

# Plant Hormones

- AUXIN
- CYTOKININ
- ETHYLENE
- ABSCISIC ACID
- GIBBERELIC ACID

# Coordination of Development via Hormone action

- The major plant hormones:

- Auxins

- Cytokinins

- Gibberellins

- Abscisic acid

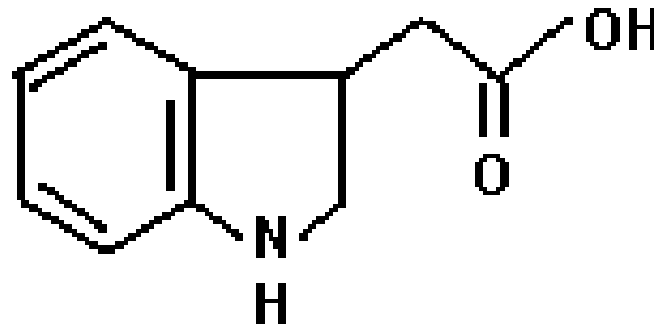
- Ethylene

Hormones that promote/control growth (direction)

Survival hormones (tend to inhibit growth)

# Auxin

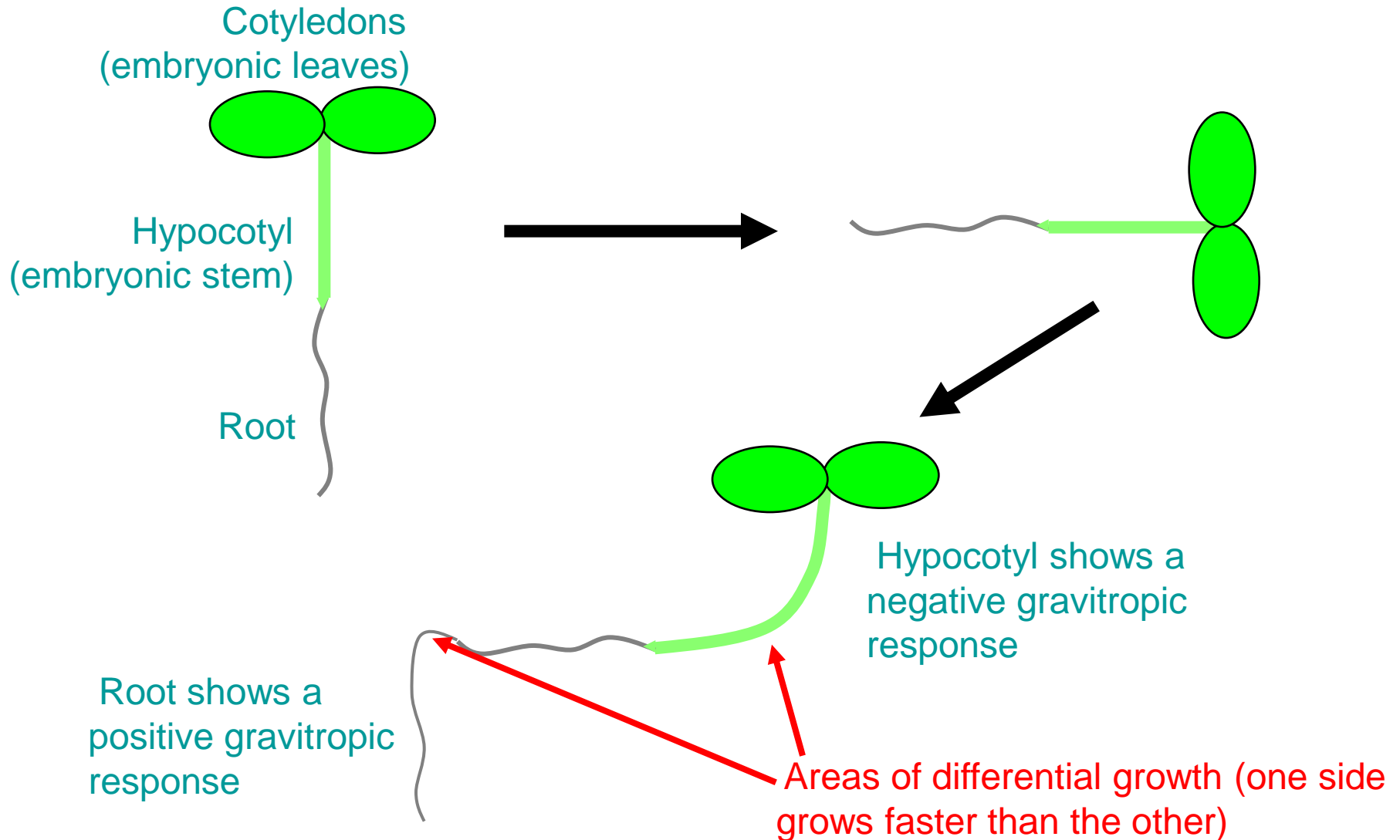
- promotes cell elongation
- inhibits lateral meristem activity
- promotes root formation



