

Development and Physiochemical Evaluation of Manzanita (*Muntingia Calabura Linn*) as Wine

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ABSTRACT: Manzanitas, otherwise known as Aratiles is a nostalgic fruit found in tropical countries like the Philippines. Fond from being nostalgic, the fruit is not famous for some local tongues, especially for the adults. To introduce this little but abundant fruit, the researchers produced a homemade by-product wine to highlight this ignored fruit. The study focused on ethanol analysis and consumer acceptability of wine made out of manzanita fruit. Therefore, the study aimed to determine the level of acceptability using three Treatments. The research is an experimental survey method. The facts gathered were about making organic manzanita wine from various proportions or treatments. The research was completed by the use of evaluation instruments like score sheet checklist and sensorial. The respondents' ratings were collected, tallied, collated, statistically treated, and interpreted. It has been found out that treatment 2 had the highest ethanol content and the most acceptable treatment among the three treatments. The study concludes that the developed manzanita wine and evaluated as to its level of acceptability, from the three Treatments, were safe to intake. Furthermore, the level of acceptability of the Manzanita wine were highly acceptable. The evaluations of the three groups of respondents across age groups gave significant differences in their evaluation along the three treatments. It is recommended that the manzanita wine should be fermented long enough, as it should. The treatment 2 which consists of 300g of manzanita fruit, 200ml of water, 100g of sugar, and 5g of dry active yeast should be adapted for better product as to the color, aroma, taste and texture. Likewise, treatment 2 should be modified to produce a better product in terms of ethanol content, which is 4.33% based on the DOST result.

KEYWORDS: Manzanitas/Aratiles, Ethanol Content and consumer acceptability, treatments, wine.

I. INTRODUCTION

Almost every one of us has experienced a childhood memory of playing and discovering different things around us. One of these discoveries was this fruit which seems to be a bird's food but for us, it is a snack. Fond from being entangled with fruit, it is sad to think that nowadays, children from this generation have gone far to familiarize this nostalgic fruit called, Aratiles/manzanitas or in Iloco dialect "Saraisa". Far from inquiring our elders around us, we asked them if they are aware of eating manzanita fruit found everywhere in the country, and eighty percent of them says no, and twenty percent says yes. But the shocking news about it is that some of the "parents" or adults have gone introduced it to their children and worse eating them alone. Some would have said they are not fun to its texture because it is slightly viscous and some would have said it is just for bird's food. To retain this nostalgic fruit for every adult's tongue and bring back their childhood memories, we aimed a study that surely becomes beneficial to them both by gaining potential antioxidants to cure oxidative stress caused by imbalance antioxidants and unstable molecules called free radicals, which can damage their cells (Sobel, 2019). Through a study of homemade winemaking, an artiles/manzanita/saraisa are utilized and processed to reintroduced its value and spread its benefits along the country and even from all over the world. *Muntingia Calabura Linn*, otherwise known as Aratiles, Saraisa, and Manzanitas in its native name is widely distributed in the coastline areas of Southeast Asia including some parts of America and in Europe. The Aratiles were said to be introduced in the country since the Spanish colonization, which originally came from the tropical areas of the Americas and suddenly was recognized and scattered thence. It grows usually anywhere and thrives even in poor quality soil, and is commonly found on the roadsides area and or beside houses in the country. The red fruit itself contains numerous seeds that birds are easily attracted to it and eat its sweet and flavorful pulp which they dispersed easily and make it very productive. (The Ateneo Wild, 2019) Aratiles or Manzanitas fruit is considered a berry because in botany terms a berry is a simple fleshy fruit that has usually many seeds. It is a rounded fruit ranging about 1.5 centimeters in diameter. Unripe green fruit turns from orange to red when ripen but is usually eaten even though it is still green. Hundreds of tiny yellow seeds give a nice texture similar to tiny rice crispy crunches. Because of its sweet, juicy, fleshy, seeded, and gelatinous characteristics, Aratiles are considered to be cotton candy on a tree. *Muntingia calabura* is also known throughout the world as "Jamaican cherry" and in Malaysia, particularly among the Malay, it is known as "kerukup siam". Being the sole species within the genus *Muntingia*, it is native to southern Mexico, tropical South America, Central America, The great Antilles, Trinidad

