

## SEED DORMANCY



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## Seed dormancy definitions

- Seed dormancy is a survival mechanism by which seeds can delay germination until the right environmental conditions for seedling growth and development.
- Seed dormancy is a mechanism that prevents a viable seed from germinating when placed in an ideal environment for germination



Reasons for dormancy

## Seed dormancy

- Seeds are dispersed from the parent plant with different degrees of dormancy.
- Adaptation – avoidance of seed germination under unfavorable weather conditions.



## Seed dormancy

- Dormancy also helps distribute the germination in time through its dependence on environment.
- Distributes germination in space reducing competition

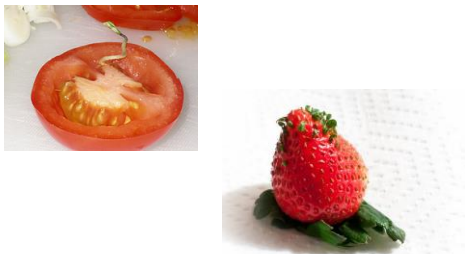


Importance of dormancy

### Is seed dormancy important?

- Important survival mechanism of weedy species, desert species, and over-wintering species
- Seed Bank
- Optimize germination over time and space
  - Time: environmental cue for germination
    - Temperature, Light
  - Space: transportation means may help break dormancy
    - Animal digestion

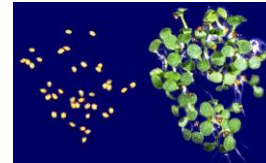
### Lack of Dormancy



Types of dormancy

### Primary and secondary seed dormancy

- Primary dormancy- present at dispersal
- Secondary dormancy- develops after dispersal



"Primary embryo dormancy is the inability of mature seed to germinate until specific environmental stimuli are perceived."

<http://www.plantbio.uga.edu/~galau/>

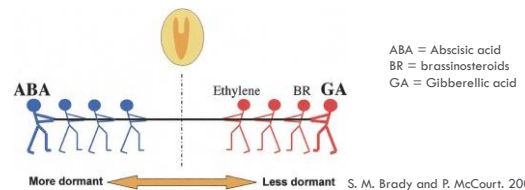
### Types of seed dormancy are based on mechanisms for dormancy

- **Physical dormancy mechanism (exogenous)-** a physical characteristic of the seed or seed coat prevents germination. EX: Hard Seeds

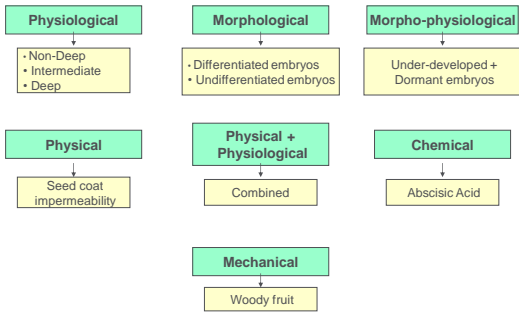


### Types of seed dormancy are based on mechanisms for dormancy

- **Physiological dormancy mechanism (endogenous)-** a physiological mechanism of the seed prevents germination. EX: Immature embryo, Hormonal inhibition.



## Types of seed dormancy



## Dormancy Mechanisms: Seed Coat Impermeable to Water

- No water uptake
- Caused by genetic or environmental factors
- AKA hard seeds
- Alfalfa, Lathyrus, Red Clover, Vetches, Cotton
- Break dormancy with scarification, hot water, acid, and fire.



## Dormancy Mechanisms Seed Coat Impermeable to Gases

- No exchange of oxygen or in some cases carbon dioxide
- Slows respiration and metabolism
- Coffee and Cocklebur
- Break dormancy by leaching with water, chilling, removing seed coat, scarification



## Dormancy Mechanisms: Immature Embryo

- Embryo may be an undifferentiated mass
  - American Holly, Viburnums, Buttercups
- Embryo may need to increase in size
  - Ash trees, Pine trees
- After-ripening
- Break dormancy by alternating warm and cool temperatures, cool temperatures, hot temperatures, or long periods of storage

