

Hormones

Hormones are compounds produced by plants/animals that bring about a specific response in certain tissues.

What are some animal (human) hormones that you produce?

Animal Hormones

- Oestrogen
- Testosterone
- FSH (follicle stimulating hormone)
- Insulin
- Adrenaline
- ADH (anti-diuretic hormone)

What are some Plant Hormones?

Plant Hormones

- Auxins
- Cytokinin
- Gibberellins
- Abscissic Acid
- Ethylene

How is a plant's environment different to an animal's environment?



Plant growth responds to environmental cues...



<http://www.youtube.com/watch?v=rDN0yAFcQok&feature=related>



Some environmental cues plants respond to are....

Light



Gravity



Temperature



What is happening here?

- <http://www.youtube.com/watch?v=aNjR4rVA8to&list=QL&playnext=2>

Class Practical Investigation

Set up prac plants to test the effects of light (phototropism) or gravity (gravitropism or geotropism) on plant germination or growth.

- We will look at the roots and the new shoots.
- You will be given seeds, containers and dirt.
- Carefully design your investigation. Identify your hypothesis. Remember only one variable should be made per group. Identify:
 - Controlled variables
 - Dependent Variable
 - Independent variables
 - No. of trials

<http://vce-unit1and2biology.wikispaces.com/Class+Investigation>

Hormones in plants are...

- relatively simple compared to the endocrine system in animals.
- not organised into glands as in animals.
- produced by the cell receiving the appropriate environmental stimulus.
- very specific i.e. when daylight increases many plant are stimulated to produce flowers.
- Generally slower to produce effects than nervous responses.

How hormones travel in plants

- Hormones travel using the plants vascular system.

Tropism

- A growth is directed by an environmental factor.
- When the direction of the growth or turning movement is related to the direction the stimulus the response is called a tropism
- Growth towards a stimulus it is called a positive tropism.
- Growth away from a stimulus it is called a negative tropism.

Hormones in plants are responsible for...

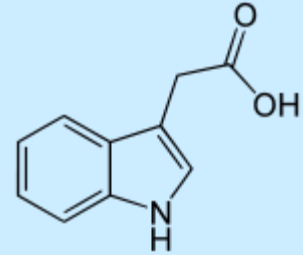
- ***Phototropism***
- ***Geotropism*** or gravitropism
- ***Apical dominance*** – inhibition of lateral branches
- ***Ripening of fruit*** – conversion of starches to sugars
- ***Abcission*** – shedding of leaves and flowers

Examples of Plant Hormones

1. Auxins (Indole Acetic Acid or IAA)
2. Cytokinins
3. Gibberellins
4. Abscissic Acid (inhibitor)
5. Ethylene
6. Florigen ????? A bit like the loch ness monster!

Auxins

Also called indole-3-acetic acid (IAA)



