

## RESEARCH NOTE

# Effect of Varied Levels of Sugar Concentration on Wines Produced from *Emblica officinalis*

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### Abstract

A study on the preparation of wine from Amla (*Emblica officinalis* Gaertn.) using varied levels of sugar was carried out. Amla wine was prepared with extractions using whole fruits in 20, 22, 24, 26 and 28°B sugar syrups. Alcohol content was found to increase with an increase in sugar concentration. Sensory evaluation was conducted for all the fresh wine samples, prior to ageing. The results revealed that the wine developed from the first five treatments were acceptable, after which the sensory acceptability scores was the best seen to decline. The wine prepared using Amla fruits with 28 °B sugar syrup were best out of all treatments.

**Keywords:** *Emblica officinalis* Gaertn, Fermentation, Wine, Sugar concentration.

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One of the cherished fruits of Ayurveda is amla and it is known to provide systematic support, natural body benefits and rejuvenation. Amla is regarded as a significant rejuvenating food and is revered as a natural plant medicine. Its nutritive profile has been chronicled in medical studies and schools of pharmacy from scientific laboratories (Basak, 2005). The main ingredient Amla /Indian gooseberry (*Emblica officinalis* Gaertn.) is a subtropical fruit belonging to family *euphorbiaceae*. It is available throughout the greater part of India. Fruit is a rich source of vitamin-C. Phyllembin from the fruit pulp is identified as ethyl gallate. Besides these, the fruits also contain 1, 3, 6- trigalloylglucose, terchebin, corilagin, ellagic, phyllenbolic acids, alkaloids like phyllantidine and phyllantine (Suresh, 2015). Amla fruits contains very high amount of ascorbic acid. On an average 600 mg/100g of fruit ascorbic acid is analgesic, anti-inflammatory and antipyretic (Basak, 2005). Besides, this compound is also

antihepatotoxic, antinephrotoxic, antioxidant and impart chromosomal stabilization The fruit contains around phenolic compounds of which ellagic acid, gallic acid, corilagin etc. are important ones. The fruit also contain gallic acid which acts as an antioxidant. This compound which inhibits auto oxidation of ascorbic acid is known to retard oxidation resulting in decomposition of organic substances which means in other words acts as a preservative (Suresh, 2015). Gallic acid scavenges free radicals generated by various metabolic processes (Majeed, 2008).

Although fresh fruit is shown to have the major therapeutic activity, the fruit is hardly used commercially. Therefore, there is possibility of commercialising the fermented fruit product. The fruit, Amla because of its high acidity and astringent taste, is not palatable for direct consumption, but its excellent therapeutic value offers enormous potential for processing.

Fermentation offers the potential for flavour enhancement in the products and improves their stability. Wines or fermented beverages not only provide calories but vitamin B complex as well, thus preventing beriberi and pellagra (nutritional deficiencies). They even contain small amounts of proteins and amino acids (Dahiya, 2001). Fermentation studies were conducted to find out suitability of Amla for wine preparation with *Saccharomyces cerevisiae* var. *ellipsoides*. The wine produced was compared for their chemical and sensory qualities. The results revealed that Amla can serve as good substrate for preparation of good quality wine (Majeed, 2008).

## MATERIALS AND METHODS

### Collection of Materials

Fully matured, disease free, amla fruits were procured from local market in Kolkata for the experiment. The Fermentation jars and bottles (1000 ml capacity) used for the experiment were also procured from local markets of Kolkata and were sterilized, and then used for preparing amla wine. A freeze dried pure culture of *Saccharomyces cerevisiae* (K1-V1116) was procured from the Lallemand Inc., Canada. This yeast strain is an industrial strain of yeast, used for wine making, hence complete genetic profile is not known. (<http://www.lallemandbrewing.com/product-details/lalvin-icv-k1-v1116/>)

### Preparation of Sugar Syrup of Different Concentrations

Sugar Concentration	Amount of Sugar / 1000 ml Water
20 °Brix	216 grams
22 °Brix	240 grams
24 °Brix	264 grams
26 °Brix	289 grams
28 °Brix	320 grams

### Yeast Preparation

The Lalvin active dried wine yeast was rehydrated by opening the 5 gram sachet and pouring contents into 50 mL (1/4<sup>th</sup> cup) clean 40°C (104°F) water. The yeast suspension was stirred lightly and allowed to stand for 20 minutes, then stirred again.

