CHAPTER I. INTRODUCTION

1. 1 Background

Most Indonesians consume rice as their staple food. In Indonesia, the consumption level of the rice commodity can reach almost 120 kg/year, much greater than the world's average rice consumption, which is only around 60 kg/year (Hasanah, 2022). According to data from the Central Bureau of Statistics 2022, rice production in West Sumatra reached 1,482,996.01 tons in 2019 and continued to decline until 2021 where the rice production was only 1,317,209.38 tons. This is inversely proportional to the large population of West Sumatra, which increases every year. Since 2019 to 2021, in West Sumatra, there was an increase in the population of 1.92%. According to Sunani (2009), population affects rice consumption. Therefore, it is necessary to increase rice production.

Increasing crop production begins at the early stages of growth, namely germination. Improving germination quality can be done in various ways, one of which is with biopriming techniques. Biopriming is a seed-priming technique that uses biological agents in the form of beneficial microorganisms, such as nitrogen-fixing microbes or microbes capable of producing growth hormones (Livia *et al*, 2016). This biopriming technique is carried out by soaking seeds in a microbial suspension solution for a certain duration so that seeds can be improved in germination quality

According to Pawar dan Laware (2018), biopriming can increase germination, accelerate flowering, protect seeds from disease, and increase plant

adaptation to certain stress conditions. Many types of microbes have been used in research related to biopriming, including Trichoderma and Bacillus. According to Gusnawaty *et al*., (2014), these microbes can produce growth hormones such as gibberellins and IAA(Indole Acetic Acid) that can break seed dormancy and encourage seeds to germinate. Prathibha and Siddalingeshwara (2013) conducted research using *Bacillus subtilis* on several types of plants and found that these bacteria could inhibit plant pathogens and increase growth. In sorghum plants, this bacterium effectively increased seed germination, vigor index, and protein and carbohydrate content of the seeds. The use of *Bacillus subtilis* on pepper seeds was tested by Yildirim *et al*., (2021), and it was found that there was an increase in germination and seedling emergence characteristics of immature seeds and mature seeds compared to the control group. *Trichoderma harzianum* can increase seeds germination and vigor index in Kanchan, pioneer, and sweet corn varieties (Nayaka *et al*., 2010). Chickpea plants primed with *Trichoderma harzianum* showed longer seedling roots than other types of Trichoderma and control (Ali *et al*., 2014).

Several studies related to biopriming have been conducted on rice plants, as in the research of Razad *et al*., (2021) who tested upland rice by giving *Pseudomonas fluorescens* KLKU02. From this study, it was found that the application of *Pseudomonas fluorescens* KLKU02 was able to increase rice production compared to the control by 56.32%. As reported by Ashrafuzzaman *et al*., (2009), there was an increase in seedling height, dry seedling weight, root length, and dry weight in rice plants treated with rhizobacteria. Research on rice variety Inpari Unsoed 79 Agritan by Purwanto *et al*., (2022) primed with rhizobacteria from rice rhizosphere can

increase seed germination rate, seed vigor index, and early vegetative growth in rice. Several factors influence the success of the priming technique, one of which is the soaking duration. Soaking time treatment on seeds is carried out with the aim that seeds have more opportunities to absorb water to stimulate seed germination. Haerani and Nurdin (2021) tested *Trichoderma harzianum* on cucumber plants with various soaking times of 24 hours, 48 hours, and 72 hours. Soaking for 24 hours increased the germination rate of the plants to 94%. Then, soaking for 48 hours showed an effect on fruit length and diameter of cucumber fruit, which was higher than the other treatments and had a significant effect on the number of fruits. Then, for the biopriming treatment for 72 hours, the lowest results were obtained in each parameter. The variation in the length of soaking shows the effect on germination.

Rice plants are often affected by blast caused by the fungus *Magnaphorte oryzae*, which has caused 10% to 30% of global rice yield loss Ashrafuzzaman *et al*., (2009). The presence of this fungus will certainly cause a decrease in rice productivity. Therefore, it is necessary to control the disease, including the application of microbes that are antagonistic to *Magnaphorte oryzae*. Antagonism test is an evaluation of interactions between microorganisms to determine the inhibitory potential of a microorganism against other microorganisms The study by Yuliani *et al*., (2020) related to the antagonistic test of Dark Septate endophytic isolates against *Magnaphorte oryzae* showed the growth inhibition of *M.oryzae* fungus by Dark Septate endophytic isolates around 43.75%. This can certainly be used in attempts to control rice plant diseases. *Bacillus subtilis* and *Trichoderma harzianum* are a group of beneficial microorganisms for plants and

are able to produce compounds to increase the growth of a plant and a biocontrol agent. This can be seen from their ability to inhibit pathogen growth in antagonistic tests against *Fusarium* sp, *Collethroticum* sp, and other pathogens (Yu *et al*., 2021).

West Sumatra has wide local rice varieties, including the Anak Daro variety. The advantage of this variety is that many people favor it because it produces rice with delicious taste, fragrant, and soft texture. Considering the germination phase determines the subsequent growth phase, research is conducted to determine the effect of soaking duration in biopriming using *Bacillus subtilis* and *Trichoderma harzianum* on germination of rice var. Anak Daro.

1. 2 Problem Formulation

Based on the background that has been described, the problems in this study can be formulated, namely :

1. What is the effect of biopriming agents using *Bacillus subtilis* and *Trichoderma harzianum*, soaking duration and interaction of biopriming agents and soaking duration on the germination of rice var. Anak Daro ?
2. What is the viability of *Bacillus subtilis* and *Trichoderma harzianum* after biopriming?
3. What is the percentage inhibition of *Bacillus subtilis* and *Trichoderma harzianum* on the growth of the pathogenic fungus *Magnaphorte oryzae*?

1. 3 Research Objective

The objectives to be achieved in this study are :

1. To determine the effect of biopriming agents using *Bacillus subtilis* and *Trichoderma harzianum*, soaking duration and interaction of biopriming agents and soaking duration on the germination of rice var. Anak Daro
2. To determine *Bacillus subtilis*'s and *Trichoderma harzianum*'s viability after biopriming
3. To determine the percentage of inhibition of *Bacillus subtilis* and *Trichoderma harzianum* against the growth of the pathogenic fungus *Magnaphorte oryzae*

1. 4 Benefit of Research

This research is expected to provide scientific information about the effect of biopriming and variations in soaking time using *Bacillus subtilis* and *Trichoderma harzianum* on rice germination to produce good seed quality and growth.