

Unit 5.3

Plant Biology

Lab Exercise

Lab Activity

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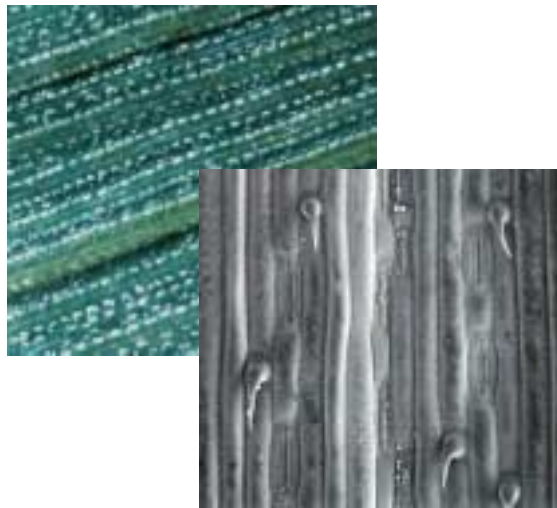
- *Performance Objectives*

To assess some of the technical and biological issues which impinge on the use of plants in a Controlled Life Support System.

- Relationship between chamber relative humidity and plant transpiration
- Seed structure, manipulation and immobilization
- Relationship between light and photosynthesis as a measure of CO₂ drawdown
- Relationship between soil matrix structure and soil moisture content

- *Materials*

- Seeds (wheat and arabidopsis)
- Leaf matter
- Microscopes
- Potometer
- Soil Moisture Analyzer
- CO₂ Analyzer
- Immobilization material
- Forceps
- Holding Chamber



- *Procedures*

Activity 1: Identifying the relationship between chamber relative humidity and plant transpiration

- View leaf material under the microscope
 - Identify Leaf 'stomata' and 'trichomes'
 - Comment on the difference of the test samples
- Familiarize yourself with the design and function of the 'Potometer'
 - Measure the transpiration rate of the test specimen in an 'open' and 'closed' chamber environment.
 - Comment on the observation

Consideration: What other techniques could you use to measure plant transpiration in your Earth office and in space flight conditions ?

Procedures (continued)

Activity 2: Seed structure, manipulation and immobilization

- a. View seed material under the microscope
 - Wheat (*Triticum aestivum*)
 - Arabidopsis
- b. Use forceps to manipulate and immobilize seed onto support posts



Consideration: Approaches that could be used in the large scale manipulation and sowing of 'monocot' and 'dicot' seed in space flight conditions.

Activity 3: Relationship between light and photosynthesis as a measure of CO₂ draw down

- a. Familiarize yourself with the Carbon Dioxide analyzer and plant chamber set up.
- b. Measure the CO₂ profile in the plant test chamber
 - At a low light level
 - At a high light level
 - In the absence of light

Activity 4: Relationship between soil matrix structure and soil moisture content

- a. Familiarization with soil samples
- b. Hydrate soil samples
- c. Measure the moisture content of the soil samples with soil analyses