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and St. Vincent. It is also widely cultivated in warm areas in India and Southeast Asia such as Malaysia, Indonesia and the Philippines. Fruit-eating birds crave this little fruit and are endemic in countries like the Philippines. Apart from the knowledge we have, it is not surprising that behind its small size, there are many health benefits that birds enjoyed that we too can gain from this shocking revelation. Dr. Paul Haider a renowned master herbalist from the U.S. revealed his findings through a published blog stating that Fast-growing *Muntingia calabura* trees produce the cherry-like Kerson Fruit, which has a number of health advantages, including decreasing blood sugar, avoiding cancer, supporting cardiovascular health, lowering blood pressure, and inhibiting pain. He found out that the manzanita fruit has an antioxidant property, where in fact the leaves also contain lots of antioxidants for over 24 flavonoid and phenolic compounds like that found in green tea plus saponin compounds. And also found out that Manzanita fruit contains B vitamins for energy and a positive attitude as well as fiber, water, carbohydrates, protein for strong muscles, calcium and phosphorus for healthy bones. A student from Iloilo National High School Maria Isabel Layson, a scientist, who recently competed at the Intel International Science and Engineering Fair (ISEF) held in Arizona, USA submitted her study on the anti-diabetic effects of aratiles as a submission for the contest. The aratiles fruit included anthocyanin, bioactive flavonoid, substances such and polyphenol, according to Layson. Her research indicates that the fruit possesses anti-diabetic and antioxidant qualities. Aratiles could cure type-2 diabetes mellitus through the prevention of postprandial hyperglycemia according to her study. According to Agatha Francesca Z. Guzman in her study "Evaluating the health benefits of *Muntingia calabura* L. (aratiles) on maternal and neonatal health" the manzanita fruit itself contains anticancer, antinociceptive, anti-inflammatory, antipyretic, antibacterial, antiproliferative, and antioxidant capabilities, among other well-studied pharmacological effects. Despite the fact that M. Calabura exhibited estrogenic properties, the obtained data from the study reveals the ability of M. Calabura to either improve or compromise maternal and neonatal health. The mere fact that this oft fruit and unfamiliar berry to many people remains a bird's cycle of a meal, this only shows that even if it is small, still found numerous benefits and valuable qualities this fruit can give. Wine is a preserved fruit juice fermented with yeast and processed by consuming the sugar converting it to ethanol and carbon dioxide, making it alcoholic. Different varieties of grapes and strains of yeast are major factors in different styles of wine. These differences result from the complex interactions between the biochemical development of the grape, the reactions involved in fermentation, the grapes growing environment and the wine production process. Many countries enact legal appellations intended to define styles and qualities of wine. While winemaking otherwise known as vinification is the process of making the wine itself. Thus, winemaking probably is the best strategy to preserve the quality and efficacy of this underrated fruit. By extracting the fruit and turning it into a well-preserved and manmade product, Aratiles fruit will be utilized to create and make a by-product wine.

The Research addressed the following questions:

1. What is the procedure involved in developing Manzanita wine?
2. What is the level of acceptability of M. Calabura or Manzanitas wine in terms of;
 - a. appearance;
 - b. aroma;
 - c. texture;
 - d. taste;
 - e. after taste?
3. What is the ethanol content of the wine developed from Manzanitas?
4. Is there a significant difference in the level of acceptability of each treatment of wine developed from Manzanitas in terms of the three-aged group?
 - a. 19-21
 - b. 22-24
 - c. 25 and above?

