PRIMA ITB 2020 - Pameran Virtual Riset, Inovasi dan Pengabdian Masyarakat ITB

Analysis of Gene Expression Related to Reactive Oxygen Species (ROS) in Rice Seeds (Oryza sativa subs Indica) with Extracellular Self-DNA Treatment

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Abstract

Abstract. The increasing global population demands a rapid increase in food supply. Alternative means of modern green efficient farming are required to continue supporting the population without further damaging the environment. Recent research reported that extracellular self-DNA (esDNA) serves as a prominent danger sensing, leading to augmented defense or inhibited growth. This pattern is a potential alternative to be explored to substitute the application of chemically-based herbicide that often harms the environment. Following esDNA recognition, the subsequent signaling pathway is known to involve membrane polarization, calcium signaling, reactive oxygen species (ROS) upsurge and changes in CpG DNA methylation. However, the general view of how metabolism and signaling pathways are orchestrated in response to esDNA recognition is not yet available. Thus, this research aims to investigate the effect of extracellular self-DNA in *Oryza sativa* by analyzing the expression of genes involved in the synthesis of ROS. In this study, the rice genomic DNA were fragmented using sonicator and applied to rice seedling in various concentration. The total RNA were then isolated from each rice seedlings. The expression level of CAT and SOD genes were measured and histochemical activity were observed.

Background

Alternative means of modern green efficient farming are required to continue supporting the population without further damaging the environment. Recent research show that extracellular self-DNA (esDNA) serves as a prominent danger sensing, leading to augmented defense or inhibited growth. This pattern is a potential alternative to be explored to substitute the application of chemically-based herbicide that often harms the environment. Following esDNA recognition, the subsequent signaling pathway is known to involve membrane polarization, calcium signaling, ROS upsurge and changes in CpG DNA methylation. However, the general view of how metabolism and signaling pathways are orchestrated in response to esDNA recognition is not yet available. Recently Mazzoleni et al., (2015a, 2015b) reported that extracellular self-DNA at certain concentrations could inhibit the growth of organisms from various taxa, including plants, bacteria, protozoa, fungi, algae and insects.

Objectives

This study aims to determine the effect of extracellular self-DNA in *Oryza sativa* by analyzing the expression level and activities of genes, such as superoxide dismutase (SOD) and Catalase (CAT), which involved in the synthesis of ROS.

Methods

1. **Determination of the effect of extracellular self-DNA in rice seedling (*Oryza sativa*)**
2. **Gene expression analysis related to SOD and CAT genes**
3. **Histochemical detection of Reactive Oxygen Species Activity**

Result and Discussion

The effect of extracellular self-DNA administration at several concentrations on the growth of rice sprouts

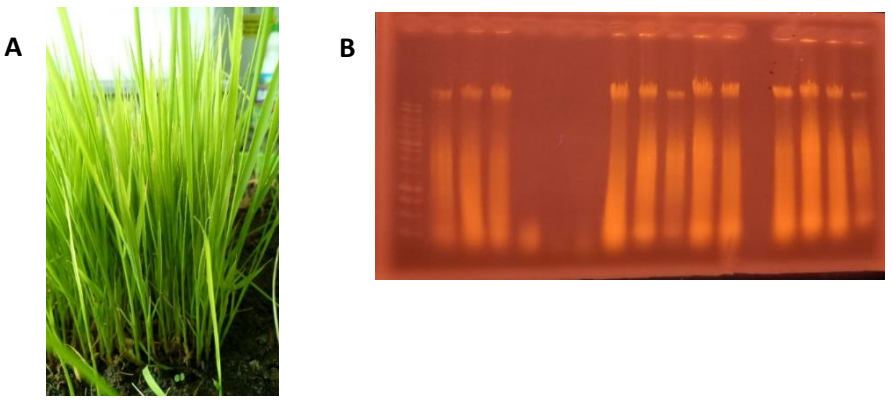

Figure 1. Rice plant for DNA isolation. (A) Isolated rice plant samples (B) Rice genomic DNA

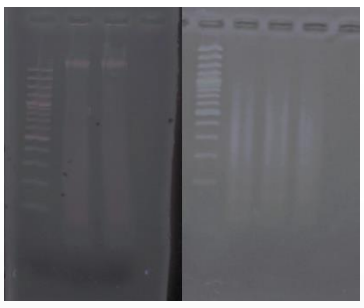

Figure 2. Sonication results of the rice genomic DNA

Figure 3. Supplementing extracellular self-DNA to rice seeds

Note: This is on going research and currently we are waiting for the result or qPCR analysis and histochemical result t conclude the experimet

Target Output

Scientific article in Q3 journal

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