



# Production, Development of Mixed Fruit Wine and Quality Analysis During Fermentation

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## Abstract

The mixture of fruit pulp contains low sugar, and thus the sugar level will adjust to 25° Brix by using a sugar solution. The pH level of the mixture will be adjusted to 4. The juice will be yeasted by *Saccharomyces cerevisiae* at 0.5%. The specific gravity of mixed fruit wine showed an increasing trend for all the treatments with fermentation periods up to 0, 10, 20, and 30 days. The TSS largely affects the various physicochemical parameters of fermented wine. Sugar is the main substrate for the fermentation of fruit juice into alcohol. The specific gravity of the wine was found to decrease with an increase in sugar percent. The highest value of alcohol content was found at 11.62 v/v in the T<sub>6</sub> sample after the last day of the fermentation period with 0.5% yeast concentration. It has been observed that the sample shows a low-alcoholic wine.

**Keywords:** Fruits, Fermentation, TSS, Specific Gravity, Alcoholic Wine

## Introduction

Grape wines are maybe the most financially significant organic product juice liquor (Kelebek and Canbas 2013). Strains of *Saccharomyces cerevisiae* yeast, which are known to deliver diverse, unpredictable profiles, have been regularly utilized for alcoholic maturation.

Wines are regularly utilized as a result of the typical alcoholic aging of the juice. Grape wines are maybe the most monetarily significant organic product (Kumar et al., 2021). Aging of the wine, utilizing acidic corrosive microbes, changes the liquor over to acidic corrosive, accordingly bringing about the item known as vinegar (Silva et al., 2007). Vinegar is a significant additive and fixing agent, and it has an assortment of modern, clinical, and homegrown applications (Lowor et al., 2016).

Grapes are known to be the most commonly used raw material for the production of wine (Satav and Pethe 2017). Winemaking is one of the most ancient technologies and is now one of the most commercially prosperous biotechnological processes. The best pH values are essential for yeast augmentation and ethanol materialization. Most of

the yeasts grow very well between pH 4.5 and 6.5, and nearly all species are not able to grow in more acidic or alkaline media. (Walker, 1998).

## Materials and Methods

### Alcohol Content

Alcohol determination by a specific gravity method provides an approximation of the alcohol content only. The method assumes that there is a difference in specific gravity. Before and after fermentation is due solely to the conversion of sugars before fermentation. The alcohol content is calculated by the following relationship:

$$\text{Alcohol (\%v/v)} = (\text{SG}_2 - \text{SG}_1) / 0.0074$$

Where,

SG<sub>1</sub>= Initial specific gravity measurement  
SG<sub>2</sub>= Final specific gravity measurement

### pH

The pH was determined directly during fermentation using a digital pH meter as described by Ochai and Kolhatkar (2008). Total soluble solids (TSS)

Alcohol determination by a specific gravity method provides and the total soluble solid content was determined in terms of °Brix by using a hand refractometer at 20 °C. It measures TSS in terms of refractive index. Brix is a measure of solids only in the case of pure sucrose solutions. Generally, fruit juices contain more sugar than any other soluble constituent, and hence brix provides a useful guide for soluble solid or sugar content (Maziar, 2010).

### Specific gravity

The specific gravity was determined using specific gravity bottle. The empty bottle was weighed, filled with distilled water and reweighed. It was then filled with sample and weighed (Ranganna, 1986).

The specific gravity, of the sample will be calculated, as follows:

$$\text{Specific gravity} = \frac{W_s}{W_w}$$

Where,

$W_s$  = Weight of known volume of sample in gm

$W_w$  = Weight of an equal volume of water in gm

### Density

The density,  $\rho$  in  $\text{kg/m}^3$ , will be calculated as:

$$\rho = 1000 \times \text{Specific gravity}$$

### Experimental Plan

The juice will be extract by homogenizing the pulp mixer after washing the fruits. The mixture of fruits pulp containing low sugar and thus sugar level will adjust from 25° Brix by using sugar solution. The pH level of mixture will adjust at 4. The juice will yeast by *Saccharomyces cerevisiae* with 0.5%. The complete mixture will be hold 30 days for fermentation at room temperature. The wine will be racking pasteurization (60° C, 3 min.) and bottling after fermentation process.

