

Laboratory Investigation 13I

Chapter 13B: The Environment and Plant Responses

Plants: Tropisms in Seedlings

You may refer to pages 188-190
in your textbook for a general
discussion of tropism.
Time required: 25 minutes

Background Material

tropism – the growth responses of plants to their environment
a plant's directional growth response to a physical stimulus
the growth of plants in response to external stimuli such as light, gravity, or contact
positive: when the plant grows *toward* the stimulus
negative: when the plant grows *away from* the stimulus

types of tropism:

1. phototropism – light
plant's response to light
positive phototropism - turns toward light (stem and leaves)
negative phototropism - away from light (roots)
2. gravitropism – gravity
plant's response to gravity
positive gravitropism - grows toward the pull of gravity (roots)
negative gravitropism - grows away from the pull of gravity (stem and leaves)
3. thigmotropism - touch
4. chemotropism - chemicals
5. hydrotropism - water

Plants and Light

Characteristics of light that are significant for plant growth:

1. Intensity
etiolated - the condition of a plant when grown in the absence of light
elongated stems with small, pale leaves
2. Duration
duration - the length of daylight
affects the photoperiodism of plants
the chief factor affecting flowering

photoperiodism – the response of a plant to changes in the length of daylight
(the responses of a plant to changes in light intensity and length of days)

It often determines whether or not a plant produces flowers.

Some plants can accurately measure the length of light and darkness to within minutes so they will flower at precisely the right time of year.

Short-day plants: plants that flower when exposed to less than 12 hours of sunlight
(bloom when the days are short and the nights are long)
examples: chrysanthemums, corn, strawberries, apples, soybeans, violets, ragweed
flower naturally out-of-doors in the early spring or in late summer and fall

Nurserymen can delay the natural blooming schedule by placing the chrysanthemums in a greenhouse and illuminating them for a short period of time during the night. The plants respond to this lighting arrangement just as they would to days consisting of long periods of sunlight. The flowering hormone is not formed, and the flowering of these plants is artificially delayed. When the nurserymen are ready for the chrysanthemums to flower (usually in Oct. or Nov. - in time for football season), they suspend the nightly periods of illumination. This same procedure has been used successfully with other short-day plants such as poinsettia, dahlia, and aster.

Long-day plants: require more than 12 hours of light
bloom with long periods of light and short periods of darkness
generally flower during late spring and summer
examples: clover, gladiolus, sunflowers, beets, lettuce, grains

Neutral-day plants: flower independently of a photoperiod
bloom whenever conditions like moisture and temperature are acceptable regardless of the amount of light or darkness
usually flower continuously if other conditions (temp., moisture, etc.) are favorable
examples: tomato, dandelion, hybrid roses, beans, zinnias, cotton

Materials

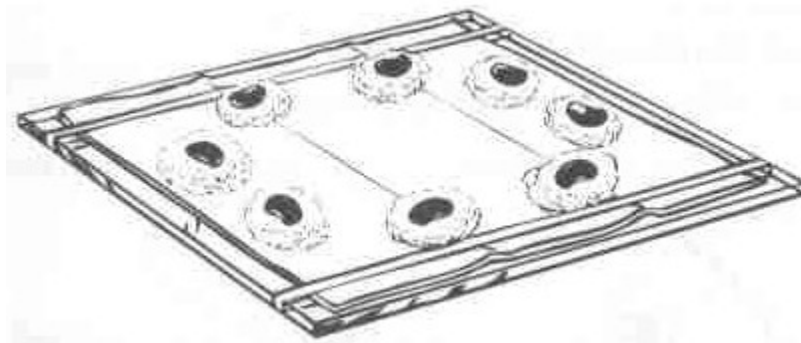
bean seeds, cotton, eyedropper, CD case, egg cartons

Procedure

Experiment 1

Setting up

1. Place a piece of masking tape on the lower back (where the opening is NOT) of the CD case. Put your names on it.
2. Place five cotton balls in the CD case (spread the cotton out); then place bean seeds in the center of each cotton ball. Be sure that the bean seed hilum "face" up, right, left, down, and diagonally (in the center).
2. Wet the cotton.
3. Close the CD case and place it in the holder (egg carton). Make sure the hole to water is on top.
4. Set this assembly in a dark, warm area.



Procedures and observations

1. Using an eyedropper, daily add water to the assembly.
2. Observe the bean seeds daily.
3. Once the seeds begin to grow, record their growth patterns on the chart.

Chart

Date	Direction Hilium is Facing	Root Growth (length & direction)	Other Observations
	up		
	down		
	left		
	right		
	middle		
	up		
	down		
	left		
	right		
	middle		
	up		
	down		
	left		
	right		
	middle		
	up		
	down		
	left		
	right		
	middle		
	up		
	down		
	left		
	right		
	middle		

Summing up

1. What is gravitropism? _____

2. Did the roots of the bean seedlings exhibit positive gravitropism or negative gravitropism?

3. Did the stems of the bean seedlings exhibit positive gravitropism or negative gravitropism?

4. Did the way in which the seeds were positioned affect their response to gravitropism? If so, what were the differences?
