Effects of Chitosan on the Upregulation of Peroxidase When Treated on Kernels

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INTRODUCTION

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The Hook: How does chitosan affect the upregulation of stress gene peroxidase when the kernels are soaked in chitosan?
The Gap: The current standard method falls short because there aren't enough experiments on the subject.
Peroxidase (POX) is an **enzyme** found in plants that breaks down **hydrogen peroxide**, because peroxide is harmful to plants [1][3]. It was observed that **chitosan influences the plant defense system, increasing the activity levels of peroxidases** [2].

VARIABLES AND PARAMETERS

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Independent variable: Chitosan
Dependent variable: POX Gene Expression
Controlled variable: Kernels
Critical concentrations: 1% Chitosan solution
Run-time: 1-2 weeks
Temperature: Unknown
Positive control: None
Negative control: Water, primer and enzymes
These controls validate our methodology and interpretation.

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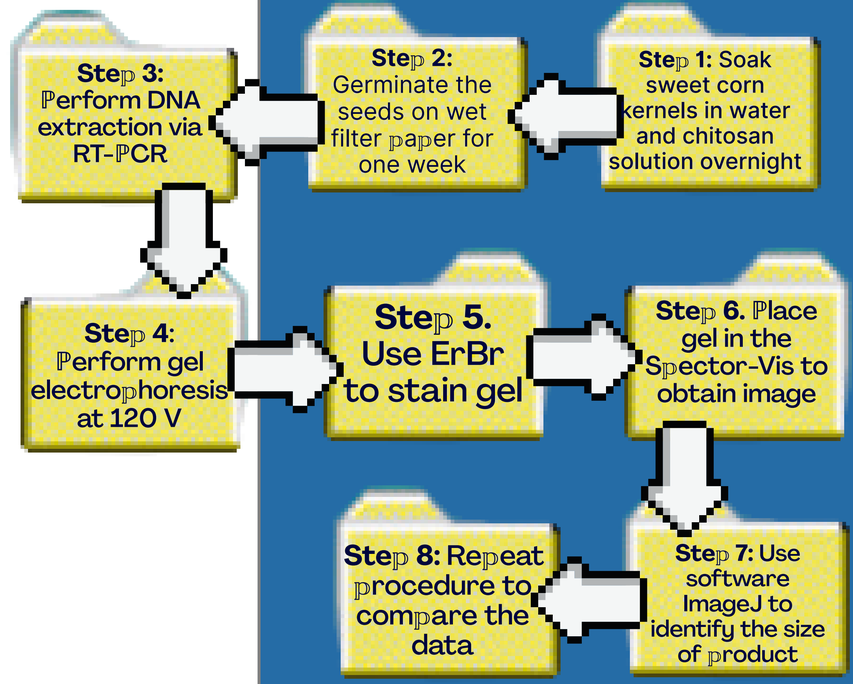

OUR RESULT

GOAL AND CRITERIA

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The goal of this project is to develop and validate a protocol for testing the ability of chitosan to activate/heighten the stress response gene expression, such as peroxidase (POX).

Success Criteria
The bands of the chitosan treated seeds' RNA are brighter.

STABILITY AND NEXT STEPS

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The significance of this experiment is to analyze the impact of Chitosan on the expression of the stress response gene.
We were looking for a POX band with the size of 340 base-pairs (bp) and we got a band size that was too big. The large band size shows that the RNA extraction was contaminated with DNA. For further studies we need to work on our POX primers.
Once the current protocol consistently produces clean, uncontaminated results and is fully certified, the first full-scale experiment we should conduct is a comprehensive dose-response study. This would involve testing a wide variety of chitosan concentrations, going beyond the initial 1% solution, to systematically map out how different levels affect peroxidase (POX) gene expression. This will help identify the precise, optimal dosage needed to maximize the plant's stress response activation.

POTENTIAL FAILURE POINTS:

Pipetting inaccuracies/human error.
Mistakes were also made when labelling and keeping track of solutions.
There are multiple factors that could've affected our results but since we failed to keep track of our solutions properly, we can't interpret our results.

ANTICIPATED OUTPUTS

CITATIONS
[1] Mohamed, S.A., et al. "Horseradish peroxidase and chitosan: Activation, immobilization, and comparative results." International Journal of Biological Macromolecules, p. 295-300. June 2013. doi: 10.1016/j.ijbiomac.2013.06.003
[2] López-Velázquez, Julio César et al. "High-Density Chitosan Induces a Biochemical and Molecular Response in Coffea arabica during Infection with Hemileia vastatrix." International journal of molecular sciences vol. 24,22 16165. 10 Nov. 2023, doi: 10.3390/ijms242216165
[3] Bansal, Neelam. Kanwar, Shamsher S. "Peroxidase(s) in Environment Protection." The Scientific World Journal, Hindawei Publishing Corporation. August 2013. doi: doi.org/10.1155/2013/714639

ACKNOWLEDGMENTS
First, we want to say a special **"Thank You!"** to our instructor, **Lauren Maniatis**. We give a shout out to **Mark Lee and especially Mann Zhou** for her amazing work on this project. Finally, we would like to say thank you to **WCC** for this opportunity.

ANTICIPATED OUTPUTS

The bands should be at around **343 base pairs**.

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