**Exercise 16 — Secretory Structures**

**Objectives:**
By completing this laboratory session you will be able to:

1. Identify the types of internal and external secretory structures commonly found in plants.
2. Describe some of the ways in which insectivorous plants are uniquely modified with secretory structures.
3. Understand how trichomes may be modified for various types of secretion.
4. Identify hydathodes and understand how they function.

**Materials:**
In addition to the basic equipment for preparing slides, you will need the following plant materials and stain:

- *Lycopersicum esculentum* (tomato) – young plants
- *Nerium oleander* (oleander) - stem
- *Impatiens* sp. (touch-me-not) - stems and petioles (optional)
- *Mentha* sp. (mint) - leaves
- *Ficus* sp. (rubber tree) - leaves
- *Brassica* sp. (cabbage) – prepared slides
- *Drosera* sp. (sundew) - tentacles
- *Euphorbia* sp. (spurge) – leaves
- *Citrus limon* (lemon) - peel
- Sudan IV, toluidine blue-O & phloroglucinol stains
- *Musa* sp. (banana) prep slide
- *Pinus strobus* (pine) – needles and stem
- *Pine* needles and stem

**Laboratory Exercises:**

- **TRICHOMES:** Prepare paradermal sections or a segment of a leaf tip whole mount from *Lycopersicum esculentum* (tomato) and *Mentha* sp. (mint) and examine trichomes under the microscope. Pick one species and answer the following:

  Which species selected? ______________________. What type(s) of secretory trichomes do you see? ___________________________________________.

  Draw the trichome(s).
• Observe the tentacles of a *Drosera* sp. (sundew) leaf under the dissecting scope. Isolate individual tentacles and observe under the compound microscope. *Optional*: stain with phloroglucinol.

What type of trichome is a tentacle?___________________________________________

Draw a tentacle and label the following: head, stalk, endodermoid cells with Casparian strips, and tracheids.

• **LATICIFERS**: Using *Euphorbia* sp. (spurge) or *Nerium oleander* (oleander), take a drop of latex and place it on a slide with a drop of Sudan IV. Examine at higher magnification for emulsified lipids. Use polarizing filters if desired.

Cut paradermal sections of leaves of *Euphorbia* to examine laticifers (stain with Sudan IV).

What color is the latex stained?______________________________________________

Using *a prepared slide of Musa* sp. (banana) draw and label the laticifers from the cross-section.
Cut cross-sections of *Ficus* sp. (rubber tree) to observe lithocysts in the epidermis. Draw and label a lithocyst and the cytolith in the epidermis.

What is a lithocyst? ________________________________________________________________

What is a cystolith (composition)? _________________________________________________

**OIL CAVITIES AND RESIN DUCTS:** Cut cross and paradermal sections of *Citrus limon* (lemon) peel and observe oil cavities. Most cavities are lysigenous, but some may be schizogenous.

If an epithelium is present, did it arise via schizogenous or lysigneous development?______________________________________________________________

Cut cross-sections of pine (*Pinus strobus*) needle and young stem and look for resin canals. **Draw** a resin canal within either a needle or stem and label as appropriate the canal, epithelial cells, mesophyll, epidermis, phloem or xylem.

**HYDATODES:** Using prepared slides of *Brassica* sp. (cabbage), **draw** the hydathode, guard cells and epithem region.
What are the significances or functions of hydathodes? _________________________________
___________________________________________________________________________

Observe a Mentha sp. (mint) leaf tip, under light microscopy. Look for hydathodes.

• **PEARL GLANDS:** Pearl glands are small stalks with globular heads. Stain isolated pearl glands from *Impatiens* sp. (touch-me-not) and paradermal sections of stems at the sites of pearl glands with Sudan IV. The lipids should stain red. Ants, in a type of mutualism, harvest the lipids. **Draw and label** what you see.