### Fermentation Process

The good quality fruits were procured from the local market of Meerut. The procured fruits were washed with water and unwanted material like dust; dirt and surface adhering were removed. The fruits were peeled with the help of a stainless

steel knife and boot the ends of the fruits were weighted according to the treatments ratio.

After setup the treatments of sample the sugar level in juices were adjusted at 25 °Brix and yeast *Sacharomyces cerevisiae* was added to the clarified juice to initiate fermentation for 30 days. The yeast percentages were used in the treatment 0.5 % than the samples were fermented at room temperature. In red wine making the pulp, skins and seeds of grapes and other fruits are kept together after crushing and during all parts of the fermentation. This is done to extract color and flavor. The post fermentation process was necessary to ensure good conservation and presentation of produced mixed fruit wine.

## Results and Discussion

### Effect on Specific Gravity

The data were analyzed to observe the effect of 0.5% yeasting concentration of mixed fruit wine during fermentation period as show in bar diagrams Fig. 1. The Specific Gravity of mixed fruit wine showed an increasing trend for all the treatments with fermentation period up to 0, 10, 20 and 30 days. The study revealed that specific gravity of the samples having yeast concentration of 0.5%.

Estimation of specific gravity of T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub>, T<sub>5</sub> and T<sub>6</sub> has been conducted. It has been studied that as the number of day's increases, the specific gravity also increases gradually. The specific gravity ranges from 1.01 to 1.061 for T<sub>1</sub> on 1<sup>st</sup> day to last day of fermentation period. 1.012 was the starting specific gravity of T<sub>2</sub> which increased to 1.075 on 30<sup>th</sup> day. The initial specific gravity of T<sub>3</sub> was 1.016 which increased to 1.098 on the 30<sup>th</sup> day. For T<sub>4</sub>, the specific gravity starts from 1.022 and increased to 1.098 on 30<sup>th</sup> day. On the 1<sup>st</sup> day the specific gravity was 1.008 for T<sub>5</sub> and then it increased to 1.099 on 30<sup>th</sup> day. In case of T<sub>6</sub>, specific gravity was 1.025 on 1<sup>st</sup> day which increased to 1.094 on 30<sup>th</sup> day.

### Effect on Total Soluble Solids (TSS)

The TSS content of mixed fruit wine showed a decreasing trend for all the treatments with fermentation period up to 30 days. The study revealed that TSS of the samples having 0.5% yeast was observed as 25 °Brix in fresh samples. From Fig. 2 it was observed that TSS of all the samples decreased with fermentation period (0, 10, 20, and 30 days). The TSS largely affects the various physic-chemical parameters of fermented wine. Sugar is the main substrate for fermentation of fruits juice into alcohol. The specific gravity of the wine was found to be decreased with increase in sugar percent. This might be due to increase in alcohol percent with increase in sugar percent.

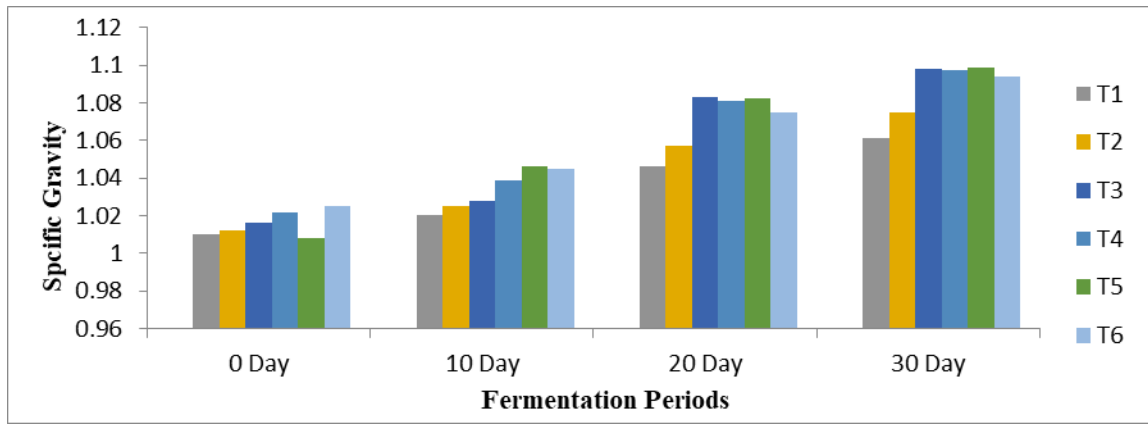


Fig. 1 Specific gravity 0.5% yeasting during fermentation period

Estimation of TSS of T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub>, T<sub>5</sub> and T<sub>6</sub> has been conducted. It has been studied that as the number of day's increases, the TSS (°Brix) also decreases gradually. The TSS (°Brix) ranges from 25 to 18.67 for T<sub>1</sub> on 1<sup>st</sup> day to last day of fermentation period. 25 was the starting TSS (°Brix) of T<sub>2</sub> which decreased to 18.67 on 30<sup>th</sup> day. The initial TSS (°Brix)

