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Development and Acceptability of Dragon Fruit Wine

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Abstract: *The wine making is an activity being performed by the students in Organic Chemistry class to relate the concept of Organic Reactions to real life situations. The study attempts to develop wine from red variety of dragon fruit (Hylocereus polyrhizus) and determine its acceptability through sensory evaluation. There were 29 Faculty and Staff of the Isabela State University who were purposively selected as evaluators.*

By Steam distillation, the volume percent of the product was 12.38% (g/100 ml). For the sensory characteristics, it has an excellent rating in terms of clarity with verbal interpretation as brilliant with outstanding characteristics color. Moreover, rated as good for its pleasant aftertaste, characteristic aroma , distinguishable bouquet and balanced. A positive correlation on their educational background and frequency of drinking alcoholic beverages with r=0.400 and negative correlation to the aroma and bouquet with r= -0.400. Finally, a positive correlation between the appearance and overall impression with r=0.400.

Key Words: *Wine Making, Steam Distillation, Appearance, After Taste, Aroma and Bouquet*

I. BACKGROUND

Hylocereus polyrhizus, also known as red pitaya or dragon fruit that consists of red peel covered with large scales and red flesh dotted with edible black seeds. It grows on long, thin, vining cactuses that are often seen growing up trees, fences or walls. And is popularly known in South America and is being cultivated in Malaysia, Vietnam, Taiwan, and Thailand and later in the Philippines. In fact, it is tagged by the Department of Agriculture – Bureau of Agricultural Research (DA-BAR) as a money crop because of little investment capital and maintenance for growing. Many farmers engaged in dragon fruit production due to high demand and high market price. And in response to one of the agenda of R&D which is ensuring that the natural resources in the Philippines are used and maximized to its full potential such as the unexplored fruits common in our country. Food technologists in some State Universities in the country have already developed dragon fruit products such as jam, jelly, ice cream, macaroni, siomai, lumpiang shanghai, cupcake, empanada, puree, wine, and soap. The proximate analysis for the composition of Dragon fruit showed the following; moisture 87.90±0.03%, ash 87.90±0.03%, reducing sugar 4.50±0.04%, non-reducing sugar 3.50±0.01%, total sugar 8.00±0.01%, total soluble solid 11±0.13%, pH 4.20±0.02%, acidity 0.45±0.01% and vitamin-C 9.90±0.04%.(Santos, et al, 2011). Fermentation is a viable technique in the development of new products with modified physicochemical and sensory qualities especially flavor and nutritional components. Wine making involves a chemical reaction in which sugars are turned to alcohol and carbon dioxide. The most important in the process is the breaking down of glucose by yeast (*Saccharomyces cerevisiae)* forming ethanol and carbon dioxide. The reaction is exothermic (heat is produced by the reaction), and

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the temperature must be controlled throughout the process otherwise the growth of the yeast will stop. Fruit wines are undistilled alcoholic beverages usually made from grapes or other fruits such as peaches, plums or apricots, banana, elderberry or black current etc. which are nutritive, more tasty and mild stimulants. These fruits undergo a period of fermentation and ageing. They usually have an alcohol content ranging between 5 to 13 percent. (Swami & Divate, 2014)

II. MOTIVATION AND OBJECTIVE

The main objective of the study determined the acceptability of the dragon fruit processed into wine. Specifically, (a) to find out the percentage volume alcohol content of the dragon fruit wine, (b) to determine if there are significant differences and correlations among the evaluators profile with their sensory evaluation and (c) to determine the acceptability of the product.

III. STATEMENT OF CONTRIBUTION

The researcher attempted to process it to wine considering the health benefits and its abundance when it is in season and wastage problems can be solved. Homemade wines have relatively low alcohol content than the commercially available wine and there is no usage of either any preservative or any additives, so homemade wines are not harmful for health and are acceptable for daily usage. (Nandagopal & Nair, 2013). Related studies are done into the constituents of the wine which give health benefits when taken in moderation. Statistical studies have shown that wine drinkers are less prone to heart disease, cancer and other diseases. It may be that there are certain chemicals that combat certain conditions, for example the antioxidant resveratrol which may reduce cholesterol and the risk of Alzheimer's disease.

