



Development of a Herbal Wine Using *Cassia auriculata* and *Woodfordia fruticosa*

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ABSTRACT

Wine is a popular alcoholic beverage that has been adored by people around the world for thousands of years. Herbal wine is a type of wine that is infused with medicinal herbs which enhances its flavor and adds to its health benefits. Herbal wine provides numerous health benefits, including a decrease in ovarian cancer, improved bone and skeleton strength, destruction of tumor cells, prevention of heart attacks by maintaining slender coronary arteries, and improved lung function. Herbs have potent anti-bacterial, anti-mutagenic, and anti-microbial capabilities. This research aims to produce a wine based on herbal ingredients that are important to the human body. The main raw materials used in this study, which consisted of three rounds and a total of thirteen samples, were *Cassia auriculata* and *Woodfordia fruticosa* as herbals. The organoleptic properties were evaluated using sensory tests, and the findings were observed while the alcohol content was checked using an ebulliometer. The third sample of the third round passed both tests. This sample was the most promising in terms of the alcohol percentage, which contained a 4%-5% alcohol level, and a sensory test, which was used to check the highest organoleptic characteristics. The major goal of this study was to produce herbal

wine utilizing *Cassia auriculata* and *Woodfordia fruticosa*. Determining the best combination of *Cassia auriculata* and *Woodfordia fruticosa* for wine formulation, as well as the impact of sugar concentration on the synthesis of alcohol activity, were the main objectives.

1. INTRODUCTION

Wine is a beverage that has a rich history and cultural significance. The earliest evidence of winemaking dates back to ancient civilizations in the Middle East, where grapes were cultivated and fermented into wine for religious and medicinal purposes. Key classifications of wine can be sorted into four distinct categories; such as Table wine, Fortified wine, Fruit wine, and Herbal wine (Deshmukh et al., 2021). Herbal wine is a type of wine that is infused with medicinal herbs which not only enhances its flavor but also adds to its health benefits. The use of herbs in wine has been practiced for centuries, and many cultures have their own traditional herbal wine recipes. The herbs used in herbal wine can vary widely, but some common examples include ginger, chamomile, lavender, rosemary, thyme, and mint (Lwin, M. T., & Yee, M. M., 2020). Herbal wine provides numerous health advantages, including a decrease in ovarian cancer, improved bone and skeleton strength, the destruction of tumor cells, the prevention of heart attacks by maintaining slender coronary arteries, and improved lung function. In a nutshell, these plants have potent anti-bacterial, anti-mutagenic, and anti-microbial capabilities. This research was conducted using mainly two herbs *Cassia auriculata* and *Woodfordia fruticosa*. The bioactive potential, pharmacological potential, optimization of polyphenol and carotenoid extraction, phytopharmacological activity of anthelmintics, anticancer effect of *Cassia auriculata* leaf extract and curcumin, and evaluation of antioxidants using ultrasound-assisted extraction of total phenolics from *Cassia auriculata* has been previously studied (Zheng, W.

& Wang, S.Y., 2001). Commercial products include *Cassia auriculata* and *Woodfordia fruticosa* tea and supplement liquids, as well as some cosmetic products.

However, no wine has yet been produced using *Cassia auriculata* and *Woodfordia fruticosa*. The main objective of this research was to develop herbal wine utilizing *Cassia auriculata* and *Woodfordia fruticosa*. There were two specific objectives which were to identify the best combination of *Cassia auriculata* and *Woodfordia fruticosa* in wine formulation and the effects of sugar concentration on the production of alcohol activity.

Herbs are available in numerous varieties and have a global role in wine production and flavour development. Herbal extracts have excess esters and aldehydes, which make them nutritionally and medicinally beneficial. An evergreen plant called *Cassia auriculata* can be found in numerous locations throughout Asia, including Sri Lanka. *Cassia auriculata* is a small, deciduous tree or shrub that can grow up to 5 meters in height. It has a smooth, greyish-brown bark and long, slender branches. The flowers are bright yellow, small, and arranged in racemes at the end of the branches. *Cassia auriculata* has several bioactive compounds, including flavonoids, alkaloids, and tannins, that contribute to its medicinal properties. Studies have shown that it has anti-diabetic, anti-inflammatory, anti-microbial, and antioxidant properties. Anti-diabetic properties include hypoglycemic effects, anti-inflammatory properties, antioxidants, antimicrobial properties, hepatoprotective effects, and diuretic properties (Gowri et al., 2018).

