**Worksheet**

Before the experiment:

It’s important to keep good records when doing an experiment, so document the experimental setup.

**Independent Variable** (what we are changing): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Dependent Variable** (what we are observing): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Control Variables** (what we are keeping the same between groups): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Number of **replicates** are we testing for each treatment: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Document the substances you are testing:

**Substance A** : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Substance B**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Write below what you hypothesize will happen in this experiment.

**Hypothesis:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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During the experiment:

**Fill in the table each day with your seed counts.** Each day, all bags should have 10 total seeds. On Day 3, calculate percent (%) germinated seeds for each bag using this equation:

**Table 1. Seed Toxicity Test Results**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Bag # | **Dose**  (Substance Concentration) | **Response** | | | | | | |
| Day 1  # of seeds… | | Day 2  # of seeds… | | Day 3  # of seeds… | | |
| Germinated | Not  Germinated | Germinated | Not  Germinated | Germinated | Not  Germinated | Percent (%) Germinated |
| 1 | 0% (Control) |  |  |  |  |  |  |  |
| 2 | 50% A |  |  |  |  |  |  |  |
| 3 | 75% A |  |  |  |  |  |  |  |
| 4 | 100% A |  |  |  |  |  |  |  |
| 5 | 50% B |  |  |  |  |  |  |  |
| 6 | 75% B |  |  |  |  |  |  |  |
| 7 | 100% B |  |  |  |  |  |  |  |

**Record observations from the experiment.** Where did you keep the seed bags? Did any of the seeds do anything unusual? Did anything not go according to plan? How did you decide when to count a seed as “germinated”?

After the experiment:

**Construct a dose-response plot for your data using the space below.**

1. Draw x and y axes. Label the x “Dose” and the y “Percent Germinated Seeds” and add numbers to the axes.
2. Plot the percentages of germinated seeds (Day 3) for each of the different doses for each substance. If possible, use a different color for each substance.

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**Discussion Questions:**

1. Was Substance A more toxic to the seeds than Substance B? How does this compare to what you hypothesized?
2. Looking at your results, would you classify these substances as toxic, non-toxic? Provide evidence.
3. Why might one chemical be more toxic than another?
4. What were some potential sources of **error** in our experiment?
5. If you did this experiment again, what would you do differently?
6. How well can plants help us to predict whether chemicals will cause toxicity in humans? Are there other model organisms that could enable us to make better predictions? Why?