CALIFORNIA STATE SCIENCE FAIR
2006 PROJECT SUMMARY

Name(s)
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Project Number
J1140

Project Title
A Study of Performance Fabrics: Staying Warm Wet or Dry

Abstract

Objectives/Goals

I would like to determine which fabric, commonly used in outdoor performance clothing, is the best insulator that will keep me the warmest while I am camping and hiking. Since it is often cold and raining when I go camping, my project tests the fabrics in both dry and wet conditions.

I evaluated seven fabrics, two wools (worsted & knit) and five specialty polyester fabrics made by Malden Mills. I hope this experiment will be of benefit to me and my fellow campers in selecting the best clothing for cold and rainy environments.

Methods/Materials

Use the Boxcar software to launch the HOBO data logger; setting the reading interval at 15 min. and the start times. Wrap each jar with an 18cmx36cm performance fabric. Heat ten liters of water to 50°C, pour 900 mL of water into each jar. Put on lids and place sensor through the lid. Put the jars on the insulating pad in the refrigerator. Plug the temperature sensors into the Hobo data logger. Turn on fan. After four hours, unplug the sensors from the Hobo data logger and plug the data logger into the computer and download data to Boxcar software. Repeat the Dry Trial experiment for a total of four replicates. For the Wet Trial, add 30mL of 20°C water to each fabric before placing jar in refrigerator. Perform a total of four replicates. Export all data to Excel to create data tables and charts.

Results

Thermal Pro was the best insulator in the dry trial of the seven performance fabrics tested. Following the Thermal Pro, the three Polartec Classics and the wool knit fabrics performed about the same. In the lowest tier, the worsted wool and Power Shield performed about the same as the control.

In the Wet Trial, wool knit was the best performer closely followed by the Polartec Classic 300. Both of these easily outperformed the other five fabrics.

Conclusions/Discussion

Polartec Thermal Pro was clearly the best at insulating in the dry experiment. My first surprise was how well the wool knit performed compared to the four Polartec fabrics. In the wet trial, the wool knit surprised me again. It came in first over-all. Polartec Classic 300 placed 2nd followed by Thermal Pro. Thus, I learned that in cold and dry weather, I will be happiest in my Thermal Pro jacket. But, if it is cold and rainy, I will go out wearing a wool knit (and a rain coat). I may have found the key to being both a warm & happy camper.

Summary Statement

I evaluated seven performance fabrics to determine their relative insulating capabilities under dry and wet conditions.

Help Received

My teacher, Amy Talbot, helped organize my project. Malden Mills provide the Polartec fabrics. My mother helped with the board. My grandmother loaned me the jars. My dad loaned me the data logger and showed me how to create graphs and tables in Excel.