II. METHODOLOGY

This chapter contains the ingredients, materials, equipment, procedures, experimental design, collection of the data, statistical tools and analysis used in the study.

Research Design

This study utilized an experimental research design to develop and evaluate manzanita wine. The design is appropriate because it involves formulating, processing, and testing a new food product while controlling key variables such as ingredient proportions, processing methods, and sensory attributes. The data were analyzed using one-way analysis of variance (ANOVA) to determine which is more acceptable between the three treatments in terms of appearance, aroma, texture, taste and after taste. The independent variable consisted of the three treatments of manzana wine, while the dependent variables were the sensory evaluations, which included appearance, aroma, texture, taste and after taste.

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Treatment of the Study

There are three treatments that was utilized in this study. Treatment one comprises 200 (two-hundred) grams of the Aratiles fruit, 300 (three hundred) milliliter of water, 85 (eighty five) grams of sugar and 5 (five) grams of dry active yeast, while treatment 2 (two) will have 300 (three hundred) grams of the manzanitas fruit, 200 (two hundred) milliliter of water, 100 (one hundred) grams of sugar and 5 (five) grams of dry active yeast and lastly, in treatment 3 there will be a 400 (four hundred) grams of fruit, and 400 (two hundred) milliliter of water, 80 (one hundred) grams of sugar and 5 (five) grams of dry active yeast. If we look to all treatments, we observe the volume of liquid, amount of sugar and amount of the fruit differs a lot, hence, we look forward to which is well and acceptable in the three treatments developed.

Data Gathering

Sensory evaluation was conducted at the Isabela State University-City of Ilagan Campus to determine the acceptability of the manzanita wine in terms of appearance, aroma, texture, taste and after taste. The instrument used in data gathering was a score sheet using the 5-point hedonic scale.

The range of scale is interpreted as follows:

Scale	Mean	Descriptive Interpretation
5	4.50 - 5.00	Highly Acceptable
4	3.50 - 4.49	Acceptable
3	2.50 - 3.39	Moderately Acceptable
2	1.50 - 2.49	Slightly Acceptable
1	1.00 - 1.49	Not Acceptable

A sensory panel of this study was composed of twenty-eight (28) individuals who were ten (15) Bachelor of Technology and Livelihood Education (BTLED) students major in Home Economics, ten (10) College of Education Faculty, and three (3) random person winebibbers. The qualification of panelists in terms of age should be 20 to 50 years old.

Ingredients, Materials and Equipment Needed in Making Manzanita Wine

These ingredients, materials and equipment are essential for making manzanita wine, ensuring a smooth preparation process of the final product.

Table 1: Ingredients, Materials and Equipment Preparation

Category	
Ingredients	- Fresh pick manzanita fruit
	- Dry Active Yeast
	- Sugar
	- Water
Materials	- Liquid Measuring cup
	- Small Mixing bowl
	- Large Mixing bowl
	- Monkey Dish
	- Stainless container
	- Metal Strainer
	- Cheese Cloth Strainer
	- Bucket (For fermentation)
	- Wine bottle with cap
	- Sealer
Equipment	- Digital weighing scale
	- Alcohol meter or Vinometer

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III. RESULTS AND DISCUSSION

This chapter presents the findings, analysis and interpretation drawn from the data gathered to determine the level of acceptability of manzanita (*muntingia calabura linn*) as wine along three treatments.



Figure 1. Sample Product developed.

A. The procedure involved in developing Manzanita wine

Processes applied in making manzanita wine along the three treatments.

The researcher executed the process of making wine out of manzanita using the following steps:

Procedure:

1. Collection and Preparation of the Material
2. Wash Hands and Sanitize Everything.
3. Prepare and measure the ingredients. Prepare and clean the containers.
4. Dissolve yeast in 500 ml of lukewarm water. Add 500g of sugar and 500 ml of water to dissolve.
5. Mixed all the ingredients in one large container
6. Clarification and final checking of the alcohol content.
7. Bottling, evaluating, and final checking of the product.