### Preparation of Amla Wine

300 gm. of matured, disease free amla fruits were taken. They were washed with water and put in a basket to drain excess water. The fruits were cut into small pieces and slightly crushed. One litre of sugar syrup with different sugar concentrations was prepared. It was boiled for five minutes and the boiling syrup was poured over amla fruits in such a way that it covered the amla fruits completely. It was closed and allowed to cool. After it came to room temperature, 10 ml of inoculum was added. It was closed loosely and fermentation was allowed for 24 hours. For the next 14 days, it was allowed to ferment under airtight condition in the absence of light. The prepared wine was then clarified using bentonite and clear wine from top was siphoned into sterilized bottles.

### Alcohol Content Analysis

Alcohol content was analysed using Spectrophotometric method. 1 ml of wine sample was taken in 9 ml of distilled water. 1 ml of freshly prepared K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> solution was added to 1 ml aliquots. 4 ml of concentrated H<sub>2</sub>SO<sub>4</sub> was added. The OD was measured at 600 nm. The alcohol content was found out by comparing with standard curve (Ranganna, 1986; Joshi, 1998).

### Sensory Evaluation

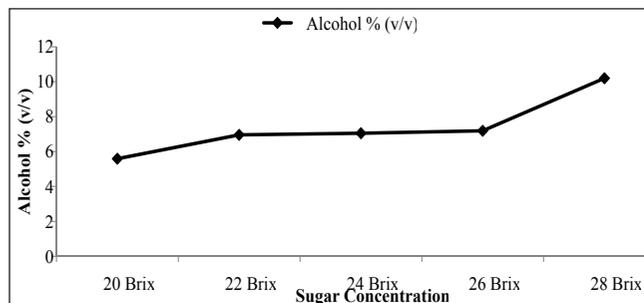
The prepared amla wine with different sugar concentrations (20, 22, 24, 26 and 28°B) were evaluated for the quality attributes like appearance, colour, sweetness, astringency and overall acceptability by a panel of 50 non-trained panel members by following the 5-point Hedonic rating scale (Kappel, 1996).

## RESULTS AND DISCUSSION

### Alcohol Content of Wine

The data on alcohol concentration of Amla wine as influenced by different concentrations of sugar, showed an increasing trend as the sugar concentration increased. There were significant differences between the treatments with respect to alcohol content of

the Amla wine. The higher alcohol% was observed when sugar concentration was increased. The alcohol content was found to be significantly highest with 10.2% in Amla wine with 28% sugar syrup (T5). The lowest alcohol% was observed in Amla wine with 20% sugar syrup (T1) with an alcohol content of 5.59 %.



**Fig. 1:** Effect of increasing sugar concentration on alcohol content in wine

As the concentration of sugar increased in Amla wine the alcohol content increased significantly. This may be due to greater extent of conversion of sugars into alcohol by yeast. Hence, as sugar concentration increases, more sugar is available for the yeast to metabolize and higher is the ethanol production. The higher levels of reducing sugars present in the wine are more readily fermentable, giving rise to higher levels of alcohol.

### Sensory Evaluation

The quality of amla wine samples was assessed by sensory evaluation by a panel of judges. The wine was evaluated based on the appearance, for its overall quality. The score obtained by sensory evaluation are presented in table 2 and discussed here under.

**Appearance:** The highest score (4.38) for appearance was recorded in Amla wine with 28% sugar syrup. This treatment was very much attractive and acceptable compared to all other treatment and found superior with respect to appearance. The wine with 20% sugar syrup got least sensory score (3.32). These results are also in agreement with Bardiya *et al.* (1974). This may be due to low tannin content with increasing sugar concentrations, leading to increased

clarity.

**Colour:** Amla wine with 28 % sugar syrup recorded highest sensory score (3.94) with respect to colour. The wine was found to be attractive and acceptable. The treatment Amla wine with 20% sugar recorded sensory score (2.35) with respect to colour. The increase in score for colour can be attributed to increased clarity as well increasing sugar concentration, which led to increased diffusion of polyphenolic-derived pigments (such as xanthophylls, anthocyanins etc.) from the fruit. The colourless phenolic compound from skin of fruit binds with anthocyanins and form stable colour complexes. These results are similar to the findings of Singh *et al.* (1976).

**Aroma/Bouquet:** Amla wine with 28% sugar syrup recorded highest sensory score (3.73) with respect to aroma. The wine was found to be attractive and acceptable. The treatment Amla wine with 20 % sugar recorded sensory score (3.17) with respect to aroma. The sensory acceptance for aroma was found to be similar due to same amount of fermentation time allotted for each treatment. Also the increase in sugar concentration was found to play no role in variation in aroma/ bouquet of the wine samples.

