Name: _____ Date/Lab time: _____

Lab 7: PLANT GROWTH AND DEVELOPMENT:

Supplies:

Dwarf plants (peas and corn) (age?) Non-dwarf plants Gibberellic acid	Auxin paste Coleus plants

Vocabulary to know: hormones, gibberellin, auxin, cytokinin, abscisic acid, ethylene, cell division, cell elongation, phototropism, geotropism, apical dominance, dwarfism

LAB SYNOPSIS:

We will explore some ways plants respond to their environment (i.e. by altering their growth). These include: gravity, light, dwarfism and bushy-ness.

Introduction:

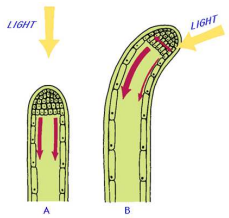
Hormone- are organic substances made in small amounts in one area, transported to another area, where they have a large effect.

There are 5 major plant hormones: gibberellin (gibberellic acid), auxin, cytokinin, abscisic acid and ethylene.

Plant hormones allow distant parts of the plant body to communicate. They help coordinate growth and development, and allow the plant to respond to its environment.

Exercise 1: Phototropism:

Plant stems have the ability to grow towards the direction of light.

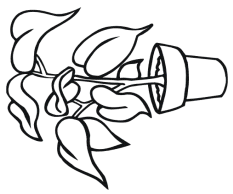


Phototropism is controlled by the plant hormone **auxin**. Auxin is produced in the shoot tip and then moves down the shoot. To sense and respond to the direction of light, auxin moves to the side of the stem that is shaded. This stimulates the cells on the shaded side to elongate. Overall this growth causes the stem to bend towards the direction of light.

Procedure: (demo) Place a plant in a box that is open to just one side. Place the open side towards the window. You will observe this plant again each lab session.

What do you predict will happen?	Observations over time (how is the plant responding to light?)

Exercise 2: Gravitropism:



Gravitropism is also controlled by auxin. Many plant cells contain specialized starch grains called statoliths. Statoliths have weight, and they end up at the bottom of cells. If the statoliths are moved around (by laying a plant on its side, for instance), the cells on the new "bottom" of the stem become more sensitive to auxin and elongate. The cells on the top of the stem do not respond to auxin and do not grow. Again, because the one side of the stem is growing faster than the other, the stem bends.

Procedure:(demo) Place a plant in a horizontal position and observe the gravitropic response over time. To assure that any growth response is not due to phototropism, place plants in a dark area.

What do you predict will happen?	Observations over time (how is the plant responding to gravity?)

What do you think would happen if you hung a plant upside down?

Exercise 3: Dwarf plants and internode elongation:

Dwarf plants- Varieties of plants breed for minimal internode elongation. The elongation of internodes is due to the hormone gibberellic acid.

Half the groups will be assigned corn, the other half will be assigned beans.

Obtain potted dwarf plants (hopefully there are multiple plants per pot). One plant will act as a control. Label the pot with your name, date and its treatment "control" (you will leave this plant as is). Measure the height of the plant from the ground to the shoot apical meristem (where is the shoot apical meristem?). Record this initial height in the table below.

The other plant will act as your experimental group. Label the pot with your name, date and its treatment "treated with GA". Spray this plant with the solution of gibberellic acid (avoid spraying the control plant!). Measure the height of the plant from the ground to the shoot apical meristem. Record this initial height in the table below.

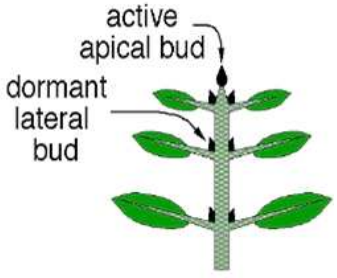
After 3 weeks, again measure the height of the plant from the ground to the apical meristem. Compare your results to "normal" plants (non-dwarf varieties).

Plant type (bean or corn)	Initial height	Height after 3 weeks	Change in height
Control			
GA treated			

Interview a group who did the other dwarf plant (corn or bean). How do their results compare to yours?

Exercise 4: Apical Dominance:

Recall: leaves have a bud in their axis. The stem's apical meristem determines whether axillary buds begin to grow, producing new stems. The apical meristem produces the hormone auxin which moves down the stem inhibiting axillary bud growth. What would happen if you removed the source of this auxin, the apical meristem?



Procedure:

Obtain a coleus plant with multiple braches (or multiple plants). Label the pot with your name, date and its treatments "apical dominance exp."

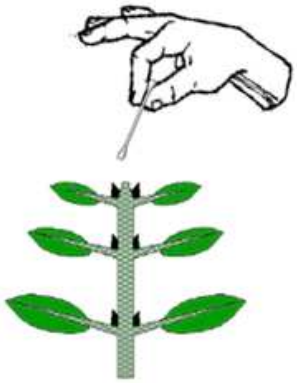
1. One branch will act as a control.). Label this branch "control" (you will leave this branch as is. Record whether or not, and how much growth there is in axillary buds below the branches apical meristem.

Two other branches will act as your experimental groups.

2. Label one of these braches as "exp. 1 decapitated". Record whether or not and how much growth there is in axillary buds. Then remove the apical meristem.

3. Label another branch as "exp. 2 decapitated treated with auxin". Record whether or not and how much growth there is in axillary buds. Then remove the apical meristem. Apply a small amount of auxin paste to the cut end of the stem.

You will make observations as to axillary bud growth periodically over the next few weeks. Look at those axillary buds in the leaves just below where you cut, and the next leaf set down.



What do you predict will happen with the 3 set-ups?

	Initial growth of axillary buds	Amount of axillary growth after ____ days (no growth : some growth : lots of growth)
Control		
Cut and untreated		
Cut and auxin treated		

Other possible exp. to add? Ex do Banana and ethylene

Questions:

1. What would make good questions here? Yes I am asking you.

How might one of these benefit plants in the wild?
Did you have fun and learn something?
What happen with the ___ experiment? Why?