Preparation, Characterization of Orange Wine and Comparison of Some Physical Parameters of Different Wines

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Abstract

This research concerns with production of orange wine and some physical parameters of different wines were studied. The orange sample was purchased from Myoma market, Kyaing Tong in Eastern Shan State. The orange wine was produced by fermentation method. Some physical parameters of the orange wine and different wine such as pH, specific gravity and percent alcohol by volume (ABV) were examined. The pH of mature of orange wine and different wines such as grape, strawberry, pear, damson and apple (after the fermentation period of two week interval and for three months) had found to be (3.4, 3.6, 3.6, 3.2, 3.3 and 3.5) respectively. The specific gravity of orange wine and different wines were (1.010 g cm^{-3}, 1.050 g cm^{-3},1.015 g cm^{-3}, 1.020 g cm^{-3} , 1.005 g cm^{-3} and 1.025 g cm^{-3}). The percent alcohol by alcohol by volume (ABV) of orange wine and different wines were (20.38 %, 13.56 %, 21.05 %, 19.70 %, 23.77 % and 17.66 %). The preliminary phytochemical test revealed the presence of phenolic compound, carbohydrate, reducing sugar, glycoside, steroid and protein by using the standard methods. In addition, some nutritional values like moisture (86.00 %), ash (0.11 %), fibre (0.8 %), fat (0.01 %), protein (0.1 %) and carbohydrate (12.98 %) content were determined by official analytical methods.

Keywords: Orange wine, specific gravity, percent alcohol, phytochemical test, nutritional values

Introduction

Oranges are one of the most popular fruits around the world. While they are enjoyable as a snack or as a recipe ingredient, its juice is highly associated with good health which acts as an integral part of a healthy breakfast. Oranges are round citrus fruits with finely-textured skins that are orange in color just like their pulpy flesh. The size of the fruit ranges from about three inches in diameter. Oranges are classified into two general categories sweet and bitter. The word orange is derived from the Sanskrit 'naranga" which means orange tree. Usually, ripe oranges consist of 40 % - 55 % juice by weight, depending on their variety. Like other citrus fruits, its rind contains essential oils which are used in cooking and perfumery. Sweet oranges are divided into five or six main categories. Common sweet oranges, blood, navel, acidless, bitter and mandarin, are available at different times of year (Lglesias*et al*, 2007).

The orange types basically belong to two different species and are classified according to the acid concentration, color of pulp and presence of reproductive orange. One species, the Citrus sinesis, produces sweet oranges. The ripe fruits contain high percentage of water (85-90%) and many constituents; carbohydrates, organic acids, vitamin C, minerals and small amount of lipids, proteins, carotenoids, flavonoids and volatile compounds (Okafor, 2007). Sweet orange pulp is usedfor preparing fresh juice which is rich in protein content. Juice extracted from sweet orange leaves are used to control ulcers, sores etc. Sweet orange health benefits which are rich vitamin C content in sweet orange helps in the antioxidant protection and immune support. Then, sweet orange is rich fiber in the fruit helps to prevent

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atherosclerosis.The consumption of citrus fruits like orange and lemon singly and especially when combined offer significant protection against various cancers, diabetes, Parkinsons disease and inflammatory bowel disease (Csiro, 2003). The fruit of Citrus sinensis is called sweet orange to distinguish it from Citrus urantium, the bitter orange. The name is thoughtnumerous intermediate languages. In a number of languages, it is known as a "Chinese apple", (Idise, 2012).

