Gibberellic Acid (GA)

- Overview
- Biochemistry
- Physiological action of Gibberellin
- Transport of Gibberellins
History

• Discovered in Japan
• Foolish rice seedling disease
• Fungus: Gibberella fujikurai
• 1950s active agent
Biochemistry

• Derived from terpenoids
• over 50 naturally occurring GAs
• GA$_1$ most active
• synthesized in young leaves (primordia)
• root apices
• developing fruits & seeds
Synthesis
Pathway

GA₁ is the most abundant and is biologically active. GA₃ and GA₄ are both biologically active in bioassays.
Mutants

Mendel's pea plants: GA mutants
Physiological action of Gibberellin

- Cell division
- Cell elongation
- Inhibit Tuber formation
- bud dormancy/seed dormancy
- fruit setting
- Mobilization of seed reserves
Cell division

• increases cell #
• shortens G1 to S transitions
Cell Elongation

- internodal elongation
- bolting response in biennials (cabbage)
- not like auxin, 1 hr response
Mobilization of seed reserves

- Cereal grasses (Barley)
- embryo produces GA
- diffuse to aleurone layer
- de novo synthesis of amylase
- hydrolyze starch
Applications of GA increase enzyme activity/protein synthesis

(A) Enzyme synthesis

(B) mRNA synthesis

Treated with GA₃

No GA treatment

Treated with GA₃

No GA treatment
Photoperiod

- Bud dormancy/seed dormancy, photoperiod requirement
- Plants which require cold/long days
- Substitute by GA
fruit setting:

- Thompson seedless grapes: larger fruit with GA application
- Apple fruits
CAM induction

Fig. 2 Western immunoblots for *M. crystallinum* leaf Rubisco and PEPcase. Leaf samples were harvested at the end of a 6-week treatment period. Pairs of samples were collected consisting of LP 5 and axillary leaves. Salt-treated plants were control plants irrigated for 5 d prior to the end of experiment. Abbreviations: Pre=Pretreatment (3-week-old plants prior to spraying); C=control; GA=gibberellic acid treated; Slt=salt treated; 1=LP 5; 2=axillary leaves.
Transport of Gibberellins

- transport from cell to cell in seedling
- older plants transport in phloem
- in root, maybe in xylem
- transported as glucosides