IV. METHOD

A. Preparation fruits were obtained from a local farm in the municipality of the researcher. The processing is considered to be a homemade recipe and a still-wine production (without carbonation). At the start of the processing all materials and equipment were sterilized to ensure that no other microorganisms will grow and interfere in the reaction process, the laboratory room was well sanitized. The processing started by peeling off the fruit and slicing the pulp into small pieces prior to liquefaction using blender. Then combining the fruit extract, water and sugar in a stainless casserole and boil until the desired result comes out. Allowing it to cool and add dry active yeast. Ferment for 21 days. Pasteurize Transfer to a bottle, cap tightly closed. Aging for one month.

B. Analysis

One (1) liter of the product was brought to Department of Science and Technology, Tuguegarao City for the determination of Percent Volume Alcohol by Steam Distillation. 100 ml sample volume was steam distilled to about 100 ml distillate. The distillate was diluted to 100 ml in a volumetric flask. Apparent specific gravity of the distillate was obtained using pycnometer method. % alcohol by volume was determined using the table ***"Percentages by Volume 15.56ºC Of Ethyl corresponding to Apparent Specific Gravity at Various Temperatures".*** *(See Appendix 1).*

B. Evaluation

For the acceptability of the product, the sensory method was conducted, 29 Faculty and Staff of the Isabela State University, were purposively selected to evaluate. The Chart of the *American Wine Society for wine evaluation was adapted).* Statistical tool pack was used for the quantitative data analysis, frequency is used in the evaluators profile to easily identify the total number in terms of their classification, age bracket, gender, educational background and the frequency of drinking alcoholic beverages. one-way ANOVA to test the significance among variables at 0.05 level of significance and Pearson correlation in the correlation between variables. Responses in the questionnaires on Taste and Appearance range from 1 to 3 using a scale and the new range of scores as follows: 3.50-4.00 (Excellent); 2.50-3.49(Good); 1.50-2.49(Poor); 1.00-1.49(Objectionable).For Aroma and Bouquet, Taste and Texture, 6.00-6.99(Extraordinary); 5.00-5.99(Excellent); 4.00-4.99(Good); 3.00-3.99(Acceptable); 2.00-2.99(Deficient);1.00-1.99(Poor).While for the overall impression, 3.00-3.99(Excellent);2.00-2.99(Good); 1.00-1.99(Poor).

V. RESULTS AND DISCUSSION

The researcher successfully proved that the fruit can produce a wine. Tables were presented to describe results.

Table 1. Test Result on Average by Volume (ABV) of the Dragon Fruit Wine

Sample Number	Sample Description	Parameter	Result (g/100 ml)	Method Used
CHM-S-016	Dragon fruit Wine	% Alcohol	12.38	Steam distillation

The result of the test done is 12.38%, which is imperative to the study of Neuser (2000), that natural wine may exhibit a broad range of alcohol content, from below 9% to above 16% ABV, with most wines being in the 12.5%- 14.5% range.

Table 2. Profile of the Evaluators

Profile	Frequency	Percent
A. Classification		
Teaching	14	48.3
Non -Teaching	15	51.7
Total	29	100.0
B. Age		
20-25 years old	5	17.2
26-30 years old	5	17.2
31-35 years old	4	13.8
36-40 years old	3	10.3
41-45 years old	3	10.3
46-50 years old	1	3.4
51-55 years old	5	17.3
56-60 years old	3	10.3
Total	29	100.0
C. Gender		
Male	22	75.9
Female	7	24.1
Total	29	100.0
D. Highest Level of Education Completed		
completed college	14	48.3
some masters	7	24.1
completed masters	3	10.3
some PhD	2	6.9
completed PhD	3	10.3
Total	29	100.0

As shown in the table, there were almost equal in number between faculty and Staff. Majority belongs to the age brackets 20-25, 26-30, and 51-55 years old with equal percentages of 17% and the least on age bracket 46-50 years old with 4% only. Most of the evaluators were male with 75.90%, or 22 out of 29 evaluators. Among the 2evaluators there were 14 (49%) who completed college degree, 7 (24%) had masters units, 3 '(10%) have completed masters, 2 (7%) with PhD units and 3 (10%) completed PhD. Based from the 29 evaluators,23 (79%) drink occasionally, 3 (10%) drink once a month, 2 (7%) drink one a week and 1 (4%) seldom.

