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## Phytochemical Analysis of Ginger Raisin Wine and its Fermentation Process: Investigating Antibacterial Properties

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### ABSTRACT

Due to its nutritional benefits, wine is a popular alcoholic beverage that is widely recognized, consumed, and flavored. Wine can be fortified with particular ingredients that may be good for our health to improve its nutritional value. Rhizomes of ginger are widely utilized in the food, beverage, and confectionary sectors as flavorings and are consumed all over the world. Terpenes and oleoresin are just two of the many active components found in ginger. In the lab raisins, sugar and yeast were used to try to make wine from ginger rhizome. 21 days were spent fermenting it at 25°C. The alcohol was then detached from its sediments and kept for around 300 days to mature. The ginger wine's hue, pH, acidity, brix, and alcohol content were noted. When the wine sample underwent phytochemical analysis, different components including flavonoids, alkaloids, terpenoids, carbohydrates and proteins were discovered to be present. In comparison to ethanol and ginger extracts, wine had the largest zone of inhibition when its antibacterial ability was evaluated against the test pathogens. As a result, ginger can be useful for the creation of an herbal wine due to its significant phytochemical components are preserved in the wine and can therefore be made in big quantities as a health beverage.

**Keywords:** Ginger Raisin Herbal Wine, Phytochemical screening, Antibacterial activity

### INTRODUCTION

The phytochemicals are biological compounds that produced by plants throughout primary and secondary metabolisms. Many phytochemicals are widely known for nutritional, biological and pharmacological for health benefits<sup>[1,2]</sup>. One of the most significant fermented undistilled drinks is wine<sup>[3]</sup>. The manufacture of beverages utilizes a variety of herbs and spices as flavour enhancers, preservatives, and sources of antioxidants<sup>[4]</sup>. Wine increases longevity and lowers the chance of a heart attack. A heart attack is 30% less likely to occur in moderate drinkers with high blood pressure compared to non-drinkers. It also slows brain ageing and reduces the risk of type 2 diabetes, stroke, cataracts, colon cancer, and other diseases. Because it aids in appropriate food digestion and absorption, wine is a crucial addition to the human diet<sup>[5]</sup>. The herb ginger (*Zingiber officinale* L.), a member of the Zingiberaceae family, is a popular spice that is consumed on a regular basis in many Asian nations. Additionally, it is widely utilized as a flavouring agent in the food, beverage, and confectionary industries and is consumed globally<sup>[6]</sup>. Ginger originated in China and India, where it has been used in cooking for the past 4,000 years. Ginger is widely used as a natural remedy throughout India. Ginger is renowned for its hot and astringent flavour<sup>[7]</sup>. Ginger compounds are active against specific type of diarrhea which causes death in infants. It is also effective in treating nausea caused by sea sickness, morning sickness, chemotherapy and for post-operative nausea<sup>[8]</sup>. Therefore, the purpose of this research was to study phytochemical activities of ginger raisin wine. These findings would be considered as new knowledge about natural ingredients for future pharmaceutical, food.

### MATERIALS AND METHODS

#### Methods of preparation of Wine

The ginger rhizome, 150gm was carefully cleaned with water. After being peeled and sliced into little pieces, the skin was placed in the glass jar. Allow 3 liters of water to come to boil.

Ginger is chopped and added to the water, which is then allowed to boil. It mixes with 200 gm of sugar after two minutes. In that order, add 200gm of raisin, lemon zest, and dry chilies (2-3pieces). A few minutes, then chilled the mixture after allowing it to boil.

It is combined with tiny pieces of cinnamon and cloves for a delicious scent. On the other hand, 1 teaspoon each of sugar and yeast are combined with 1 teaspoon of lukewarm water in a glass container. It was allowed to ferment for 5 minutes. The fermented yeast was added once the mixture had cooled. The mixture is then well combined with half tablespoon of lemon juice. The combination was then maintained at 37°C for days in an airtight container. There's no need to stir the container every day. Shake the combination bowl thoroughly and dump it into a clean container after the seven days are up. It was finally prepared for use.



Figure 1: Boiling of Raw Material

### Physical and Chemical Evaluation of Ginger Raisin Wine

Using a hand refractometer (ERMA) with arrange of 0-32 Brix, the total soluble solids (TSS) of the wine were measured. A digital pH meter was used to measured pH. The entire titratable. Citric acid (g/100 ml of sample) was used to measure acidity. Using an Amber Hydrometer (0- 20) the alcohol percentage of the ginger wine was determined.

### Phytochemical analysis of Ginger Raisin Herbal Wine

The ginger-raisin wine was subjected to qualitative phytochemical testing using the protocols outlined below [9, 10, 11,12]

#### Test for proteins:

2 ml of Sodium hydroxide was added to 1ml of wine sample, then a few drops of 1% Copper sulphate. The development of bluish violet hue suggested the presence of proteins.

#### Carbohydrate test (Molisch Test):

Two drops of an alcoholic solution of alpha naphthol are added to 2 ml of a wine sample. After thoroughly shaking the mixture, a few drops of strong Sulphuric Acid are carefully added along the test tube's sides. A violet ring denotes the presence of Carbs.

#### Test for flavonoids:

A small amount of sodium hydroxide solution was applied to a wine sample. Flavonoids are indicated by the formation of a bright yellow colors that turns colorless when diluted acid (HCL) is added.

