Development of Floral Based Fermented Drink with Mahua Flowers

Abstract: In the world alcoholic beverages, such as whiskey, rum, beer etc were taken daily by about 2 billion people (WHO report). About 12% people consumed wine in their party, occasion, festival but the more alcohol containing wine are harmful for human. Some of local and cheap alcoholic beverage contain high amount of ethanol or contaminated by methanol, arsenic and other microorganism that are harmful for human being. Fermented floral wine is an alcoholic beverage made from mahua flowers. Floral wine is widely consumed during social and cultural events, and is part of offerings for a good harvest and traditional medicine as Indian tequila. The choice of raw material plays a vital role in producing wine of good quality and volume. The use of different starter cultures with varying microbial content and floral variety has-been associated with the production of wine with different tastes and flavours. Saccharomyces cerevisiae has been reported to produce wine with a diverse flavour profile. In this present work entitled

"Development of fermented floral wine with mahua flowers", floral wine developed from *Madhuca longifolia* flowers. Results of this study shown that floral wine produced from mahua flower was highly nutritious containing polyphenols, flavonoids, terpenoids, alkaloids and low concentration of ethanol and carbohydrates. No signs of methanol which is harmful to human beings, which signifies the potential benefits of the wine.

wine is an indigenous preparation that can be made in household for consumption as a beverage before food, as a dessert after food, or as an energy drink for lactating mothers with a low to moderate alcohol content managed with varying no of days of fermentation. The indigenous flower madhuca longifolia are suitable for floral wine preparation, which matches with locally available toddy in taste, flavour, and intensity. The economic impact of Mahua wine production on local communities, including employment generation and income opportunities. Researching the nutritional components of Mahua wine provides insights into its potential health benefits or

drawbacks. Exploring traditional medicinal uses of Mahua wine and its potential therapeutic effects. Studyingthe production methods can lead to improvements in the quality, efficiency, and scalability of Mahuawine production. Exploring modern techniques or technologies to enhance production while preserving its traditional essence. Traditionally this wine is produced by the tribes of Telangana, Andhra Pradesh, Orissa, and Chhattisgarh people analysis of this wine and its benefits help improvetheir economic standards by employment generation and income opportunities.

Keywords: *Madhuca longifolia,* polyphenols, flavonoids, ethanol, methanol, alkaloids

Introduction:

Wine is an "alcoholic beverage" prepared from fermented grapes, berries, apple and other fruits with the help of yeast since thousands of years. Wine is widely consumed throughout the globe from ancient time in the name of Madeira, Sula etc. Wine has potentially beneficial effects on human health, especially due to the presence of polyphenols and resveratrol (Weingerl, 2012).

Mahua, the Indian Butter-nut Tree, is economically vital in tribal population because of the extensive usages of its various parts, namely, flowers, fruits, seeds and timber (Ramadan et al., 2016). Mahua tree flowers during the sparest season of agriculture (March-April). It acts as a source of income and employment generation for the frailest section of the society. Flowers of the plant are edible with the fleshy corollas and are rich source of natural sugars and appreciable number of vitamins and minerals (Sinha et al., 2017). Liquor consumption in India is influenced by a combination of cultural, social, economic, and regulatory factors. Excessive alcohol consumption poses significanthealth risks, leading to various health issues like liver disease, cardiovascular problems, and socialissues like alcohol addiction. It is used as a sweetening agent in numerous local food preparations like halwa, kheer, puri and burfi (Patel, 2008). Mahua winemaking is also on the rise and also promoted by the Government of India. The sweet taste and presence of phenolics esp. gallic acid, chlorogenic acid, catechin, epicatechin, caffeic acid, 4-hydroxybenzaldehyde, ascorbic acid, and tannic acids in mahua (*Madhuca longifolia*) wines make them unique flower wines. These are a rich source of sugars and contain appreciable

amounts of vitamins and calcium. However traditional processing of distillation leads to loss of the bulk of its aroma, volatile ingredients, physicochemical and sensory qualities.

Table1 Hierarchy of Mahua flower

Kingdom	Plantae
Division	Angiosperms
Clade	Asterids
Order	Ericles
Family	Sapotaceae
Genus	Madhuca
Species	*M.longifolia*

Saccharomyces cerevisiae:

Saccharomyces is a genus in the kingdom of fungi that includes many species of yeast.

