Studies on preparation of wine from Kiwi fruit.


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Abstract: In order to prepare the kiwi wine with high nutritional characteristics and low alcohol content, the physicochemical properties, organic acids, monomer phenols, water-soluble vitamins and aroma of kiwi wine fermented by Saccharomyces cerevisiae and Wickerhamomyces anomalus in different inoculation method were analyzed. A novel kiwifruit wine (KW) fermented by Aspergillus Niger and Aspergillus oryzae was developed with elegant flavor and poor alcoholic strength. The results showed that the alcohol content of the three kiwi wines ranged from 5.3 to 5.5% (v/v). The quercetin and catechin contents of WSF (sequential inoculation with W. anomalus followed by S. cerevisiae) low-alcohol kiwi wine were significantly lower than those in the other kiwi wines. The esters, alcohols, acids, and aldehydes in ultrasonic-aged wines were in dynamic balance and harmony with each other. The wine was soft and mellow, making the kiwi wine more typical. The aroma in COF and WSF low-alcohol kiwi wines were predominately from W. anomalus, while those in SWF (sequential inoculation with S. cerevisiae followed by W. anomalus) low-alcohol kiwi wine were predominately from S. cerevisiae.

Keywords: Low-alcohol kiwi wine, Inoculation sequence.

I. Introduction

The botanical name of kiwi is (Actinidia delicosa), also called kiwifruit or Chinese gooseberry, woody vine and edible fruit of the family Actinidiaceae. The plant is native to mainland China and Taiwan and is also grown commercially in New Zealand and California. Raw kiwis are high in vitamins C and K. The fruit of the Actinidia plant is known more commonly as kiwifruit; in Greece it is also called actimio (πάντος) or “fruit of Mount Olympus”. It is cylindrical or pear-shaped and has fuzzy brown skin. The interior of the fruit is bright green with tiny black seeds radiating from a central core. During the y

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expansion. New Zealand has earned a reputation for producing top-notch wines, such as Sauvignon Blanc and Pinot Noir, especially in the districts of Marlborough and Hawke's Bay. Here is a timeline of the development of kiwi wine. A strain of Kiwi wild mold was selected and mixed with yeast for the fermentation of kiwi wine of strains. A strain of Kiwi wild mold was selected and mixed. It was shown that the ethanol, color index, and organic acids of the wines were closely related to the inoculation method. Mixed fermentation produced a greater variety and concentration of volatiles than pure yeast fermentation. The fermentation of fruit wines is a complex microbial reaction process. The final product contains a large number of volatile aroma substances in addition to alcohol and carbon dioxide. There are three primary sources of these aromatic substances: the various aromas produced during fermentation, the fruit itself, and the aromas resulting from complex chemical reactions during aging. The types and relative contents of different varieties’ main aroma components in kiwifruit wines differed significantly. It was found that the innovative aging process and jar and mixed well at room temperature according to the manufacturer’s instructions. After fermenting for 9 days, the dregs were removed, and further fermentation was carried out at 18 °C for 18 days. The raw wine was obtained after removing dregs. All raw wines were filled with glass jars and aged for six months at room temperature. The fermented kiwi wine was divided into three groups: natural aging, microwave aging, and ultrasonic aging. After 0, 120, and 240 days of aging, the aroma components of the above nine groups were detect. (E. H. Souflerosa, Irini Pissab, 2017)

Kiwi wine not only tastes great and is refreshing, but it also has a number of health advantages. The kiwi fruit itself is renowned for being packed with antioxidants, vitamins, and minerals, which can enhance the wine's overall nutritional worth. The following are a few of the health advantages of kiwi wine:

1) Vitamin C-rich: The kiwi fruit is a great source of vitamin C, which supports a strong immune system and encourages the absorption of iron from plant-based diets.
2) High levels of antioxidants: Polyphenols, which can help protect the body from oxidative stress and possibly lower the risk of chronic diseases, are present in kiwi wine.
3) Promotes digestive health: Kiwi fruit's fiber content may help with regularity and healthy digestion. To intestinal health generally.

II. MATERIALS AND METHODS

The present study was carried out at department of chemical technology, at Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar during the year 2020-2024. Materials and methods adopted for the present investigation are presented under suitable headings.

Kiwi Fruits:
The fully ripened green to purplish-red skin and fragrant kiwi fruit were collected from local market of Chhatrapati SambhajiNagar.

Wine Yeast: The Dry wine yeast, Saccharomyces cerevisiae var. bayanus was used in this process.

Fresh and ripened kiwi fruit

Sorting and washing, cleaning by tap water
Cut into pieces
In plastic jar bottle (Add kiwi pieces (200gm), sugar (260gm), water (650mL), wheat (5gm) Add dry wine yeast (Saccharomyces cerevisiae)
Fit the containers with airlocks
Primary Fermentation (one weeks or 15days)
Use Clarification process (Bentonite agent)
Filtration, treatment for the filter liquor
In second fermentation Stored in glass sterile bottle in three or five days
Cold stabilization at -4degree C
Ageing for 1-2 weeks at 22-25 degree C or Dark place
Stored, preservation, in glass bottle (5 months)
Wine is prepare.

