CALIFORNIA STATE SCIENCE FAIR
2016 PROJECT SUMMARY

Name(s)

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Project Number

36102

Project Title

Heat Controlled Eradication of Fungus

Abstract

Objectives/Goals

The purpose of this study is to learn how to kill pathogens with heat treatment with as much energy efficiency as possible by determining whether, in a controlled environment, high temperatures set for a short amount of time will be more energy efficient at destroying pathogens than lower temperatures set for a longer amount of time.

Methods/Materials

Attached an immersion circulator to a pot, set it to a desired temperature after filling the pot with water, and submerged sealed petri dishes containing agar and a solution of penicillium candidum and water. One petri dish was left outside as a control. At repeated intervals, one petri dish was removed. Growth rates of the culture were measured afterwards.

Results

Multiplying the degrees above 70 degrees Fahrenheit that the immersion circulator was set to during an experiment by the amount of minutes that a petri dish in that experiment was submerged for, it was determined the amount of energy added to the system to kill the pathogens.

For the experimental run performed at 160 degrees Fahrenheit, the kill was complete within ten minutes. So the heat input above room temperature (90 degrees) was multiplied by ten minutes to determine an energy consumption of 900 Energy Units.

For the 145 degrees Fahrenheit experiment, a kill was achieved in a petri dish that was submerged for 15 minutes. The degrees above room temperature (75 degrees) multiplied by 15 minutes submerged equaled 1175 Energy Units

For the experiment run at 120 degrees Fahrenheit, no kill was achieved. The highest submersion time of petri dishes was 40 minutes in this experiment. The degrees above room temperature (50) multiplied by 40 minutes submerged determined 2000 Energy Units.

Conclusions/Discussion

Based on observations of the growth of a culture of penicillium candidum inside sealed petri dishes that were submerged in water heated to a desired temperature, it can be concluded that a sealed petri dish containing a culture of penicillium candidum that was submerged in water heated to a desired temperature would have the culture that it contains killed with maximum efficiency if it was submerged in this water

Summary Statement

My partner and I submerged sealed petri dishes containing a culture of penicillium candidum into heated water, and found that high temperatures set for long times or lower temperatures for long times are more efficient at killing pathogens.

Help Received

Dr. Adrian Land, Steve Carlson (father), Illya Vinogradsky(partner's father), and Dr. Jayne Hastedt