

I. INTRODUCTION

1.1. Background

Indonesia is rich in biodiversity, with hundreds of different medicinal plants that have long been utilized by the locals to treat a variety of ailments. These herbs were chosen as alternative related to their relatively low-price, availability, and use depends on ancestral experience (Ameer *et al.*, 2009). However, only a few conventional medications have been demonstrated to be effective up to this point (Sudewo, 2005).

Mistletoe is a species of plant that is extensively used as medicine in the community. The mistletoes have been recently studied due to their widespread uses as traditional medicine (Hong *et al.*, 2020). Mistletoe is used in the community in a variety of ways, including boiling the leaves, filtering them, and drinking the boiled water (Santoso, 2008).

So far, however, there has been little research about other species of mistletoe especially Southeast mistletoe. In comparison to other types of mistletoe, not much attention has been paid to *Scurrula ferruginea* (Roxb. ex Jack) Danser which belong to the family of Loranthaceae (Vidal and Nickrent, 2008). *S. ferruginea* is known as one of medicinal plants which has been widely used in traditional medicine as therapeutic herbs. Preparation from leaves, stems and flowers of *S. ferruginea* were used by local people for treatment of high blood pressure, hypertension and gastrointestinal malfunction (Lohézic-Le Dévéhat *et.al.*, 2002). The part used is the leaves or all parts of the plant in a fresh state or after drying (Purnomo, 2000).

The mistletoe plant contains compounds from flavonoid isolates, namely the flavone or flavonol group (Sunarni, 2005). Flavonoids are one of the components of plants that have many benefits. Flavonoids have activities such as antifungal, diuretic, antihistamine, antihypertensive, insecticide, bactericidal (compounds that can kill bacterial growth), antiviral, and inhibit enzyme work (Harbone, 1987).

Several *Scurrula* plants members have been shown to possess promising anti-microbial activity. A study by Marvibaigi *et al.* (2014) showed that the leaf, flower and stem *S. ferruginea* crude acetone extract had good anti-bacterial activities against a range of Gram positive and negative bacteria. Notably, the leaves and stems *S. ferruginea* extract has potent anti-microbial activity against the clinically relevant skin pathogen, *Staphylococcus aureus* (Marvibaigi *et al.*, 2014).

Drying is a vital method for the preservation of plant phytochemicals; it allows rapid protection against deterioration, microbial attack, and enzymatic processes that occur (Rodriguez *et al.*, 2016). Traditionally, air drying is the preferred method of drying, meanwhile oven drying is considered the latest method. The drying process is important in determining the quality of the final product that contributes to high efficiency and efficacy of medicinal plants. A good choice of drying method may lead to an increase in the phenolic compounds extracted from the plants, thereby accounting for better antioxidant properties.

Antioxidants are compounds that can counteract free radicals and inhibit oxidation in cells, thereby reducing cell damage (Simanjuntak *et al.*, 2004). Compounds that have antioxidant activity are flavonoid, phenolic, and alkaloid

compounds. Flavonoid compounds and polyphenols have antioxidant, anticancer, antiseptic, and anti-inflammatory activities (Surya and Yesti, 2018).

Resmi *et al.* (2017) revealed that the ethanol extract, fractions of water, and the ethyl acetate contained flavonoids and polyphenol potential as antioxidants. This assumption in-line with others that majority of antioxidant compounds present in plants are secondary metabolites phenolic compounds (tannins, flavonoids, and phenolic acids) which exhibit their protective properties through scavenging free radicals (Dai & Mumper, 2010). In addition to phenolics, plants may also contain antioxidant volatile oils, carotenoids, and vitamins (Marvibaigi *et al.*, 2014).

Several research publications have reported the effects of mistletoe tea, including improving the immune system (Winarno *et al.*, 2003) and inhibiting the growth of tumor cells (Nugroho *et al.*, 2000). Mistletoe leaves and stems contain alkaloids, flavonoids, terpenoids, glycosides, triterpenes, saponins, and tannins (Tambunan *et al.*, 2003).

So far, there has been no study that has reported a direct comparison of the extraction technique for the tea mistletoe. Based on the things that have been mentioned above, the author is interested in seeing the effects of several extraction techniques on the antimicrobials potency of the mistletoe from tea plants (*Scurrula ferruginea* (Roxb. ex Jack) Danser) and its antioxidant activities.

1.2. Problem Formulation

- a. How is the antimicrobial activity of infusion/extract of tea mistletoe (*Scurrula ferruginea*) against the tested microbes?

- b. What are the Minimum Inhibitory Concentrations (MIC) and Minimum Lethal Concentrations (MLC) of tea mistletoe (*Scurrula ferruginea*)?
- c. Which extraction technique gives the best results in antimicrobial testing?
- d. How is the antioxidant activity of tea mistletoe extract (*Scurrula ferruginea*)?

1.3. Research Objective

- a. To determine the antimicrobial activity of infusion/extract of tea mistletoe (*Scurrula ferruginea*).
- b. To determine the Minimum Inhibitory Concentration (MIC) and Minimum Lethal Concentration (MLC) from tea mistletoe (*Scurrula ferruginea*).
- c. To find the extraction technique that gives the best results in antimicrobial testing.
- d. To determine the antioxidant activity of extracts of tea mistletoe (*Scurrula ferruginea*).

1.4. Benefit of The Research

The results and data from this study are expected to be a source of information and scientific reinforcement regarding the antimicrobial and antioxidant potential of the mistletoe from the tea plant (*Scurrula ferruginea*) for the scientific community and the general public and can be used as articles in print media and be published in national scientific journals.