Fig 1: The flow- chart for making kiwi wine
(Journal of Food Research and Technology, Jakraya Publications (P) Ltd 2014). There are five wine making process steps:
1. **The Harvest:** Without fruit there would be no wine, and therefore harvesting (or picking) is the first step in the wine making process. Other fruits lack the requisite acids, esters and tannins to make natural, stable wine on a consistent basis. For this reason and a host of others, most winemakers acknowledge that wine is made in the vineyard, at least figuratively.

![Image of grapes]

2. **Crushing and Pressing:** Crushing the whole clusters of fresh ripe kiwi is the next step in the wine making process. For thousands of years, men and women performed the harvest dance in barrels and presses that began kiwi juice’s magical transformation from concentrated sunlight and water held together in clusters of fruit to the most healthful and mystical of all beverages – wine. Mechanical pressing has also improved the quality and longevity of wine, while reducing the winemaker’s need for preservatives.

![Image of kiwi fruit processing]

3. **Fermentation:** Fermentation is the magic at play in the making of wine. If left to its own devices, must (or juice) will begin fermenting naturally within 6-12 hours with the aid of wild yeasts in the air. In very clean, well-established wineries and vineyards, this natural fermentation is a welcome phenomenon. However, for a variety of reasons, many winemakers prefer to intervene at this stage by inoculating the natural must. An alcohol level of 10% in cool climates versus a high of 15% in warmer areas is considered normal. Sweet wine is produced when the fermentation process stops before all of the sugar has been converted into alcohol. This is usually an intentional decision on the part of the winemaker.
4. **Clarification**: Once fermentation is complete, the clarification process begins. Winemakers have the option of racking or siphoning their wines from one tank or barrel to the next in the hope of leaving the precipitates and solids called pomace in the bottom of the fermenting tank. These substances adhere to the unwanted solids and force them to the bottom of the tank. The clarified wine is then racked into another vessel, where it is ready for bottling or further aging.

5. **Aging and Bottling**: The final stage of the wine making process involves the aging and bottling of wine. After clarification, the winemaker has the choice of bottling a wine immediately. Further aging can be done in bottle, stainless steel or ceramic tanks, large wooden ovals, or small barrels, commonly called barriques. The choices and techniques employed in this final stage of the process are nearly endless, as are the end results.
Fermentation process:
The juice's carbohydrates are transformed into alcohol and carbon dioxide during fermentation. The sugars are used by yeast during the fermentation process. When yeasts do not entirely consume the available sugar and the rate of fermentation slows down or even stops, the fermentation becomes stuck. Centrifugation and clarification. In a non-traditional method of winemaking, di-ammonium phosphate (DAP) may be added to the anaerobic conditions of fermentation to replenish the nitrogen needed for yeast growth. After fermentation has reached the required stage or is finished, post fermentation procedures are carried out. In this step, wine is often racked from the yeast lees into stainless steel or wood barrels. The wine may be filtered, cold stabilized, fined, and/or blended during the storage period. Several fining agents, including enzymes, bentonite, and Wine clarifying agents like diatomaceous earth, egg albumen, etc. may be commercially purchased and added. Wine continues to change as it ages, and when the alterations are appropriate, the wine is filtered and bottled.

Fermentation: Wine is made through the miracle of fermentation. If left alone, must (or juice) will start organically fermenting in 6 to 12 hours with the help of wild yeasts in the air. This natural fermentation is a welcome occurrence in vineyards and wineries that are exceptionally clean and well-established. But for a number of reasons, many winemakers choose to step in at this point to inoculate the unprocessed must. Regardless of the route taken, fermentation usually lasts until all the sugar has been turned into alcohol and a dry wine has been formed.

Principle: Fermentation process:
C₆H₁₂O₆ + YEAST  →  2C₂H₄OH + 2CO₂
Approximately 12-15% of ethanol is present in the fermentation-produced alcohol solution. Higher ethanol concentrations will kill the yeast, which is consistent with the parameters under which yeast cells can live. About a half gram of alcohol is created for every gram of sugar that is transformed. Starting material needs to have about 24% sugars in order to produce alcohol with a 12% concentration.

Malo-lactic fermentation (secondary fermentation):
In addition to changing the flavor of the wine from crisp to creamy buttery and reducing the quantity of acidity (increasing PH from 3-5 units). Malic acid is transformed into lactic acid and carbon dioxide. This can be introduced and monitored by testing with paper chromatography. By controlling the pH(best around 3.0-3.5) The wine produces fewer flavors when the pH is high. Tartaric acid is added at the start of the fermentation process to reduce pH.

