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HERBAL WINE PRODUCTION FROM FRUITS AND VEGETABLE WASTES AND PEELS

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Abstract-Production of herbal wine from fruits and vegetable waste and their peels was carried out by using different herbs, by simple fermentation process. Different herbs such as tulsi, amla, ginger, tea leaves, aloe vera, and peppermint were used. The fermentation was carried out in two groups A and B. In group A all the herbs are used with pineapple, beetroot and carrot peels while in group B all the herbs are used with pineapple, beetroot and carrot waste obtained after extracting their juices. The fermentation process was carried out in presence of active yeast (*Saccharomyces Cerevisiae*) at room temperature for 10 days. Various fermentation parameters such as pH, specific gravity and alcohol content were determined for both the Groups A & B at room temperature. The yield of alcohol contents was found to be 10.5 and 15.75 % in peels and waste of selected material respectively. These herbal wines were found to be better in quality and due its various health benefits it can be widely used in medical application for preventing and treating various disorders.

Keywords: Herbal wine, Herbs, Fruits and vegetable waste, Peels, Health benefits.

I. INTRODUCTION

Wine is an alcoholic beverages made from fermented foods. Since from ancient times generally it is made from grapes, by fermenting grapes for specific duration of time, adding them in oak barrels followed by storage in wood barrels covered with leather cloth (Rathi, 2018). The earliest known winery is the 6100 year old Areni-1 winery in Armenia. Wine reached the Balkans by 4500 BC and was consumed and celebrated in ancient Greece, Thrace and Rome. Throughout history, wine has been consumed for its intoxicating effects (<https://en.m.wikipedia.org>). Wines are also produced from other fruits like apple, berries, apricot, kiwi, strawberry, cherry, mango, banana etc. Wine made from fruits contains

alcohol content of 5.5- 15.5 % by volume. Wines are the healthful beverage that has been seen as a natural remedy for man's illness from early day and are said to aid recovery during convalescent period (Okonkwo and Dilar, 2016).

Herbal wines are the wine having medicinal properties which is usually prepared with incorporation of different herbs and medicinal plants. Herbal wines have anti-cancerous, anti-microbial, anti-diabetic and anti-oxidant properties. It has many health benefits like reduction in ovarian cancer, strengthening the bones and overall skeleton, cancer cell deterioration, prevention of heart strokes by keeping the coronary arteries clean, elevating lung functionality (Rathi, 2018). India has rooted evidences of expertise in Ayurveda where herbs, herbal powders and liquid herbal formulation are proved effective against diseases from common ailments to fatal diseases (Jayasundar, 2010a; Rathi, 2018b). Therefore these materials provide good adjuncts for herbal wine production having various health benefits and can be used to prevent diseases (Okonkwo and Dilar, 2016). The different types of herbs used for wine production are holy basil (*Oscimum sanctum*), peppermint (*Menthe arvensis*), ginger (*Zinziber officinale*), Indian gooseberry or amla (*Embllica officinalis*), aloe vera (*Aloe barbadensis*), tea (*Camellia sinensis*) etc. These herb plays a vital role for flavour enhancement and act as a preservative in wines (Rathi, 2018). The herb used in wine contains more tannins, polyphenols and lower acidity. Tannins found in the herbs are astringent in nature; they have aroma enhancing and antioxidant properties. They contain hydroxyl groups and carboxyl groups to form complexes with proteins (Ashok *et al.* 2012a; Rathi, 2018b). These antioxidants are found in flowers, fruits, stem, roots, bark and leaves. Now a days herbal infusions are trendy in wine. These herbs either in powder form or completely dry form are mix with base wine to increase its positive effect on health and over all body of human beings (Rathi, 2018).

The agricultural waste is generated in tonnes from beverages and fruit juice industries discard on daily basis. These wastes and peels contain



valuable nutrients components of simple sugar such as sucrose, glucose and fructose. Lignocellulose is a major structural component of woody and non woody plants (Shilpa *et al.*2013). The waste generated after extracting juice from fruits and vegetable and its peels can be used to make wine by Fermentation process. The fermentation is a simple process in which conversion of sugar into alcohol and carbon dioxide takes place in presence of yeast. In the present study the preparation of herbal wine from fruits and vegetable waste as well as its peel has been reported. The pineapple, beetroot and carrot waste and its peels are used to make wine. The herbs such as tulsi, amla, peppermint, aloe vera, ginger and tea leaves are added to wine to increase its flavour and health benefits. The fermentation is carried out in two groups A and B in an anaerobic fermenter. In group A all these herbs and peels of pineapple, beetroot and carrot are used while in group B all these herbs and wastes of pineapple, beetroot and carrot are used. The controlled fermentation was carried out with proper anaerobic conditions in both the fermenter to avoid bacterial growth. Various fermentation parameters such as pH, specific gravity and alcohol content were determined for both the Groups A & B at room temperature.