Woodfordia fruticosa is a species of flowering shrub in the Lythraceae family, native to the Indian subcontinent and Southeast Asia. It has attractive red flowers that are used in traditional medicine and other traditional uses. It is a deciduous shrub that can grow up to 3 meters in height,

with simple, opposite, and lanceolate leaves. The flowers are bright red, trumpet-shaped, and have four petals and eight stamens. *Woodfordia fruticosa* is a plant used in conventional treatment for a variety of ailments, including diarrhea, dysentery, hemorrhoids, and menstrual disorders. It has been the subject of several scientific studies, which have shown that it has a range of potential medicinal properties. These include anti-inflammatory, antioxidant, anti-cancer, anti-diabetic, and cardiovascular benefits (Dinesh et al., 2016).

Natural sweeteners can be added to wine to balance acidity and enhance flavor profile. They can also be used to mask off-flavors or defects, such as metallic taste. Palmyra sugar is a natural sweetener made from the sap of the palmyra palm tree and has a rich, caramel-like flavor. It is unrefined and contains trace amounts of vitamins and minerals, and has a lower glycemic index, making it a healthier alternative to refined sugar.

The intention of this research was to determine the ideal ratio of two herbal ingredients and determine the appropriate alcohol content. A variety of herbs are fermented in a solution of water and alcohol to create herbal wine. Although some kinds may have higher or lower percentages, the range of alcohol level is between 4% and 8%. To protect your health, it's important to drink herbal wines in moderation. The 'ebullimeter' is a common equipment used to check the alcohol content. A refractometer was used to measure the sugar level in herbal wine, which affects its taste. If the sugar level is too high, the wine will taste too sweet, while if it is too low, the wine will taste too dry. Sugar is essential in the fermentation process of wine, as it helps to prevent spoilage and maintain the wine's quality over time. A good sugar level ensures that the wine is preserved properly and can be enjoyed for longer periods.

2. MATERIALS AND METHODS

2.1. PREPARATION OF THE POWDER OF DRIED FLOWERS

Cassia auriculata and *Woodfordia fruticosa* flowers were dried using an oven drier at 60 °C in under 2 and 4 minutes respectively and crushed separately using a grinder.

2.2. PREPARATION OF SAMPLES

There was a total of three rounds and, altogether, thirteen samples. Every sample has a unique ratio. A relevant amount of *Cassia auriculata* flowers and a relevant amount of *Woodfordia fruticosa* flowers were added to the beaker. The amounts of herbs were different for each sample. Then 1 liter of water was added to fill the beaker. After that, palmyra sugar was added to the sample, which was then boiled for 30 minutes at a temperature of 100 °C using a hotplate. The sample was stirred using a glass rod when boiling. After the sample had cooled, the residue was removed from it and the product was put in a sterilized glass bottle. The relevant amount of yeast was then measured and the yeast solution for sample was prepared. The amount of yeast added was different for each sample. After preparation, all samples were kept for fermentation in a dark place. Ten days were allocated for the fermentation process. Following fermentation, the alcohol content of all the samples were determined using an ebullimeter. The sugar content was measured using a refractometer. The scale indicated the level of sugar in the sample, usually measured in Brix. After that an analysis of antioxidant properties in both *Cassia auriculata* flowers and *Woodfordia fruticosa* flowers, was performed to determine whether any antioxidant activity was present or not (Gunathilake et al., 2016).

3. RESULTS AND DISCUSSION

3.1. EFFECT OF ORGANOLEPTIC PROPERTIES OF A WINE SAMPLE

The quality of herbal wine samples was assessed by determining the organoleptic properties using sensory evaluation by a panel of judges, on a 5-point scale. Based on that, the best wine was the one which was produced using 20g of *Cassia auriculata* flowers and 10g of boiled *Woodfordia fruticosa* flowers (sample 3 of round 3). This sample scored the highest on the panel members' sensory evaluations for overall acceptability due to its sweetness, delectable flavor, mild acidity, and pleasing color and appearance. This sensory test was performed on six panelists, and the average results are shown in the table below (Table 1).

	Round 1				Round 2					Round 3			
Organoleptic Characteristics	S 1	S 2	S 3	S 4	S 5	S 6	S 7	S 8	S 9	S 10	S 11	S 12	S 13
Appearance (0-5)	2	2	3	3	2	2	3	3	5	3	4	5	3
Fragrance (0-5)	2	1	2	2	3	2	4	2	3	3	2	5	3
Sweetness (0-5)	2	3	2	2	2	3	3	3	4	2	2	4	3
Astringency (0-5)	2	2	3	4	2	2	3	2	4	3	2	1	4
Overall Acceptability (0-5)	1	2	1	2	3	3	4	3	3	4	4	5	2

Table 1 – Results of organoleptic properties using a sensory test

3.2. ANTIOXIDANT PROPERTIES

Antioxidant properties refer to the ability of certain compounds to inhibit or neutralize the damaging effects of free radicals in the body. Free radicals are highly reactive molecules that have the potential to harm cells, and they play a role in the development of a number of disorders. Antioxidants work by preventing or reducing the damage caused by free radicals by donating an electron to stabilize them. Consuming a diet rich in antioxidants can help to protect against the harmful effects of free radicals and decrease the probability of developing chronic diseases. Though supplements are also available, it is recommended to obtain antioxidants from whole foods as much as possible.