**Indole-3-acetic acid (IAA)**

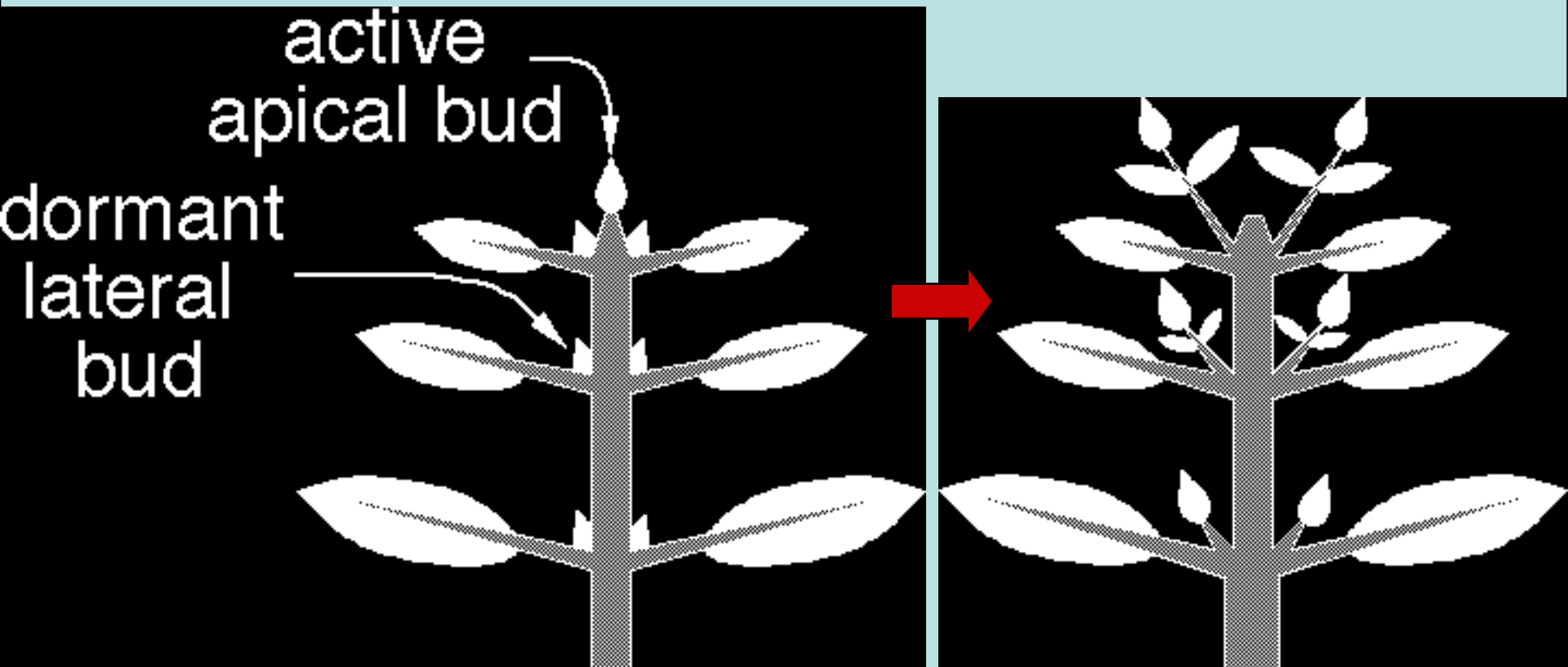
# Auxin and differential growth:

Gravitropic growth responses of Arabidopsis seedlings



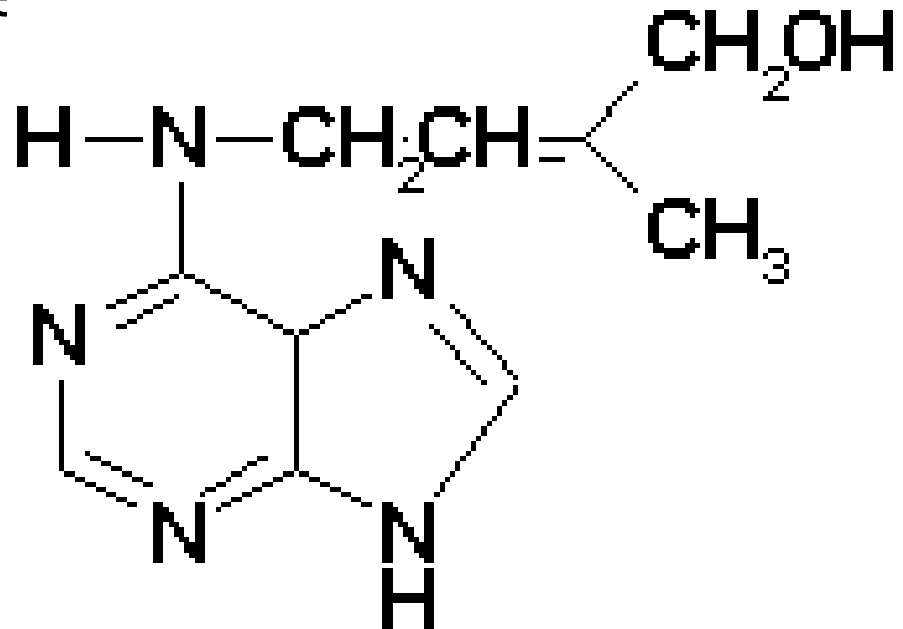
# Auxin and shoot apical dominance

- Decapitation of the apical bud releases the lateral buds. In the absence of auxin coming from the shoot apex, lateral buds become active leading to branching (and a more bushy shoot development)

