

INTRODUCTION

1.1. Background

Wine is a type of alcoholic beverage which is considered to be the most ancient as according to documents obtained from Asian countries and also the fact that it is mentioned in the Bible. Generally, the contents of wine include tannins, amino acids, ethyl alcohol, sugar, vitamins, minerals, esters, higher alcohols, anthocyanins, flavoring compounds, etc. Wines are classified as either natural wines or dessert and appetizer wines, depending on various attributes including the alcohol and sugar content, fruit ripening stage, additives used, aging of wine and vinification techniques, chemical composition of juice, and cultivar. Based on product manufacturing, wines are classified as either grape wine, berry wine, fruit wine, plant wine, or raisin wine, amongst others. In particular, fruit wines are undistilled alcoholic beverages, made from a variety of choices of base ingredients other than grapes, and may also contain additional flavors derived from flowers, herbs, and fruits; This type of wine is produced through a process generally similar to grape wines, although with slight additional steps which varies according to the requirements of each fruit (Swami, Thakor & Divate., 2014).

Fermentation is the main process of creating wine as it is the process most widely employed in the processing of beverages with alcohol as the major constituent. The process taken to produce a wine includes yeast as the main requirement. It will work as an alcohol and carbon dioxide producer by consuming sugar, where the rate and time is to determine the quality of the fermented product. Furthermore, its varying concentration may also result in the different content of phenolic compounds, therefore also affecting the antioxidant contents. In the process of wine making, the primary fermentation step is often coupled with maceration, followed by dejuicing before moving over to the secondary fermentation (malolactic fermentation), and finally clarification prior to bottling. Wines generally contain an increased nutritional value of the original fruit juice due to the fermentation process which releases amino acids and other nutrients from the yeast. Many tropical and subtropical fruits contain a good amount of extractable juice, these juices are then able to be transformed into wine upon fermentation (Peltier et al., 2019; Saranraj & Ray, 2019; Swami, Thakor & Divate., 2014; Tena, Martin & Asuero, 2020).

Black sapote (*Diospyros digyna*) is a fruit that is part of the *Diospyros* genus and belongs to the Ebenaceae family. It is commonly found in tropical and subtropical areas, currently mainly found in Mexico and Central America. This fruit is considered as an exotic fruit, and is widely accepted because of its organoleptic characteristics due to its sweetness, also highly appreciated due to its high vitamin C and calcium content. Additionally, it also contains high antioxidant capacity from its high amounts of polyphenols, which is known to exert various positive health effects. Moreover, it is also

a good source of phosphorus, ascorbic acid, carbohydrates, and minerals. In terms of consumption, black sapote can be freshly consumed, served as a dessert, or processed together with juice, liquor, or wine. A large amount of waste is produced from the production of black sapote as there is currently a low rate of consumption (Jiménez-González & Guerrero-Beltrán, 2021; Yahia & Gutierrez-Orozco, 2011).

In general, fruits hold a promising potential as a substrate for the production of fruit wine through fermentation processes. Some of the requirements include being a good source of sugar, as well as containing good amounts of vitamins, minerals, color, and aroma. The process of producing wine, either from grapes or other fruit extracts, is principally through fermentation by yeasts which produces a significant amount of ethyl alcohol. Black sapote holds a potential as a good source fruit wine as they are known to have high sugar content and contain high amounts of phenolic compounds, along with its positive effects towards human health due to its nutritional contents such as vitamin C, calcium and antioxidants, as well as its previously stated highly accepted sensorial characteristics. However, there is currently insufficient data from previous studies to support the effect of various yeast concentrations on the properties of wine, including antioxidative activity as well as phenolic compounds. Both the Black Sapote fruit as well as commercial wines are known to possess phenolic compounds with high antioxidant activities, which is why they are evaluated as well, in order to determine their potential in product development. Furthermore, being known as a tropical and subtropical fruit, black sapote has the potential to grow in Indonesia (Baidya, Chakraborty & Saha, 2015; Jiménez-González & Guerrero-Beltrán, 2021).

By considering the health beneficial characteristics of black sapote with its low consumption rate, and examining the scope of creating wine products from the locally available fruit will enable the reduction of post-harvest loss of excess fruits, and will lead to agricultural diversification (Baidya, Chakraborty & Saha, 2015). The fermentation of wine from black sapote should therefore be explored to fulfill the potential of creating a more diversified wine product while also reducing harvest waste.

1.2. Objectives

1. To evaluate the difference in the presence of antioxidant activity and total phenolic compound content between the juice at the start of fermentation and the wine after the fermentation process
2. To evaluate the effect of different yeast concentration to the antioxidant activity, total phenolic compound content as well as the color intensity of wine during the fermentation process of black sapote

1.3. Scope of Work

The scope of this research includes the fermentation of the fruit into wine for 7 days with different yeast concentrations (0%, 0.5%, and 1% Inoculum), as well as color, antioxidant, phenolic content analysis of the wine and the juice throughout fermentation.

1.4. Expected Output

- The Final Research Project Report
- Final Research Project Presentation in the form of a PPT

1.5. Hypothesis

Null hypothesis (H_0):

- The antioxidant activity and the amount of total phenolic compound present in the wine will not differ from the beginning to after the fermentation process has completed
- The antioxidant activity, total phenolic compound, and color intensity of the wine throughout the fermentation process will not be affected by the difference in yeast concentration

Alternative hypothesis (H_1):

- The antioxidant activity and the amount of total phenolic compound present in the wine will differ from the beginning to after the fermentation process has completed
- The antioxidant activity, total phenolic compound, and color intensity of the wine throughout the fermentation process will be affected by the difference in yeast concentration