Saccharomyces is from the Greek„sugar "and „mushroom "and means sugar fungus. Many members of this genus are considered very important in food production. It is known as the brewer's yeast or baker's yeast. They are unicellular and saprophytic fungi. One example is Saccharomyces cerevisiae, which is used in making wine, bread, and beer. Other members of this genus include Saccharomyces bayanus, used in making wine, and Saccharomyces boulardii, used in medicine.

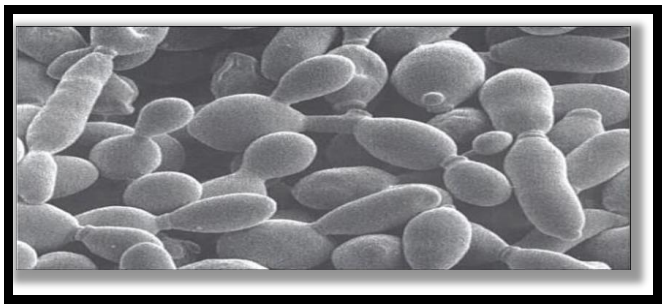


Table 2 Scientific Classification of Saccharomyces cerevisiae	
Domain	Eukarya
Kingdom	Fungi
Phylum	Ascomycota
Subphylum	Saccharomycotina
Class	saccharomyces
Order	saccharomycetales
Family	Saccharomycetaceae
Genus	saccharomyces

Methodology:

Materials required:

1. Mahua flowers 2. Anaerobic fermenter with air lock lid 3. Brewers' yeast 4. sugar 5. Glass bottle 6. filter paper 7. Funnel 8. muslin cloth 9. Strainer.

Chemicals required:

1. Sodium metabisulphite 2. Sodium benzoate 3. Distilled water.

Sample size:

The sampling technique adopted in this study was convenience sampling. Mahua flowers are ordered from Amazon through e-commerce 1000 gms for Rs 378 /-. Brewer's yeast ordered from Flipkart of 300/- Rs for 100 gms. To guarantee that the food would have enough nourishment without compromising flavor or texture, the proportions of each ingredient were carefully considered. Mahua flowers were graded and sorted according to quality attributes.

Procedure:

First collect the fresh mahua flowers from the mahua tree. Wash the flowers thoroughly to remove any dirt or impurities. clean the flowers using anti-fungal agents like sodium metabisulphite. Dry mahua flowers using solar drying method for 2-3 days. Once the flowers are clean, place them in a large container. Add water to the mahua flowers in 1:1 ratio and let the mixture soaked for overnight to allow the Flavors to infuse. After the soaking period, strain the liquid to remove the solid flower particles using muslin cloth. Transfer the strained liquid into a fermentation vessel, such as a clean and sterilized glass container. Add a yeast culture with sugar content for rapid growth in the mixture of mahua flowers to start the primary fermentation process. Cover the vessel using lid with an airlock to allow the release of carbon dioxide during fermentation while preventing contaminants from entering. Place the vessel in a dark and relatively warm area to ferment for a15-18 days, checking on it periodically. Once the primary fermentation process is complete, check the Ph value and presence of microbes in the wine. In secondary fermentation addition of pineapple pulp for the value addition in terms of flavour and taste for 3 days. Addition of preservative like sodium benzoate for shelf life. Use centrifugation or filter paper for clarification wine. Transfer the wine into clean bottles and store them in a cool, dark place for further aging.

Value addition: In secondary fermentation fruit pulp like pineapple, grapes, mangoes are used for flavour and taste of the wine for 3days.

Fig 1 Mahua flowers

Fig 2 Dehydration

Fig 3 Extraction

Fig 4 Autoclaving fermenter

Fig 5 Fermenter

Fig 6 Filtration using filter paper

Fig 7 Pure mahua wine

Fig 8 Flavoured wine

Physio-chemical analysis of fermented floral wine.

The results of the physicochemical analysis of fermented floral wine prepared from the mahua flowers (*Madhuca longifolia*) were done at different fermentation periods 8,16, 24, and 32 days.

Fermented floral wine developed from *Madhuca longifolia* was tested for physio-chemical parameters like hydrogen ion concentration(pH), total soluble solids, carbohydrate, titrable acidity, and alcohol content, and the details are given in Table 3. The analytical values of each parameter are discussed below under specific headings.

