Evaluating the Effectiveness of Manoomin Hulls as Mulch

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Introduction

Manoomin, or wild rice, is culturally significant to the Anishinaabe people, traditionally used as a staple food source. The hulls, a byproduct of organic wild rice processing, were sourced from a local Indigenous producer. Despite their abundance, little is known about the potential of rice hulls as mulch in agricultural settings. This project investigates how wild rice hulls may enhance soil moisture retention and promote vegetable growth under drought conditions. The potential outcomes could offer practical applications in community gardens or larger-scale agriculture, where using locally sourced materials like organic wild rice hulls could enhance sustainability, promote water conservation, and support crop growth even under challenging conditions.

Research Questions

- How does the thickness of wild rice hull mulch impact soil moisture retention during drought conditions?
- How does the thickness of wild rice hull mulch affect soil temperature levels?

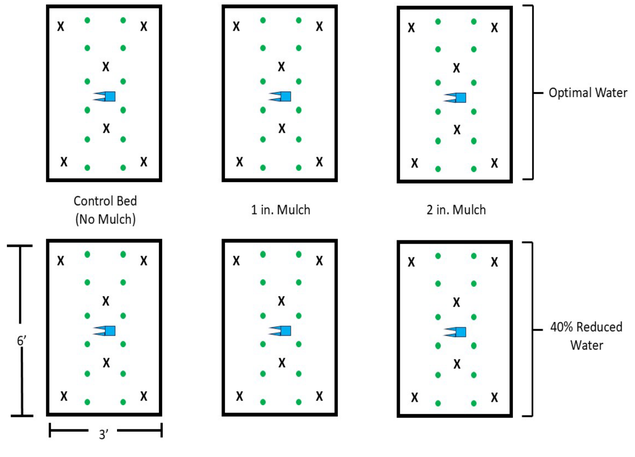
Objectives

- To evaluate the effectiveness of one-inch and two-inch layers of wild rice hull mulch in retaining soil moisture.
- To provide practical recommendations for using wild rice hulls in sustainable agriculture.

Methodology

Six raised beds were established in a high tunnel to simulate semi-controlled environmental conditions for vegetable growth. The beds were divided into three groups:

- Two beds with a one-inch layer of organic wild rice hull mulch.
- Two beds with a two-inch layer of organic wild rice hull mulch.
- Two beds with no mulch, serving as the control group.



Data Collection

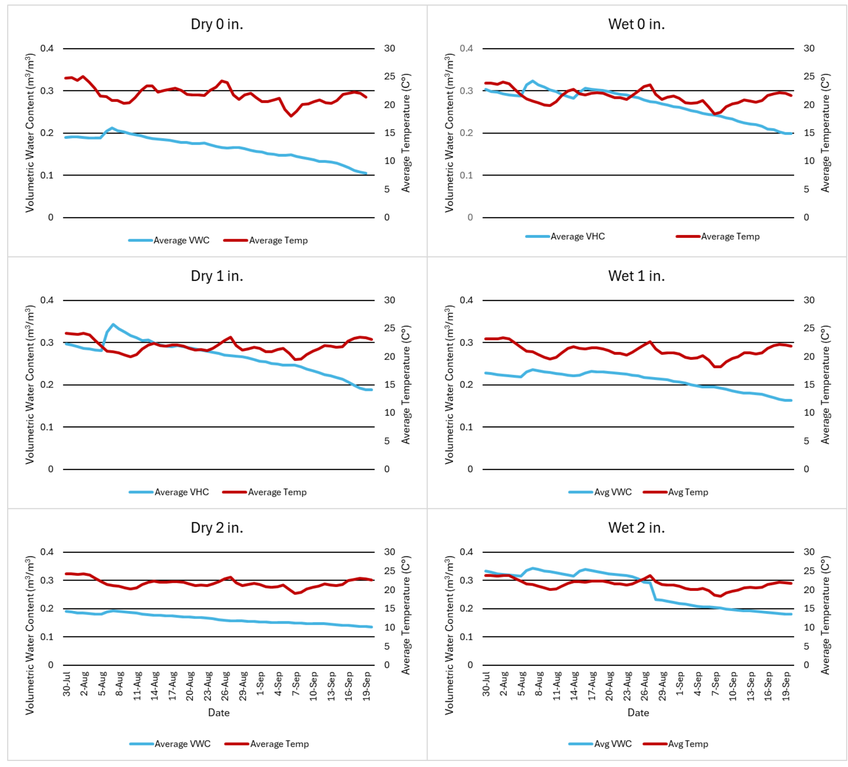
Drought Simulation: To simulate drought conditions, half of the beds (one from each mulch thickness and one control bed) where water was reduced by 40%. The other half received regular watering, allowing us to observe plant growth and soil conditions in both well-watered and drought-stressed scenarios.

Soil Moisture and Temperature:
These levels were monitored daily using the LabQuest device throughout the beds (6 total measurements) and the Hobo Sensor for continuous hourly data, with the addition of soil temperature. These measurements helped track how well each treatment retained moisture under both drought and well-watered conditions.

Air Temperature and Humidity (Weather conditions/Abiotic):
Hourly soil temperature data was collected via the Hobo Sensor, while the Hobo Weather Station tracked air temperature every 15 minutes. The Hobo Weather Station gathered data on wind speed, direction, air temperature and relative air humidity. This allows for a comparison of soil and air temperature fluctuations, especially during periods of peak heat, and highlights how mulch thickness influences soil temperature.

Results/Discussion

Our findings suggest that over time, wild rice hull mulch effectively retains soil moisture and helps regulate soil temperature, maintaining more consistent temperature levels compared to unmulched soil. However, as soil moisture levels declined, there was a corresponding increase in soil temperature. In some cases, more mulch resulted in greater moisture retention, but inconsistencies were observed, which may be attributed to variations in the watering schedule.



Future Research

Long-term Effects: How do wild rice hulls perform as a mulch over multiple growing seasons? Does their effectiveness in retaining soil moisture and regulating temperature decrease as they decompose?
Nutrient Contribution: Do wild rice hulls contribute to soil fertility over time? How do they affect nutrient cycling in the soil compared to other organic or synthetic mulches?
Environmental Impact: How does using wild rice hulls as mulch compare environmentally to other types of organic and synthetic mulches in terms of carbon footprint, decomposition rates, and waste reduction?

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