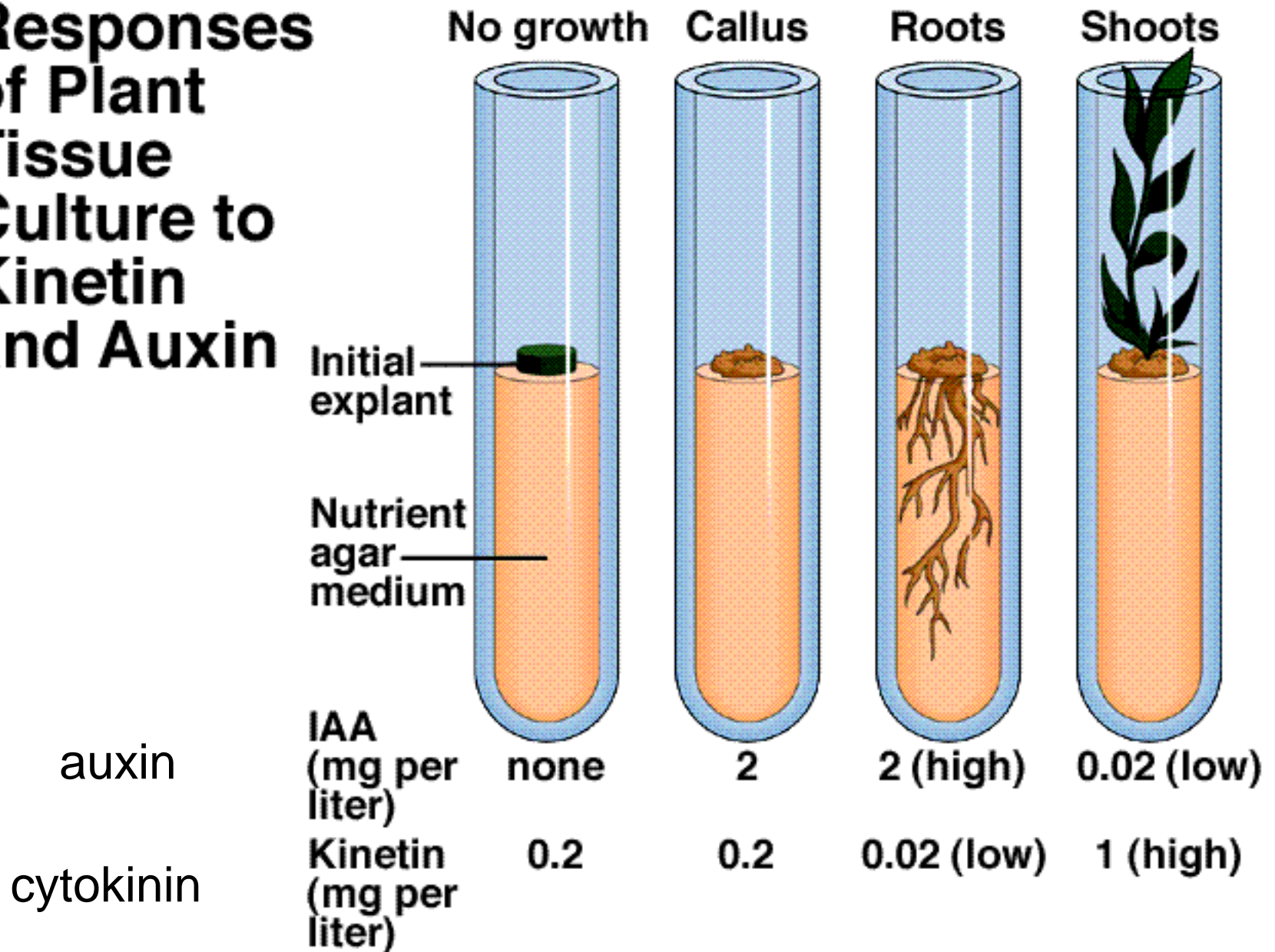


# Cytokinin

- promotes cell division/shoot formation
- promotes lateral meristem activity
- controls sink/source identity of plant organs
- delays senescence

