PLANT BIOLOGY LABORATORY MANUAL
REGULATION OF SEEDLING GROWTH BY PLANT HORMONES

Introduction:

Growth can be defined as an irreversible change in volume of plant material. We define growth as an irreversible change because plants can change volume reversibly during the day by gaining or loosing water. Typically, growth is measured by measuring a change in length or a change in width of a plant organ like a stem, and the assumption is made that if length is increased then volume must also have increased.

Plants make and respond to a variety of compounds we refer to as hormones. Hormones are defined as compounds made in one tissue or location, that produce a response at low concentration in other tissues. These responses typically lead to altered growth and/or development.

In the experiment below we will examine the effect of three classes of plant hormones, i.e. auxins, gibberellins, and cytokinins on the growth of pea plants.

Materials:

4 pots each containing 4 10-day-old bean or pea seedlings
Ruler
16 tags or labels
Spraying device
50 mL of distilled water containing a drop of nonionic detergent
Hormone stock solutions (50 mL each)
- 0.1 mM gibberellic acid
- 0.1 mM indoleacetic acid
- 0.1 mM kinetin

Procedure:

Your instructor will provide you with the 4pots of 10-day-old bean or pea seedlings. Measure the height from the soil to the shot apex and stem diameter of each plant in each pot and record the measurements in Tables 1 and 2. Use the tags or labels to identify each plant so that measurements can be compared at the end of the experiment. Note that you may need some advice from your instructor to identify the shoot apex of each plant, as this may not be the tallest part of the plant.

Spray the plants in pot #1 with the water-detergent solution. Spray the plants in pot #2, #3, and #4 with the gibberellic acid, indoeacetic acid, and kinetin solutions respectively. The spraying is best done out of doors, and care should be taken not to allow the spray to drift from one pot to the others during spraying. Once the spraying is completed, return the pots to the

growing environment, and after a week, remeasure the plants in each pot and record the results in Tables 1 and 2. Complete the growth calculations in Tables 1and 2, and compare the growth of plants treated with each of the hormone solutions to the water treated controls.

Table 1. Plant Height

Pot Treatment	Plant	Initial Length	Final Length	Difference	% Increase
Pot 1 (Control)	Plant 1				
	Plant 2				
	Plant 3				
	Plant 4				
Pot 1 Average					
Pot 2 (Gibberellic acidl)	Plant 1				
	Plant 2				
	Plant 3				
	Plant 4				
Pot 2 Average					
Pot 3 (Indoleacetic acidl)	Plant 1				
	Plant 2				
	Plant 3				
	Plant 4				
Pot 3 Average					
Pot 4 (Kinetin)	Plant 1				
	Plant 2				
	Plant 3				
	Plant 4				
Pot 4 Average					

Table 2. Stem Diameter

Pot Treatment	Plant	Initial Diameter	Final Diameter	Difference	% Increase
Pot 1 (Control)	Plant 1				
	Plant 2				
	Plant 3				
	Plant 4				
Pot 1 Average					
Pot 2 (Gibberellic acidl)	Plant 1				
	Plant 2				
	Plant 3				
	Plant 4				
Pot 2 Average					
Pot 3 (Indoleacetic acidl)	Plant 1				
	Plant 2				
	Plant 3				
	Plant 4				
Pot 3 Average					
Pot 4 (Kinetin)	Plant 1				
	Plant 2				
	Plant 3				
	Plant 4				
Pot 4 Average					

Questions:

1. Do the three hormones all effect plant heighth in the same way?

2. Do the three hormones all effect stem diameter in the same way?

3. What was the purpose of including the nonionic detergent in all of the treatments?

4. Based on what you know about how these hormones work, would you predict that their effects would be the same if etiolated (dark grown) seedlings were used rather than green photosynthetically active seedlings?

5. List the sources of error you observed in this experiment?