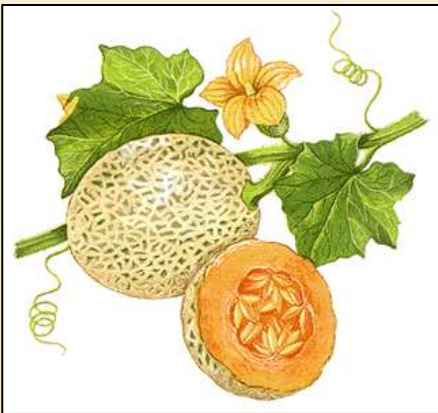
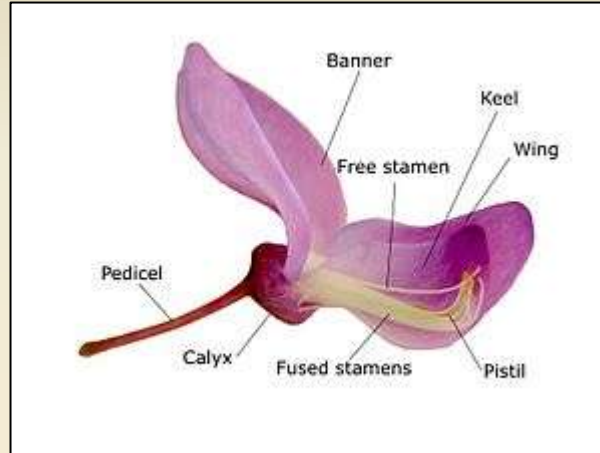
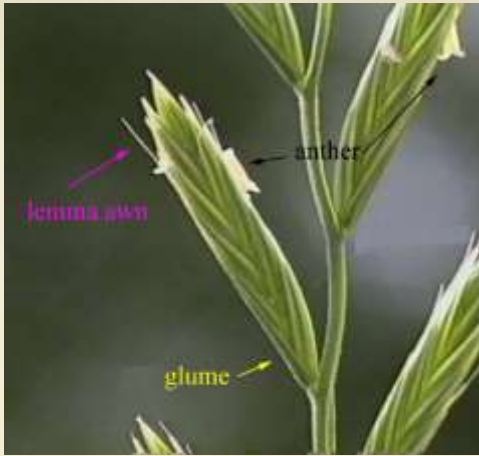


Six Plant Families of Economic Importance



Six Top Agricultural Crop Families

- **Grass family** (Poaceae)—rice, wheat, corn, etc.
- **Bean family** (Fabaceae)—soybeans, peas, beans
- **Tomato family** (Solanaceae)—tomatoes, potatoes, peppers, eggplants
- **Mustard family** (Brassicaceae)—cabbage, mustard, turnips, broccoli
- **Squash family** (Cucurbitaceae)—watermelon, honeydews, squash, zucchini
- **Carrot family** (Apiaceae)—carrots, celery, parsnips, cilantro

Poaceae

(=Gramineae)

