

Thermocouple Lab Report, additional instructions (this replaces p. D-2 in your lab manual)

You are receiving an Excel file of all the data—use this to do calculations and to prepare graphs.

(NOTE: If you do not know how to use Excel to construct graphs, or to calculate averages of columns of numbers, or if you'd like some tips or instructions, please ask Edwin to show you. You may use other graphing software if you wish, but Excel is easy and adequate for this report.)

1. Calculate the average temperatures for each treatment, date/time, and depth; ie, adjacent to the 12 columns of numbers, you will calculate averages of A and B replicates and end up with 6 columns, one for each treatment. **Read the note about potentially bad data on the spreadsheet, before you do your calculations!**

2. You should then prepare the following 3 graphs:

(With Excel, I'd suggest X:Y(scatter) plot with lines connecting the points, with decimal day as X-axis, and with y-axis scale starting at 10 °C and going to 35 °C.)

Graph 1 - Temperature at 2.5 cm (1 inch) depth vs. Decimal day, for all 6 treatments (6 lines on same graph)

Graph 2 - Temperature at 30 cm (12 inch) depth vs. Decimal day, for all 6 treatments (6 lines on same graph)

Graph 3 - Temperature at both depths (2.5, 30 cm) vs. Decimal day, for the bare soil, clear plastic, and straw treatments (6 lines on same graph).

3. Include answers to the following questions in the discussion portion of the lab report:

Graph 1 - how did the treatments affect soil temperature, and why? How did the time of day affect the order of the treatments, and why? Observe both the overall temperature trends, and the degree of variation, for the different treatments. Some specific questions to guide you include:

--Which treatment had the highest temperature almost all the time? Why?

--Which treatment varied the most? (readily observable by lines crossing over each other, being higher than most treatments at some times and lower than most at other times). Why?

--The bare soil also varied a lot, but not as much as the treatment you identified above. Then there were 2 treatments that had relatively small variations across the measurement period—which 2 treatments were these? Why did they vary the least? (you should relate this to some of the discussion in your text or in lectures on soil temperature).

--Of the two mulch treatments (straw, woodchips), which one was the warmest overall? Why? Or if they were not much different this year, why do you think that might be?

Graph 2—

--Were overall temperatures similar to graph 1 or were there less extremes than at the 2.5 cm depth? Why?

--Were variations from day to day about the same order of magnitude as at 2.5 cm, or were they smaller (“damped”)? Why?

--Which treatment had the highest temperature almost all the time? Why?

Graph 3—here you are comparing a subset of the treatments, but both depths at the same time.

--Note that there is “crossover” of the lines for the 2.5 cm and 30 cm depths for all treatments, but especially two of the three—ie, in late afternoon the temperatures were warmer near the surface (2.5cm) than at 30cm, while in the AM they were colder at 2.5cm than at 30cm. With the exception of Decimal Day 20.537, which treatments had this effect most pronounced? Why? Again, what concepts from lecture does this illustrate?

You might also consider weather conditions (rain, cool days or nights) and discuss any effects that are observable. Remember to consider the time of year when these treatments were established and measured! i.e., soil treatments imposed in August, when the soil is already warm and the surface soil may be starting to cool down, could show different responses than when soil treatments are imposed in early spring while soil is still cold.

References-- Methods (1986), Chapter 37.