of T<sub>3</sub> was 25 which decreased to 17.00 on the 30<sup>th</sup> day. For T<sub>4</sub>, the TSS (°Brix) starts from 25 and decreased to 17.67 on 30<sup>th</sup> day. On the 1<sup>st</sup> day the TSS (°Brix) was 25 for T<sub>5</sub> and then it decreased to 17.67 on 30<sup>th</sup> day. In case of T<sub>6</sub>, TSS (°Brix) was 25 on 1<sup>st</sup> day which decreased to 16.33 on 30<sup>th</sup> day.

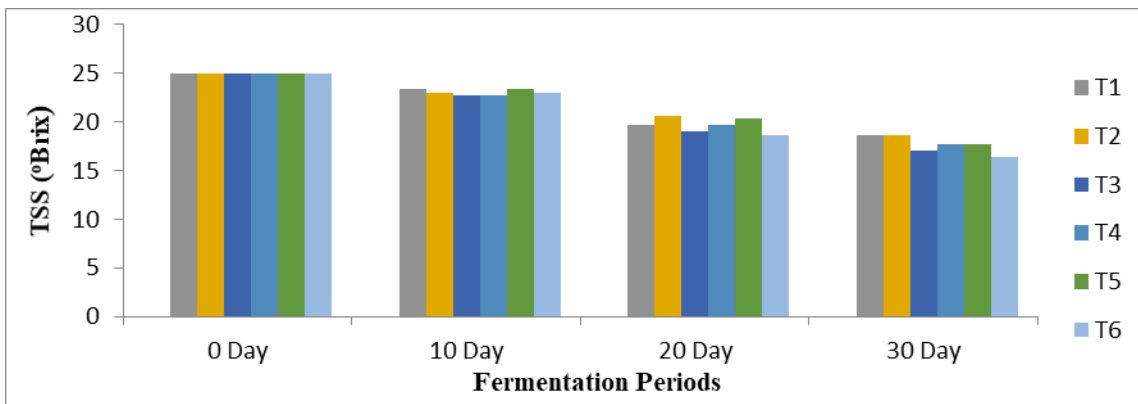


Fig. 2 TSS of 0.5% yeasting during fermentation period

**Effect on Density**

The Density of mixed fruit wine showed an increasing trend for all the treatments with fermentation period up to 0, 10, 20 and 30 days. The study revealed that density of the samples having yeast concentration of 0.5%. The data were analyzed to observe the effect of 0.5% yeasting concentration of mixed fruit wine during fermentation period as show in bar diagrams Fig. 3.

Estimation of density of T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub>, T<sub>5</sub> and T<sub>6</sub> has been conducted. It has been studied that as the number of day's

increases, the density also increases gradually. The density ranges from 1016.67 kg/m<sup>3</sup> to 1060.67 kg/m<sup>3</sup> for T<sub>1</sub> on 1<sup>st</sup> day to last day of fermentation period. 1012 kg/m<sup>3</sup> was the starting density of T<sub>2</sub> which increased to 1075 kg/m<sup>3</sup> on 30<sup>th</sup> day. The initial density of T<sub>3</sub> was 1016 kg/m<sup>3</sup> which increased to 1098 kg/m<sup>3</sup> on the 30<sup>th</sup> day. For T<sub>4</sub>, the density starts from 1022.33 kg/m<sup>3</sup> and increased to 1097.33 kg/m<sup>3</sup> on 30<sup>th</sup> day. On the 1<sup>st</sup> day the density was 1015 kg/m<sup>3</sup> for T<sub>5</sub> and then it increased to 1098.67 kg/m<sup>3</sup> on 30<sup>th</sup> day. In case of T<sub>6</sub>, density was 1025.33 kg/m<sup>3</sup> on 1<sup>st</sup> day which increased to 1094.33 kg/m<sup>3</sup> on 30<sup>th</sup> day.