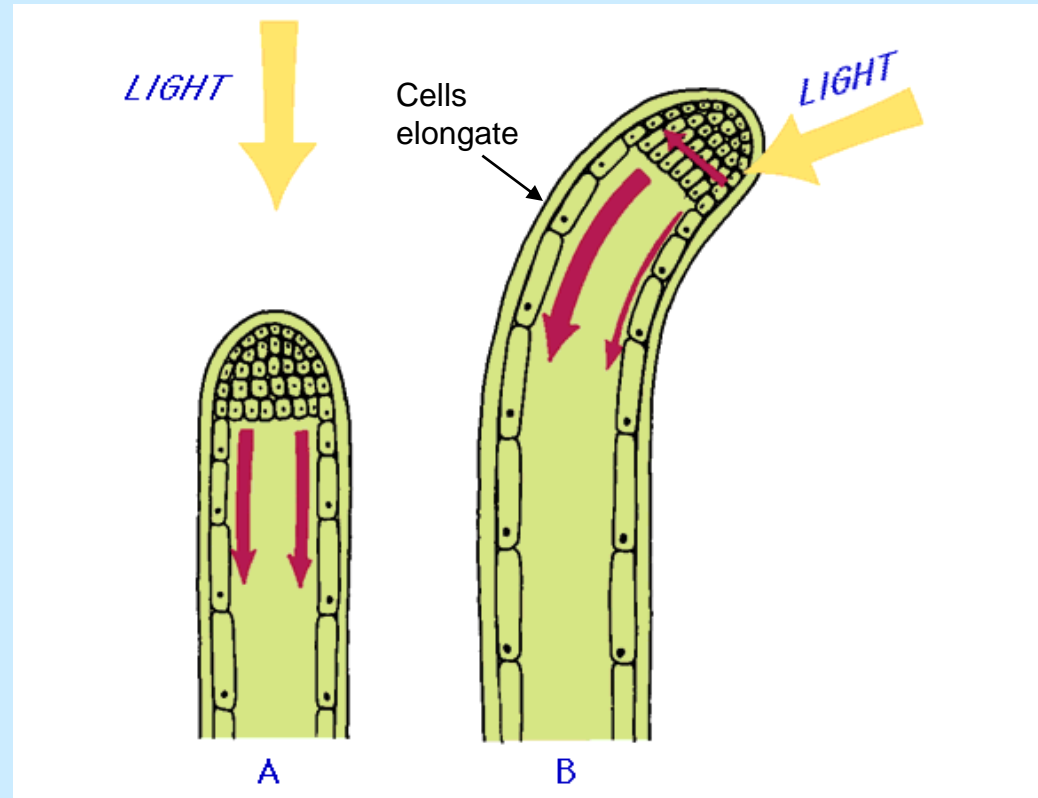
Auxins have an essential role in coordination of many growth and behavioral processes in the plant life cycle.

Some Effects:

1. Cell elongation in stems
2. Stimulation of cell division
3. Responsible for tropisms (phototropism, geotropism)
4. Promotes Apical Dominance

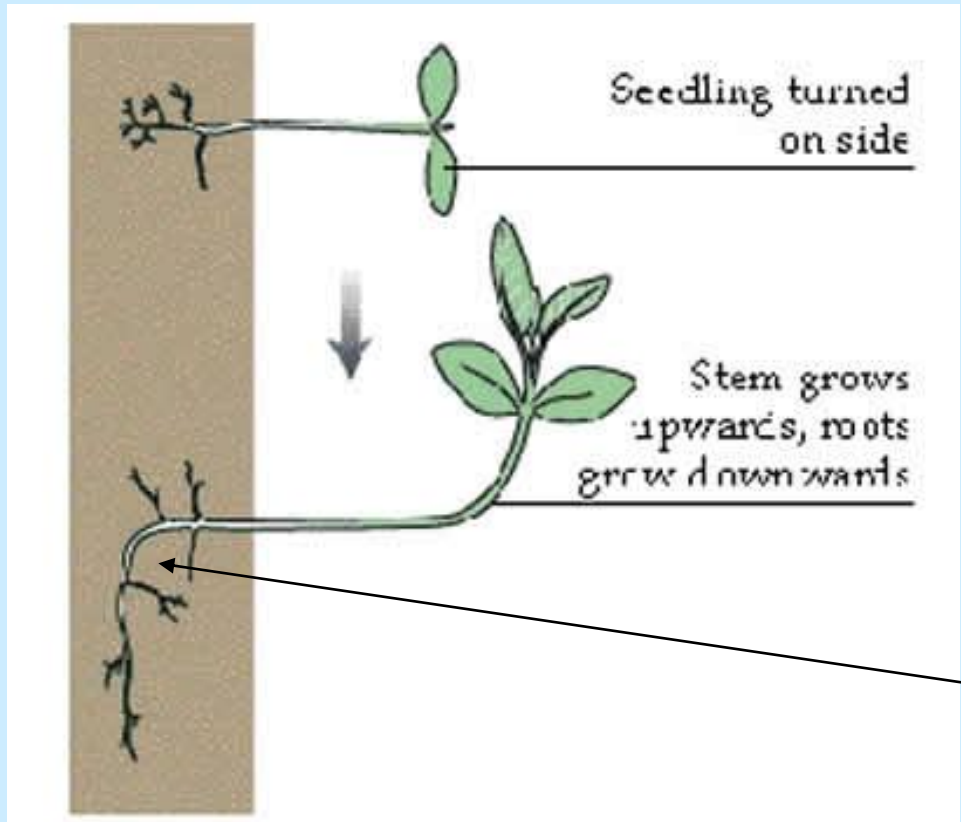
Positive Phototropism

- Plants grow towards a source of light.
- Auxins promote cell elongation.
- Higher concentrations found on dark side of plant suggesting auxin diffuses to dark side and promotes cell elongation on this side.