Oxidation process:
Acetobacter bacteria will react with oxygen to convert the wine into vinegar. During fermentation process the most harmful bacteria that can grow is of the genus Acetobactor. However, this bacterium is sensitive to the free sulfur dioxide. Fermentation can be restarted to convert the residual sugar into alcohol. (Saranraj P et al., 2017)

RESULT AND DISCUSSION

Organoleptic evaluation assay:
15 panelists (gender: 8 men, 7 women, age range: 20-35) chosen from postgraduate students, staff, and faculty of several chemical technology-related departments who were familiar with wine consumption evaluated sensory attributes using a 5-point Hedonic scale (where 1=dislike extremely and 9=like extremely). During the evaluation session, tasters were not permitted to discuss their scores with one another. The trained panel of sensory analysts was supplied with the Kiwi wine and a chosen commercial brand of grape wine. The panelists' scores were used to represent the sensory evaluation data. The statistical significance of the difference between the scores of the two groups was examined using the conventional t-test two beverages.

Table1: Sensory evaluation of kiwi wine and commercial grape wine

<table>
<thead>
<tr>
<th>Attributes</th>
<th>Kiwi wine</th>
<th>Commercial grape wine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taste</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Aroma</td>
<td>7</td>
<td>9</td>
</tr>
</tbody>
</table>
Flavor | 7 | 9  
---|---|---
Colour/ appearance | 8 | 8  
After taste | 7 | 9

n=15
*Values are means of the panelist’s scorers.
**1=extremely dislike, 7=moderately like, 8=really like, and 9=really like

Sensory evaluation research revealed that the panelists ranked kiwi wine as having the best flavor, which may be attributable to the wine's moderate sweetness. The fragrance and flavor traits, however, were comparable to those of a commercial wine sample. While the after-taste attributes of Kiwi wine were likewise found to be within acceptable range, the color was found to be a little dull and scored lower than commercial sample. It was possible to draw the conclusion that kiwi wine was acceptable in terms of its Organoleptic quality characteristics based on the data produced on those qualities.

**Physico-chemical analysis:**
Waste index, pH, Acidity, Total soluble solids were determined by standard method.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Observation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour</td>
<td>Faint yellow</td>
</tr>
<tr>
<td>Waste index</td>
<td>54gm</td>
</tr>
<tr>
<td>TSS (Degree brix)</td>
<td>8.2</td>
</tr>
<tr>
<td>pH</td>
<td>3.1 to 3.96</td>
</tr>
<tr>
<td>Acidity</td>
<td>0.75</td>
</tr>
</tbody>
</table>

*Each value is average of five determinations

**Analysis of wine:**
The produced sparkling kiwi wine was used to analyze its TSS, titrable acidity, pH, and ethanol content. The data on analysis of kiwi wine are presented in Table3.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Observation</th>
<th>Commercial grape wine</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSS (Degree brix)</td>
<td>8.0</td>
<td>9.3</td>
</tr>
<tr>
<td>Titrable acidity (%)</td>
<td>0.89</td>
<td>0.95</td>
</tr>
<tr>
<td>pH</td>
<td>3.5</td>
<td>3.9</td>
</tr>
<tr>
<td>Ethanol (%)</td>
<td>5</td>
<td>11</td>
</tr>
</tbody>
</table>

The result concerning chemical analysis of kiwi wine and grape wine but alcohol percent of grape wine 11% was higher than kiwi wine5% showed that. The titrable acidity was found to be 0.89 with 3.5 pH of kiwi wine, and the grape wine has titrable acidity was found 0.95 and ph 3.9 The pH of kiwi wine was slightly lower than the commercially available grape wine samples.

**CONCLUSION:**
On the basis of data generated during present investigation, it was learned that kiwi fruit could be successfully used in preparation of kiwi fruit wine. The kiwi wine making process is not easy but it is very interesting to know about wine processing, manufacturing, some process like Fermentation, clarification, Filtration etc. The physico-chemical analysis of fruit showed higher yield compared to other fruit justifying techno- economical feasibility of kiwi wine manufacturing and prepared kiwi wine is comparable with commercially available grape wine, in terms of its sensorial quality characteristics. It was discovered that kiwi fruit might be successfully employed in the creation of kiwi fruit wine on the basis of the data produced during the current experiment. The results
of the chemical analysis of Kiwi wine and Grape wine showed that Grape wine's alcohol content (11% vs. 5%) was higher. Kiwi wine's titrable acidity was determined to be 0.89 with a pH of 3.5, whereas the grape wine's titrable acidity was determined to be 0.95 with a pH of 3.9. Kiwi wine had a slightly lower pH than samples of grape wine that were readily accessible commercially. Prepared kiwi wine is also comparable in comparison to the sensory qualities of commercially available grape wine.

LITERATURE CITED