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Formulation and Evaluation of Wine from Leaf of Justicia Adhatoda (ADULSA)

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Abstract: *Wine of Adulsa is a unique and traditional medicinal wine made from the leaves of the Adulsa plant, also known as Vasaka. This plant has been used in Ayurvedic medicine for centuries due to its therapeutic properties. The leaves of the Adulsa plant are rich in alkaloids, flavonoids, and other bioactive compounds that have anti-inflammatory, anti-tussive, expectorant, and bronchodilator properties. The wine of Adulsa is prepared by soaking the leaves of the plant in water and then fermenting them with sugar and yeast. The resulting wine is a dark-coloured liquid with a bitter taste and a pungent aroma. This wine is commonly used as a natural remedy for respiratory ailments such as coughs, colds, bronchitis, and asthma. It is also believed to have other health benefits such as improving digestion, boosting immunity, and reducing inflammation. Overall, the wine of Adulsa is a potent and effective natural remedy with a long history of use in traditional medicine.*

Keywords: Alcohol, Adulsa leaf, fermentation, pH , protein, total sugar, wine

I. INTRODUCTION

Wine is a psychoactive drug, like all alcoholic beverages[2], commonly used for its intoxicating effects today and throughout history[1]. Wines made from produce besides grapes are usually named after the product from which they are produced and are generically called fruit wine[5][15]. Wines are also made from some leaf such as oak leaf whereas in Kodagu district which is located in Karnataka, India, wines are made from betel leaves, ginger, pineapple, passion fruit, rice and banana[13]. In addition, there are wines made of dates, figs and star fruits too[14]. Two primary species of yeasts found in wines are Saccharomyces bayanus and Saccharomyces cerevisiae[21] which ferment glucose, sucrose and raffinose and assimilate glucose, sucrose, maltose, raffinose and D- gluconate[12][17]. Adulsa (Adhatoda vasica) is an important medicinal plant that is widely used in traditional medicine for the treatment of respiratory disorders such as asthma, bronchitis, and cough[13]. In recent years, there has been growing interest in the use of adulsa leaves for the production of wine due to their high antioxidant content and potential providing a unique travel experience[20][18].

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II. EXPERIMENTAL

MATERIALS AND METHODES

1. Justicia Adhotoda

Botanical name:- Adhatoda vasica
Common name:-Adulsa
Kingdom. Plantae
Subkingdom: Tracheobionta
Division: Magnoliophyta
Class: Magnoliopsida
Order: Lamiales
Family:-Acanthaceae
Genus:-Justicia
Species:-J. adhatoda
Justicia adhatoda is a shrub with 10-20 lance-shaped leaves 8-9 centimetres in length by four wide. They are oppositely arranged, smooth-edged, and borne on short petioles. When dry they are of a dull brownish-green colour. They are bitter-tasting.

Chemical composition
The leaves of Justicia adhatoda contains phytochemicals such as alkaloids, tannins, saponins, phenolics and flavonoids. Wine The most important is vasicine, a quinazoline alkaloid. The vasicine yield of the herbage has been measured as 0.541 to 1.1% by dry weight. Bromhexine, a serine protease inhibitor with mucolytic properties available over-the-counter in Europe, was originally derived from Justicia adhotada.

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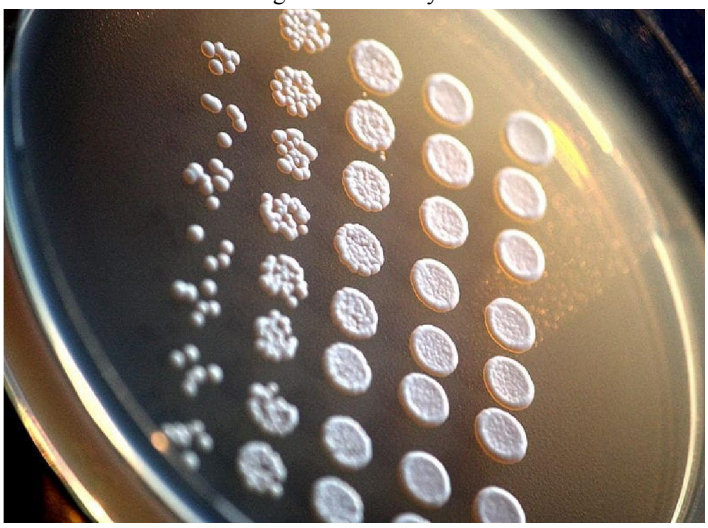
2. Wine Yeast

The most common yeast associated with winemaking is Saccharomyces cerevisiae.



