

## BAB 1. INTRODUCTION

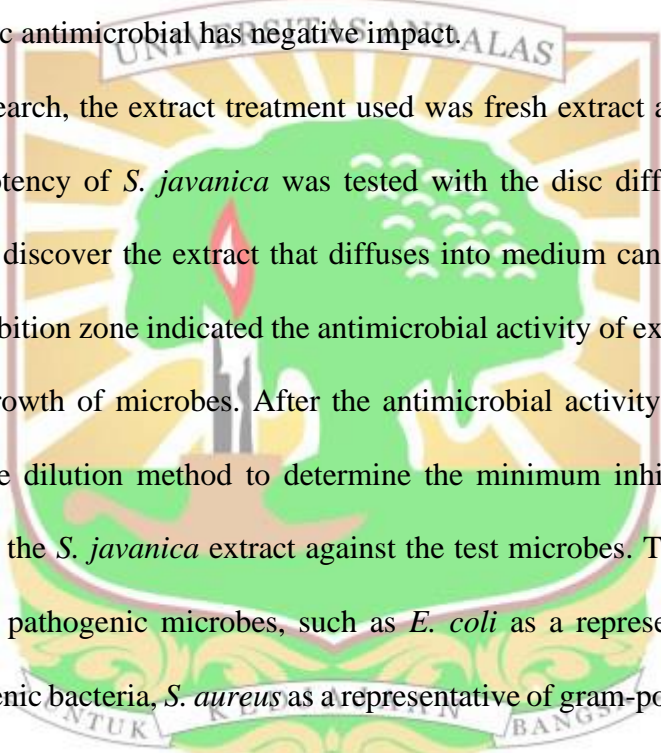
### 1.1 Background

Indonesia is a famous country for its richness of flora diversity, there are at least about 50,000 species of plant and 7,500 of them are identified as herbal plants (Agusta, 2015). Herbal plants have been long known and used by the people of Indonesia. Generally, people use herbal plants as traditional medicine in overcoming daily health problems (Adriadi *et al.*, 2020). One of the herbal plants that are often used is *Sambucus javanica*, which is commonly known as elderberry or sangitan.

*S. javanica* is a medicinal plant from the Adoxaceae family. Indonesian people have been using *S. javanica* for a long time as traditional medicine, local people in Java and Bali used flowers and leaves of *S. javanica* as diuretics, to treat wounds, bruises and also dermatitis (Silalahi and Wakhidah, 2021). People in Bengkulu Province drink decoction from the leaves and bark of *S. javanica* to treat digestive disorders (Darwis, 2012). People in Central Sulawesi used the fruit of *S. javanica* to cure acne (Gailea *et al.*, 2016). *S. javanica* also acts as an antibacterial (Dasopang, 2017), anti-inflammatory agent and immunomodulator (Putra and Rifai, 2019).

The role of *S. javanica* as medicine is supported by its secondary metabolites such as alkaloids, flavonoids, glycosides, anthraquinone glycosides, saponins, triterpenoids, and tannins that are found in the leaves of *S. javanica* (Dasopang, 2017). Flowers from *Sambucus* genus contain alkaloids and phenolic compounds such as flavonoids (flavonols, flavanols, flavanones) and tannin. Fruits of the *Sambucus* genus contain alkoids, saponin and phenolic compounds such as flavonoids (flavonols, flavanols, flavanones and anthocyanin) (Młynarczyk *et al.*, 2018).

The potential of *S. javanica* as an antimicrobial is important for further research, because research on the discovery and development of antimicrobials is currently needed to overcome antimicrobial resistance problems that facing by the global community. The expert explained that antimicrobial resistance causes the treatment period becomes longer, the treatment cost becomes more expensive, difficult in the healing process, and increases the risk of death (O'Neill, 2016). This research provides information about the potential of *S. javanica* as a substitute antimicrobial medicine, because synthetic antimicrobial has negative impact.