Table 3: Physio chemical analysis of fermented mahua wine:

Flower variety	Fermentation time	pH	TSS(° brix)	TA(%)	Alcohol(%)
Mahua flowers	8	4.2	4.28	0.30	4.62
	16	4.5	4.18	0.34	4.90
	24	4.7	3.98	0.44	5.56
	32	5.0	4.32	0.39	6.25

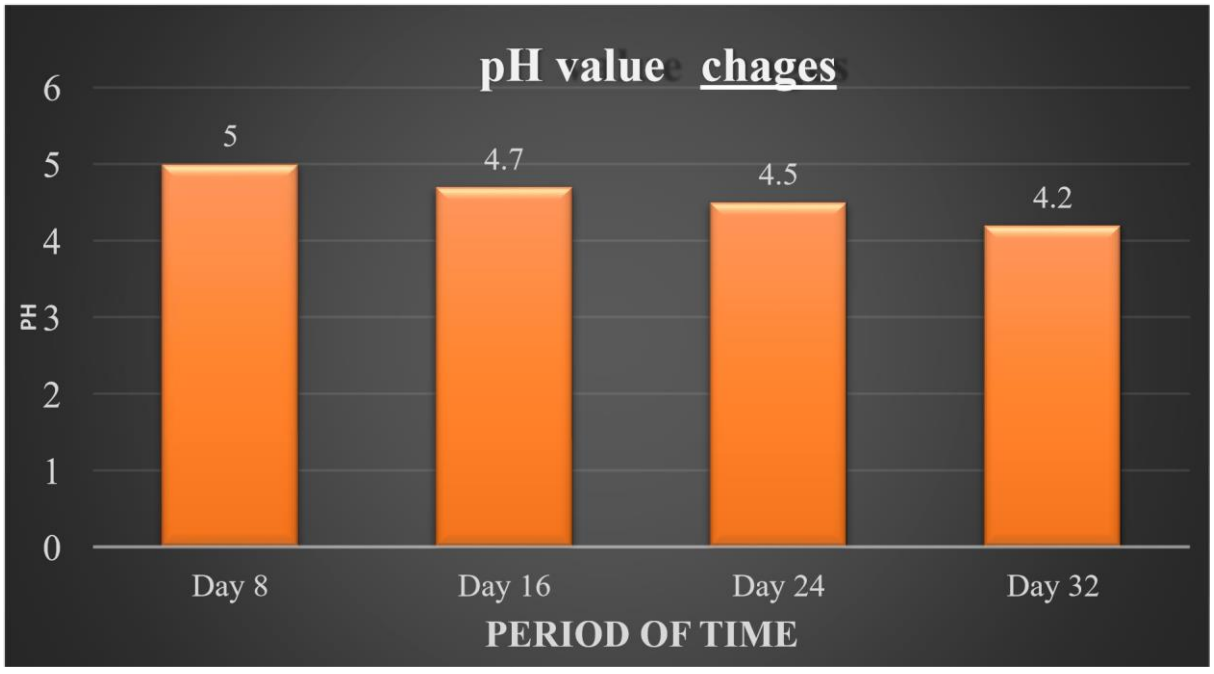
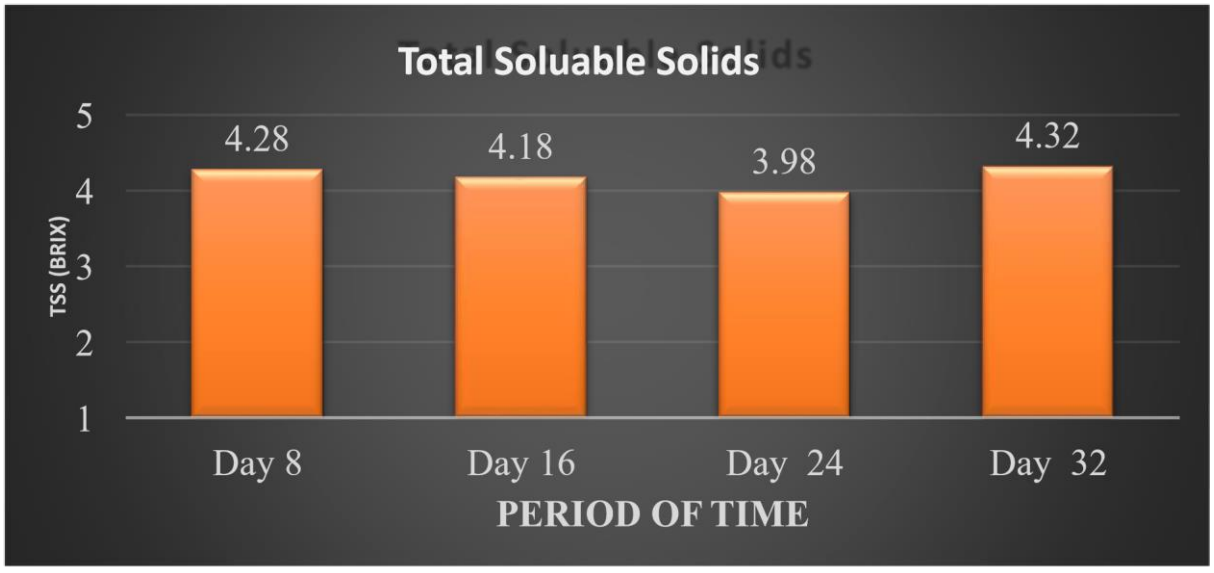


