

## I. INTRODUCTION

### 1.1 Background

Indonesia provides a wide range of biodiversity that can be used as raw materials for modern and traditional medicines. Traditional medicine has long been known and used by Indonesians to cure a variety of diseases. The rising cost of modern medicine on the market is one reason to reconsider the use of traditional medicine. Many different medicinal plants have been used as raw materials in Indonesia, and some of them have even been experimentally tested for phytochemical content, efficiency, and safety of usage (Akhyar, 2010).

Traditional medicine uses Christ's Thorn Jujube plant (*Ziziphus spina-christi* (L.) Desf.) as one of the herbs. It herb contains phenolic compounds that have a wide range of biological effects, including antioxidants, anti-inflammatory, antibacterial, antifungal, and tumor prevention (Prior *et al.*, 2003). Alkaloids, phenols, flavonoids, terpenoids, polyphenols, saponins, tannins, sitosterols, phytosterols, triterpenoids, and glycosides are some of the chemical components that function as treatments in the *Z. spina-christi* plant (Adzu *et al.*, 2001; and *et al.*, 2003). In Indonesia, *Z. spina-christi* is also known as "Tumbuhan Bidara Arab". *Z. spina-christi* is used by people all around the world to treat diarrhea, diabetes, fever, and malaria, and also beauty issues like acne, wrinkles, and dark circles under the eyes (Nugrahwati, 2016). *Z. spina-christi* leaves are used to cure diarrhea, vomiting, laxatives, skin infections, ulcers, liver ailments, rheumatism, asthma, and fever by the people of NTT in Indonesia (Fatmawati *et al.*, 2018).

Infectious diseases are one of the health-care issues that have been growing in recent years. Bacteria, viruses, fungus, and protozoa are among the microorganisms that cause infections (Mulyati, 2009). Many people choose antibiotics and other anti-infective medicines as their first treatment. Due to the establishment of resistance, one class of antibiotics is no longer utilized in therapy. Nevertheless, because antibiotics are expensive, the use of diverse plants in the treatment of infectious diseases may be an option for the Indonesian people (Wibowo, 2008).

Some Gram-positive bacteria are capable of causing disease in humans. *Staphylococcus aureus* is a normal flora in humans, especially on the skin; it can be found on the nose lining, skin, hair follicles, boils, and wounds (Irianto, 2006; Wasito *et al.*, 2008). *Bacillus subtilis* is a pathogenic organism that causes ulcers and food poisoning. *Bacillus cereus* is an aerobic Gram-positive rod-shaped bacterium that can form endospores and cause poisoning if a person consumes the bacteria or its spore form, reproduces and produces toxins in the intestine, or consumes food that already contains the toxin. Toxins that cause diarrhea and toxins that cause vomiting (emesis) are both produced by *Bacillus cereus* (Pratiwi, 2012). Skin infections, itching, and acne can all be caused by *Staphylococcus epidermidis* (Ashri, 2016). The results of Mardhiyani and Afriani's research (2021), indicated that a 70% ethanolic concentration extract of *Z. spina-christi* leaves can inhibit the development of *S. aureus* in the presence of an inhibition zone with a diameter of 12.25 mm.

According to preliminary research, infusion of *Z. spina-christi* leave extract can inhibit the growth of *S. aureus* bacteria by forming an inhibition zone. Based on this and given the lack of information on the potential of *Z. spina-christi* leaves extract

as an antibacterial against Gram-positive bacteria, an antibacterial test of Christ's Thorn Jujube (*Z. spina-christi*) leaves extract against Gram-positive bacteria was conducted.

## 1.2 Problem Formulation

1. Do fresh extract, infusion, and ethanol extract of *Z. spina-christi* leaves have antibacterial activity against Gram-positive bacteria (*B. cereus*, *B. subtilis*, *S. aureus*, and *S. epidermidis*)?
2. Which extract from *Z. spina-christi* leaves produced the greatest inhibition zone in inhibiting the growth of Gram-positive bacteria (*B. cereus*, *B. subtilis*, *S. aureus*, and *S. epidermidis*)?

## 1.3 Research Objectives

1. To clarify the antibacterial activity of fresh extract, infusion, and ethanol extract from *Z. spina-christi* leaves against Gram-positive bacteria (*B. cereus*, *B. subtilis*, *S. aureus*, and *S. epidermidis*).
2. To clarify the greatest inhibition zone of *Z. spina-christi* leaves extract in inhibiting the growth of Gram-positive bacteria (*B. cereus*, *B. subtilis*, *S. aureus*, and *S. epidermidis*).

## 1.4 Benefits of Research

It provides information on the antibacterial activity from fresh extract, infusion, and ethanol extract of *Z. spina-christi* against Gram-positive bacteria (*B. cereus*, *B. subtilis*, *S. aureus*, and *S. epidermidis*) and it is expected to provide scientific information on the potential of local wisdom of the medicinal *Z. spina-christi* as an alternative medicine to treat infectious diseases.