Kingdom:-Fungi
Division:-Ascomycota
Class:-Saccharomycetes
Order:-Saccharomycetales
Family:-Saccharomycetaceae
Genus:-Saccharomyces
Species:-S. cerevisiae

The role of yeast in winemaking is the most important element that distinguishes wine from fruit juice. In the absence of oxygen, yeast converts the sugars of the fruit into alcohol and carbon dioxide through the process of fermentation. The more sugars in the grapes, the higher the potential alcohol level of the wine if the yeast are allowed to carry out fermentation to dryness. Sometimes winemakers will stop fermentation early in order to leave some residual sugars and sweetness in the wine such as with dessert wines. This can be achieved by dropping fermentation temperatures to the point where the yeast are inactive, sterile filtering the wine to remove the yeast or fortification with brandy or neutral spirits to kill off the yeast cells. If fermentation is unintentionally stopped, such as when the yeasts become exhausted of available nutrients and the wine has not yet reached dryness, this is considered a stuck fermentation.

3. Sugar

Sugar is probably the most important ingredient when making wine. Sugar is used as food for the yeast and turned into carbon dioxide and alcohol. Generally, sugar is introduced naturally from the grape. Throughout history there have been many different methods to increase the sugar content of a wine. One of the ways is by allowing the grapes to dry out more. Either while they are on the wine by twisting the stem, or when they are off the vine sitting in the sun. This will increase the sugar content by allowing some of the residual water to evaporate.

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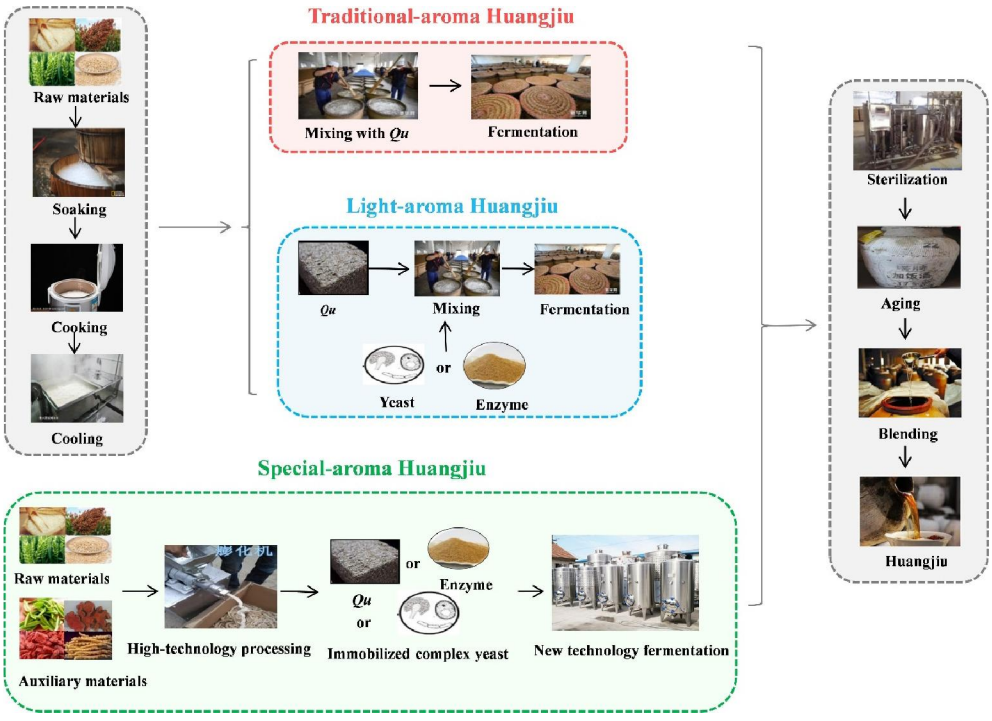
III. METHODOLOGY

- 450-500 gm fresh leaf.
- Half gallons water
- 250gm white or raw sugar
- 1 packet wine yeast

Sr.No	Ingredient	Quantity	Uses
1.	Adulsa leaf	450gm	Main Drug
2.	Sugar	300gm	Produce Alcohol
3.	Wine yeast	4-5gm	Fermenter
4.	Water	1.5Liter	Solvent



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IV. PREPERATION OF FORMULATION

