PLANT HORMONES AND PLANT DEFENCE MECHANISMS

24 APRIL 2013

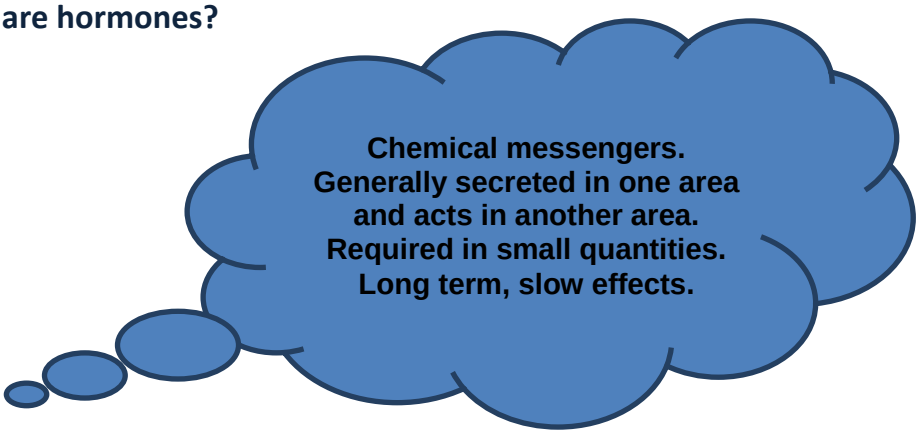
Lesson Description

In this lesson, we:

- Discuss general functions of the following plant hormones:
  - Auxins
  - Gibberellins
  - Abscisic acid
- Discuss the role of auxins in geotropism through the regulation of differential growth
- Look at the role of auxins in phototropism through the regulation of differential growth
- Discuss uses of plant hormones in agriculture:
  - Auxins as herbicides
  - Auxins to control apical dominance
  - Auxins and gibberellins to increase/stimulate fruit development
- Consider the role of the following as plant defence mechanisms
  - Chemicals
  - Thorns

Key Concepts

What are hormones?

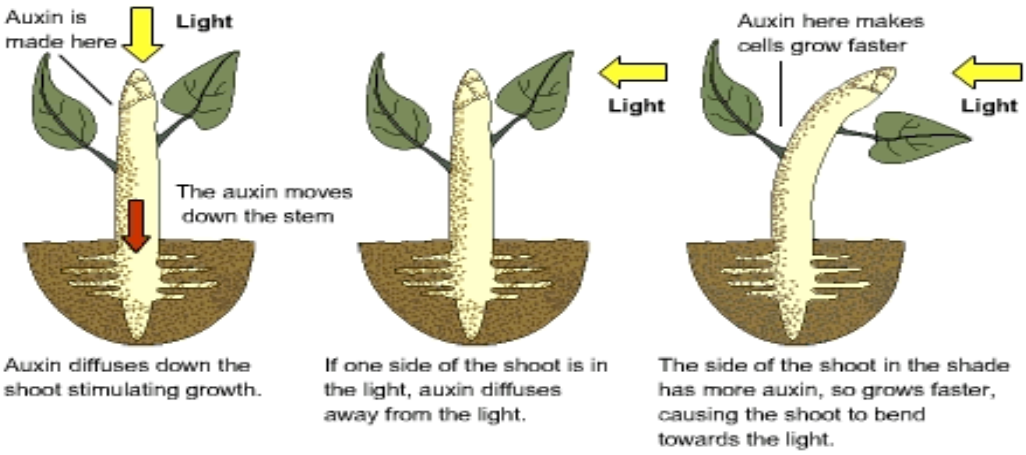


Plant hormones not true hormones as they act in the same area where they are produced.