Complete p276 Biozone

Phototropism and Geotropism (gravitropism)



Geotropism is response of plant to gravity.

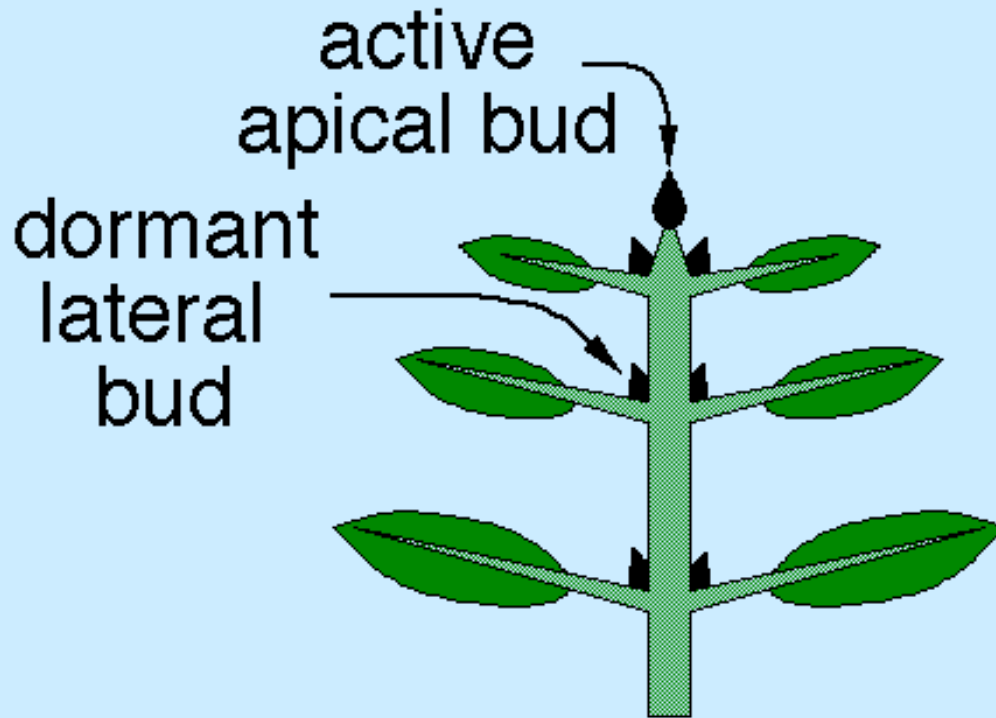
Auxins play a role in **negative geotropism** in the **stem** - tendency to grow away from force of gravity. In the horizontal shoot the concentration of auxin is greater on the lower side, causing the tip to grow upwards.

In **roots**, **auxins** play a part in **positive geotropism** accumulating at the bottom and inhibiting growth so that top part is elongated.

Negative Geotropism



Apical Dominance



Auxin is produced in tip
and moves down a stem

It inhibits the development
of lateral buds

The result is a taller plant
with fewer buds

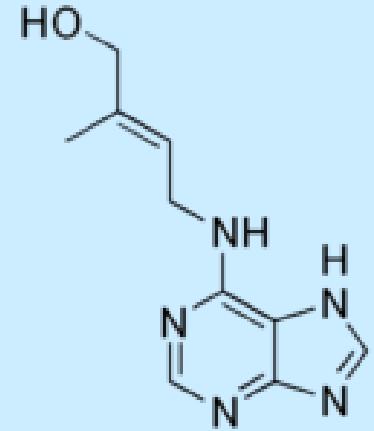
Bushiness can be
promoted in plants by
'nipping out' the apical tip
allowing the lateral
branches to grow in the
temporary absence of
auxin

Cytokinins

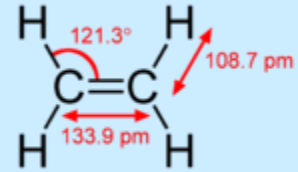
Some Effects:

