DOI:10.26524/krj70

Kong. Res. J. 2(1) : 65-70, 2015 ISSN 2349-2694
Kongunadu Arts and Science College, Coimbatore.

WINE PRODUCTION IN WILD FRUITS OF *OPENTIA STRICTA* HAW.

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ABSTRACT

The present study was attempted for using the wild species present in Nilgiri Biosphere Reserve, the Western Ghats for wine production. A wild species *Opuntia stricta* has been identified as an alternative source of grapes for wine production. The results of the study report that the carbohydrate content (sugar and pectic substances) was higher in the fruits and it was comparable to that of grapes. The various kinds of minerals, vitamins and other nutrients are also found to be higher in this species. This enriched status of nutrients provide favourable environment for the fermentation of carbohydrates. The percentage of ethanol determined in the fruit of *Opuntia stricta* was also higher as in grapes. Further it has been observed that 30 days of incubation for fermentation is found to be optimum for higher alcohol production (1.8%). Hence, *Opuntia stricta* can be served as prominent source for wine making.

Keywords: *Opentia stricta,* wine production.

1. INTRODUCTION

Wine is as old as history and has historically been regarded as a necessary, even sacred, part of our lives. Over 2,500 years ago, Cyrus the Great required wine to be carried by his troops. Jesus turned water into wine for the wedding feast. Fruit wine is an undistilled, low alcoholic beverage containing all the natural ingredients of the fruit like vitamins, amino acids, polyphenols, flavanoids, tannins, anthocyanins and minerals in it. Which is together makes it a nutritive health drink of high commercial value. The red wines are abundant source of natural antioxidants and polyphenols and represent an important dietary component for some populations. The polyphenols in the red wines are the major components which are responsible for the taste, colour, astringency, bitterness and mouth feel.

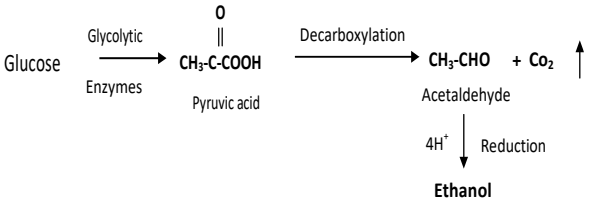
In India, the indigenous fruits collected from wild play significant role in the food and nutrient security of rural poor and tribal. Some wild fruits have been identified to have better nutritional value than cultivated fruits (Eromosele *et al.,* 1991; Maikhuri *et al.,* 1994). As a result, in recent years, a growing interest has emerged to evaluate various wild edible plants for their nutritional features (Slikkerveer, 1994; Arora and PandeyAnjula, 1996; Sundriyal *et al.,* 1998; FAO, 1999; Grivetti and Ogle Britta, 2000; Katewa, 2003; Glew *et al.,* 2005; Musinguzi *et al.,* 2007; Nkafamiya *et al.,* 2007; Aberoumand and Deokule, 2009; Nazarudeen, 2010)

The wild fruits form an important additional food source for the people of Nilgiri District. The forest wealth of edible fruits/plants is exploited by these people to quench their huger during adverse environmental conditions. (Nayakam *et al.,*1993). The Nilgiri District is blessed by nature with its diversified and rich flora (Sharma, 1977).

Opuntia stricta belongs to the family Cactaceae. It is a succulent shrub, native of the new world, now widely grown in the warmer parts of the world on account of its unique appearance and attractive flowers. *Vitis vinifera* (grape) belongs to the family, Vitaceae is the major do area of wine served as standard.

2. MATERIALS AND METHODS

Wine is a product of the natural fermentation of the fruit juices, by the action of yeast cells, *Saccharomyces cerevisiae.* This fermentation process involves a biochemical conversion of juice into wine when baker's yeast enzymatically degrade the fruit sugars like glucose into acetaldehyde and then into ethanol and carbon dioxide.



For wine production in a laboratory scale, as a first step, the fruits are washed, crushed and extracted. Baker's yeast is inoculated and incubated for 10 days under aerobic conditions at room temperature. During this time, the wine is clarified of any turbidity, thereby producing volatile esters that are responsible for characteristic flavours in the wine.