Poaceae—Grass family

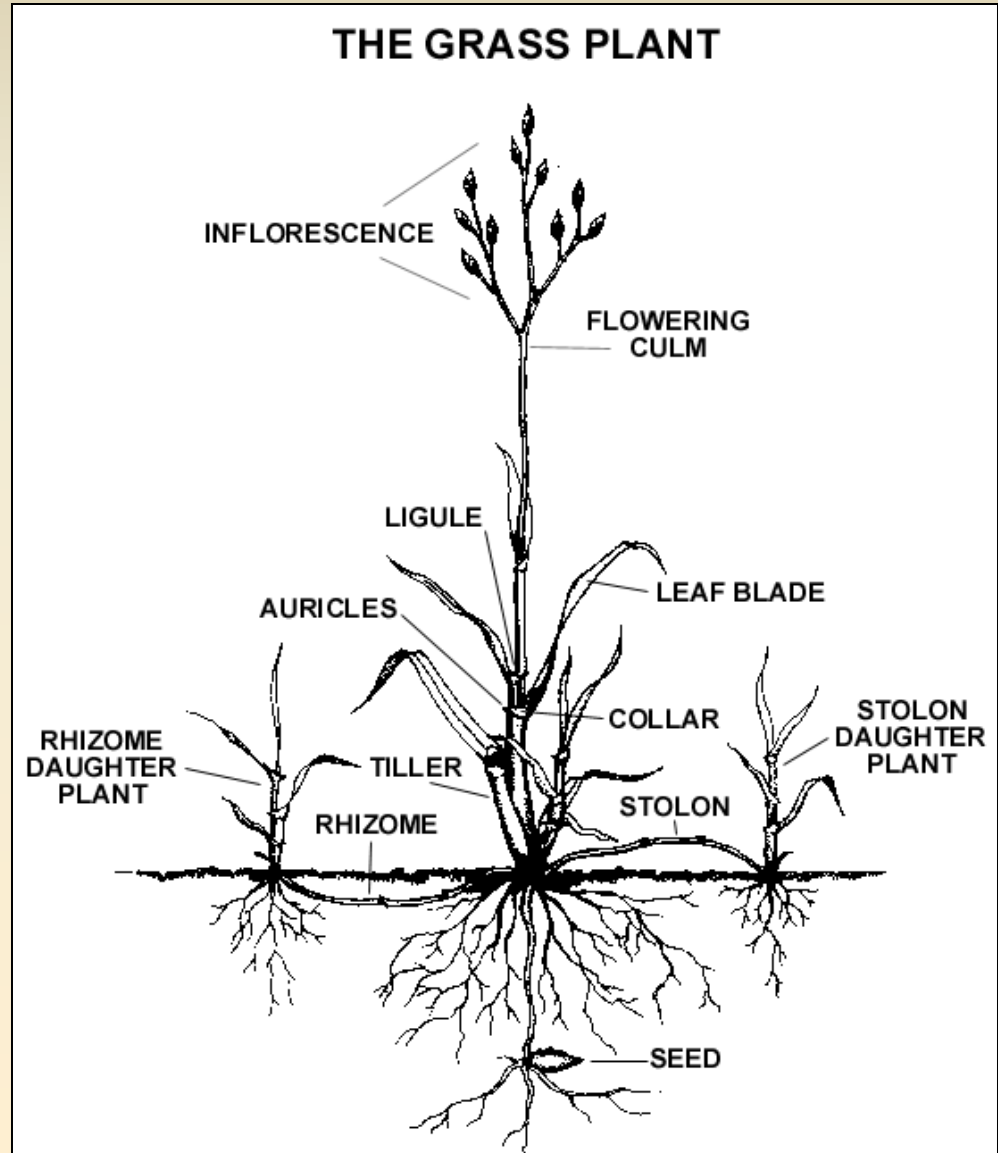
- Named for genus *Poa*
- Crops called cereal crops (Greek god of agriculture was Ceres)
- Monocots
- Old family name: **Graminae** (=grains)
- Of the total food produced by the World's top 30 crops (based on dry matter), about 23.4% comes from wheat, followed by maize (21.5%) and rice (16.5%) (Harlan, 1995).

Poaceae

- ~70% of all farmland dedicated to this group
- 9,000 species worldwide
- 35 species domesticated, **5** important today
- Only 1 from New World—which one?