1. Promote cell division (cytokinesis) and cell differentiation.
2. Stems and leaves develop when there is more cytokinin than auxin
3. Can stimulate growth of lateral buds

Can promote growth of callus -
type of tumour growth



Ethylene (Ethene)



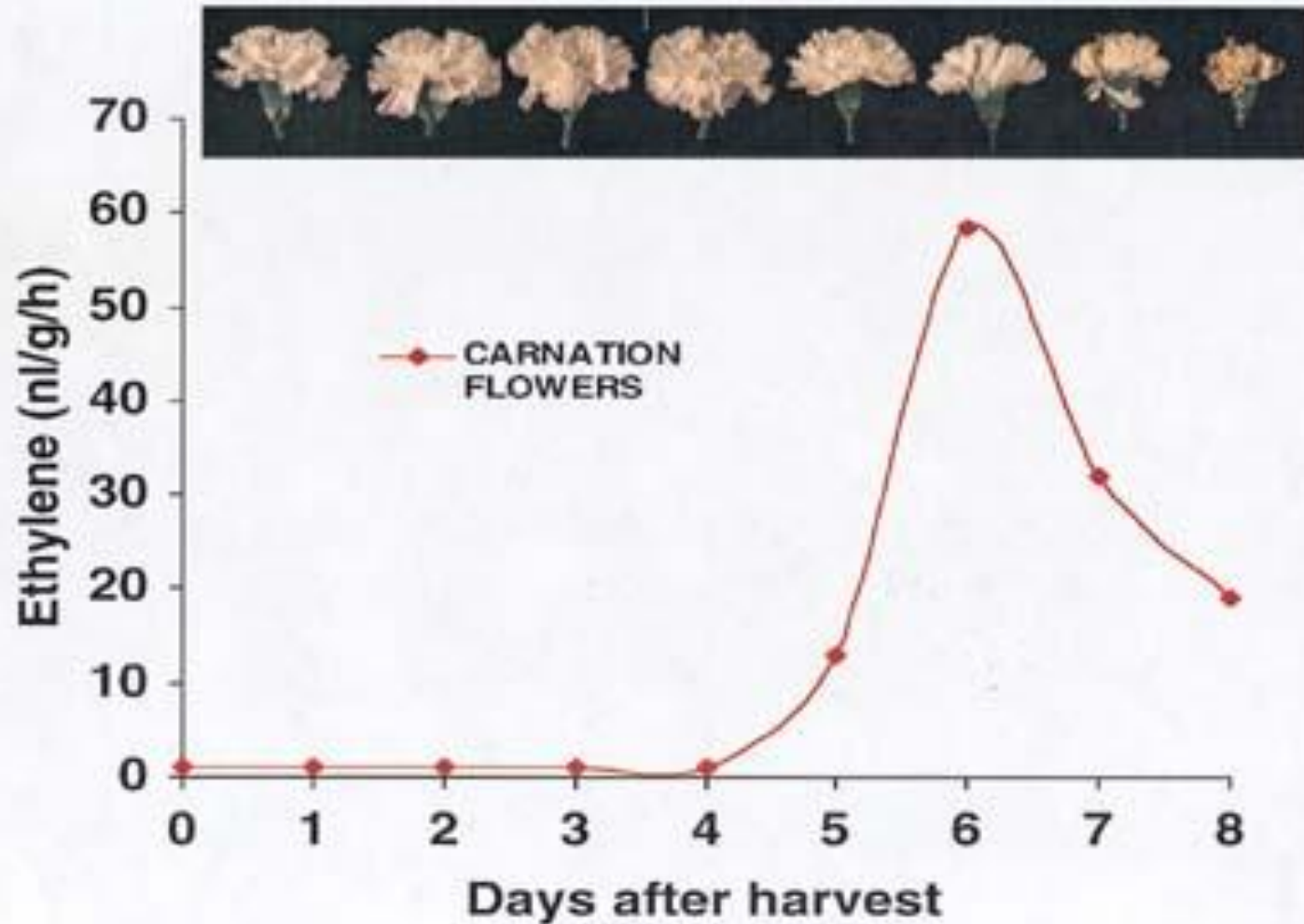
Ethylene is the only gaseous hormone found in plants.

