine, or group of wine compares to other wines in the same peer group. Thoroughly tasting a wine involves perception of its array of taste and mouth feel attributes, which involve the combination of textures, flavors, weight, and overall structure. Following appreciation of its olfactory characteristics, the wine taster savors a wine by holding it in the mouth for a few seconds to saturate the taste buds. By pursing ones lips and breathing through that small opening oxygen will pass over the wine and release even more esters. When the wine is allowed to pass slowly through the mouth it presents the connoisseur with the fullest gustatory profile available to the human palate.

Generally speaking, wine tasting will always depend on the individual preferences of wine tasters or consumers. It is influence by some factors like the mood, biases, the aroma, the appearance and the palate of the consumer. Taste is arguably subjective when art, fashion, or music is the subject of conversation. When wine is the subject, it was found out that everyone may have different taste in wine, but

tasting wine has an objective component. It involves not just taste, but sight, smell, and touch. These four senses send objective information to the brain, and this helps in evaluating, not merely appreciating a glass of wine. In the evaluation and appreciation of wine setting is enormously important. Taste is affected by mood, health, and environment. Individuals have genetic differences that determine their ability to taste. There is no such perfect wine when it comes to taste. The best wine will always depend on the preference of every individual who drinks the wine. Table 6 shows the acceptability level of lubas (*Spondias pinnata*) wine in terms of taste.

Aroma

It is said that as much as 85% of taste is derived from the sense of smell. But smelling wine requires swirling of glass gently. The action of swirling the glass allows oxygen to enter into the wine, which allows the wine to release its scent into the air while coating the glass at the same time. Generally speaking, if a wine smells good, meaning there are no off odors such as scents of wet dogs, old newspaper, mold, vinegar or generally unclean scents, the wine is sound.

Treatments 1 (muscovado) , treatment 2 (coconut sugar), and treatment 3 (refined sugar) were perceived by female and male alcohol drinkers, and bartenders as candylike in aroma . This is due to the aroma of the lubas fruit itself and the sugar used in making the lubas wine. Table 7 shows the acceptability level of lubas wine in terms of aroma.

Table 6. The Acceptability Level of Lubas (*Spondias pinnata*) Wine in Terms of Taste

Taste	Treatment	Male Drinkers	Female Drinkers	Bartenders
Sweet	1	Less Sweet	Less Sweet	Less Sweet
	2	Moderately Sweet	Moderately Sweet	Moderately Sweet
	3	Sweet	Sweet	Sweet
Sour	1	Least Sour	Least Sour	Least Sour
	2	Least Sour	Least Sour	Least Sour
	3	Less Sour	Less Sour	Less Sour
Bitter	1	Less Bitter	Less Bitter	Less Bitter
	2	Less Bitter	Less Bitter	Less Bitter
	3	Moderately Bitter	Moderately Bitter	Moderately Bitter
Hot	1	Less Hot	Less Hot	Less Hot
	2	Less Hot	Less Hot	Less Hot
	3	Less Hot	Hot	Hot

Table 7. The Acceptability Level of Lubas (*Spondias pinnata*) Wine in Terms of Aroma

Treatment	Male Drinkers	Female Drinkers	Bartenders
1	Candy like	Candy like	Candy like
2	Candy like	Candy like	Candy like
3	Candy like	Candy like	Candy like

Physical Appearance

The first thing that is being notice when someone hands a glass of wine is the color and clarity. People expect that the wine must be clear. But some home winemakers prefer not to fine their wines because it will often fall clear on its own within several months. But there are many ways to improve the clarity of a wine. Fining is the act of adding a product to wine to remove suspended solids. For many home winemakers, it is what gives their finished wine its high polish. Fining agents can be applied to the wine before fermentation, after the wine has stabilized and just before bottling. There is no fining agent that does everything to the must or wine. Not all remove suspended solids. Some have no charge at all, and only remove odors and colors. Sometimes it is necessary to apply two fining agents together, or to add fining agents at different stages of the wine's development [13].

