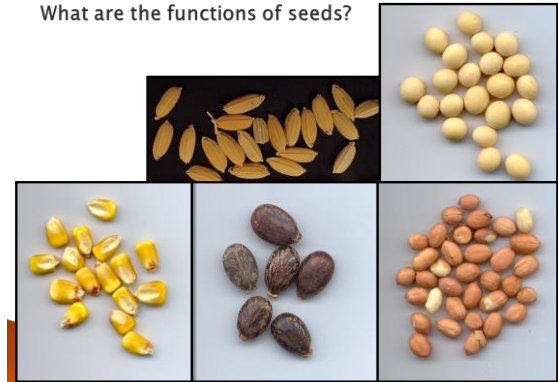


Seeds & Dormancy

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Extension Weed Science

What are the functions of seeds?



Protection

- Seeds often have special adaptations for embryo protection: burs, a hard seed coat, or distasteful or poisonous compounds.



Dispersal

- Seeds often have special adaptations for distribution such as burs, a pappus, or tasty fruits.



Diversity

- Normally the product of sexual reproduction
- Maximizes genetic plasticity in the population
- Population can withstand greater variation in the environment



Propagation

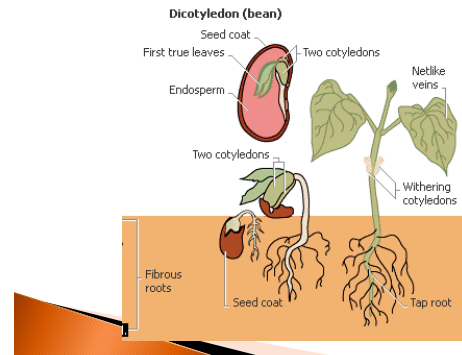
- Ultimately the unit of reproduction for many weed species and the sole method for annuals and biennials



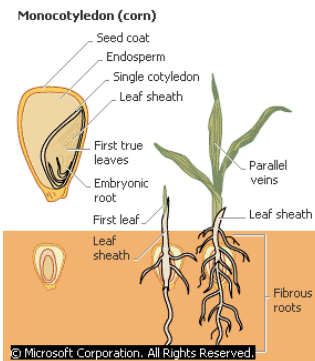
Parts of a seed

- ▶ Three basic components of all seeds
 - *embryo*--miniature living plant
 - *energy source*--either separate or as a part of the embryo
 - *outer covering*

Typical Dicot Seed & Seedling



Typical Monocot Seed & Seedling



Generally, each type of seed has a primary energy source

Table 1.2. The Food Reserves of Some Important Crop Species^a

	Average percent composition			Major storage organ
	Protein	Oil	Carbohydrate ^b	
Cereals				
Barley	12	3 ^c	76	Endosperm
Dent corn (maize)	10	5	80	Endosperm
Oats	13	8	66	Endosperm
Rye	12	2	76	Endosperm
Wheat	12	2	75	Endosperm
Legumes				
Broad bean	23	1	56	Cotyledons
Garden pea	24	1	52	Cotyledons
Peanut	31	48	12	Cotyledons
Soybean	37	17	26	Cotyledons
Other				
Castor bean	18	64	Negligible	Endosperm
Oil palm	9	49	28	Endosperm
Pine	35	48	6	Megagametophyte
Rape	21	48	19	Cotyledons

^aAfter Cleecker and Barton (1957) and Winton and Winton (1932).

^bMainly starch.

^cIn cereals, oils are stored within the scutellum, an embryonic tissue.

Requirements for seeds to germinate

- oxygen (for respiration)
- moisture (for enzymes)
- proper temperature (maximum, minimum, optimum)

*cool season crops have lower critical temperatures than warm season crops

Dry seeds are **dormant**, but living. If exposed to these elements and germination does not occur, what does this mean?

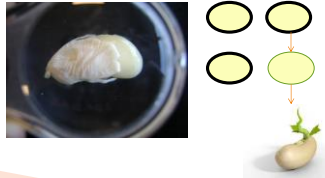
Mechanisms to maintain dormancy--

1. Hard or impermeable seed coat (**Scarification**)
2. Low temperature requirement (**Stratification**)
3. Light requirement
4. Chemical germination inhibitor in fruit or seed coat
5. Immature embryo



Impermeable seed coat

- ▶ legumes, some grasses, and many other weeds
- ▶ Requires *scarification*—scratching or dissolving the hard seed coat
 - using sandpaper
 - mild acid
 - other means



Passage by Animals

TABLE 2-4. Percentage of Viable Seeds Passed by Animals Based on Total Number of Seeds Fed

Kind of Seeds	Percentage of Viable Seeds Passed by					Average
	Calves	Horses	Sheep	Hogs	Chickens	
Field bindweed	22.3	6.2	9.0	21.0	0.0	11.7
Sweetclover	13.7	14.9	5.4	16.1	0.0	10.0
Virginia pepperweed	5.4	19.8	8.4	3.1	0.0	7.3
Velvetleaf	11.3	4.6	5.7	10.3	1.2	6.6
Smooth dock	4.5	6.5	7.4	2.2	0.0	4.1
Pennsylvania smartweed	0.3	0.4	2.3	0.0	0.0	0.6
Average	9.6	8.7	6.4	8.8	0.2	6.7

From Harmon and Keim (1934).

Light Requirement

- ▶ Lets small seeds know they are near the surface



Tillage



Low Temperature Requirement

- ▶ Seeds will not germinate until they have been vernalized over winter
- ▶ Require *stratification*—exposure of seed to low temperature to break dormancy

Immature Embryo

- ▶ Seed require a period of time after harvest before germinate can occur

Chemical Germination Inhibitors

Examples:

- ▶ pumpkins, melons – seed will not sprout inside the fruit
- ▶ desert ephemeral plants – germinate only after a heavy rain storm



Advantages of Dormancy

- all seed do not germinate at the same time
- keeps seed from germinating on plant before harvest

Disadvantages of Dormancy

- weeds with dormancy mechanisms are hard to eradicate
- weed seed can live in the soil for many years

Seed Viability vs. Longevity

Seed *viability* -living seed capable of germinating if given all necessary requirements to break dormancy

Seed *longevity* -the length of time seeds remain viable

Weed Seed Bank

- ▶ How can weed seed biology and ecology be used to manage the weed seed bank?
 - Reading: Chapters 1 & 2 in Applied Weed Science
 - Tuesday will be the first lecture Quiz