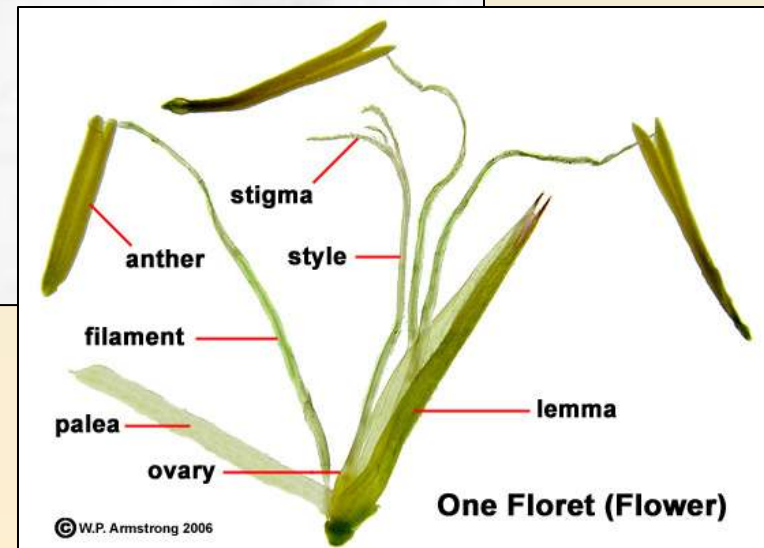
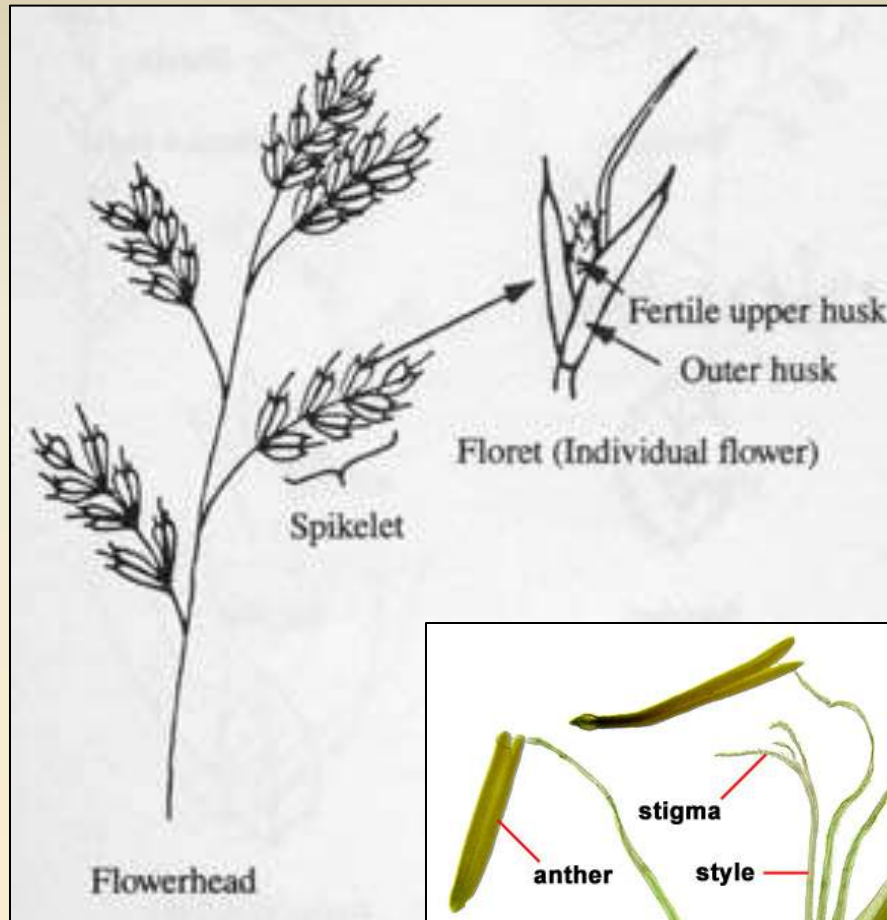
Grass vegetative structure

- Fibrous roots
- Leaves wrap around stem
- Produces clones (tillers) from runners (stolons) or from rhizomes



