CALIFORNIA STATE SCIENCE FAIR
2010 PROJECT SUMMARY

Name(s)
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Project Number
J1132

Project Title
Will the Addition of Polyacrylamide to Hydrophobic Soil Affect Its Ability to Allow Water Percolation?

Abstract

Objectives/Goals
The purpose of my science project is to determine if the addition of polyacrylamide (PAM) will help water percolate through a hydrophobic layer of soil. This is a water repellant layer of soil that often forms 3 to 5 inches below the top soil after an intense forest fire. This is important because hydrophobic soil causes greater runoff which contributes to post fire mud slides and depending on the thickness of the hydrophobic layer it could take years for the water repellancy to go away. My goal is to speed up the rehabilitation process of the hydrphobic soil.

Methods/Materials
I collected coarse, upland soil and covered it with dried leaves and wood. With supervision, I burned the organic material for 8 hours and then let it cool. I did a WDPT test to determine if the soil was hydrophobic. I had 5 test soils: untreated soil, hydrophobic soil, hydrophobic soil & linear PAM, hydrophobic soil & crosslinked PAM, and hydrophobic soil with both linear & crosslinked PAM. I placed 1 cup of test soil into a clear tube that is standing on wire mesh with a measuring cup underneath. I had 147.8ml of water rain into the clear tube and measured the time it took and the amount of water that percolated the soil. I repeated this test for a total of 10 trials per test soil.

Results
The results show that the addition of both linear and cross-linked PAM actually made the water repellency worse. Untreated soil allowed an average of 84.2ml of water to percolate the soil and collect in the measuring cup in 30 minutes. Hydrophobic soil allowed an average of 42.5ml of water percolation in 30 minutes. Hydrophobic soil with linear PAM had only 28ml of percolation while Hydrophobic soil with cross-linked PAM had 33ml of water percolation. The hydrophobic soil with both linear and cross-linked PAM had an average of 31.9ml of water percolation in 30 minutes.

Conclusions/Discussion
After completing my investigation I found that the addition of both linear and cross-linked PAM to hydrophobic soil made the soils water repellency worse. These findings are very important because both linear and cross-linked PAM are widely used today to prevent soil erosion and to retain water, but applying PAM to a post fire hillside could possibly contribute to a mudslide. I believe that finding a way to help rehabilitate hydrophobic soil would be both economically and environmentally beneficial.

Summary Statement
The purpose of my project is to help rehabilitate hydrophobic soil by increasing its ability to allow water percolation using both linear and cross-linked polyacrylamide.

Help Received
Mother photographed the testing process; Father supervised the creating of hydrophobic soil; Dr. Bob Sojka guided me to accurate research; Dr. Rodrick Lentz supplied the polyacrylamide; Peter Wohlgemuth helped with forest fire research