1. Place herbs in a nonporous, nonreactive container. Pour in boiling water and cover with lid or plate. Let steep for 1 to 3 days.
2. Strain mixture through a sieve or cloth, squeezing out excess liquid.
3. Bring strained infusion to a boil in an stainless steel pot, remove from heat and stir in the sugar.
4. Cool to lukewarm. Remove a bit of infusion into a glass, stir in the yeast and let sit 10 minutes or so, until yeast is dissolved and begins to work.
5. Pour this into a crock or carboy with the rest of the infusion. Cover with several layers of plastic wrap, secured with rubber bands, or a tight-fitting lid with an airlock. Let sit for 1 month or more, until vigorous bubbling stops and a thick layer of yeast covers the bottom of the vessel.
6. Funnel wine into sterilized jugs or jars; compost the vitamin-rich dregs or save for soup. Cork jugs loosely or cover with secured plastic wrap and store in a cool, dark place. These methods of capping allow gasses that continue to form to escape. If you cap too tightly, gas pressure could build inside the bottle and eventually cause it to explode — a dangerous mess.
7. Occasionally, a cork might pop off. If so, replace the cork with a clean one and mark the bottle for drinking sooner rather than later, or bring the wine to the kitchen for cooking use.
8. As the jugs sit, sediment continues to form. After 1 to 2 months, tap the side of the container to see if any bubbles rise to the top. If so, try again in a few more weeks. If not, you're ready to pour off the clear wine into sterilized bottles and cap or cork tightly. Store in a cool, dark place for 5 to 9 months before serving. You can sneak a taste before that if you like, but it will probably taste like hooch.

V. RESULT AND DISCUSSION

1. Alcohol content:

Wine typically contains around 10-14% alcohol by volume, although this can vary depending on the type of wine and the production process.

Alcohol level was tested for every ten days. It was increased from initial day in all the samples of leaf wine . Initially the alcohol level was ranged between 0- 4 %. After 21 days, the alcohol level was increased to the range of 15-21%. But in control there was less amount of alcohol. In sugar beet, the alcohol was estimated by modified dichromate method and it was found to be 20- 25%. In Charmat sparkling wines the alcohol level was found to be 11.54 ± 0.15% v/v . It was found to vary in different wine samples.

2. Total sugar

Total sugar was checked in the leaf wine sample for every three days. It was found that leaf wine sample containing commercial yeast (CY01:10, CY01:15, CY01:20), there was a decrease in total sugar level up to 1-2 mg/ml from initial day because sugar was utilized by the yeast. In the sample that contained white wild yeast sugar level was increased from initial day to 12th day up to 170-185 mg/ml. It may be because of the release of exo-pectinase and endo-pectinase enzymes by the yeast which broke down the pectin that would have been present in leaves . So, there was an increase in sugar level until 12th day. Then, it was decreased because total sugar was utilized by the yeast to produce alcohol.

3.**Total Protein**

Total proteins level was tested on the initial day and on the 21st day. It was observed that on final day, in leaf wine there was a slight decrease in total protein level in all the samples compared to initial day . This may be because of decrease in pH level and increase in the alcohol content in all the samples which denatured and precipitated proteins respectively.

At low pH (e.g., 2.8 and 3.0), the greater the pKa of the organic acid, the greater is the repulsion between organic acid (positive net charge) and wine proteins dissolved in water (positive net charge) and the smaller is the stabilizing effect of the organic acid on protein haze formation.

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4. pH

pH was checked in the leaf wine sample for every three days. pH level of all the samples of leaf wine were decreased from initial day because of growth of organisms during fermentation. CY01:10, CY01:15, CY01:20 samples show rapid decrease in pH due to the presence of Saccharomyces cerevisiae while in other samples presence of wild yeast delayed the process. On the last day, pH level of all the samples was ranged between 3- 4 . Similar results were also found in sugar beet, which was close to a pH 4.5

5. Aging:

Some wines are aged in oak barrels or bottles for several years before they are ready to be consumed. This aging process can help to enhance the flavour and complexity of the wine.

6. Sensory attributes

Each taster was given an evaluation form for each of the wine samples. Included four sensory attributes:

- Taste.
- Aroma.
- Colour.
- Overall acceptability.

VI. EVALUATION

Sr. No	Evaluation	Observation
1.	Alcohol Content	12%
2.	Total Sugar	170gm/ml
3.	Total protein	180gm/l
4.	pH	3.6
5.	Aging	2-3 Month
6.	Sensory attributes	
7	a. Taste.	Bitter
8	b. Aroma.	Characteristics
9	c. Colour.	Yellowish
10	d. Overall acceptability.	Acceptability

The evaluation of adulsa wine was carried out by analyzing its physicochemical properties such as pH, total acidity, alcohol content, and sensory attributes such as color, aroma, taste, and overall acceptability. The results showed that the pH of the wine was 3.6, total acidity was 0.65%, and alcohol content was 12%. The sensory evaluation revealed that the wine had a pleasant aroma, fruity taste, and a deep red color. The overall acceptability score of the wine was found to be high.

VII. CONCLUSION

The formulation and evaluation of wine from the leaf of adulsa showed promising results in terms of its physicochemical and sensory properties. Further studies are needed to investigate the potential health benefits of adulsa wine and its commercial viability.

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