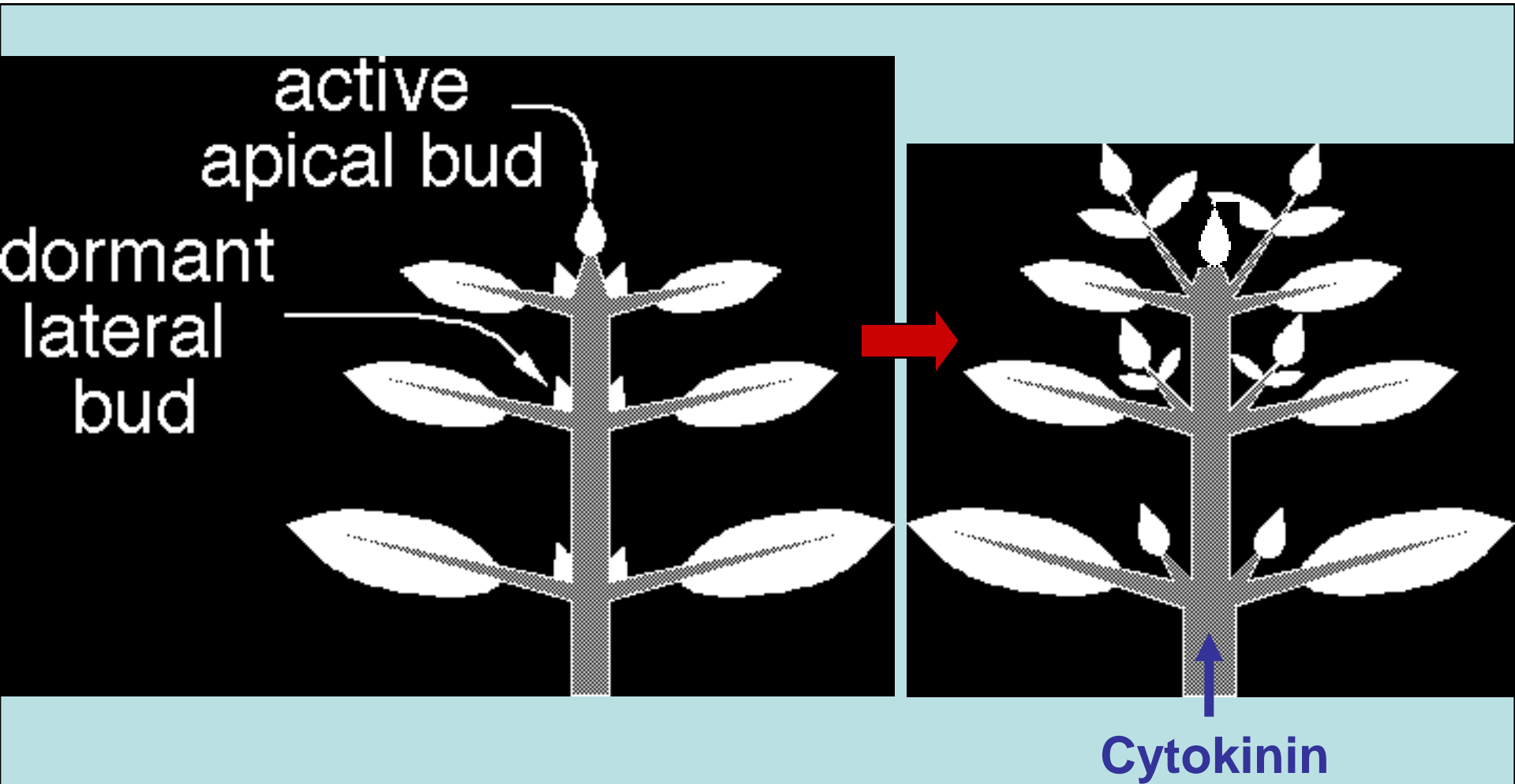


# Responses of Plant Tissue Culture to Kinetin and Auxin



# Cytokinin and shoot apical dominance

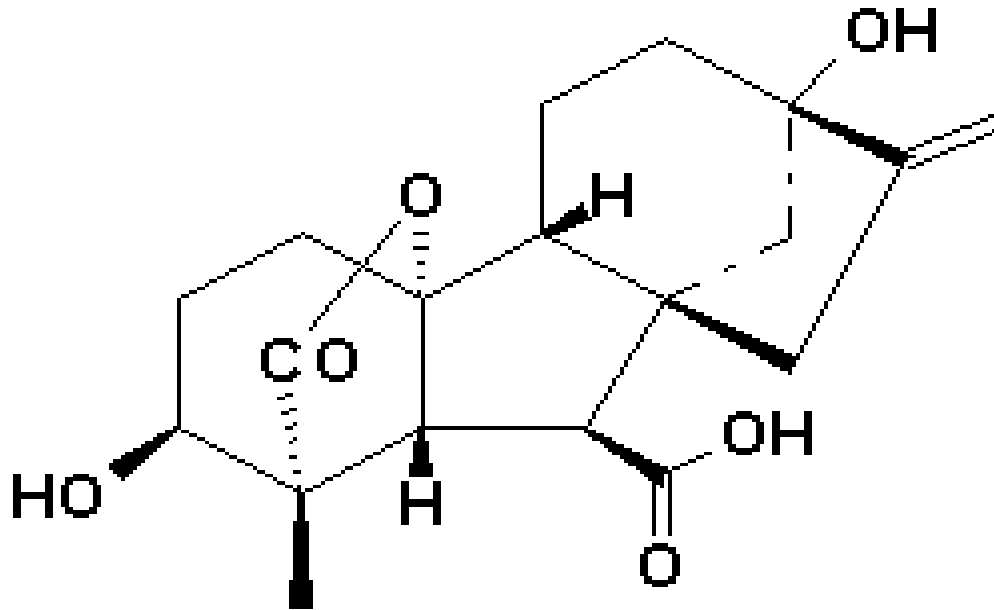
- By increasing the cytokinin concentration in the shoot, lateral buds become active resulting in increased branching (and a more bushy shoot development)