Orange wine is a type of white wine that has been gaining popularity lately as a refreshing alternating to red wine and then it is made by leaving the grape skins and seeds in contact with the juice, creating a deep orange-hued finished product. Orange wine is a complex concept-in terms both definition and sensorial analysis (sight, bouquet, taste). The same as whites, it is made of white grape varieties. This is also the only thing these two types of wine have in common. The main characteristic of orange wine is (obviously) its color that can vary from golden to copper nuances obtained. These include substrate related factors such as cultivar types, cultivation conditions, conditions at harvest and post- harvest handling (Kourkoutas*et al*, 2005). Yeast species are used in many industrial fermentation processes including alcoholic beverages production (Kunkee, 1984). Yeast fermentation of orange juice shows at once, which has been no destructive effect on vitamin C result in harmony with the observations, the contrary,activity of vitamin C persisted for a very long time-being retained for 51 days (Lepkovsky*et al*, 1925). Wine has been enormous health benefits similar to those of fruits from which they are derived (Jacob, 2001). e.g almonds have been found to be more effective in reducing bloods levels of low density lipoprotein cholestrol when combined with other foods known to independently lower cholestrol (Ramachandra*et al*, 2005). Orange wine is good for health that provides antioxidants. This damage can elevate our risk of chronic conditions, such as heart disease and cancer. Orange wine may contain significantly more antioxidant than white wine. That is because it is made by fermenting white grape juice along with the skin and seeds of white grape.

Figure 1. Photographs of orange plants and orange fruits

Botanical Description

Family name	-	Rutaceae
Genus	-	Citrus
Species	-	Aurantium
Botanical name	-	*Citrus aurantium*
Scientific name	-	Citrus sinensis
English name	-	Orange
Myanmar name	-	Pyar lain maw
Part used	-	Fruit

Materials and Methods

Collection of Sample

Fresh orange were collected from Myoma market in Kyaing Tong Township. The orange used in this fermentation studies were purchased from Myoma market in Kyaing Tong Township, Eastern Shan State. The *Citrus aurantium*were identified at Botany Department, Kyaing Tong University,Eastern Shan State.

Phytochemical Investigation in Orange Fruit

Orange fruits were subjected to phytochemical test in order to find out the types of phyto-organic constituents such as phenolics, carbohydrates, reducing sugars, glycoside, steroids and proteins.

Preparation of Orange Wine

The collected orange fruits were washed, crushed with blender and diluted with 100 mL water in the blender. The crushed fruit 1.5 kg were obtained. And then 1500 mL brown sugar solution,the mixture of yeast solution and sodium metabisulphite and ammonium phosphate solution were added and stirred continuously, and filtered the solution. This solution was poured in brown bottle and closed with stopper and not permitted to contact with air (anaerobic region). Fermentation was allowed to continue for 86 days at the dark place.

Determination of pH

pH meter was rinsed with deionized water and the pH electrode was dried by using tissue paper. It was adjusted with pH 7.00 buffer solution and 30 mL of wine sample was placed into 50 mL beaker. Then pH of wine was measured by using pH meter. After measuring pH, meter was rinsed by deionized water.

Determination of Percent Alcohol by Alcohol By Volume (ABV) in Orange Wine and Different Wines

Before using the hydrometer both the hydrometer and sample jar were clean with water surely.The liquid was poured into the hydrometer jar to avoid the formation of air bubbles by stirring the liquid gently. The hydrometer was inserted into the liquid, holding it at the top of the stem, and released it when it was approximately at its position of equilibrium. The liquid specific gravity was read and recorded it. Above procedure was carried out for the original specific

gravity and final specific gravity of orange wine. The percent alcohol of orange wine was calculated as percent alcohol of alcohol by volume. Similarly, the percent alcohol of different wines such as grape, strawberry, pear, damson and apple were also calculated as percent alcohol of alcohol by volume.

Alcohol by Volume (ABV) For Wine C.J.J Berry Method

$$\text{ABV} = \frac{OriginalSG - FinalSG}{7.36}$$

Original SG = 1.160, Final SG = 1.010

$$\text{ABV} = \frac{1.160 - 1.010}{7.36}$$

$$= 20.38\%$$

Note : To calculate the final strength of the wine, write down (omitting the decimal point) the SG.