Fig 9: pH content of fermented floral wine prepared from mahua flowers.

The pH of fermented floral wine samples prepared from selected varieties is given in Table 3 and Figure 9. The pH of fermented floral wine prepared from mahua flowers was observed to be 5.0, 4.7, 4.5and 4.2 on the 8th,16th, 24th, and 32 days of fermentation respectively. The pH or acid content of fermented floral wine was significantly higher in the 32 days compared to 24, 16, and 8 days due to an increase in acid content and fermentation. Statistically, there is a significant difference between varieties concerning pH at 5% level and also there is a significant difference between days concerning pH at 1% level. The decrease in pH was reported along with an increase in fermentation time in all samples throughout the fermentation period. Generally, pH of the wines depends on the acid and sugar content of the wine.

Total Soluble Solids in fermented floral wine:

The Total Soluble Solids (TSS) of fermented floral wine samples prepared from mahua flowers are given in Table 3 and Figure 10. The TSS content of fermented floral wine from mahua flowers was observed to be 4.28, 4.18, 3.98, and 4.32 °Brix for the 8 days,16 days, 24 days, and 32 days of fermentation respectively. As the duration of fermentation increased from 8 to 24 days the TSS content gradually decreased from 4.28 to 4.18 with increasing fermentation time. Statistically, there is no significant difference between varieties concerning TSS at a 5%.



Titrable Acidity of Floral Wine:

The titrable acidity of floral wine samples prepared from the mahua flowers is given in Table 3 and Figure 11. The titrable acidity content of floral wine from *Madhuca longifolia* was observed to be 0.30, 0.34, 0.44, and 0.39% during 8 days 16 days 24 days, and 32 days of fermentation time respectively, and as acidity from 0.30 to 0.44. The titrable acidity content of floral wine was significantly higher on the 24th day compared to 16 days and 8 days, due to an increase in fermentation time and high alcohol content.