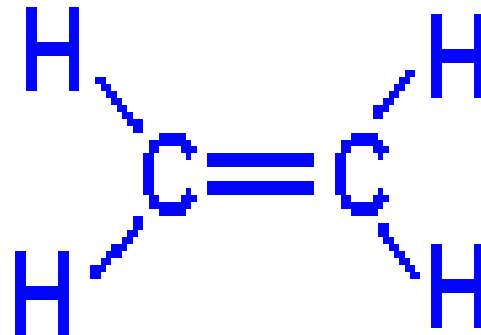
# Gibberellin

- promotes stem elongation growth
- promotes seed germination



# Ethylene

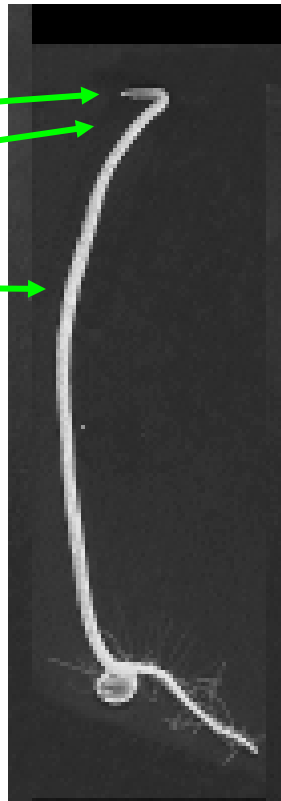
- inhibits cell expansion
- accelerates senescence
- accelerates fruit ripening



# Ethylene effects on etiolated seedlings

Arabidopsis seedlings grown in the dark display an etiolated growth pattern:

- 1) unexpanded cotyledons
- 2) Apical hook
- 3) long thin hypocotyl



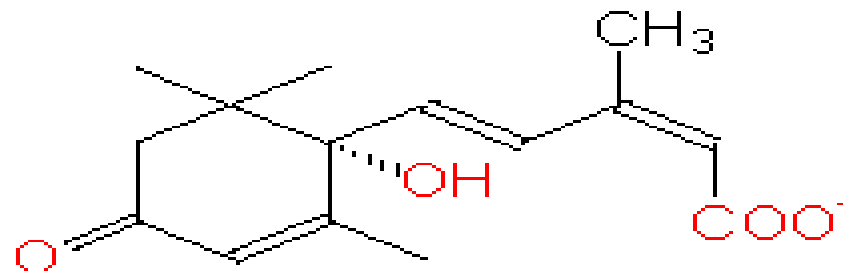
Exposure to ethylene during growth in the dark results in:



- 1) Exaggerated apical hook curvature
- 2) Much shorter and thicker hypocotyl

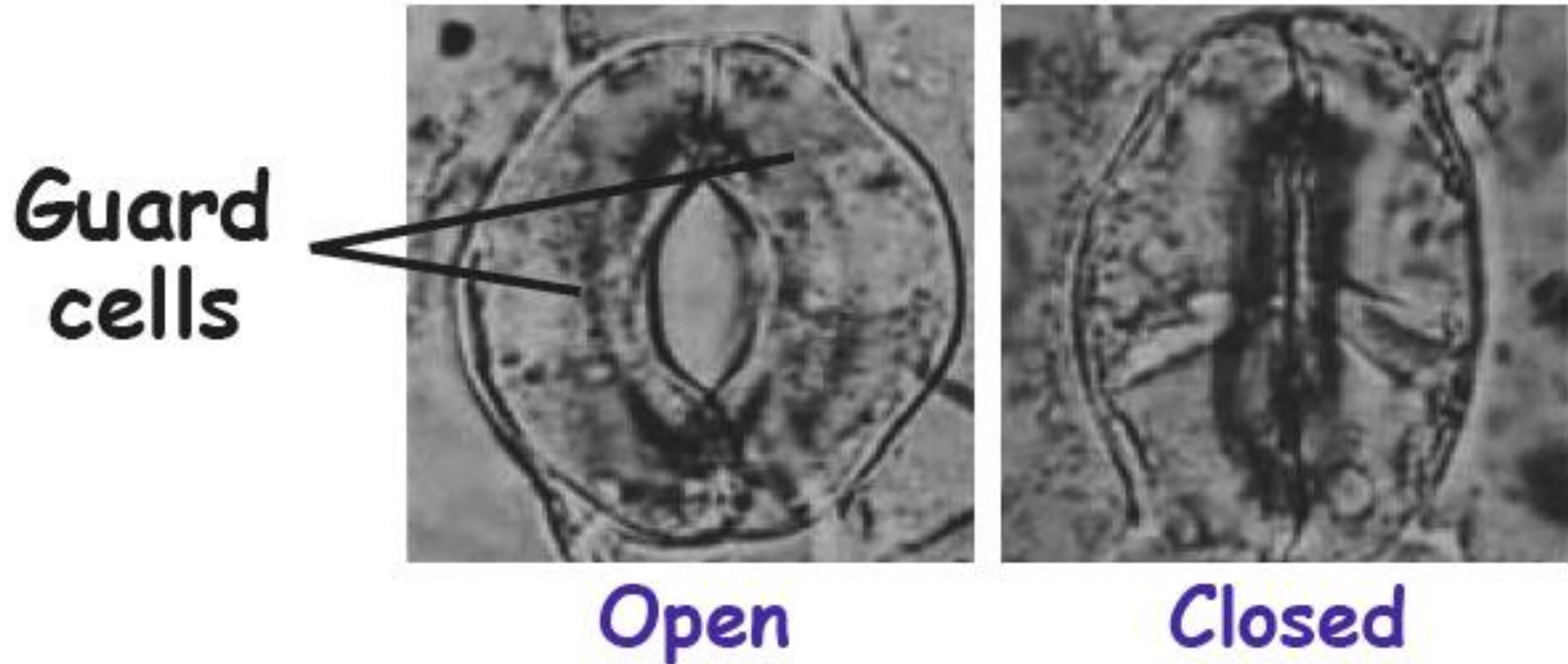
# Abscisic acid

- promotes stomatal closure
- inhibits seed germination



abscisic acid ( ABA )

# Abscisic Acid and drought stress



Abscisic acid is a signal of this emergency situation. Under drought conditions, wilted mesophyll cells of a leaf rapidly synthesize and excrete abscisic acid (ABA). This ABA diffuses to the guard cells, where an ABA receptor recognizes the presence of the hormone and acts to release  $K^+$ ,  $Cl^-$ , and as a result  $H_2O$ , thus rapidly reducing turgor pressure and closing the stomata

# Abscisic Acid and germination

Wild type (normal)  
Corn seeds  
attached . Majority  
of seeds are  
dormant: they  
contain ABA that  
prevents  
germination.



The *vp14* mutant  
of maize

ABA insensitive corn.  
Majority of seeds are  
already germinating while  
still attached to the parent  
plant because of a defect  
in ABA sensitivity.