Determination of Nutritional Values of Orange Wine

The moisture content of the orange wine sample was determined by Dean and Stark's distillation apparatus (A.O.C.S., 1950). The ash content and the crude fibre content in the orange wine sample were determined by the method given in "The Chemical Analysis of Foods" (Joslyn, 1970). The fat content was determined by the Soxhlet extraction method (Peason, 1970 & 1976). The crude protein content of the sample was determined by Macro-kjeldahl method (Steyermart, 1961; Willainn, 1984). The total carbohydrate content of orange wine sample can be obtained as the difference between 100 and the sum of the percentages of ash, fibre, moisture and protein.

$$\text{Moisture}(\%) = \frac{\text{volume of liquid (mL)}}{\text{volume of sample (mL)}} \times 100$$

$$\text{Ash}(\%) = \frac{\text{volume of evaporated liquid (mL)}}{\text{volume of sample (mL)}} \times 100$$

$$\text{Fibre}(\%) = \frac{\text{volume of liquid fibre (mL)}}{\text{volume of sample (mL)}} \times 100$$

$$\text{Fat}(\%) = \frac{\text{volume of extracted liquid fat (mL)}}{\text{volume of sample (mL)}} \times 100$$

$$\text{Protein}(\%) = \frac{(V_2 - V_1) \times 0.0141 \times M \times 100}{V} \times 6.25$$

V_1= volume in mL of standard acid for blank titration

V_2 = volume in mL of standard acid for sample solution

M = molarity of standard acid solution in $moldm^{-3}$

V = volume of the sample used for the digestion procedure

Results and Discussion

Phytochemical Investigation in Orange Furit

Phyotochemistry is the science related to the investigation of low molecular weight plant constituents which are bioactive, non-nutrient, naturally occurring plant compound found in the

Vegetables, fruits and spices. Studies carried out during the past 2-3 decades have shown that these phytochemicals have an important role in preventing chronic disease like cancer, diabetes, coronary heart disease and hyper-cholesterolemia (Rabison, 1983).

The carbohydrates are among the most abundant constituents of plants and animals. The group compounds known as carbohydrate received their general name because of early observation that they appear to be hydrates of carbons. A glycoside is

mixed acetal or ketel of a cyclic aldose or ketose. Phenolic substances are proned to be water soluble and very often, they are combined with sugars forming glycosides. In this study, water and alcohol soluble of dried orange powder were carried out phytochemical investigation using test reagents. These observations are mentioned in Table 1. In the phytochemical screening, positive sign (+) indicated presence of phytochemicals content.

Table 1. Phytochemical Investigation in Orange Fruit

No.	Extract	Chemical	Test	Observation	Remark
1	D/W Extract	10% $FeCl_3$ 10dps	Phenolic test	Brown ppt	+
2	D/W Extract	10% □-napthol	Carbohydrate	Reddish brown ring between 2 layers	+
3	D/W Extract	Fehling's solution 2ml + Δ (for 10 min)	Reducing sugar	Red ppt	+
4	D/W Extract	10% lead acetate	Glycoside	White ppt	+
5	Ethanol Extract	acetic anhydride (2ml) conc; H_2SO_4 (1ml)	Steroid	Green color	+
6	Ethanol Extract	5% NaOH, 1% $CuSO_4$	Protein	Red color (or) violet color	+

(+) = presence

Physical Parameters of Orange Wine

Some physical parameters of orange wine such as pH, specific gravity and percent alcohol were determined. These experiments were carried out by two weeks interval. The results were shown in Table 2 and Figures 2,3 and 4. The pH of wine was found to be 3.4 to 3.9. Specific gravity of orange wine indicated that the range of 1.010 to 1.035 g cm^{-3}. Alcohol percent (ABV) of orange wine was found to be range of 16.98 % to 20.38 %. It was observed that decreased the pH value and specific gravity with increased the time. Percent alcohol was increased with time increased. After three months of fermentation, pH value, specific gravity, alcohol percent (ABV), of orange wine and some physical parameters of different wines such as grape, strawberry, damson, pear and apple were shown in Table 2 and Figures 5, 6 and 7.

Comparison of orange wine and the different wines were observed that pH values of orange and apple wine were nearly the same. The pH values of grape and strawberry wine were greater than that of orange wine. But pH values of pear and damson wine were smaller than orange wine. The specific gravity of grape wine was the highest and regularly decreased in apple, pear, strawberry, orange and damson

wine. The alcohol percent (ABV) of strawberry and damson wine were greater than orange wine and then pear, apple and grape wine were smaller than orange wine.

