INTRODUCTION

1.1 Background

Tree bark is the outer part of stems and roots in woody plants containing tissues. Tree bark serves many purposes for plants. Some of its functions are as structural support, barrier toward microbial degradation, as well as giving protection against extreme weather conditions, insect, pests, and animal browsing (Pasztory et al., 2016; Vane et al., 2006). Other than that, tree bark will protect trees against fire, with increased survival rate if the tree bark present is thicker (Lawes et al., 2011; Schafer et al., 2015; Wang & Wangen, 2011). Beside that, tree bark also possesses a significant role in human life, like being used as a bioindicator for pollution, alternative fuels, mulching, used in cork production, used in clothes and pots making, as well as used to clean water and gas (Palma et al., 2003; Pasztory et al., 2016; Salem & Awwad, 2014; Whiting et al., 2015).

Besides all of those functions, it turns out that tree bark also contains phytochemical compounds, which are the most affluent secondary metabolites of plants. Phytochemical compounds are bioactive ingredients that provide health benefits beyond essential nutrition to decrease the chance of major chronic disease (Jimenez-Garcia et al., 2018). One example of phytochemicals is phenolic compounds which show prominent antioxidant activity that can be utilized for health purposes, such as flavonoids, tannins, and phenolic acid (Szwajkowska et al., 2020). Those compounds are found commonly in most plant tissues and function as an antioxidant, anticancer, antibacterial, anti-inflammation, structural polymers, UV screen, signal compounds, attractants, and defense response chemicals (Rani et al., 2021). However, although all plants possess phenolic compounds, their plant properties might differ due to the different composition/types of phenolic compounds owned by each plant which can lead to the variant utilization of the plant (Pasztory et al., 2016; Tungmunnithum et al., 2018). For example, cinnamon, obtained from the bark of *the Cinnamomum verum* tree, is commonly used as flavoring and spices due to its taste and aroma as well as its antimicrobial, antioxidant, anti-inflammatory, and anticancer properties (Charles, 2012; Rao & Gan, 2014; Parham et al., 2020). It contains alkaloids, flavonoids, coumarin, tannins, terpenoids, saponin, glycoside, anthocyanin, and phenolic compounds that are responsible for its health properties (Ahmed et al., 2020). Another example is Pine bark extracts which are usually utilized in several foods and beverages products such as Songhen noodles, then as an antioxidant in beef, and as food additives in juice industries (Mármol et al., 2019). They contain polymeric flavanols, flavonoids, tannic acid, phenolic acid, and catechins containing anti-inflammatory, antimutagenic, anticarcinogenic, antimetastatic, and high antioxidant activity (Iravani & Zolfaghari, 2014).

Despite all of those benefits, there are still a lot of unidentified compounds and plants that are utilized only by local people due to the lack of information and research done on tree bark, which

makes bioprospecting especially important. Bioprospecting is a method to discover novel inventions/compounds/ingredients usually used by industries and researchers (Beattie et al., 2011). It is essential to analyze novel compounds due to the increasing demand for new alternatives of functional food that are widely available. Moreover, even though local people were already utilizing the tree bark, their usage of tree bark in Papua is still inefficient leading to a large tree bark waste as mentioned by several studies (Haryanto et al., 2021; Rahayuningsih et al., 2020). In addition to it, this approach also might encourage local people to use their free land to cultivate rather than selling or renting their land to third parties. This way, beside obtaining money from selling their bark, they will also be able to have new job opportunities. Other studies also stated that bark may produce higher amounts of tannins compared to fruit and vegetable pulps (Dogan et al., 2019). Those information add up the reasons why tree bark is utilized in this approach. By knowing the types of phenolic compounds present in plants, appropriate analysis methods and types of solvent can be used to further discover their health benefits and properties; hence new potential use will be discovered. Therefore in this study, several phytochemical testing, total antioxidant activity and phenolic content will be measured using several solvents to further characterize and categorize the plant potential to be used in the food industry. The purpose of using different types of solvent with different polarity is to increase the accuracy of the result and to find the best solvent that can be used in future research. One of the possible uses of phytochemicals is as a functional food ingredient.

Functional food provides additional functions to promote health and reduce disease risk along with its essential nutrition, which can be achieved by adding new ingredients or existing ingredients (Donato-Capel et al., 2014). With all of that information, two unidentified Native Papuan tree barks, “Kamlowelen” and “Kayu Bawang”, as usually called by the local community, has the potential to be a new ingredient for functional food as it is already commonly used as a seasoning and as medicine to treat mild flu symptoms/gain stamina due to their health benefits. This research will open an opportunity to have new additional ingredients for functional food by further investigating the phytochemical content responsible for its function. Along with that, this research may also determine whether those trees have any other health benefits.

1.2 Objective

The objective of this research is to assess the antioxidant properties, total phenolic content, and phytochemical content of the Native Papuan tree bark with the expectation that the result will enlighten the researcher about the phytochemical compounds present in the tree bark so that in the future a discovery, may it be new functional ingredients or whole new food, which is widely available will be discovered. To add its significance, if this research successfully proves its antioxidant

properties, then local people might be able to utilize tree bark more or sell them; hence, they can use their free land to cultivate “Kamlowelen” and “Kayu Bawang” instead of selling / renting the land.

1.3 Research Scope

The scope of the research was mainly focused on the potential antioxidant properties and total phenolic compounds identification of the native tree bark from Papua. Along with that, their phytochemical compounds that might be present inside the tree bark were also checked.

1.4 Hypothesis

H_0:

1. Both, “Kamlowelen” and “Kayu Bawang” will show antioxidant activity.
2. Both tree bark will contain total phenolic content leading to significant antioxidant properties.
3. Both unidentified native papuan tree bark, “Kamlowelen” and “Kayu Bawang” will contain various phytochemical compounds.

H_1:

1. Both “Kamlowelen” and “Kayu Bawang” will not exhibit any antioxidant activity.
2. Both tree bark will not exhibit total phenolic content which will lead to non-significant antioxidant activity.
3. Both unidentified native papuan tree bark, “Kamlowelen” and “Kayu Bawang”, will not contain any phytochemical compounds.

1.5 Research Question

The research questions in this study are as follows:

a. What were the phytochemical compounds possessed by both native papuan tree bark?
b. Did they possess great antioxidant activity?
c. Which solvent was the most suitable to extract specific phytochemical compounds and produced an extract with the best antioxidant activity?