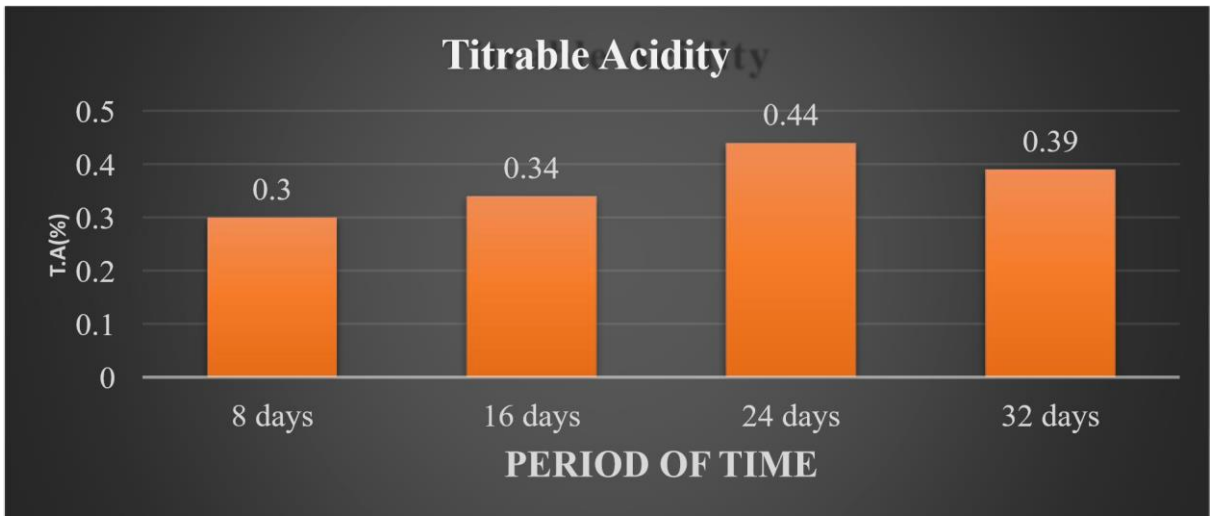


Fig 11: Titrable acidity of floral wine of different periods of time.

Fig 12: Alcohol content of floral wine prepared from mahua flowers

The ethanol content of fermented alcoholic beverages was estimated at various intervals of fermentation under different treatment combinations. The ethanol content of fermented

alcoholic beverages increased with the advancement of the fermentation period in all the treatments. The treatments had a significant effect on the ethanol content of fermented alcoholic beverages during entire fermentation periods (Table 3). The maximum ethanol content was observed at 25°C with pH 4.5 after 14 days of fermentation and minimum ethanol was found at 25°C with pH 4.0 after seven days of fermentation. The alcohol content of floral wine prepared from mahua flowers was observed during 8, 16, 24, and 32 days of fermentation time respectively is 4.62,4.90,5.56 and 6.25. presence of ethanol confirmed with qualitative test.

And methanol is absent which is harmful for human consumption.

Conclusion:

During the standardization of floral wine, the samples were incubated and tasted periodically for optimum pH and alcohol content, and finally 16 days was found to give optimum pH and alcohol content and subsequently, fermentation was extended to 24 days and 32 days. At periodical intervals of 8, 16, 24, and 32 days the floral wine samples were evaluated for physio-chemical parameters and microbial action.

The **pH content** of floral wine prepared from mahua flowers was observed to be 5.0,4.7, 4.5, and 4.2, on 8,16, 24, and 32 days of fermentation respectively. The gradual decrease in pH was observed in the floral wine with an increase in the fermentation period in the mahua flowers indicating that acidity increased in floral wine with fermentation. Statistically, there was a significant difference between varieties concerning pH($p<0.05$), and significant difference was also seen in the pH of floral wine fermented for 8,16, 24, and 32 days ($p<0.01$).

The **TSS content** of floral wine prepared from mahua flowers was observed to be 4.28,4.18,3.98, and 4.32 ^{O}brix on 8, 16, 24, and 32 days of fermentation time respectively. The concentration of sugars as TSS has decreased as the fermentation period increased showing that sugars or solids are disintegrating to form alcohol. Statistically, there was no significant difference in the TSS of floral wine from the mahua flowers however, a significant difference was seen in the TSS of floral wine at different days of fermentation ($p<0.01$).

The **Titrable acidity** content of floral wine prepared from mahua flowers was observed to be 0.30, 0.34, 0.44, and 0.39% during 8,16, 24, and 34 days of fermentation time

respectively. Statistically, there was a significant difference between days of fermentation concerning titrable acidity ($p<0.01$).

The **alcohol** content of floral wine prepared from mahua flowers was observed during 8, 16, 24, and 32 days of fermentation time respectively is 4.62,4.90,5.56 and 6.25. As the duration of fermentation increased from 8 to 24 days, there was a proportionate increase in the percentage of alcohol in floral wine and the increase was significant at $p<0.01$ for fermentation periods and there was also a significant difference between the alcohol content of floral wine ($p<0.05$). When all parameters were considered, the overall regression was significant at a 5% level. All four parameters pH, TSS, CHO, and TA were contributing together to the prediction of percent alcohol quantity to an extent of 91.6% ($R2=0.916$) where R is the coefficient of multiple determination. Multiple regression analysis has also shown that, out of the four physio-chemical parameters, TSS was found to be significantly contributing to alcohol content ($p<0.05$; $P=0.037$).

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