The pH value of wine was found to be 3.4. The pH of wine was variable in the major taste of sourness. The clarity of wine was affected by pH. For table wines, preferred pH levels were 3.1 to 3.4 for white wines and 3.3 - 3.6 for red wines. This value (pH 3.4) was agreed with literature value. So, orange wine was the white wine.

Table 2. Physical Characteristics of Orange wine for Two Interval Weeks

No	Interval weeks	Parameters		
		pH	Specific gravity ($g\ cm^{-3}$)	Alcohol percent (ABV) (%)
1	21.6.2017	3.9	1.035	16.98
2	5.7.2017	3.8	1.030	17.66
3	19.7.2017	3.7	1.025	18.34
4	2.8.2017	3.6	1.020	18.34
5	16.8.2017	3.5	1.015	19.02
6	30.8.2017	3.4	1.010	19.70
7	6.9.2017	3.4	1.010	20.38

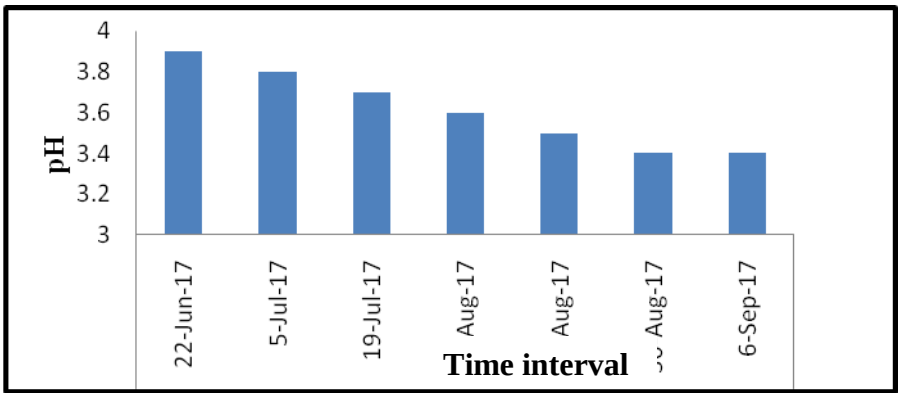

Figure 2. pH of orange wine

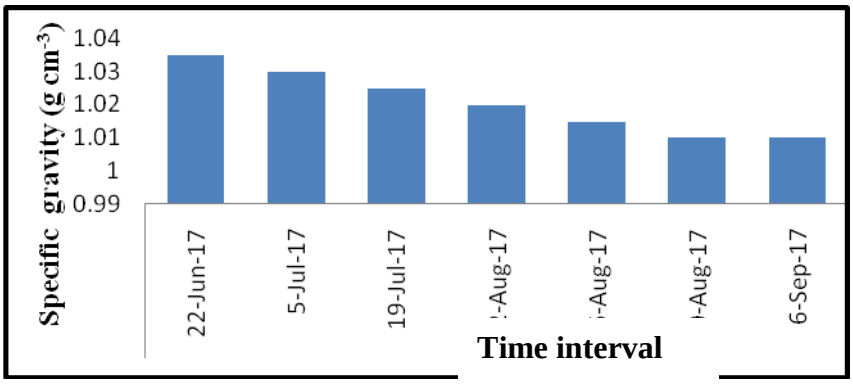

Figure 3. Specific gravity of orange wine

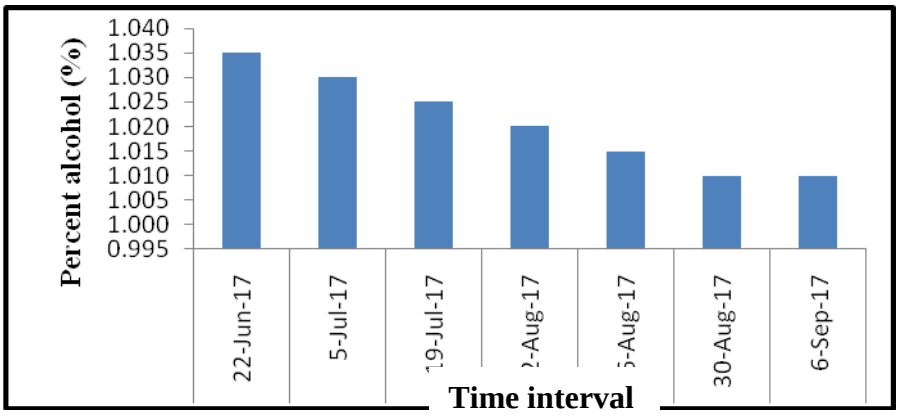

Figure 4. Percent alcohol of orange wine

Table 3.Some Physical Parameters of Orange Wine and Different Wines

No	Samples	Parameters		
		pH	Specific gravity ($g\ cm^{-3}$)	Alcohol percent by alcohol by volume (ABV) (%)
1	Orange wine	3.4	1.010	20.38
2	Grape wine	3.6	1.050	13.58
3	Strawberry wine	3.6	1.015	21.05
4	Pear wine	3.2	1.020	19.70
5	Damson wine	3.3	1.005	23.77
6	Apple wine	3.5	1.025	17.66