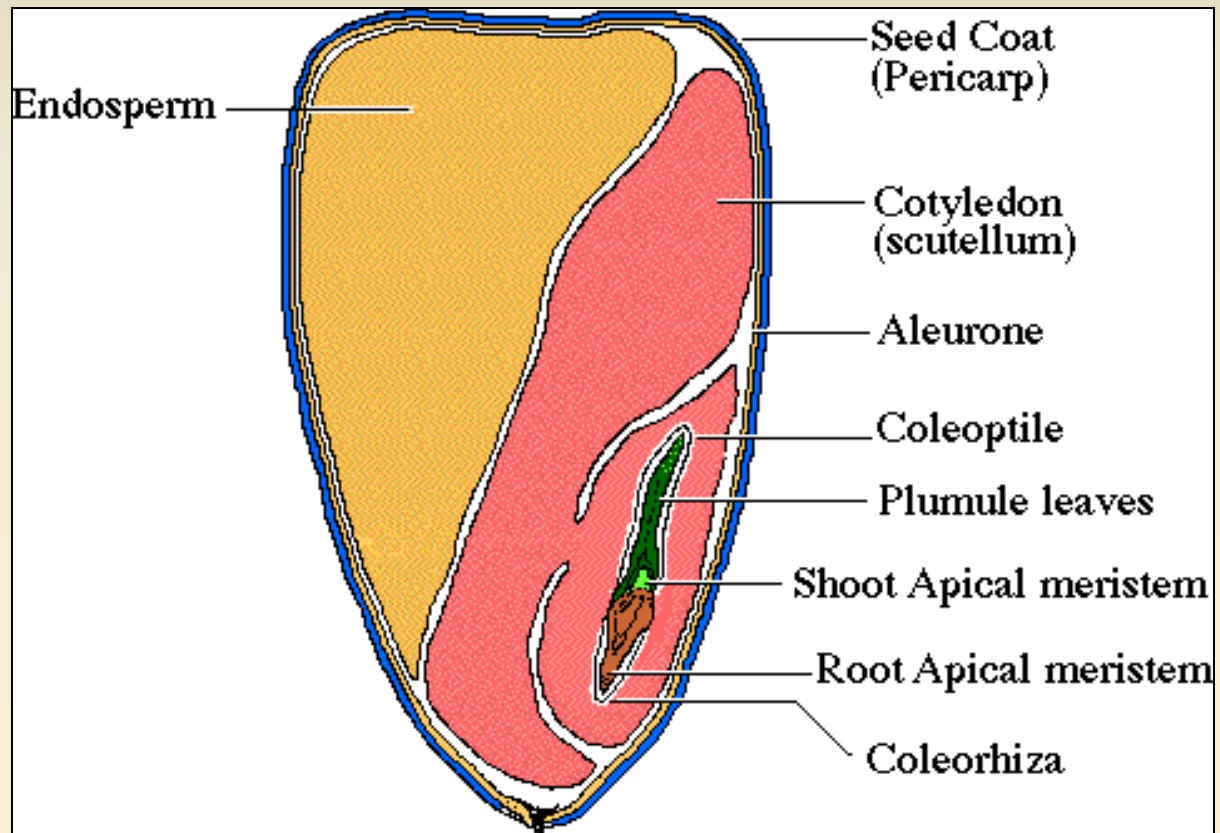
Grass reproductive structures

- Highly modified flower—no sepals, no petals
- Protective leaves (**glumes**) around flower stem base
- 2 more protective leaves: **lemmas**, **paleas** around flower
- 1 carpel, 2 stigma lobes, 3 stamens



Grass seeds:

- As seed matures, fuses completely to ovary wall=**caryopsis** (kernel)
- Ovary wall + seed coat = **bran**
- Interior to seed coat is oil-rich layer called **aleurone layer**
- Lots of endosperm
- 1-cotyledon = monocot



Wheat



Rice



Corn



Sorghum, Millet



Sugar Cane



Oats, Rye



Fabaceae

(= Leguminosae)

Bean family - Fabaceae

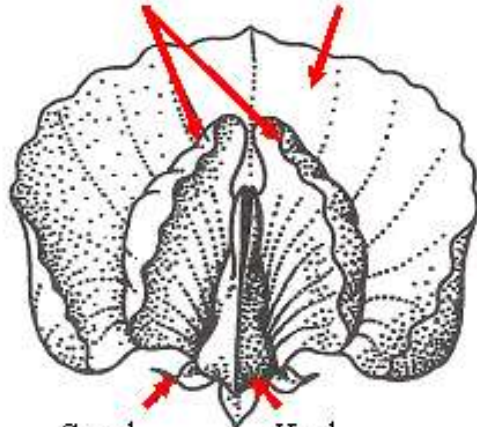
- 2nd to grasses in economic importance
- Major crops: **soybeans**, peanuts, beans, peas, alfalfa, clover, chickpeas, lentils
- Old family name = **Leguminosae** because fruit type is **legume**
- 1-carpel flowers with many seeds; dehiscent at maturity



Fabaceae – Papilionoid Flowers, wings like butterfly

Wings (2 petals)

Banner (1 petal)

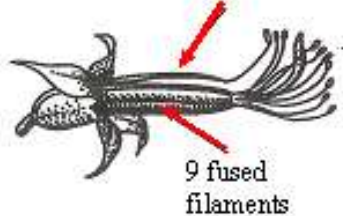


Sepal

Keel

(FRONT VIEW)

