CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)
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Project Number
38118

Project Title
Effects of Water pH on Fodder Growth

Abstract

Objectives/Goals
To compare the optimal growth (dry mass) of barley (Hordeum vulgare L.) in various water pH ranges. Usually a neutral pH (6.5-7.0) is best for all plant growth, but I wanted to test a variety of pHs to clarify which aids the most growth measured by dry mass.
To determine if adjusting the pH ranges of water used in a hydroponic system would prevent mold growth.

Methods/Materials
I built the hydroponic system using PVC pipes and fittings, seed trays, plastic bowls, water pump. Rinsed 2,267 grams of barley seed by soaking the seeds. Measured 453 grams of seed into each of the 10 bowls. Filled water reservoir and tested water pH (changed pH if needed using pH up or down). Automatic timer watered for 5 minutes, 3 times per day. Day 7 measured the weight of the wet mass and dry mass using gram scale. Put fodder samples in a convection oven to find dry mass (150 F° for 3 hours).
Independent Variables: Water pH ranges: 6.0 (acidic), 7.0 (neutral), 8.0 (alkaline), 10.0 (alkaline)
Dependent Variables: Fodder dry mass and mold growth
Controlled Variables: amount of seeds, room temperature, soaking time, watering time and frequency

Results
Average dry mass of pH levels: pH 6 was 48.5g, pH 7 was 72.4g, pH 8 was 101g, pH 10 was 52g. The average dry masses of the fodder samples were compared to the growth for a pH of 7 because pH 7 is neutral or just water. On average, the growth of the control (pH 7) was adequate compared to the other pH levels.
Percent Change in Average Growth: between a pH 7 and pH 8 was a 39.5% increase in growth; pH 6 had a 33.01% decrease in growth; pH 10 had a 28.18% decrease in growth.
Mold was present in pH levels of 6 and 10. There was no mold growth in pH levels of 7 and 8.

Conclusions/Discussion
Controlling the pH was found to be important to maximize growth and minimize mold. After completing the investigation on the optimal pH range for the growth of fodder, the original hypothesis was correct, a pH range of 7-8 was the overall best, but a pH of 8 is the most optimal for the growth of fodder. By adjusting the pH range from 7 (neutral) to 8 (alkaline) had a positive effect on fodder growth. Water levels that are too acidic (less than 7) or too alkaline (greater than 8) do not promote optimal fodder growth. The water pH range does affect mold presence.

Summary Statement
I investigated the effects of water pH on the growth of fodder to determine the optimal growing range.

Help Received
I built and conducted the project on my own.