#### Terpenes screening (Salkowski test):

In order to create a concentrated Sulphuric Acid solution, 2ml of wine sample was carefully added to 1 liter of chloroform layer. The presence of terpenoids was detected as a reddish- brown coloring at contact.

#### Test for tannins:

A few drops of 0.1% ferric chloride were applied to 1ml of wine sample. The presence of tannins in the test sample was indicated by the development of browsing green or a blue- black color.

#### Test for Alkaloids:

Wine sample was treated with a few drops of Wagner's reagent to test for alkaloids. The presence of alkaloids identified by a reddish brown colour.

### Antibacterial activity of Ginger raisin wine

The antibacterial activity of Ginger Raisin Wine was assessed using Agar well diffusion method. The plates were spread with Pure cultures of *Escherichia coli*, *Staphylococcus aureus* and *Salmonella typhi* were obtained from the by National Institute of Cholera and Enteric Diseases, Department of Health Research, Ministry of Health and Family Welfare, Govt. of India. Using a sterile cork borer with a diameter of 6 mm, wells were made on freshly prepared nutrient agar plates. The wells were dispensed with 100 µL of Ginger Raisin Wine. The plates were allowed to stand for few minutes and let the samples diffuse for some time and then incubated at 37 °C for 24 hours. After the incubation period, inhibitory zones were measured using a scale, and their diameters were recorded in millimeters [13].

## RESULT

According to the qualitative examination of the ginger wine's phytochemicals (Table:1), flavonoids, alkaloids, terpenoids, carbohydrates and proteins were present, the rhizome of ginger is Terpenes, which were also discovered to be present in the wine. Ginger raisin wine has a pH of 3.30, low pH inhibits the majority of unwanted bacteria, and for yeast, a pH range between 3 and 6 is best for growth and fermentation activities. Activity is another crucial element since yeast can't ferment effectively without it. Normal additions include citric acid, which aids in fermentation and enhances wine flavor. The yeast is impacted by temperatures, which in turn effects the process of wine fermentation. After 7 days, the wine's brix was measured at 22.6. The wine was golden in color and had a 15.8 percent alcohol concentration (Table: 2).

Table 1: Preliminary phytochemical screening of Ginger Raisin Wine; Qualitative

Phytochemicals Constituents	Wine Sample (W.S)
Proteins	+
Carbohydrate	+
Flavonoids	+
Terpenoids	+
Tannins	-
Alkaloids	+

N.B + = Positive, - = Negative. W.S = Wine Sample Table:2 Evolution of wine

Name of wine	Yield of wine (liter)	pH	Alcohol Concentration	Brix	Color
Ginger raisin	1	3.30	14.8	22.6	Golden



(a)

(b)

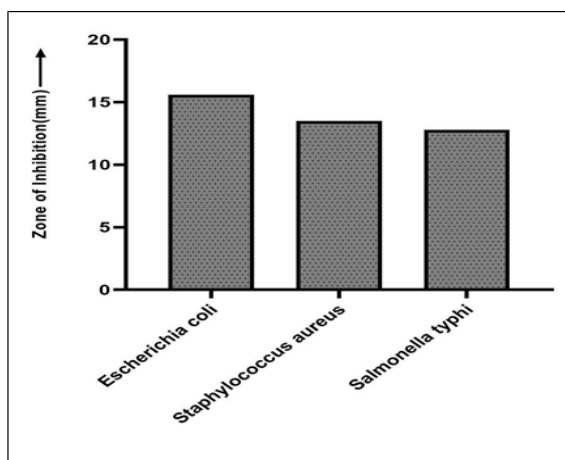
**Figure 2:** (a) Vortex of Whole-Ingredient Mixture, (b) Final Product of Ginger Raisin wine stored in a bottle

### Antibacterial activity of Ginger raisin wine

The results of antibacterial activity of ginger wine on *Escherichia coli*, *Staphylococcus aureus* and *Salmonella typhi* is shown in Table 3 and Figure 3. According to the result, ginger wine was the most efficient against all three species of bacteria. The widest zone of inhibition was seen with the wine in 13.5 mm in *S. aureus*, followed by 15.6 mm in *E. coli* and 12.8 mm in *S. typhi*.

**Table 3:** Antibacterial activity of Ginger wine

Test organisms	Zone of inhibition (mm)
<i>Escherichia coli</i>	15.6
<i>Staphylococcus aureus</i>	13.5
<i>Salmonella typhi</i>	12.8



**Figure 3:** Antibacterial activity of Ginger wine

### CONCLUSION

We all know that the excess ginger produced in the winter months is squandered since the market price is so low and these are storage

issues. According to the current study, ginger can be fermented into a product with value added. Making a blend with raisin might enhance its therapeutic qualities. Versions of raisin ginger wine have less alcohol than commercially available wine's, making them safe to drink and not hazardous to health. It actually offers to lot of health advantages. These wines are alcoholic to a high degree, acidic and sweet to dry. This study proves that decent wine may be produced from a ginger-raisin blend. Due to the preservation of the essential phytochemicals found in ginger and raisins, a herbal wine that exhibits antibacterial action against many pathogenic microbes can be produced. A small-scale wine industry will benefit from the process monitoring and final analysis results or can use the data as a guide to establish a small-scale wine industry.

### Conflict of Interest

None declared.

### Financial Support

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