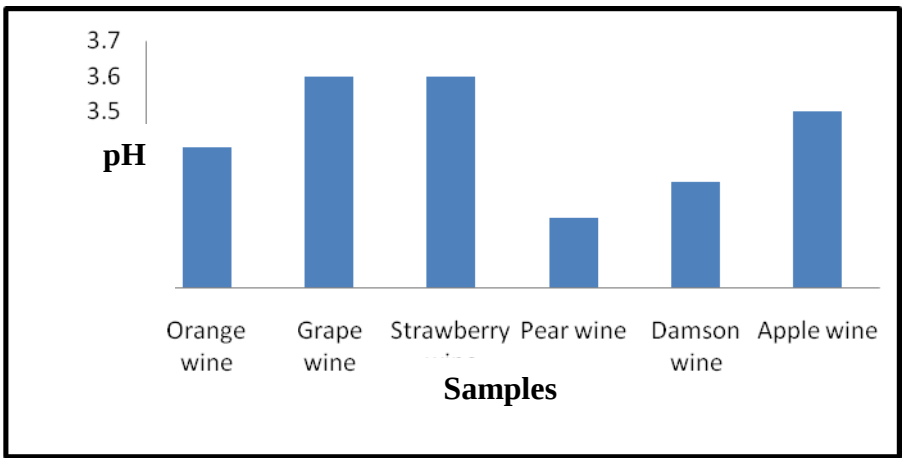

Figure 5. Comparison of pH of orange wine and different wines

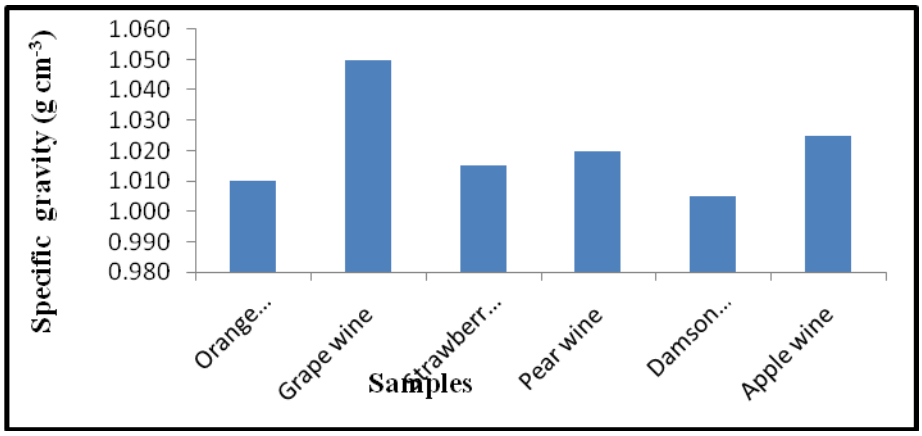

Figure 6. Comparison of specific gravity of orange wine and different wines

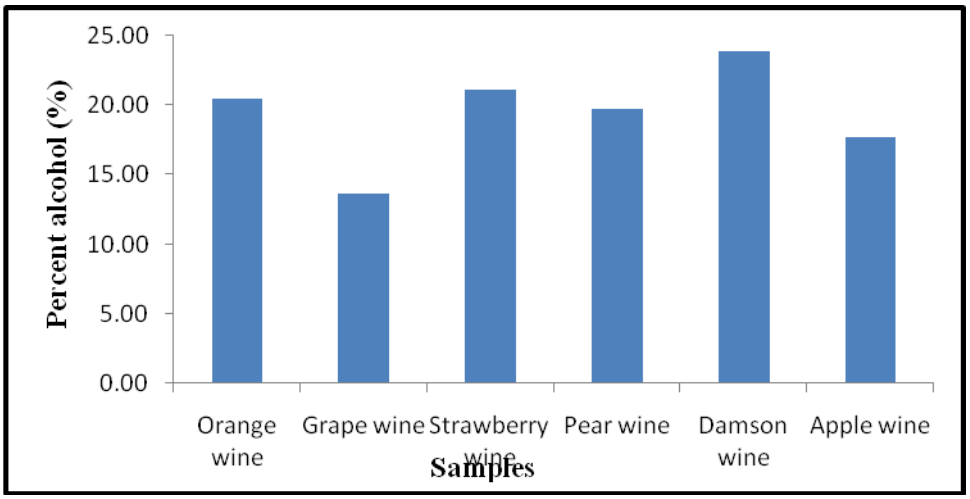

Figure 7. Comparison of percent alcohol of orange wine and different wines

Table 4. The Contents of Nutritional Values in Orange Wine

No	Chemical constituents	Experimental values
1	Moisture	86.00 %
2	Ash	0.11 %
3	Protein	0.10 %
4	Fibre	0.80%
5	Fat	0.01 %
6	Carbohydrate	12.98
7	Energy value	52.41 kcal/ 100g

Investigation of some Nutritional Values in Orange Wine

The moisture content of orange wine was determined by using Dean and Stark's method and the results were shown in Table 3. From the results, the moisture content of orange wine was found to be 86.00 % which indicates that the sample could not be stored for a long time without any growth of mould. The ash and fibre

contents were determined by the method given in "Chemical analysis of Food" and the results were shown in Table 4. A lower amount of the fibre content (0.80 %) was observed. The fibre content stimulates the movement of the intestinal muscles, which helps maintain regularity. Thus, it keeps blood sugar levels within the normal range and avoids wide fluctuations. The fat content in orange wine was carried out by Soxhlet extraction method. From this experiment, the fat content analyzed was found to be 0.01 % which contained a little amount in orange wine was described in Table 3. The protein content of the sample was found to be 0.10 % which is a little amount in this selected medicinal fruit. Protein is one of the important parts of human