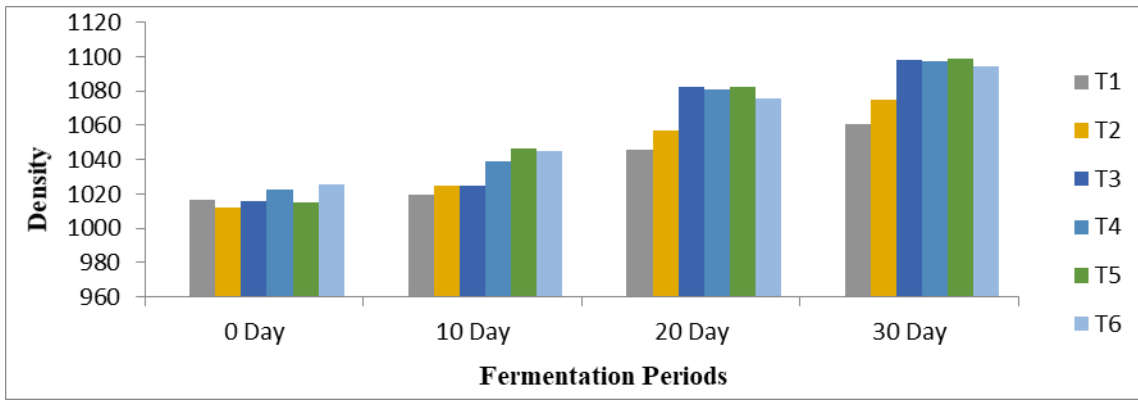


Fig. 3 Density for 0.5% yeasting during fermentation period

**Effect on pH content**

The pH plays an important role in aging, clarifying or fining. As the strength of the relative charge of suspended particles decreases in the wine, the pH of the wine increases. At high pH, organic protein fining agents may possess a positive charge insufficient to bind to the negatively charged particulates, thus potentially increasing the turbidity of the wine (Nuengchamnog and Ingkaninan 2017). Estimation of pH content of T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub>, T<sub>5</sub> and T<sub>6</sub> has been conducted. It has been studied that as the number of days increases, the pH

content also decreases gradually. The pH content ranges from 4.50 to 3.70 for T<sub>1</sub> on 1<sup>st</sup> day to last day of fermentation period. 4.50 was the starting pH content of T<sub>2</sub> which decreased to 3.72 on 30<sup>th</sup> day. The pH content of T<sub>3</sub> was 4.5 which decreased to 3.69 on the 30<sup>th</sup> day. For T<sub>4</sub>, the pH content starts from 4.50 and decreased to 3.68 on 30<sup>th</sup> day. On the 1<sup>st</sup> day the pH content was 4.50 for T<sub>5</sub> and then it decreased to 3.59 on 30<sup>th</sup> day. In case of T<sub>6</sub>, pH content was 4.50 on 1<sup>st</sup> day which decreased to 3.52 on 30<sup>th</sup> day.

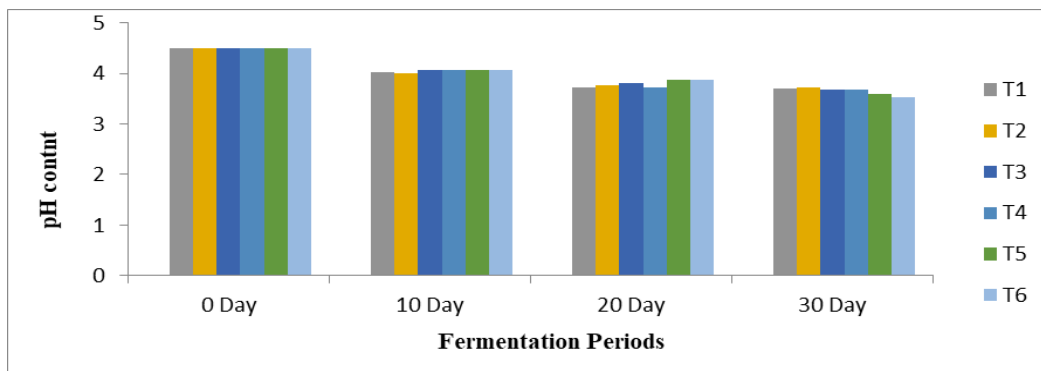


Fig. 4 pH content of 0.5% yeasting during fermentation period

**Effect on Alcohol content**

The alcohol content production of mixed fruit wine showed an increasing trend for all the treatments with fermentation period up to 30 days. The data were analyzed to observe the effect of 0.5% yeasting concentration of mixed fruit wine during fermentation period as show in bar diagrams Fig. 5.