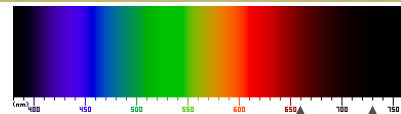


## Dormancy Mechanisms: Light Requirement

- Specific light quality (wavelength or intensity) or quantity (photoperiod) required for germination
- Lettuce, Birch, native grasses such as western wheatgrass, Virginia Pine, Tobacco, and Shepherds purse
- Break dormancy with Light



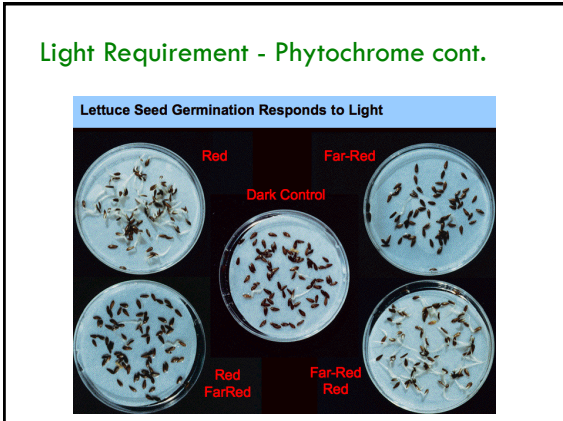
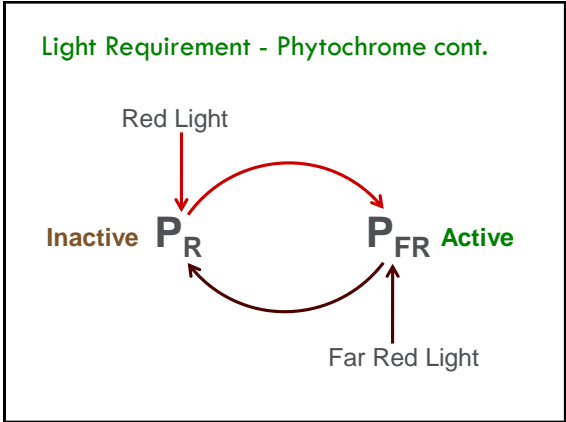
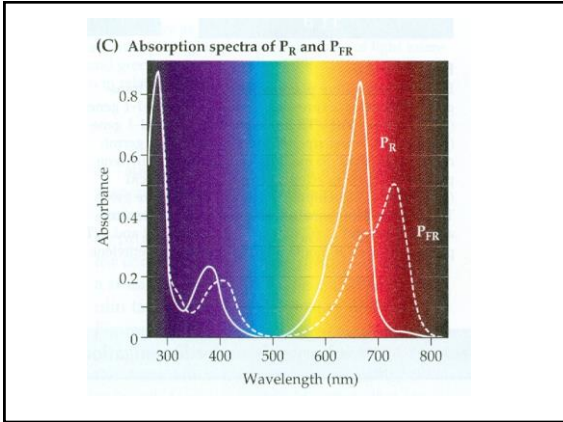
## Light Requirement - Phytochrome



Phytochrome is a plant pigment protein

- Phytochrome R is cis form
- Phytochrome Fr is trans form

Red Light (660nm) Far Red Light (730nm)



Light Requirement - Phytochrome cont.

- Physiological role of phytochrome is unclear. Although, there are some theories.
  - ▣ Influences gibberellin synthesis
  - ▣ Selectively activates specific genes
  - ▣ Changes membrane permeability

(D) Phytochrome activities

Dormancy Mechanisms: Temperature Requirement

- A certain temperature (high or low) is required for the seed to break dormancy.
- Stratification
- After-ripening

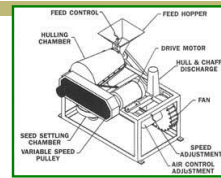
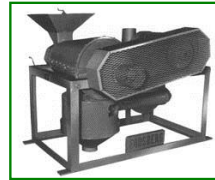
After-ripening

- A progressive loss of dormancy in mature dry seed. During this period changes occur in the seed to allow it to germinate after time.

## Mechanically Breaking Dormancy

- Risky, seeds are easily damaged
- May reduce storage life of seed
- Horticulture industry uses other means of propagation if seed dormancy cannot be broken easily

## Huller and Scarification



## Brush Scarification