Important Definitions

Tropism:	growth by part of a plant in response to an external stimulus
Phototropism:	growth by part of a plant in response to light stimulus
Geotropism:	growth by part of a plant in response to gravity
Hydrotropism:	growth by part of a plant in response to water
Thigmotropism:	growth by part of a plant in response to touch
Chemotropism	growth by part of a plant in response to chemicals

Phototropism



Plant Hormones in Agriculture

Auxin

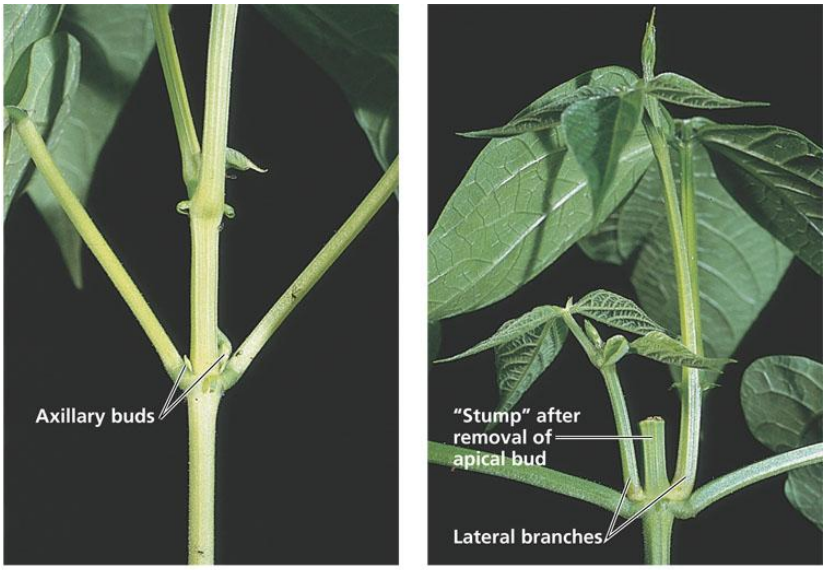
- Selective weed killer (herbicide)

- Stimulate roots in cuttings

- May improve the quality of fruit, e.g. tomatoes

- Many fruit trees, e.g. apple, pears and citrus trees sprayed with auxin to prevent abscission

- Farmers may use the property of apical dominance to make plants grow thicker…



(a) Intact plant (b) Plant with apical bud removed

Gibberellins

- Spraying grapes with gibberellins makes the larger
- Spraying also makes internodes of the plant bigger to provide more space for individual grapes, which increases air circulation and reduces infection by pathogens.

Cytokinins

- Slow down aging process in some plants – fruit and flower industry.
- Ethylene
- Promotes ripening of fruit.

Abscisic Acid

- Seeds sprayed with abscisic acid to prevent germination in winter.

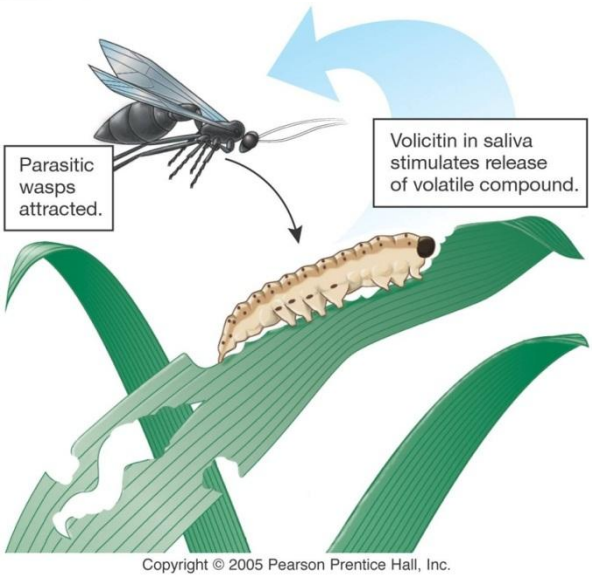
Plant Defence Mechanisms

Mechanical

- Xerophytes (desert plants) have their leaves reduced to thorns to prevent water loss
- Spiny shrubs (cactuses, raspberry etc) with thorns acts as defence mechanism against herbivores feeding on them
- Acacia species have thorns to prevent excessive feeding by giraffes, kudu, impala etc
- Plants are covered by hard bark or waxy cuticle to prevent enemy penetration.
- The fruit of a coconut is covered by multiple layers of fibres that make penetration difficult and protects the seed

Chemical

- Plants communicate chemically.
- Injured plants send out chemical signals that may
    - signal other plants to prepare for an attack.
    - attract other insects that eat the insects that are attacking the plant.
    - These chemicals may act as poisons, repellent, or affect the herbivores digestion.