B. Level of Acceptability of Manzanita Wine along the Three Treatments and Proportions

The following Tables present the level of acceptability, general acceptability, and significant difference in the evaluations of the respondents across their age groups applying the different treatments and proportions.

Table 2: Level of Acceptability along Treatment 1

Treatment 1	Sensorial Criteria	Mean	Qualitative Description
Manzanita Fruit – 200g	Appearance	4.2	Like Very
Water – 300ml			Much
Sugar – 85g	Aroma	4.25	Like Very
Dry Active Yeast – 5g			Much
	Taste	3.87	Like Very
			Much
	Texture	4.12	Like Very
			Much
	After Taste	3.87	Like Very
			Much
	Overall Weighted Mean	4.07	Like Very Much

Table 2 presents the evaluation of the respondents in the level of manzanita wine along treatment 1 which is 200g manzanita fruit, 300ml water, 85g sugar, and 5g dry active yeast. As seen in the Table, the appearance (4.25), aroma (4.25), taste (3.87), texture (4.12), and after taste (3.87) were rated “like very much”. Meanwhile, the computed overall weighted mean is 4.07 which is interpreted as “like very much”. This shows that Treatment 1 which is 200g manzanita fruit, 300ml water, 85g sugar, and 5g dry active yeast have a strong liking for the evaluators.

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Table 3: Level of acceptability along treatment 2

Treatment 2	Sensorial Criteria	Mean	Qualitative Description
Manzanita Fruit- 300g	Appearance	4.75	Like Extremely
Water- 200ml Sugar- 100g	Aroma	4.87	Like Extremely
Dry Active Yeast- 5g	Taste	4.87	Like Extremely
	Texture	4.75	Like Extremely
	After Taste	4.87	Like Extremely
Overall Weighted <u>Mean</u>		4.82	Like Extremely

Along treatment two which is 300g manzanita, 200ml, 100g sugar, and 5g dry active yeast, the appearance (4.75) aroma (4.87), taste (4.87), texture (4.75) and after taste (4.87) of the wine were rated “*like extremely*”. The overall weighted mean is 4.82 was described as “*like extremely*”. This goes to show that the manzanita wine using Treatment 2 was very tremendously preferred by the evaluators.

Table 4: Level of acceptability along treatment 3

Treatment 3	Sensorial Criteria	Mean	Qualitative Description
Manzanita Fruit- 400g	Appearance	4.25	Like Very Much
Water- 400ml Sugar- 80g	Aroma	4.5	Like Extremely
Dry Active Yeast- 5g	Taste	4.0	Like Very Much
	Texture	4.62	Like Extremely
	After Taste	4.0	Like Very Much
Overall Weighted Mean		4.27	Like Very Much

For Treatment 3 which is 400g manzanita fruit, 400ml water, 80g sugar, and 5g dry active yeast, the appearance (4.25), aroma (4.5), taste (4.0), texture (4.62) and after taste (4.0) were described as “*like very much*”. Furthermore, the computed overall weighted mean is 4.27 and it was described as “*like very much*”. This goes to that Treatment 3 made of 400g manzanita fruit, 200ml water, 100g sugar, and 5g dry active yeast, is much preferred by the respondents.

Based on the sensory evaluation conducted among respondents, **Treatment 2 obtained the higher overall acceptability rating**, this shows that Treatment 2 which is 300g manzanita fruit, 200ml, 100g sugar, and 5g dry active yeast was tremendously preferred by the respondents

C. Report of Analysis of the laboratory testing of manzanita wine and its ethanol content developed along with the three treatments