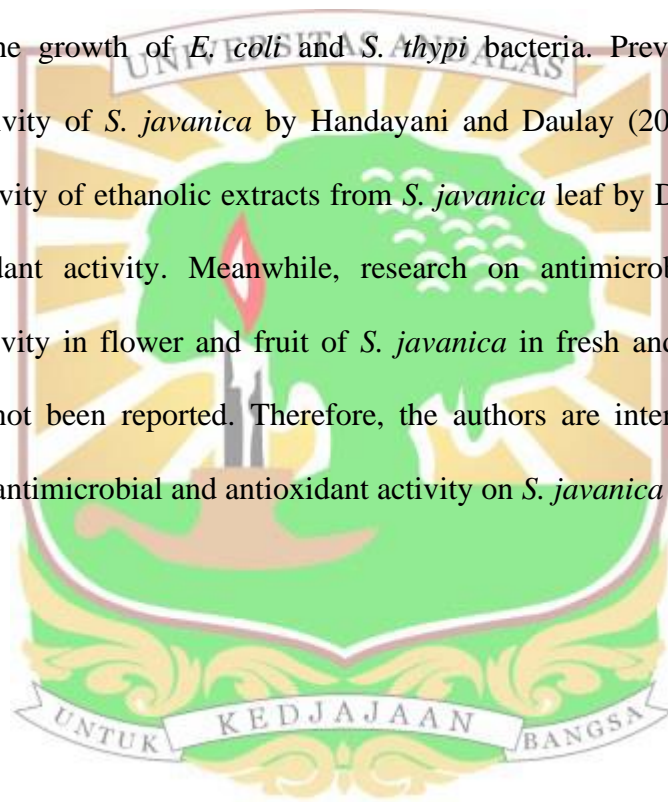
The logo of Universitas Andalas is a circular emblem. At the top, a banner reads 'UNIVERSITAS ANDALAS'. The center features a green tree with a red flame-like shape at its base. Below the tree, a banner contains the motto 'UNTUK KESEHATAN BANGSA'. The background of the emblem is yellow with radiating lines.

In this research, the extract treatment used was fresh extract and infusion. The antimicrobial potency of *S. javanica* was tested with the disc diffusion method by Kirby Bauer, to discover the extract that diffuses into medium can create inhibition zone or not. Inhibition zone indicated the antimicrobial activity of extract by killing or inhibiting the growth of microbes. After the antimicrobial activity was found, then continued by the dilution method to determine the minimum inhibitory and lethal concentration of the *S. javanica* extract against the test microbes. This research used three species of pathogenic microbes, such as *E. coli* as a representative of gram-negative pathogenic bacteria, *S. aureus* as a representative of gram-positive pathogenic bacteria and *C. albicans* as a representative of pathogenic fungal.

Besides of *S. javanica* as an antimicrobial, in this research also done testing about antioxidant activity, as another benefit that can be obtained when consuming fresh juice or infusion of *S. javanica*. Antioxidants are needed to maintain health, because antioxidants can reduce the negative effects of free radicals reaction in the human body. According to experts, the Source of free radicals comes from normal cell metabolism and inflammatory processes that occur in the body, free radicals also come

from gamma rays, UV radiation, pollution and cigarette smoke (Irianti, 2017). Excessive free radical oxidative reactions that occur in the body can cause cell damage, diabetes, hypertension and cancer (Winarsi, 2007). The antioxidant activity of *S. javanica* extract was tested using the DPPH method, the concept of this method is the reduction of free radical molecules (diphenyl-picrylhydrazyl) by *S. javanica* extract.

Previous research on the antimicrobial activity of *S. javanica* by Dasopang (2017), discover that ethanolic extract of *S. javanica* leaf shows antibacterial activity in inhibiting the growth of *E. coli* and *S. thypi* bacteria. Previous research on antioxidant activity of *S. javanica* by Handayani and Daulay (2022), discover the antioxidant activity of ethanolic extracts from *S. javanica* leaf by DPPH method has strong antioxidant activity. Meanwhile, research on antimicrobial activity and antioxidant activity in flower and fruit of *S. javanica* in fresh and infusion extract treatment has not been reported. Therefore, the authors are interested to conduct research about antimicrobial and antioxidant activity on *S. javanica* extract.



## 1.2 Problem formulation

Based on the information that has been described in the research background, there are several problems formulations, as follows:

1. How is the antimicrobial activity of *S. javanica* extracts against pathogenic bacteria and fungi?
2. How much is the MIC and MLC of *S. Javanica* extracts for each pathogenic bacteria and fungi?
3. How is the antioxidant activity of *S. javanica* extracts?

## 1.3 Research objective

To answer the problems that have been stated above, the objectives of this research are:

1. To test the antimicrobial activity of *S. javanica* extracts against pathogenic bacteria and fungi.
2. To determine the MIC and MLC of *S. javanica* extracts for each pathogenic bacteria and fungi.
3. To discover the antioxidant activity of *S. javanica* extracts.

## 1.4 Significance of the research

The results and data from this research are expected to be a source of scientific information about the potential of *S. javanica* as an antimicrobial and antioxidant, and also can be published in national scientific journals.