II. MATERIALS AND METHODS

A. Herbs, fruit and vegetable used

The pineapple (*Ananas comosus*), beetroot carrot and vegetable were purchased from the local market of Nagpur. The herbs used in the process such as holy basil/ tulsi (*Oscimum sanctum*), peppermint (*Menthe arvensis*), ginger (*Zinziber officinale*), Indian gooseberry/amlam (*Emblia officinalis*), aloe vera (*Aloe barbadensis*) and tea leaves (*camellia sinensis*) are also brought from the local market. These materials were selected due to their some uncommon and unmatched medicinal properties which makes them special and essential in this work (Shiradhonkar *et al.*2014).

B. Preparation of raw materials

The pineapple, beetroot and carrot were washed thoroughly and peeled. The juice was extracted from pineapple, beetroot and carrot with help of juicer. The remaining waste left after extracting juice as well as its peels were used in this work. All the herbs were cleaned and washed under running water properly under running water. The ginger and amla were cut into smaller pieces where as pulp from aloe vera was extracted. The extracts of tulsi, peppermint and tea leaves were prepared by soaking them in boiled water for 30 minutes.

The fermentation process was done in two groups A and B in a fermenter. In group A all the herbs

with peels of pineapple, beetroot and carrot were used while in group B all the herbs with wastes of pineapple, beetroot and carrot were used. The proportions of herbs in both the fermenter A and B was maintained same as shown in **Table 1**.

C. Preparation of yeast

The dry yeast (*Saccharomyces cerevisiae*) were purchased from local market. The activation of dry yeast was done by taking 100 ml each of lukewarm water having temperature of 45-50 °C in two beakers and adding 15 gms of sugar in each beaker with proper stirring then 15gms of dry yeast was added in both the beaker with proper stirring. After keeping both the beakers undisturbed for 10-15 minutes the froth formed will ensure that the yeast is being activated and then added to both the fermenters A and B.

Table 1. Quantity of material used in both fermenter A and B

Sr.No.	Material used	GROUP A (Fruit Peels)	GROUP B (Fruit Wastes)
1.	Tulsi leaves	10 gms	10 gms
2.	Peppermint leaves	20 gms	20 gms
3.	Tea leaves	10 gms	10 gms
4.	Ginger	20 gms	20 gms
5.	Aloe vera	80 gms	80 gms
6.	Amla	150 gms	150 gms
7.	Pineapple	200 gms	150 gms
8.	Beetroot	80 gms	150 gms
9.	Carrot	100 gms	150 gms

D. Fermentation of wine

The respective mixture of A and B were added in both fermenter along with the prepared activated yeast at the room temperature of about 27 °C and maintained constant for subsequent time. The anaerobic fermentation was encouraged through airtight arrangement and providing an outlet for CO₂ into the balloon. The fermentation was carried out at room temperature for next 10 days. After the fermentation the pH, specific gravity and percentage alcohol content of fermentation broth was measured of both the fermenter A and B respectively.

III. HEALTH BENEFITS OF HERBAL WINE

The herbal wine prepared with incorporation of herbs possesses many health benefits. Herbs used act as enhancer, antioxidant and act as a preservatives in wine (Soni *et al.*2009a; Rathi, 2018b). It has natural anti-bacterial constituents. They have numerous properties like anti-diabetic,



anti-cancerous, gastro-protectant, nerve soothing, pain killer (analgesic), good intestinal motility and cardiac activity (Rathi, 2018a; Stewart *et al.*1991b). It possesses anti-microbial and anti-bacterial

against food borne pathogen (Rathi, 2018a; Kumar *et al.*2016b). The various health benefits of herbal wine is shown in table 2.

Table 2. Health benefit of raw herbs and material used for preparation of herbal wine