A wine is considered clear when there are no visible particles suspended in the liquid and, especially in the case of white wines, when there is some degree of transparency. A wine with too much suspended matter will appear cloudy and dull, even if its aroma and flavor are unaffected; wines therefore generally undergo some kind of clarification. Most wines will naturally clear on their own. Red wines in particular have a better chance to clear with brilliant clarity. The lower the sugar content in the wine, the more effective the sedimentation process. This process of letting wines naturally clear over time, can take weeks, months or over a year [14].

Table 8. The Acceptability Level of Lubas (*Spondias pinnata*) Wine in Terms of Physical Appearance

Treatment	Male Drinkers	Female Drinkers	Bartenders
1	Hazy	Hazy	Hazy
2	Hazy	Hazy	Hazy
3	Hazy	Hazy	Hazy

The physical appearance of the lubas wine was evaluated in terms of characteristics as cloudy, brilliant and hazy. Treatments 1, 2 and 3 were described by the evaluators as hazy. Haziness of the

wine is due to the age of the wine. All treatments are still on the process of clarification. It will naturally clarify as it age within several months or a year. Table 8 shows the acceptability level of lubas wine in terms of physical appearance.

Marketability

The researcher also determined the marketability level of lubas wine. Treatment 1(muscovado) was described by male drinkers and bartenders as moderately marketable while female drinkers described it as marketable. Treatment 2 (coconut sugar) and treatment 3 (refined sugar) was described by the evaluators as marketable The results were based on the comments and responses of the evaluators. They considered the physical appearance, aroma and the taste of the treatments in evaluating the wine in terms of marketability. Among the treatments, treatment 2(coconut sugar) and treatment 3 (refined sugar) had the highest acceptability in terms of marketability due to its taste, aroma and appearance. Table 9 shows the acceptability level of lubas (*Spondias pinnata*) wine in terms of marketability.

Table 9. The Acceptability Level of Lubas (*Spondias pinnata*) Wine in Terms of Marketability

Treatment	Male Drinkers	Female Drinkers	Bartenders
1	Moderately Marketable	Marketable	Moderately Marketable
2	Marketable	Marketable	Marketable
3	Marketable	Marketable	Marketable

CONCLUSION AND RECOMMENDATION

In wine making, every process has its effects on the quality of the produced wine. It determines the quality of wine in terms of taste, aroma, physical appearance and alcohol content. From selection of fruits to racking and clarification, correct procedure must be performed. Generally speaking, most of the flaws in wine making is due to wrong processing of wines. Different types of sugar used in making lubas wine resulted to different alcohol content and pH level. Refined or table sugar produced more alcohol content because it is the most commonly used sugar in wine making. It is also cheap, readily available and easily utilized by the yeast. Muscovado sugar and coconut sugars contains nutrients that hinders the maximum fermentation of the wine. The type of fruit, the type and amount of sugar and the fermentation process determine the alcohol content and the pH level of the wine. There is no significant difference between the alcohol content and pH level of lubas

wine. The different sugars used in making the lubas wine resulted to different tastes, aroma, physical appearance and marketability. In evaluating wines, different senses are used. A wine that is sweet to a wine drinker would be different from another wine drinker. Others may say it's sour or hot or bitter. Taste of wine will depend on the preference of the taster. Marketability of wine also depends on the preference of the wine drinkers. Lubas wine has a market value and can be sold in the market.

Since wine making is a complex process, every step in the making must be given attention and importance. Other procedures can be used for wine processing depending on the type of fruit that will be used. To produce desired alcohol content of wine, the type and quality of fruit must be considered. Adding of sugar is necessary to achieve the preferred alcohol content. Hydrometer can be used to measure and monitor the level of alcohol along the fermentation process. Further trials should be done to achieve the best ratio and type of ingredients to produce better wines in terms of its taste, aroma, appearance and alcohol content. Different sugars can also be used in wine making like honey and molasses. Adding of sugar can be done before, during and after fermentation to produce the desired sweetness and alcohol content. Ripe lubas fruit can also be used in making wine. Ample time must also be given consideration in processing wines so that better quality of wine can be achieved. Although wines clarify themselves naturally in several months or years, clarifying agents can be used to produce clear and brilliant appearance of wines. Juicer can be used instead of blender to produce clearer wine. Lubas fruit can be exploited in the market since it is available all year round and because of its benefits to human health. Production of lubas fruit preserves and other products can also be ventured to augment family income.

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