The developed wine and its three treatments have been processed and tested for its ethanol content at the Department of Science and Technology (DOST) Region 02 located at Regional Government Center, Carig Sur, Tuguegarao City. A month of fermentation processed and extraction has passed at the laboratory center and tested for almost 2 weeks through Steam Distillation or Pycnometer. The Tables below show the test result of the analysis of the wine developed from manzanita fruit. These are legitimate results from the Department of Science and Technology DOST R-02 Regional Standards and Testing Laboratory

Table 5: Report of Analysis of Treatment 1 (T1) on its Alcohol (Ethanol) Content from the DOST Testing Laboratory

REPORT OF ANALYSIS

Laboratory Reference No:		R2-112022-CHE-0864				
Sample Submitted:		Wine				
Date Submitted:		November 21, 2022				
Date Reported:		December 01, 2022				
Sample Code	Sample Description	Parameter	Result (g/100g)	Method Used	Date of Analysis	Analyst
CHE- 01028	Treatment 1	% Ethanol in wine	3.76	Steam Distillation/Pycnometer	Nov. 29, 2022	GGP

Table 5 presents the report of analysis of the first treatment concerning to its ethanol content. The table shows that sample treatment 1 has 3.76% percent ethanol in wine through steam distillation/pycnometer. This only shows that the developed treatment provides the lightest alcohol content along the three treatments.

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Table 6. Report of Analysis of Treatment 2 (T2) on its Alcohol (Ethanol) Content from the DOST Testing Laboratory

REPORT OF ANALYSIS						
Laboratory Reference No:		R2-112022-CHE-0864				
Sample Submitted:		Wine				
Date Submitted:		November 21, 2022				
Date Reported:		December 01, 2022				
Sample Code	Sample Description	Parameter	Result (g/100g)	Method Used	Date of Analysis	Analyst
CHE- 01028	Treatment 2	% Ethanol in wine	4.33	Steam Distillation/Pycnometer	Nov. 29, 2022	GGP

Table 6 presents the report of analysis of the second treatment concerning to its ethanol content. The table shows that sample treatment 2 has 4.33% percent ethanol in wine through steam distillation/pycnometer. This only shows that the developed treatment provides the strongest alcohol content along the three treatments.

Table 7. Report of Analysis of Treatment 3 (T3) on its Alcohol (Ethanol) Content from the DOST Testing Laboratory

REPORT OF ANALYSIS						
Laboratory Reference No:		R2-112022-CHE-0864				
Sample Submitted:		Wine				
Date Submitted:		November 21, 2022				
Date Reported:		December 01, 2022				
Sample Code	Sample Description	Parameter	Result (g/100g)	Method Used	Date of Analysis	Analyst
CHE- 01027	Treatment 3	% Ethanol in wine	4.22	Steam Distillation/Pycnometer	Nov. 29, 2022	GGP

Table 7 presents the report of analysis of the third treatment concerning to its ethanol content. The table shows that sample treatment 3 has 4.22% percent ethanol in wine through steam distillation/pycnometer. This only shows that the developed treatment provides moderate alcohol content along the three treatments. The result shows that the alcohol content of Manzanita Wine sample was obtained through Steam Distillation / Pycnometer Method.

D. Test of Difference in the Level of Manzanita Wine Using the Three Treatments as Evaluated by the Three Age Groups

The table below shows the test of differences and the level of significance of the developed and evaluated manzanita wine along the three treatments using the selected variable. The three treatments were evaluated by the Three Age Group.

Table 8. Significant Difference in the Level of Manzanita Wine using the Three Treatments as Evaluated by the Three Age Groups

Age Group	25 years old and above						
Source of Variation	Sum of Squares (SS)	Degree of Freedom (df)	Mean Square (MS)	F-value	Table Value	Decision	
Between Groups	1.24668	2	0.62334	44.08	3.88	Significant	
Within Groups	0.16968	12	0.01414				
Total	1.077	14					