The major product in wine is the ethanol. The quality of the wine is checked by estimating the ethanol content of the wine employing dichromate oxidation method. This method is based on the quantity of acid dichromate required to oxidize the primary or secondary alcohols to acetic acid.

The optimum temperature for oxidation is 60-65˚C. The intensity of color developed by the oxidation reaction is read colorimetrically at 570 nm.

2.1. Materials required

1. Fruits
2. Sugar
3. Baker's yeast
4. 25% Chromic acid

2.2. Procedure

2.2.1. Wine production

1. 1 kg of the fruits were weighed and washed with distilled water.
2. It was crushed by hand and transferred into a conical flask.
3. Sugar was added to the final concentration of 20% on the weight by weight basis to that of the fruits taken.
4. The flask was plugged air tight.
5. It was incubated for 21 days at room temperature.

2.2.2. Analysis

1. The ethanol content was estimated by dichromate oxidation method.
2. Absolute alcohol was used as standard and 1% acid was prepared as working standard.
3. Different concentrations of standard solutions of 0.2%, 0.4%, 0.6%, 0.8% and 1% were prepared in separate test tubes.
4. Unknown sample of equal volume was taken. Water was used as blank.
5. 25% chromic acid was added in equal volume to all the standards and also to the unknown sample.
6. The tubes were incubated in a 70˚C water bath for about 10 min.
7. The absorbance values were taken at 570 nm using a colorimeter.
8. A calibration curve was drawn by plotting the concentration of alcohol on X- axis and the absorbance values on Y- axis for the standard. The ethanol content of the wine sample was determined from the fruits.

3. RESULTS AND DISCUSSION

The results of fermentation experiments and nutrition are given table number 1-3 and graph 1 and 2. Wine is an alcoholic bewarage typically made of fermented fruit juice (Okafor, 2007). In addition to grape *Opuntia stricta* Haw. Has been identified as the source for wine production. The contents of nutrients complied from literature sources, absorbance level during different period of fermentation and content of ethanol in the fermented fruits with different time intervals are noted in the present study. The results of the study revealed that *Opuntiastricta* fruit containing the carbohydrates 12-17%.The minerals and vitamins estimated in the studied wild fruit also known to be higher and most adequate.

The carbohydrates are the primary sources for the production of wine throughout world since many centuries. Soluble carbohydrates are the major nutritional reward in the pulp of most vertebrate-dispersed fruits (Corlett 1996; Herrera, 1987; Johnson *et al.,* 1985; Jordano, 1995). However, although detailed analyses have been made of the carbohydrate content of many cultivated fruits (e.g. Nagy *et al.,* 1990; Widdowson and McCance, 1935), most studies of wild fruits have only quantified total soluble carbohydrates (e.g. Conklin and Wrangham, 1994; Corlett, 1996; Foster and McDiarmid, 1983; Herrera, 1987; Izhaki, 1992). This is unfortunate because relatively minor differences in the chemical structure of nutrients can have profound implications for frugivorous animals (Martinez del Rio and Restrepo, 1993), and the fruit choices of these animals may, in turn, have major implications for the abundance and distribution of plant species.

The absorbance value at 570nm for the determination of ethanol content in various time, old series of fermented fruits of*Opuntiastricta*. Ajay and Harsh (2013) also be reported wild berriesuses as a cheap source of herbal wine. Generally the absorbance value was increased progressively from the 10 days old fermented product to 30 days old fermented products range between 0.77 and 1.50 value.It is of common fact that any fruit material with lot of minerals and vitamins can be fermented

easily with high efficiency and produce large quality of ethanol in wine (Sawaya *et al.,* 1983; El kossori *et al.,* 1998; Ramadan and Morsel, 2003). The present study it is evident that quantitatively of many kind of nutrients and ascorbic acid. This is the most favourable factor for the activity of yeast type of fermentor to produce necessary enzyme for the production of alcohol. So the intrinsic factor available in these fruit sources is known to be more favourable for alcohol production.

The 40 and 50 days old fermented fruit showed absorbance value in declined condition. It indicates that 30 days fermentation is the most appropriate and optimum for higher production of ethanol (from 0.51 to 1.10 Ab).The content of ethanol in the fruits of the time old series in fermented juice contained high content of 1.80% of ethanol. The production of ethanol was declined in 40 and 50 days of fermentation.