Some Effects:

1. Ripening of fruit.
2. Stimulates flower and leaf senescence



Ethylene Production in Cut Flowers



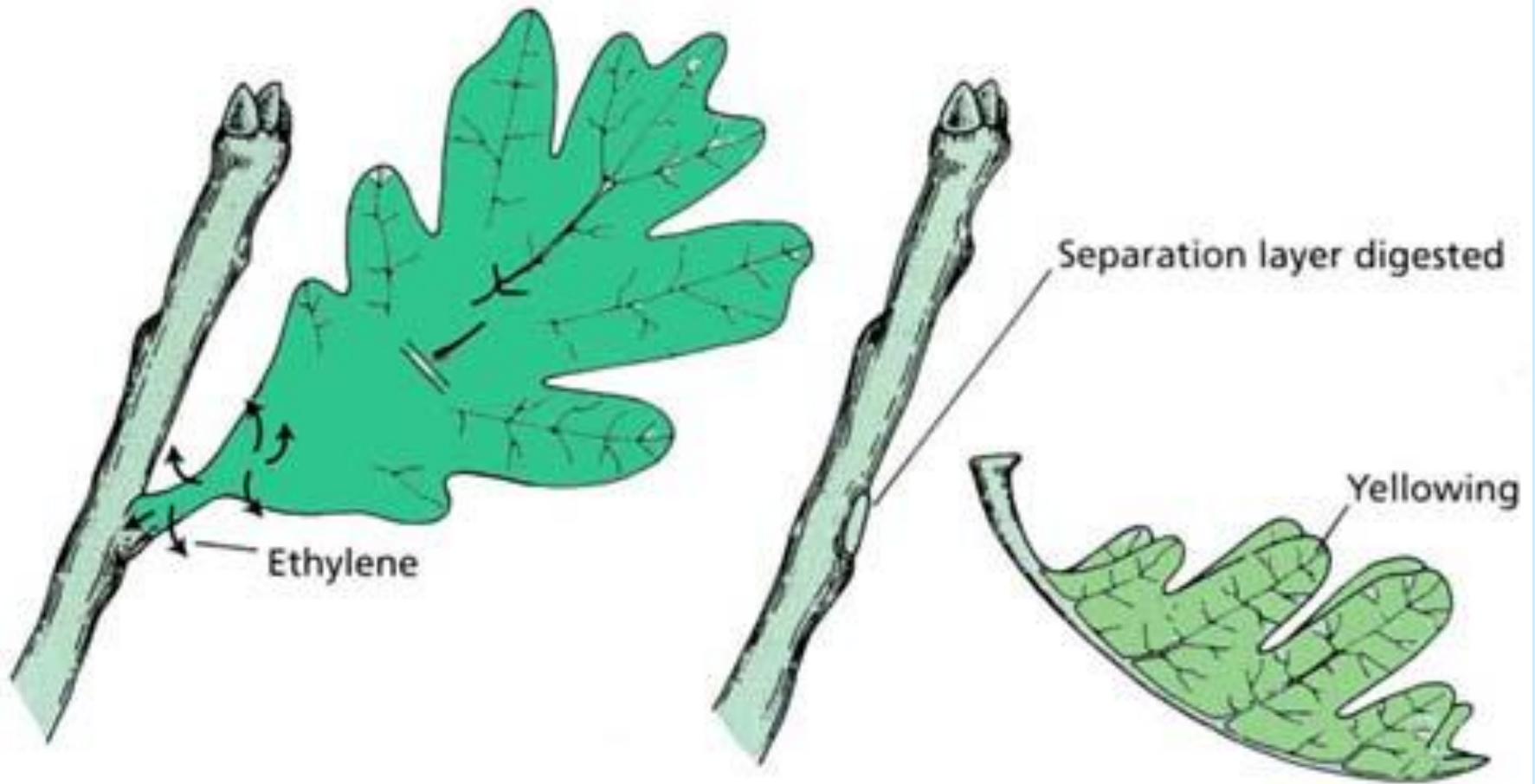
What's going on here????



and here....????