nutrition: it not only supports growth but is also important for maintenance and repair of body tissues. From this experiment, it was found that the carbohydrate content of orange wine possessed 12.98 %. The relatively high carbohydrate content can be used as energy source and also it is necessary in the digestion and assimilation of other foods (Nwaogu*et al.,* 2006).

Conclusion

From the overall assessments of the present research work, the following inferences could be drawn. According to the preliminary phytochemical investigation, it was found that phenolic compound, carbohydrate, reducing sugar, glycoside, steroid and protein by using the standard method. Orange wine was prepared by fermentation method. The physical parameters of orange wine and different wines were examined. Some nutritional values such as moisture, ash, fibre, fat, protein and carbohydrate contents were determined from the orange wine. The energy value was found to be 52.41 kcal/100g. Orange wine is a type of white wine which is lower in carbohydrate. White wine provides of our daily nutritional needs 3 % magnesium, 3 % vitamin B_6, 3 % vitamin B_2 , 3 % Niacin,1 % Riboflavin along with trace elements iron, calcium, potassium, Phosphorus and zinc. It can be concluded that people should drink the orange wine regularly and moderately than the different wines. Nowadays, orange wine has been popping up on the influential wine lists across the world. In the summer, the London Ritz added five orange wines to its highly traditional 800 wine list, while wine sellers in New York are also catering for a spike in its popularity, according to Bloomberg.

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