Free Stamen

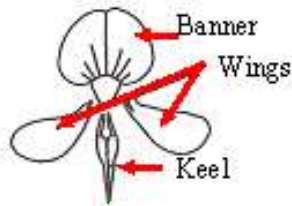


9 fused filaments

Banner

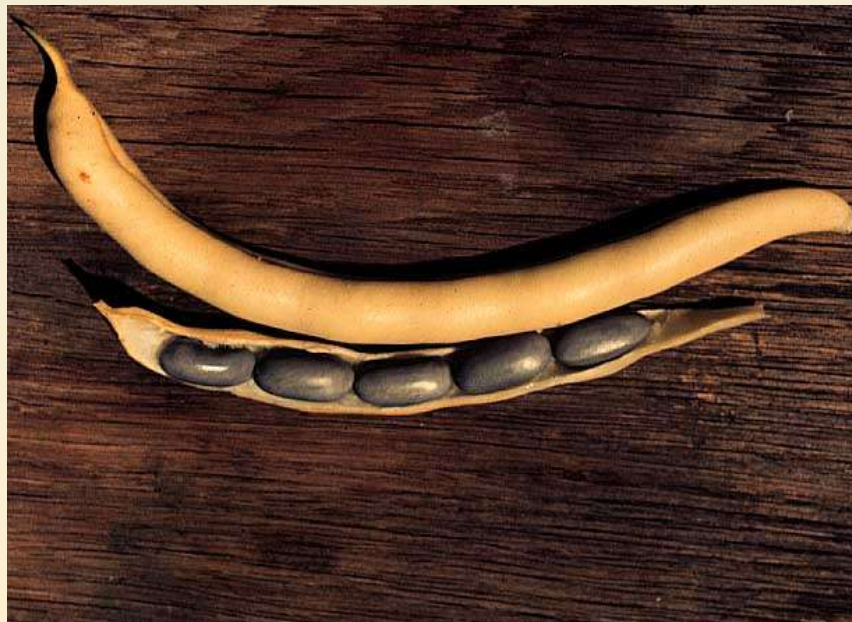
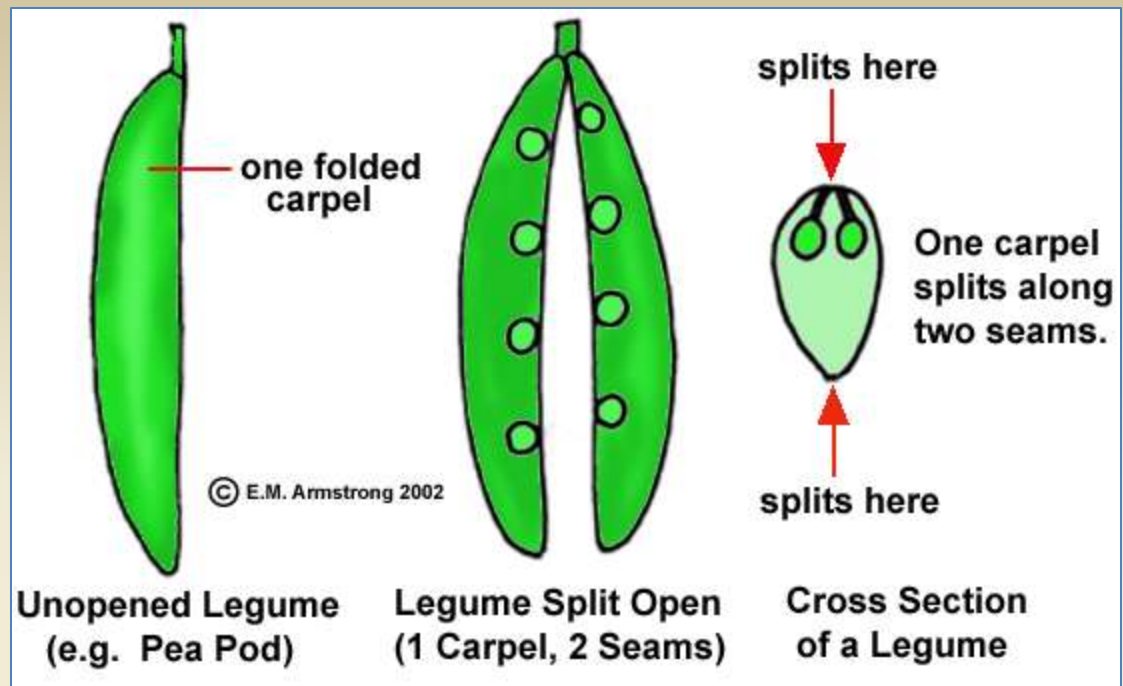
Wings

Keel



Flowers of the Fabaceae
(legumes)

Legumes



Soybeans



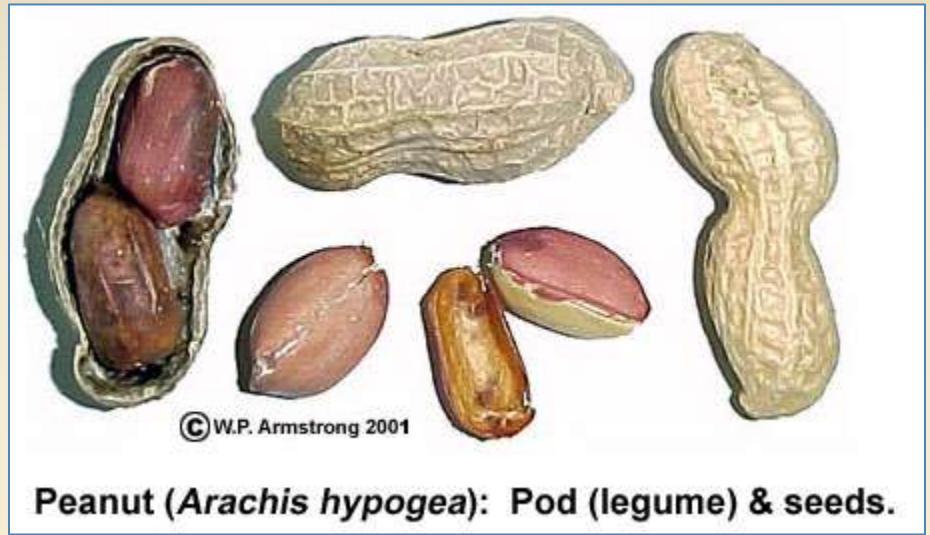
Soybeans consists of more than 36% protein, 30% carbohydrates, and excellent amounts of dietary fiber, vitamins, and minerals. It also consists of 20% oil, which makes it the most important crop for producing edible oil.