**Acidity:** Amla wine with 28% sugar syrup recorded highest sensory score (3.61) with respect to acidity. The wine was found to be attractive and acceptable. The treatment Amla wine with 20% sugar recorded sensory score (2.73) with respect to acidity. The acidity of the wine samples was seen to decrease with increasing sugar concentrations, which can be attributed to masking interaction between sugar and acid. Increase in the added sugar reduced the apparent acid taste in the wine.

**Sweetness:** Least sensory score (2.61) was observed in Amla wine with 20% sugar syrup. Sweetness in wine is a combination of two factors. First for the presence of sugar which is sensed by sweet taste receptors on the tongue. Second, the sweetness of the fruit itself. This may be due lower sugar concentration in this treatment. These results are at par with the results of Kulkarni *et al.* (1980).

**Table 2:** Effect of Sugar Concentration on sensory quality Amla Wine

Attribute	Mean Sensory Score (+/- Standard Deviation)				
	T1	T2	T3	T4	T5
Appearance	3.32 ± 0.3	3.38 ± 0.24	3.52 ± 0.42	3.67 ± 0.36	4.38 ± 0.21
Colour	2.35 ± 0.24	2.94 ± 0.21	3.41 ± 0.22	3.70 ± 0.2	3.94 ± 0.27
Aroma/Bouquet	3.17 ± 0.07	3.38 ± 0.05	3.41 ± 0.02	3.47 ± 0.06	3.73 ± 0.05
Acidity	2.73 ± 0.12	3.32 ± 0.15	3.32 ± 0.1	3.32 ± 0.17	3.61 ± 0.23
Sweetness	2.61 ± 0.12	2.76 ± 0.1	2.79 ± 0.1	3.08 ± 0.1	3.52 ± 0.7
Body	3.88 ± 0.31	3.29 ± 0.25	2.91 ± 0.37	2.88 ± 0.29	2.82 ± 0.36
Astringency	2.38 ± 0.11	2.97 ± 0.17	3.11 ± 0.12	3.41 ± 0.1	3.82 ± 0.16
Overall Acceptability	2.47 ± 0.25	2.64 ± 0.33	2.88 ± 0.38	3.77 ± 0.31	3.54 ± 0.42

T1: Amla Wine (20° Brix), T2: Amla Wine (22° Brix), T3: Amla Wine (24° Brix), T4: Amla Wine (26° Brix), T5: Amla Wine (28° Brix)

**Body:** The maximum score (3.88) which means least viscosity was recorded in treatment Amla wine with 20% sugar, however, the least score (2.82) i.e., higher viscosity was recorded in treatment Amla wine with 28% sugar. As the concentration of sugar increases with each subsequent treatment, the viscosity tends to increase. This is due to the reason that sugar is a form of soluble solid in the liquid medium. Since body is a measure of alcoholicity, as sugar concentration increases, the body of wine is enhanced indicating higher strength of the wine.

**Astringency:** The maximum score (3.82) which means least astringency was recorded in treatment Amla wine with 28% sugar, however, the least score (2.38) i.e., higher astringency was recorded in treatment Amla wine with 20% sugar. Reduced astringency in last treatment can be attributed to higher sugar concentration and low tannin content. Both tannins and acids are able to counter the taste of sweetness, providing balance to a wine. Due to the absence of aging in case of the wine samples, tannins have not got adequate time to break down, thereby resulting in sweetness masking astringency.

**Overall Acceptability:** The highest sensory score (3.77) for overall acceptability was obtained for Amla wine prepared from 26 % sugar syrup. All the treatments were found acceptable with respect to quality. This may be due to the presence of sufficient sweetness, pleasant flavour, moderate astringency and acidity, colour and appearance.

## CONCLUSION

Sugar concentration was evidently seen to affect the Sensory quality of the prepared wine samples. There was a significant increase in the levels of alcohol% with increase in sugar concentration. The use of Amla fruit gave a novel product with better qualities, increased acceptability and wider applications. Such functional ingredients need to be explored for developing products that could be included in the realm of Health-oriented products. Also the application of such fruit wines in the field of therapeutics is a conceivable approach.

This wine can thus prove to be a good herbal drink with alcohol as a stimulant, phenolics and vitamin C as antioxidants. As an overview, this work provides a greater horizon to the prospects of wine making, its applications and overall acceptability in the market, along with the creation of a value added product.

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