Opuntia stricta produced more ethanol than that of the grapes, despite the higher content of carbohydrate and sugar in grape fruits. This may be attributed to be presence of many kinds of nutrients including vitamins in higher content. Which can support the yeast nutritionally for better activity of fermentation *Opuntia stricta* (Saenz, 1995; Piga 2004; Stintzing and Carle, 2005) through the alcohol producing efficiency is greater than grapes, the availability of fruits of these species in a constraint to utilize the species for alcoholic production. Therefore cultivation of this species in large scale in degraded sholar, waste lands and other cultivable lands in Nilgiri Biosphere Reserve will solve this problems, the large scale production through cultivations can also give good economic return to the down trodden formers. This species can be used as an alternative source of wine production to the grapes. In addition raising of these plants would also ensure ecological security through enhancing green cover.

4. CONCLUSION

Opuntia stricta Haw.has been identified an alternative source of grapes for wine production. The results of the study report that the carbohydrate which include the sugar and pectic substances in higher and comparable to that of grapes. The various kinds of minerals, vitamins and other nutrients are also founded to be higher in this species. This enriched status of nutrients is providing favourable environment for the fermentation of carbohydrates.

The percentage of ethanol determined in *O. stricta* is also comparable to that of grapes. This fact clearly ensured the usage of the fruits of these species as an alternative source for wine production. Further it has been observed that 30 days duration of fermentation is found to be optimum for higher alcohol production. Hence this species can be served as prominent source for wine making.

For better utilization, this species are suggested for cultivation is degraded shola and other waste lands of Nilgiri Biosphere Reserve. This can improve the status of farmers and can meet the demand as well.

Table 1. Nutrient content in the fruits of *Opuntia stricta* (Feugang *et al.,* 2006).

S. No.	Nutrients	Percentage (%)
1.	Water	84-90
2.	Carbohydrate	12-17
3.	Ash	0.3 -1
4.	Protein	(0.5)
5.	Fibers	0.02-3.15
6.	Iron (mg/100 g)	4.28
7.	Protein	0.21-1.6
8.	Lipids	0.09-0.7
9.	Ascorbic acid	12-81 mg 2
10.	Total vitamin E	111-115 µg
11.	Calcium (Ca)	12.8 -59
12.	Magnesium (Mg)	16.1 -98.4
13.	Potassium (K)	90-220
14.	Phosphorus (P as PO4)	15-32.8

Table 2. Absorbance at 570nm for the ethanol content present in the wild fruits of various duration of fermentation

AA	Species	Days under fermentation (O.D)				
		10	20	30	40	50
1.	*Opuntia stricta,* Haw.	0.80	1.10	1.50	1.10	0.72
2.	*Vitis vinifera,* L.	0.77	0.94	1.28	0.93	0.51

Table 3. Concentration of alcohol (%)in the fermented fruits of wild plants during various time intervals.

S. no	Species	Days under fermentation				
		10	20	30	40	50
1.	*Opuntia stricta,* Haw	0.97	1.22	1.80	1.22	0.87
2.	*Vitis vinifera,* L.	0.92	1.15	1.55	1.12	0.62

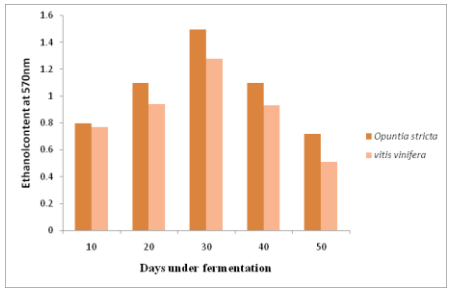


Fig. 1: Ethanol content present at various duration of fermentation

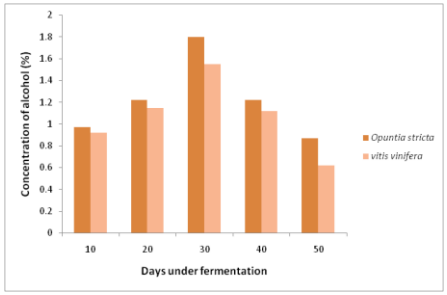


Fig. 2: Concentration of alcohol (%) in the fermented fruits during various

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