Soybean Products

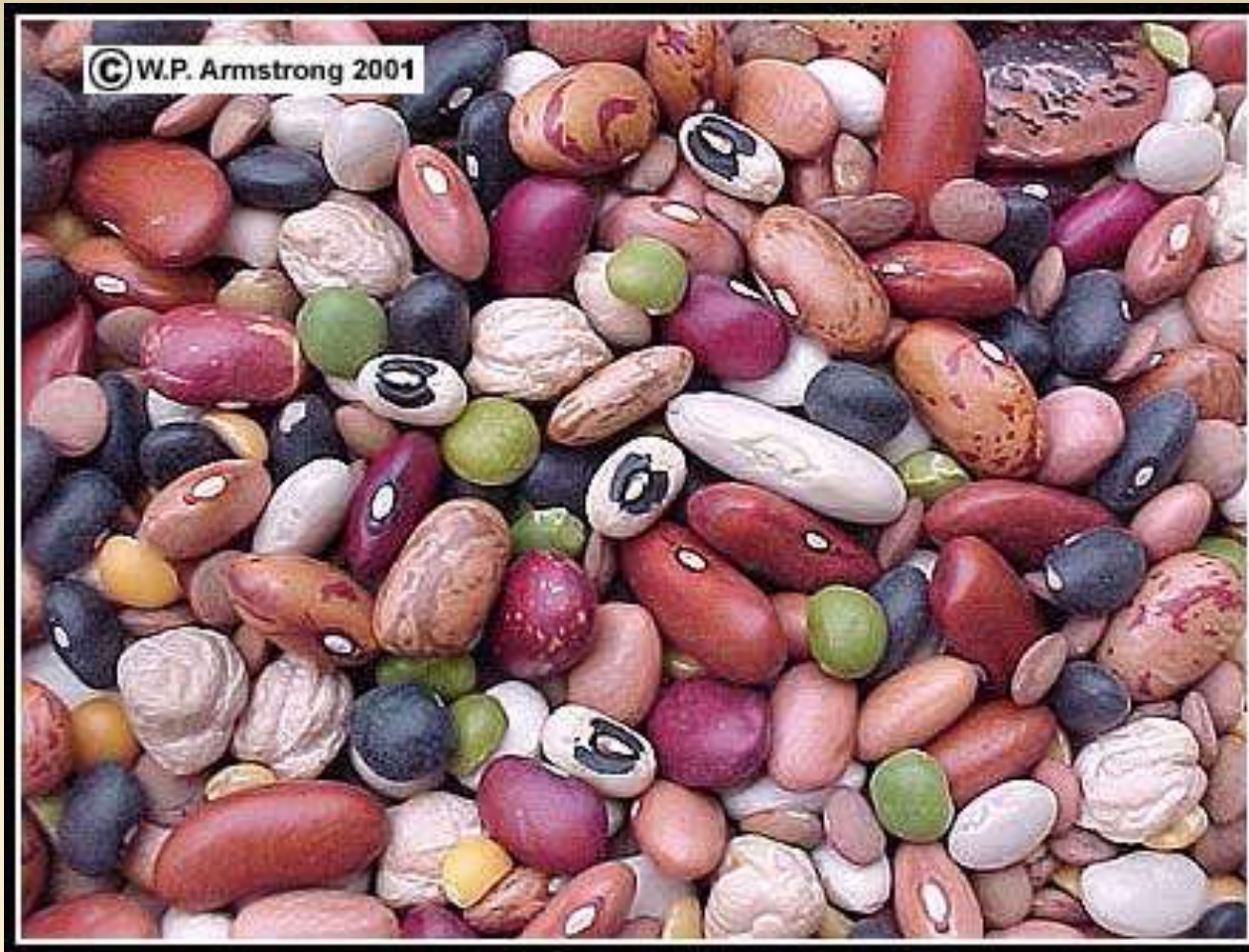


Peanuts – *Arachis hypogea*

indehiscent legumes, develop underground



Garden Beans – *Phaseolus vulgaris*



Nineteen varieties of beans: Northern, pinto, large lima, blackeye, garbanzo, baby lima, green split pea, kidney, cranberry bean, small white, pink bean, small red, yellow split pea, lentil, navy, white kidney, black bean, pearl barley and scarlet runner.