3.3. EFFECT OF ALCOHOL CONTENT AND SUGAR LEVEL OF WINE SAMPLES

Alcohol is a natural byproduct of the fermentation process used to make wine, where yeast consumes sugars in palmyra sugar and transforms it into carbon dioxide and ethanol. The amount of sugar in the fermentation mixture determines how much alcohol is created, but alcohol and sugar have a nonlinear relationship. The type of yeast employed, the fermentation temperature, and the amount of sugar in the mixture, all affect the precise alcohol concentration at which fermentation ceases. The final product's flavor and aroma can also be influenced by the fermentation mixture's sugar concentration.



The results of all wine samples, percentage of alcohol and sugar level are presented in Tables 2, 3 and 4 respectively.

Round 01				
Code	241	302	230	345
Materials	Sample 1	Sample 2	Sample 3	Sample 4
C.auriculata (Ranavara)	10g	20g	10g	10g
W.fruticosa (Malitha)	10g (boil)	10g (boil)	20g (boil)	20g (not boil)
Yeast	2g	2g	2g	-
Palmyra Sugar	10g	10g	10g	10g
Sugar Level				
(Brix)	1	0.8	0.9	1.2
Alcohol percentage	1%	1.5%	1%	0.5%

Table 2 – Results of wine samples prepared in the first round

The initial batch of *Woodfordia fruticosa* and *Cassia auriculata* flowers was prepared in various ratios. A fourth sample was created without boiling to detect that the flowers naturally contain yeast because *Woodfordia fruticosa* flowers contain yeast naturally. According to Table 2, the highest sugar level of round 1 was 1.2 (sample 4), while 1.5% was set as the maximum alcohol content (sample 2). The results for the sugar level and alcohol percentage were given separately in accordance with the variations in qualities between *Cassia auriculata* and *Woodfordia fruticosa* flowers.

After considering the results of the samples from the first round, a few changes were made in the second round such as increasing the amount of yeast and herbs. Accordingly, compared to the first round, the amount of yeast used in the second round has increased by 5g, and the amount of palmyra sugar has been increased by 7g (Table 3).

Round 02						
Code	201	132	453	324	155	
Materials	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	
C. auriculata (Ranavara)	10g	10g	20g	10g	10g	
W. fruticosa (Malitha)	10g (not boil)	10g (Boil)	10g (not boil)	20g (not boil)	10g (not boil)	
Yeast	7g	7g	7g	7g	-	
Palmyra Sugar	17g	17g	17g	17g	17g	
Sugar Level (Brix)	After boil	2.5	2.9	3.0	2.8	2.3
	After fermentation	1.4	1.8	1.8	2.0	2.1
Alcohol percentage		0.7%	0.8%	1%	0.6%	Not detected

Table 3 – Results of wine samples prepared in the second round second round prepared wine sample

As the second round was unable to yield the desired alcohol percentage, the third round was performed with some modifications. Four samples were prepared in the third round, and the third sample of this round was successful due to its alcohol concentration being in the desired range of 4-5% (Table 4).

Round 03				
Code	161	252	283	364
Materials	Sample 1	Sample 2	Sample 3	Sample 4
C. auriculata flowers (Ranavara)	10g	10g	20g	10g
W. fruticosa (Malitha)	10g (Boil)	20g (Boil)	10g (Boil)	10g (Boil)
Yeast	7g	7g	7g	-
Palmyra Sugar	17g	17g	17g	17g

Sugar Level	After boil	3.2	4.0	3.6	3.0
	After fermentation	2.1	2.1	2.0	2.6
Alcohol percentage		1%	1%	4-5%	1.5%

Table 4– Results of wine samples prepared in the third round

4. CONCLUSION

This research aimed to develop herbal wine using *Cassia auriculata* and *Woodfordia fruticosa* as raw materials. Thirteen samples were tested for alcohol levels, with the third sample of the third round having the desired percentage. The sensory test identified this sample as successful. The herbal wine samples were enriched with palmyra sugar and dry yeast, promoting fermentation. The combination of two herbs, along with the presence of natural yeast and sugar in *Woodfordia fruticosa*, contributed to the success of the research. This herbal wine can be considered as a high-quality beverage without any artificial additives.

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