Table 3. Descriptive Statistics on the Acceptability of Dragon Fruit When Processed into Wine

	N	Minimum	Maximum	Mean	Std. De	Rating
Clarity	29	3.0	4.0	3.5172	0.50855	Excellent
Aftertaste	29	3.0	4.0	3.2414	0.43549	Good
Aroma and Bouquet	29	2.0	4.0	4.4483	0.78314	Good
Taste and Texture	29	3.0	6.0	4.4483	0.73612	Good
Overall Impression	29	2.0	3.0	2.3448	0.48373	Good
Valid wise	29					

As shown in the Table 3, evaluators rated the dragon fruit wine in terms of its appearance as excellent with mean of 3.5172, after taste rated as good with mean of 3.2414. Moreover, in aroma and bouquet, taste and texture, overall impressions were also rated as good with mean of 4.4483, 4.4483, and 2.3448 respectively.

Table 4. Summary of ANOVA Between the Evaluators Profile in terms of Age and Acceptability

		Sum of Squares	df	Mean Square	F	Sig.
Clarity	Between Groups	3.218	7	.460	2.529	.047
	Within Groups	3.817	21	.182		
	Total	7.034	28			
Aftertaste	Between Groups	1.377	7	.197	1.050	.428
	Within Groups	3.933	21	.187		
	Total	5.310	28			
Aroma and Bouquet	Between Groups	6.156	7	.879	1.676	.169
	Within Groups	11.017	21	.525		
	Total	17.172	28			
Taste and Texture	Between Groups	5.889	7	.841	1.903	.120
	Within Groups	9.283	21	.442		
	Total	15.172	28			
Overall Impression	Between Groups	3.944	7	.563	4.104	.005
	Within Groups	2.883	21	.137		
	Total	6.828	28			

At 5% level of significance, only the evaluators profile in terms of age with their ratings on appearance and overall impression have significant differences with F=2.529, p=0.047, and F=4.104, p=0.005 respectively. The evaluators

profile in terms of classification, gender, level of education and the frequency of drinking alcoholic beverages were insignificant. (See appendix 2).

In Pearson correlation, the evaluators profile in terms of highest level of education is positively correlated to the frequency of drinking alcoholic beverages at r= 0.400 and negatively correlated to the aroma and bouquet at r=-0.400 and also a positive correlation between the appearance and overall impression at r=0.400. (See appendix 3).

VI. SUMMARY, CONCLUSION AND RECOMMENDATION

To help students understand and remember name reactions in organic chemistry, the winemaking is therefore a concrete example of a learning outcome. An outcome is a culminating demonstration of learning; it is what the student should be able to do at the end of a course. (Davis, 2003). The most important chemical reaction in the wine making process is the breaking down of glucose by yeast, forming ethanol and carbon dioxide as gas. The fermentation stopped on the 21st day when no visible bubbles had been observed and at the same time the desired aroma for wine was achieved. No Sulfur dioxide (SO_2) is added as preservative to eliminate side effects derived from the compounds namely sulfites, which are becoming more frequent, causing symptoms such as headaches, nausea, gastric irritation, and breathing difficulties in asthma patients. (Islam MZ et al, 2011). However, in the whole duration of the processing, hygiene and sanitation were observed, and confident that no bacterial growth since ethanol and the acidity of wine act as inhibitor allowing wine to be safely kept for long in the absence of air.

The attempt to process the dragon fruit into wine and evaluate its acceptability was successful based from the analysis conducted. The percent volume alcohol that was determined by steam distillation is 12.8, which was within the range of commercial wine. The Sensory analysis was analyzed for sensory characteristics. Sensory quality characteristics were evaluated by a panel of 29 faculty and staff of the Isabela State University by adapting the Chart of the *American Wine Society for wine evaluation* The Dragon fruit wine were evaluated by Clarity, Aftertaste, Aroma and Bouquet, Taste and Texture, Overall Impression. For the appearance, the panels rated as excellent with mean= 3.5172, while the After Taste, Aroma and Bouquet, Taste and Texture, Overall Impression. Were rated as good with mean=3.2414, 4.4483, 4.4483, 2.3448 respectively. The evaluators profile in terms of age with their ratings on appearance and overall impression have significant differences with F=2.529 , p=0.047 and F=4.104, p=0.005 respectively. Classification, gender, level of education and the frequency of drinking alcoholic beverages were insignificant with their ratings. There was a positive correlation between the evaluators level of education and the frequency of drinking alcoholic beverages with r=0.400, while negatively correlated to the Aroma and Bouquet with r=-0.400. Moreover a positive correlation between the appearance and overall impression at r=0.400.

A further scientific study is recommended on the development of winemaking and the technology to improve it. This maybe on how to the determine those that cause the flavor, aroma and appearance of wine so that these can be manipulated in the production process. And other chemical analyses like determination of brix of the fruit juice so as to know the exact measurement of sugar added before the fermentation phase.

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