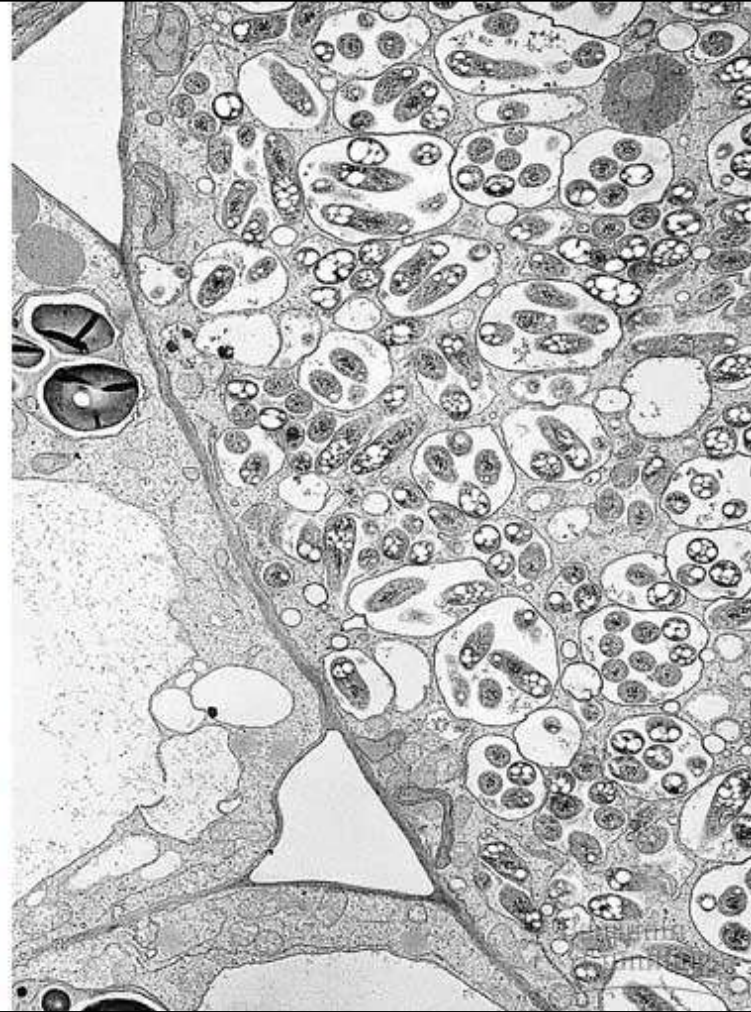
Carob - *Ceratonia siliqua*



Carat is derived from the word "carob," in reference to the carob seed. One carat is precisely 200 milligrams. The diamond in the engagement ring shown above is 1.09 carats or 218 milligrams.

Fabaceae

- *Rhizobium* bacteria form symbiotic relationships with roots
- Produce nodules. Nitrogen in atmosphere “fixed” by bacteria



Solanaceae

Tomato Family - Solanaceae

- Flowers **radially symmetrical** with
- **5 united sepals** and
- **5 petals** united at base
- Stamens are usually 5
- Superior ovary
- Leaves are **alternate, simple or lobed.**
- Fruit is a **berry** or **2-chambered capsule**



capsule

berry

Tomato Family - Solanaceae

Edible Genera:

