**Laboratory** 4**: Winter Rye Data Collection/ Lab Report - Effects of road salt on winter rye**

**Data Collection:**

Today we will be collecting our data and then cleaning up the experiment. For each pot, you will collect two points of data with which we will evaluate the results of the experiment: germination success and average shoot length per pot. Then we will combine the results on the board, and into a file posted on Sakai you will use to complete the lab report. Each group should get their pots and perform the following steps:

1. Count and record all of the shoots per pot for germination success. Any shoot that has broken the soil and is vertical will count as a germinated sprout. Make sure to record the treatment for each of the pots.

2. Using the rulers provided measure the length of all shoots, in millimeters (mm), for each pot. This will be the smallest gradation on the rulers, each one being one millimeter. The marked centimeters are each equal to 10 millimeters. Take the average length by adding all of the shoot lengths per pot and dividing by the number of shoots in that pot. Record only the average length of the shoots that sprouted in each pot, also taking care to note the treatment of the pot.

Once all the data is collected, clean up your work area. Everything goes back where you found it and countertops should be cleaned. Dump the plants and soil in the bin provided and stack the cups by the sink.

**Data Sheet**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Measurement | T1 | | | T2 | | | T3 | | |
| Pot # | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 |
| # of Germinations |  |  |  |  |  |  |  |  |  |
| Average Shoot Height |  |  |  |  |  |  |  |  |  |

**Lab Report General information**

* Should be typed, single spaced, standard margins; 4 - 5 pages in length (not including Cover Page)
* Should be in scientific format with Cover Page, Introduction, Materials and Methods, Results, Discussion, Conclusion and References
* Lab report is due by the end of the day on **3/19** (no class that day due to spring break); report will be submitted through Turnitin
* **Title:**The title should indicate what kind of experiment you did: e.g. “Effects of salt on germination and growth of winter rye”. Titles should always encapsulate the spirit of the research and some- times the results, though conciseness is a virtue here.
* **Introduction:** This section should provide background, rationale, and approach, and include your hypothesis
  + *Background*: Information about what others have done before you relative to your research, information about the system (plants and road salt), and an introduction to the problem being studied: Why would this experiment be relevant? e.g. use of road salt on highways and  what happens to it, why organisms would be affected, how much we use, etc.
  + *Rationale:* Overlaps with background. State the problem: why are you doing this experiment? And what is your hypothesis? This needs to be a clear statement about how you believe the results will turn out.
  + *Approach:* A very brief description of how you intend to accomplish this, in a sentence or  two summaries.
* **Materials and Methods:**  Include a description of what you used to conduct the experiment and your experimental design. Remember, this section needs to provide all of the necessary information so if somebody would to read your report they would know what to do and how to do it. What was the experimental design? What were the treatments and the amounts used? How many replicates were there per treatment? How where the pots constructed and deployed? What materials and time intervals were used for the experiments?
* **Results:**  Here you present the raw results of the experiment which may include figures, tables, diagrams etc. accompanied by some descriptive text. As usual, a summary of the results also highlight data trends in order of presentation.
  + Label tables and figures in order of appearance; remember that all tables and figures need to have a caption, not just a title!
  + There will be *two tables and two graphs* for this experiment, as described below*.*
  + Two tables reporting the results of statistical tests; one for number of sprouts and one for the shoot length in each pot.
    - Statistical table – results of t- tests performed on groups of pots from the entire class – will show the results of the comparison between control and dilute, control and full, and full and dilute  o *I will provide the information on the stat test after the class results are in and post it onto Sakai.*
    - Each table will have two columns: one should be the comparison type (i.e. control vs. T1, etc.) and the other should be the p- value obtained in the test.
    - This allows you to say with a certain degree of probability that your hypotheses are re- jected or supported, usually this is agreed to be 95% probability of being correct (*P* < 0.05; or value =0 .05).
    - Conversely, this also means there is a 5% or less probability of an error by chance.
    - You must include properly done t- tests in your report as well as discuss the tests in the  results and discussion sections or don’t expect a good grade on the report!!!
  + Two figures, one for germination success and one for shoot length; the averages over all pots of each treatment. Therefore, each of the two figures will have three columns.
    - Should be column graph, x axis will be the treatment (and replicate), y axis will be either germination success or shoot length (two different sets of units).
    - Must be referenced in the accompanying text of the results section.
    - While you should indicate data trends in the results, you must save the part where you try  to explain why you got the results you got for the.....
* **Discussion:** Explanation of results.
  + Each discussion should minimally answer the following questions:
  + Was my hypothesis supported or rejected? Or some combination of both?
  + Why do you think you got the results that you did? How does what you learned in your background research help explain the results obtained? Are there any alternative explanations for the results obtained?
  + What are the bigger implications of the results: how does this piece of the puzzle fit in?
  + What does this experiment potentially say about how road salt runoff could potentially  impact plant growth in bordering areas?

* **In general :**
  + Write in a passive style and avoid fluff! Scientific writing is very direct and to-the-point.