

# PLANT BIOLOGY LABORATORY MANUAL

## ETHYLENE-INDUCED EPINASTY OF TOMATO PLANTS

Copyright - R.Locy, 1998

### Introduction:

Ethylene is a naturally occurring, gaseous plant hormone. Among the known hormones in both plants and animals, ethylene has the simplest chemical structure consisting of 2 carbon atoms and 4 hydrogen atoms. Ethylene is made from the amino acid methionine in response to a variety of stimuli including: environmental stress, mechanical stress, wounding, pathogen infection, auxin treatment, and during the ripening of many fruits. Ethylene produces a number of growth and developmental responses in vegetative and reproductive tissues including: leaf epinasty, radial swelling, stem and hypocotyl growth inhibition, increased curvature of the apical hook, ripening responses, accelerated senescence, and isodiametric cell division and elongation in meristems.

In this experiment we will examine both the synthesis of ethylene in response to wounding in apple fruit, and the apparent effects of ethylene gas on leaf and petiole epinasty in tomato seedlings.

### Materials:

- 2 Tomato plants (at least 1 month old)
- 2 large plastic bags big enough to hold the plants (with ties or other closures)
- 2 ripe apples
- Knife or peeler

### Procedure:

Place the two tomato plants in the two plastic bags, and peel the apples. Dice the remainder of the apples, and place both apples with the peelings in one of the two bags. The bag without the apple will be the control plant, and bag containing the apple will be the ethylene-treated plant. Note that the wounded apple tissue produces copious quantities of ethylene gas, and thus you are using the apple tissue as the source of ethylene. Close the two bags using the ties provided and set them aside in a undisturbed part of the lab until next week's lab period (at least 24 hours).

After at least 24 hours of treatment, open the bags and visually evaluate the plants. Pay particular attention to the degree of curling of leaves, and the angle formed between the leaf petiole and the stem of the plant. Record your observations in Table 1, and supplement your description of the plants by sketching the control plant in Figure 1, and the ethylene-treated plant in Figure 2.

**Table 1.**

<b>Control Plant</b>	<b>Ethylene-treated Plant</b>
Observations:	Observations:

**Questions:**

1. Describe the experiments you would do to determine that ethylene is, in fact, the compound made by the apple tissue that produces the epinastic growth of the tomato plants?
2. How do you know that the growth response you observed is not caused by auxin, cytokinin, or gibberellic acid?
3. If we had done a third treatment that consisted of the apple treatment, but we placed high levels of CO<sub>2</sub> in the bag along with the apple, can you predict what you would have observed?

Figure 1A.  
Sketch of the control plant

Figure 2A.  
Sketch of the ethylene-treated plant

Figure 1B.  
Sketch of a control leaf

Figure 2B.  
Sketch of an ethylene-treated leaf