Questions

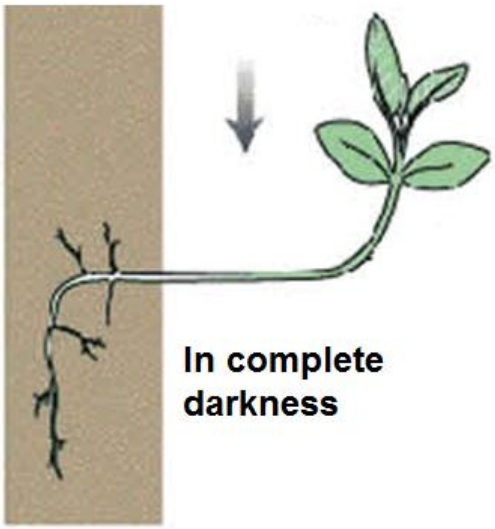
Question 1

a.) Name the five main plant hormones. (5)

b.) Tabulate the functions of the three hormones prescribed in the curriculum (13)

Question 2

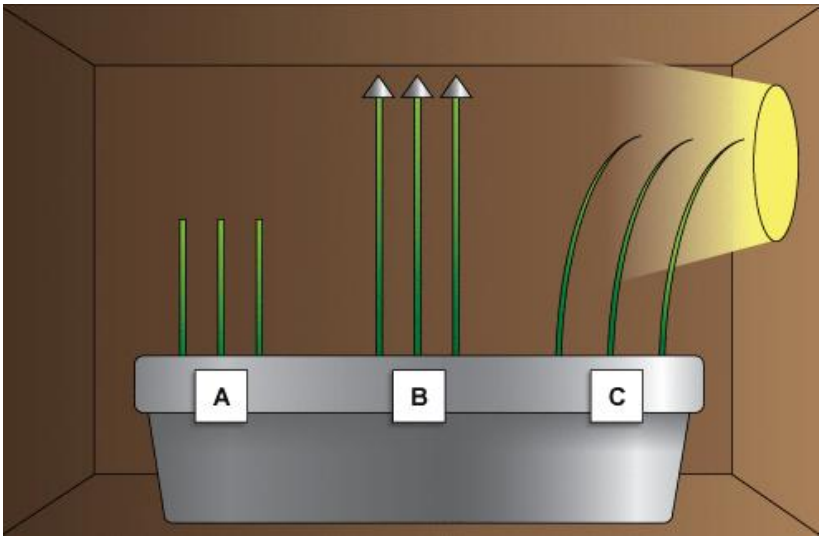
Study the following diagrams and answer the questions.



a.) Why is this experiment carried out in darkness?
b.) What is the aim of the experiment?
c.) Explain the results of the experiment.

Question 3

A group of Grade 12 learners, Sabeeha, Yaseera, Sameera and Muhammad set up an experiment where 3 groups of seeds are grown in a cardboard box. Study the diagram showing the experiment with the results and answer the questions that follow.



a.) Describe the results shown in the diagram.
b.) Explain the results above.
c.) Provide TWO conclusions these learners can make from the experiment.

Questions 4

(Adapted from Free State resources)

Tropic responses can be analysed in terms of:

Stimulus – receptor- transmission- effector – response

If a coleoptile is stimulated by a light source from one side and responds by bending towards that light source, what is:

a.) the receptor (1)
b.) the effector of the response? (1)
c.) How is transmission between receptor and effector achieved? (4)

Question 5

Plants often respond to external stimuli by means of **growth movements**. **Discuss** the different growth movements and the **name** the **substance/s that cause it**. [20]