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# *Mimosa pudica* as an experimental organism for Botany Lab

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## **Abstract**

*Mimosa pudica* (sensitive plant) was used as an experimental organism to allow Botany students to design original experiments. Students were introduced to the topic of plant movements and provided with general information about *Mimosa pudica*. The students were then posed with the challenge of characterizing the response of the plant to physical stimulus. Specific questions addressed included “is response time and /or recovery time dependent on leaf size,” “is leaflet folding dependent on adjacent leaflet responses,” and “which part of a leaflet is most sensitive to movement or touch?” In assessment of the experiment I asked students to comment on the most and least understandable parts of the lab and what would they change about the exercise. The only change suggested was to have the plants further apart in the lab room to reduce interference by other groups. The least understandable parts were how the plants were able to move and why they were not consistent in their responses. This exercise can be used at any level of botany and increased in sophistication to be adapted for a plant physiology course.

## **Introduction**

The movement of plant organs in response to environmental stimulus is an interesting phenomenon and can serve to heighten the interest of students in the study of botany. Simple experiments involving tropic responses are routine in many botany courses, but are not appropriate for single class periods. The response of *Mimosa pudica* to seismic stimulus is immediate and captures the attention of anyone observing it. Even Charles Darwin was intrigued enough to devote time to describing the leaf-closing response of this plant to external stimuli.

*Mimosa pudica* is a short-lived sub-shrub that is native to Brazil but has become pan-tropical. It has prickly stems that can grow to a height and spread of one meter. In some areas it is considered a noxious weed. *Mimosa* can grow in most well-drained soils with high or low nutrient availability but is not shade tolerant. As a member of family Fabaceae, the roots of *Mimosa* contain nitrogen-fixing nodules. In cultivation the plant will produce pink fluffy flowers from which viable seeds may be collected.

The purpose for developing this lab exercise was to allow students to practice experimental design and observe plant movements in response to stimuli in a single laboratory period.

## Procedure

### Before Lab

Students were introduced to the concept of plant nastic responses in lecture. The response by *Mimosa* to vibration was demonstrated.

### Experimental Design

Prior to lab, students were instructed to design group experiments to address the following questions:

1. What is the response when the plant is stimulated?
2. Which part of the plant is most sensitive to stimulus (touch, movement, light)? (i.e. where must you touch the plant to get the response)
3. How fast is the response?
4. What is the recovery time?
5. Is the response all-or-none or can you get a partial response? (Do all leaves respond, or only those stimulated?)
6. What level of stimulus is required to get a response?

They were encouraged to develop their own questions for testing.

### In Lab

Students worked in groups to collect data to answer their questions. Groups could work collaboratively to provide replication due to the low number of plants available.

### Reporting the Results

Student reports followed the format of a scientific paper and included a minimum of one table or graph and three references. In the final reports students addressed their questions as well as the following:

- What is the mechanism for the response?
- How is this response different from tropic responses?
- Do your results agree with published research?

## Hints for Working with *Mimosa pudica*

The plant is very sensitive to low temperatures and vibration. It will close its' leaflets if the room is too cold or if it is shaken during transport. As the students found, recovery time is highly variable so the plants should be held in the room in which the experiments will take place for at least 24 hours prior to lab time to acclimate.

The plant can be started from seeds and will set viable seeds in cultivation. Propagation information often suggests soaking the seeds in warm (boiling!) water overnight and then planting only the seeds that swell. I started seeds with and without soaking with nearly equal success. The plants we use are two to three months old with three or more fully expanded leaves.

All parts of the plant are potentially toxic and should not be ingested.

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## Evaluations

Students were asked to comment on the most and least understandable parts of this exercise and to suggest changes to the experiment.

### Selected responses from student evaluations

- Keep the groups of plants further apart to reduce interference by people walking by.
- Least understandable part: how the plants were able to move and why they were not consistent in their responses

## Suggested Literature

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