

# Plant Hormone Activity

Read through the following slides to fill in the table and pages 870 to 880.

## Gibberellins

- Growth promoter (stems and fruit)
  - Causes bolting
  - Increase fruit size
  - Auxin and gibberellins must be present for fruit development
- Stimulates cell division and elongation (in stems)
- Promotes embryo growth (breaks seed dormancy)
- Determines sex expression of flowers

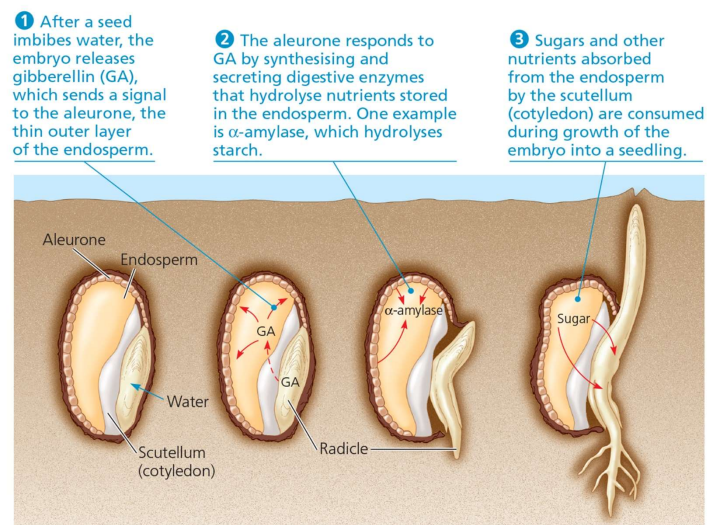


(a) Some plants develop in a rosette form, low to the ground with very short internodes, as in the *Arabidopsis* plant shown at the left. As the plant switches to reproductive growth, a surge of gibberellins induces bolting: Internodes elongate rapidly, elevating floral buds that develop at stem tips (right).



(b) The Thompson seedless grape bunch on the left is from an untreated control vine. The bunch on the right is growing from a vine that was sprayed with gibberellin during fruit development.

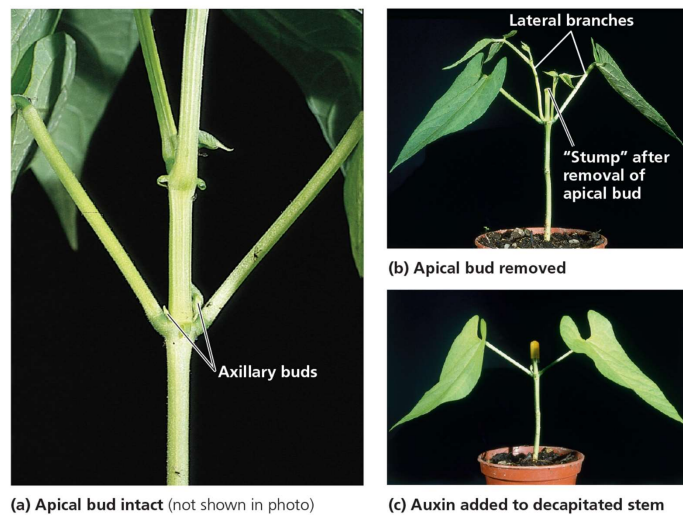
◀ **Figure 39.9** Effects of gibberellins on stem elongation and fruit growth.



▲ **Figure 39.10** Mobilisation of nutrients by gibberellins during the germination of grain seeds such as barley.

# Cytokinins

- Stimulate cytokinesis (cell division)
- Slows senescence (Plant aging and organ death)
- Control cell division and differentiation
  - Produced in actively growing tissues (roots, embryos and fruits)
- Promotes lateral bud development – opposite effect of Auxin



(a) Apical bud intact (not shown in photo)

(b) Apical bud removed

(c) Auxin added to decapitated stem

▲ **Figure 39.8 Apical dominance.** (a) The inhibition of growth of axillary buds, possibly influenced by auxin from the apical bud, favours elongation of the shoot's main axis. (b) Removal of the apical bud from the same plant enables lateral branches to grow. (c) Applying a gelatin capsule containing auxin to the stump prevents the lateral branches from growing.

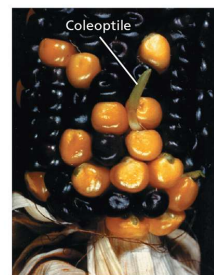
# Abscisic acid

- Growth inhibitor
  - Opposes action of auxins, cytokinins and gibberellins
- Involved in drought tolerance
  - Stress hormone e.g. Water stress causes accumulation of abscisic acid in leaves which causes stomatal closure preventing transpiration

- Induces dormancy
  - Ensures seed will germinate under optimal conditions
  - Precocious germination is seen in maize mutant that lacks a transcription factor required for ABA action.



◀ Red mangrove (*Rhizophora mangle*) seeds produce only low levels of ABA, and their seeds germinate while still on the tree. In this case, early germination is a useful adaptation. When released, the radicle of the dart-like seedling deeply penetrates the soft mudflats in which the mangroves grow.



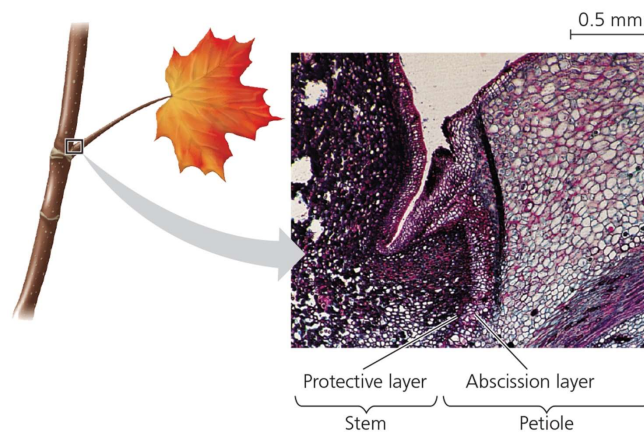
▲ Precocious germination in this corn mutant is caused by lack of a functional transcription factor required for ABA action.

▲ **Figure 39.11** Precocious germination of wild-type mangrove and mutant corn seeds.

# Ethylene

A gaseous hormone involved in:

- Abscission (dropping of autumn leaves, fruit, flowers)
- Fruit ripening
- Senescence (programmed cell death)
- Response to stress (drought, flooding, mechanical pressure, injury)



**▲ Figure 39.14** Abscission of a flame tree leaf (*Brachyton acerifolius*). Abscission is controlled by a change in the ratio of ethylene to auxin. The abscission layer is seen in this longitudinal section as a vertical band at the base of the petiole. After the leaf falls, a protective layer of cork becomes the leaf scar that helps prevent pathogens from invading the plant (LM).