Ethylene and leaf fall

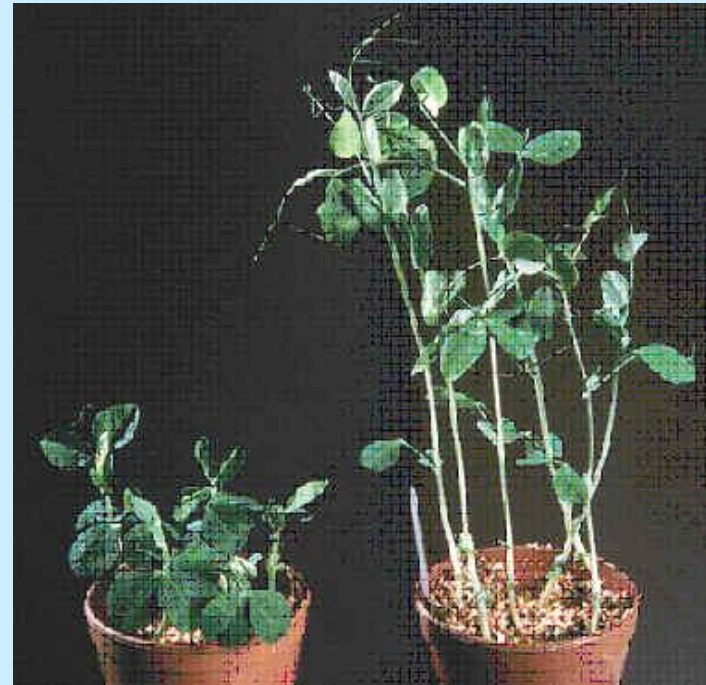


Gibberellins

Gibberellic Acid (GAs)

Some Effects:

1. Stimulate stem elongation (growth) by stimulating cell division and elongation.
2. Breaks seed dormancy in some plants.

