**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**

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

**Importance of dormancy**

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

Primary and secondary seed dormancy

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.

ABA = Abscisic acid
BR = brassinosteroids
GA = Gibberellic acid

More dormant → Less dormant
S. M. Brady and P. McCourt, 2003
Types of seed dormancy

- **Physiological**
  - Non-Deep
  - Intermediate
  - Deep

- **Morphological**
  - Differentiated embryos
  - Undifferentiated embryos

- **Morpho-physiological**
  - Under-developed + Dormant embryos

- **Physical**
  - Seed coat impermeability

- **Physical + Physiological**
  - Combined

- **Chemical**
  - Abscisic Acid

- **Mechanical**
  - Woody fruit

---

**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
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

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