Sr. no.	Material used (herbs, fruit and vegetable)	Parts of herb or plant is used	Medicinal usage	Reference
1.	Holy basil / tulsi (Oscimum sanctum)	Leaves of tulsi	Therapeutic properties against common ailments like cough, cold, chronic dysentery, anti-cancerous, anti-oxidant, anti-diabetic and good gastro-intestinal effect.	(Shiradhonkar <i>etal.</i> 2014);(Kaur andKaur,2015)
2.	Peppermint (Menthe arvensis)	Mint leaves	Stimulating, stomachic and carminative properties like indigestion, gastro-intestinal, antiemetic, lowers cholesterol and lower the activity in liver enzyme.	(Shiradhonkar <i>etal.</i> 2014) ; (Joshi <i>et al.</i> 2014)
3.	Tea (Camellia sinensis)	Leaves	Rich in astringent compounds like flavonoids that aids in protecting against cough cold, fever. Anti-cancerous, anti-diabetic and weight loss properties.	(Kumar <i>et al.</i> 2016)
4.	Aloe vera (Aloe barbadensis)	Transparent slime	Anti-fungal, anti-bacterial, anti-viral, anti-inflammatory, anti-arthritis, gastro-intestinal, tissue healing properties.	(Trivedi <i>et al.</i> 2012)
5.	Ginger (Zinziber officinale)	Roots	Effective against respiratory congestions and common aliment like cough and cold. Anti-oxidant, anti-fungal, anti-cancerous.	(Shiradhonkar <i>etal.</i> 2014)
6.	Indian gooseberry (Emblica officinalis)	Berry	Rich source of vitamin C, good for eye sight and hair growth, effective against constipation and stomach disorder.	(Nandagopal and Nair,2013);(Soni <i>et al.</i> 2009); (Rana and Singh, 2013)
7.	Pineapple (Ananas comosus)	Fruits peels and its waste after extracting juice	Improves bone and eye health, aiding in digestion, prevent arthritis, cancer and heart diseases, boosts immunity.	(www.organicfacts.net)
8.	Beetroot (Beta vulgaris)	Root peels and its waste after extracting juice	Lowers blood pressure, increased exercise capacity, boosts digestion, prevent anemia, boosts blood detoxification, prevent skin, lung and colon cancer, strengthens heart and reduces cholesterol.	(www.organicfacts.net)
9.	Carrot (D. carota)	Roots peels and its waste after extracting juice	Reduced cholesterol, lower risk of heart attacks, improve eye health, weight loss friendly, detoxify the body and improves skin, boost the immune system and oral health.	(www.organicfacts.net)

IV. RESULTS AND DISCUSSION

After 10 days of fermentation, the wine formed in both the fermenter was assessed for its pH, specific gravity and alcohol content.

The initial specific gravity of both the groups A and B before fermentation was found to be 1.04. while after the fermentation the specific gravity of A and B was found to be 0.96 and 0.92 respectively



at controlled temperature. The pH of both the wine A and B was found to be 5.5 and 5.3 respectively. The alcohol content of both the herbal wine was calculated by the basic formula used by most home brewer to determine the alcohol content in the beverages as:

$$ABV = (OG - FG) \times 131.25$$

Where ABV = alcohol by volume, OG = initial or original specific gravity, and FG= final specific gravity. The alcohol content in ABV of both the group A and B was found to be 15.75% and 10.5%. The fermentation parameter of both the group A and B is shown in table 3 and Fig. 1

Table 3. Fermentation parameters of both herbal wines

Sr. no.	Parameters	GROUP A (Fruit peels)	GROUP B (Fruit wastes)
1.	pH	5.5	5.3
2.	Specific gravity	0.96	0.92
3.	Alcohol content (ABV)	15.75%	10.5%

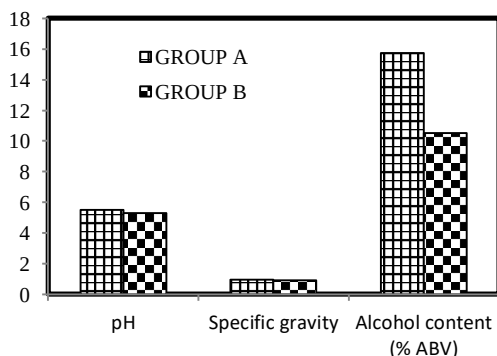


Fig.1 Fermentation parameters for both the wine

V. CONCLUSION

In the present study production of herbal wine by fruit and vegetable waste and its peels has been studied at controlled temperature. The herbal extracts used were found to complement the basic attributes of the wine when used in the specified amounts. The produced herbal wine was assessed for fermentation parameters such as specific gravity, pH and alcohol content by volume. The alcohol content was found to be more in the herbal wine (15.75%) containing peels than that of herbal

wine from fruit waste (10.5%). Both the herbal wine formed is of red colour, acceptable taste and smell. Regular, but limited administration of these herbal wines would help in receiving benefits of the herbal extracts, thus, minimizing the need for synthetic medicines for treating various disorders. The combinations gave a novel product with better qualities, increased acceptability and wider applications. The herbal wine formed is having many health benefits which can help in preventing various diseases and has wide medicinal application. Therefore these used herbs, waste and peels material may provide good adjuncts for wine and alcohol production. This may also lead to reduce seasonal losses of the fruits and vegetables as well as reduces waste load in the environment.

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