For ages 25 and above the computed F-value is 44.08, while the Table value is 3.89 lesser than F-value computed. At 14 degrees of freedom, the F-test exhibited a “significant” result. This goes to show that there is significant difference in the evaluation of the respondents under ages 25 and above. Meaning, they have different perceptions as to the appearance, aroma, taste and texture and after taste. of the manzanita wine out of three Treatments. Hence, “reject” the null hypothesis. As reported by Ravishankar. B. v ET Al (2016) Knife, weight balance, fermentation tank, refractometer, Flow UV System, pH meter, ethanol meter, and buret were among the laboratory utensils and equipment in making wine. The amount of ethanol produced after fermentation was measured using gas chromatography, and it was found to be nearly equal to any commercial fruit ethanol production. Based on the articles about wine of Dr. Vinnifera texture referred to as “mouthfeel” refers to the way wine feels in your mouth. The wine should be smooth, coarse, creamy, waxy, velvety or silky. Texture in wine is an integral part of the best wines in the world, and winemakers employ a whole arsenal of techniques to create a desirable texture of a wine.

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Table 9. Significant Difference in the Level of Manzanita Wine using the Three Treatments as Evaluated by the Three Age Groups

Age Group	23-24 years old							
Source of Variation	Sum of Squares (SS)	Degree of Freedom (df)	Mean Square (MS)	F-value	Table Value	Decision		
	1.25648	2	0.62823					
	0.79264	12	0.0661	9.5042	3.88	Significant		
Between Groups	2.0491	14						
Within Groups								
Total								

As to ages 23-24, the computed F-value is 9.504 and the Critical value is 3.88. At 14 degrees of freedom, the F-test exhibited a “significant” result. This goes to show the responses of the respondents as to the appearance, aroma, taste, texture and after taste of the product are not the same. Hence, there is a significant difference in the evaluation of the respondents under the age category of 21-22. So, the null hypothesis of the study is “rejected”. Based on Binwise Brad Johnson blog people smell wine before tasting it to detect the wine’s aroma and therefore to sense how the wine will taste. About 80% of how something tastes comes from aroma, so smelling a wine reveals most of its flavors. According to (Ursula Kennedy 2022) the Appearance of the wine should be clear, free of any haziness or solids “natural” wines may have some haziness due to yeast residue.

Table 10. Significant Difference in the Level of Manzanita Wine using the Three Treatments as Evaluated by the Three Age Groups

Age Group	19-21 years old							
Source of Variation	Sum of Squares (SS)	Degree of Freedom (df)	Mean Square (MS)	F-value	Table Value	Decision		
Between Groups	1.24668	2	0.62334	44.08	3.88	Significant		
Within Groups	0.16968	12						
Total	2.0491	14						

For the 19-21 years old evaluators, the computed F-value is 44.08 while the Table value is 3.88 lesser than F-value. At 14 degrees of freedom, the F-test exhibited a “significant” result. This goes to show that there is significant difference in the evaluation of the 19-20 years old evaluators as to the level of acceptability of the manzanita wine along the three treatments. This goes to show that the respondents’ evaluation of the manzanita wine along the three treatments in terms of appearance, aroma, taste, texture, and aftertaste are not the same. In this case, “reject” the null hypothesis of the study. According to (Tom and Phil Gearing 2019) the taste of the wine should have sweetness because is one of the subtlest aspects of tasting wine, because so many factors can affect how you perceive sugar. It also can describe the fruitful taste of the developed wine. Based on the website we’ve found in the internet; the aftertaste of the wine is the most important factor in judging a wine’s character and quality. Greats wine should have rich, long, complex aftertastes.

IV. CONCLUSION

According to the findings of the study, treatment 2 had the highest ethanol content and the most acceptable treatment among the three treatments. The study concludes that the developed manzanita wine and evaluated as to its level of acceptability, from the three Treatments, were safe to intake. Furthermore, the level of acceptability of the Manzanita wine were highly acceptable. The evaluations of the three groups of respondents across age groups gave significant differences in their evaluation along the three treatments.

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