The Alcohol content of mixed fruit wine showed an increasing trend for all the treatments with fermentation period up to 0, 10, 20 and 30 days. The study revealed that specific gravity of the samples having yeast concentration of 0.5%.

Estimation of alcohol content of T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub>, T<sub>5</sub> and T<sub>6</sub> has been conducted. It has been studied that as the number of day’s increases, the alcohol content also increases gradually. The alcohol content ranges from 0 to 6.4 for T<sub>1</sub> on 1<sup>st</sup> day to last day of fermentation period. 0 was the starting alcohol content of T<sub>2</sub> which increased to 8.51 on 30<sup>th</sup> day. The initial alcohol content of T<sub>3</sub> was 0 which increased to 9.82 on the 30<sup>th</sup> day. For T<sub>4</sub>, the alcohol content starts from 0 and increased to 10.14 on 30<sup>th</sup> day. On the 1<sup>st</sup> day the alcohol content was 0 for T<sub>5</sub> and then it increased to 11.17 on 30<sup>th</sup> day. In case of T<sub>6</sub>, alcohol content was 0 on 1<sup>st</sup> day which increased to 11.62 on 30<sup>th</sup> day.

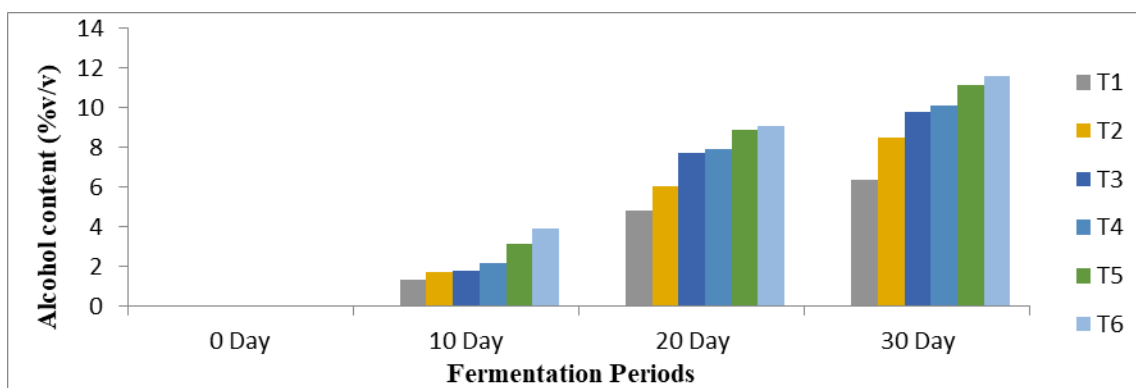


Fig. 5 Alcohol content of 0.5% yeasting during fermentation period

## Conclusion

The specific gravity of mixed fruits wine observed an increasing trend for all treatments with increasing in fermentation period upto 30 days. The T<sub>6</sub> sample has observed the maximum value of specific gravity 1.094 after last day of fermentation period with 0.5% of yeast concentration. The TSS (°Brix) of mixed fruits wine observed a decreasing trend for all treatments with increasing in fermentation period upto 30 days. The T<sub>6</sub> sample has observed the minimum value of TSS 16.33° Brix after last day of fermentation period with 0.5% of yeast concentration. The density of mixed fruits wine observed an increasing trend for all treatments with increasing in fermentation period upto 30 days. The T<sub>6</sub> sample has observed the maximum value of density 1094 kg/m<sup>3</sup> after last day of fermentation period with 0.5% of yeast concentration. The pH content of mixed fruits wine observed decreased trend for all treatments with increasing in fermentation period upto 30 days. The T<sub>6</sub> sample has observed the minimum value of pH content 3.52 after last day of fermentation period with 0.5% of yeast concentration. The alcohol content of mixed fruit wine showed an increasing trend for all the treatments with increasing in fermentation period upto 30 days. The highest value of alcohol content was found 11.62 v/v in T<sub>6</sub> sample after last day of fermentation period with 0.5% of yeast concentration. It has been observed that the sample show the low alcoholic wine.

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