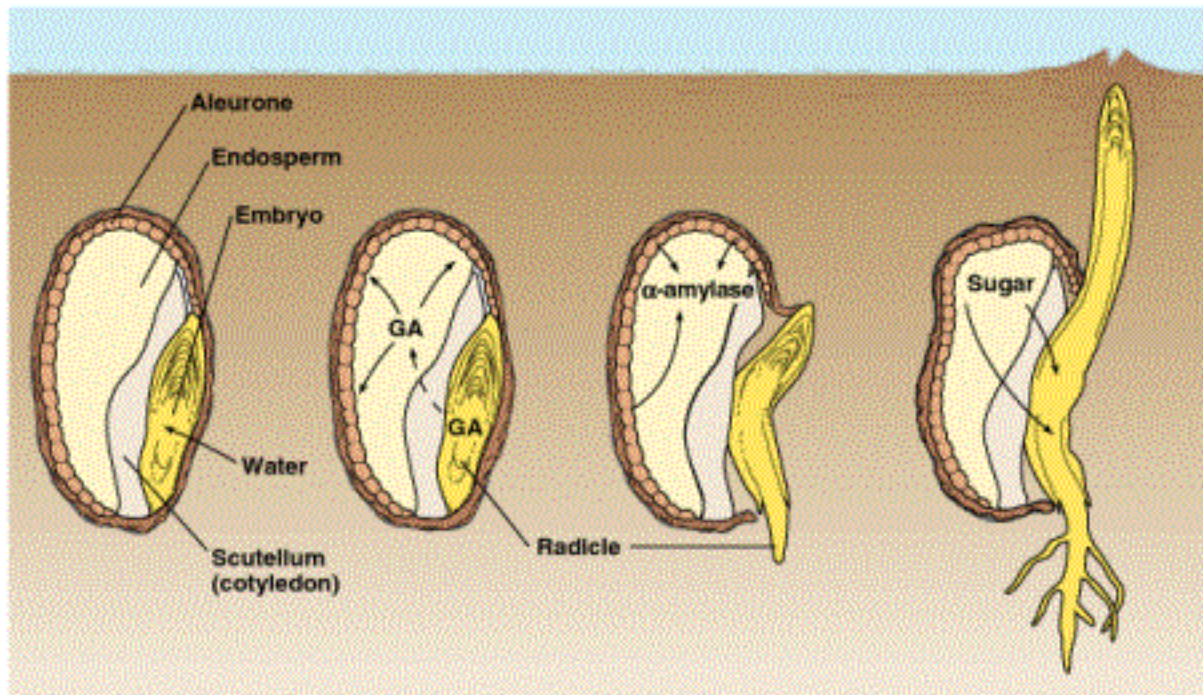


Gibberellin and its effect on stem growth

Giberellin (GA) and its role in Seed Germination

As a seed absorbs water, the embryonic plant produces gibberellin. This causes the production of amylase (protein) which is secreted into the endosperm (stored starch). Amylase breaks down starch to glucose which diffuses to the embryo and is used for the early stages of plant growth.

Role of Gibberellin in Seed Germination



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1. Water uptake induces GA synthesis by embryo
2. GA stimulates α -amylase production by aleurone
3. Amylase breaks down starch reserves in endosperm
4. Sugars fuel growth of embryo

Abscisic Acid

Growth-inhibiting hormone have effects opposite to those of auxins, giberrellins and cytokinins.

Assist plants to tolerate adverse conditions such as drought, salinity and low temperatures

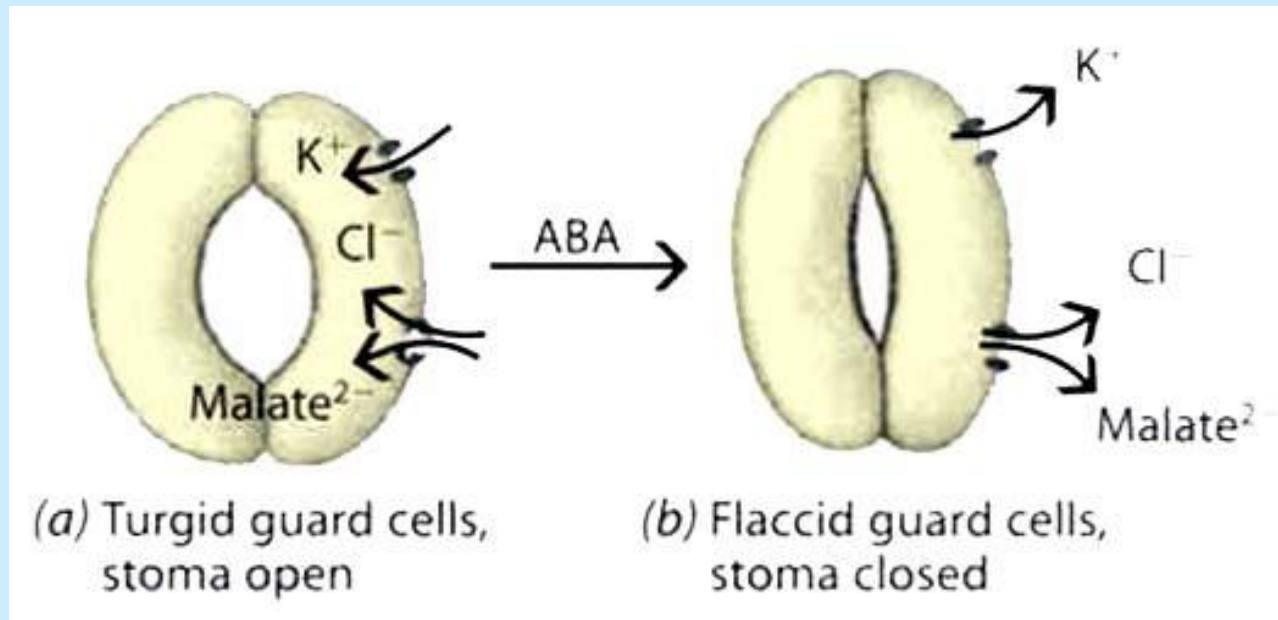
Abscisic Acid is the best known of these and regarded as a plant hormone associated with stress, such as drought etc.

Some effects:

1. Stimulates the closure of stomata when plant is water stressed.
2. Induces dormancy.

Closure of Stomata

Abscissic acid also has short term effects , including control of stomatal movement. When plants begin to lose too much water , abscissic acid carries a message that causes guard cells to close.



The concentration of abscissic acid increases under stressed conditions such as drought, high temperature and water logging.