Capsicum

bell peper

chilies, all kinds

paprika



Physalis

tomatillo

strawberry tomato



Solanum

tomato, roma, cherry, heirloom

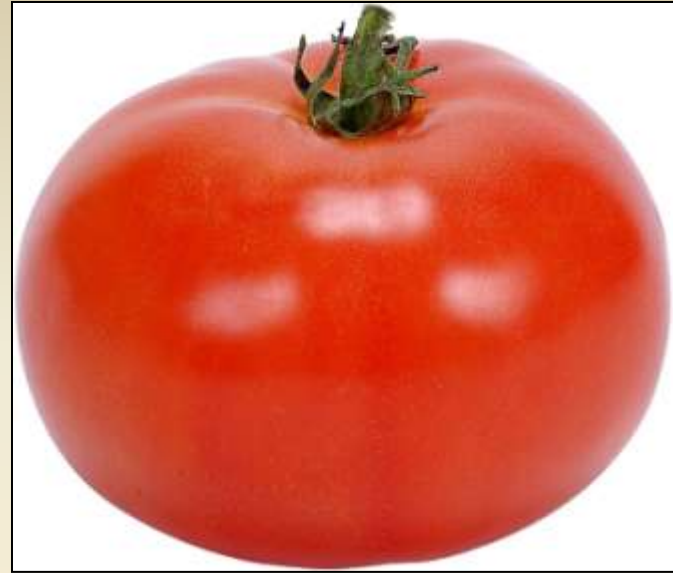
eggplant

potato



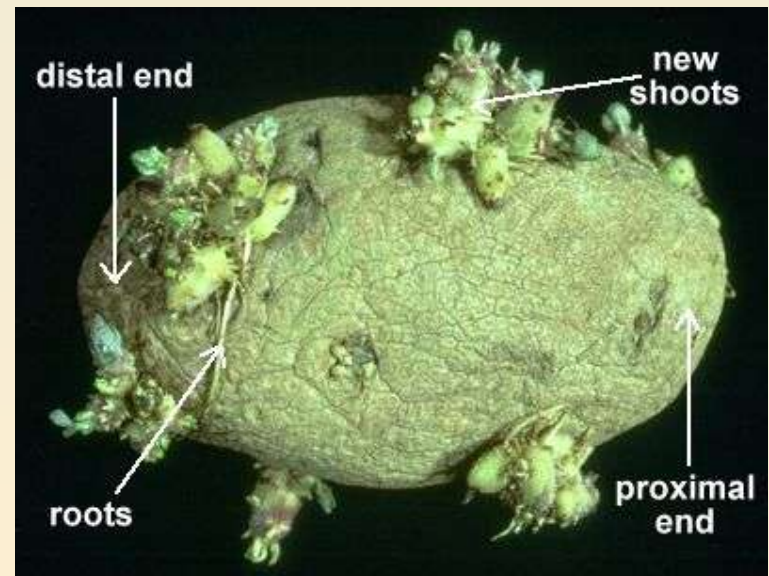
Tomatos

- *Solanum lycopersicum*
- Domesticated in Central America
- Nahuatl tribes called them **'tomatl'**
- First record in Europe is 1544 in Italy
- Not eaten for centuries in Europe because it looked like local toxic cousins
- Ketchup popularized in early 1900s, salsa in the 1980s



Potatoes

- *Solanum tuberosum*
- Domesticated in mountains of Argentina
- Good crop for cool, moist, country,
- **Tuber** = modified stem, produced underground
- Biennial crops
- 'eyes' = axillary buds
- Native name → '**batatas**'
- Scrape away any sprouts or green spots, since they might contain a mildly toxic compound called solanine



Potatoes & history

- **Irish potato famine**—1840s—killed 1-6 million people—caused by potato fungus *Phytophthora*
- Russians used potatoes as fermentation source → **vodka**



Eggplant

- *Solanum melongena*
- Native to India
- Domesticated about 3,000 yrs ago
- Original plants produced egg-like fruit
- Modern varieties have thicker, purple skin



Solanaceae
Solanaceae



Capsicum annuum L.
Capsicum annuum L.

Peppers

3 main species, each with many varieties:

Capsicum annuum

Capsicum frutescens

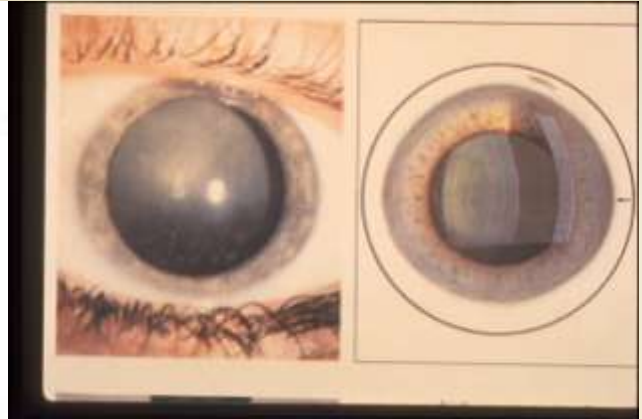
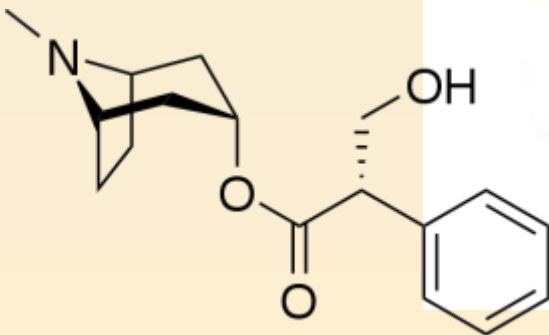
Capsicum chinense

The name “Capsicum” could arise from the Latin **capsa** (box) or the Greek **kapto** (to bite).

Alkaloids of Solanaceae plants:

Atropine from
belladonna

Hyosciamine
from
Henbane



Tobacco - Nicotine

- 2 main species:
Nicotiana rusticum
& *N. tabacum*



Brassicaceae

(= Cruciferae)

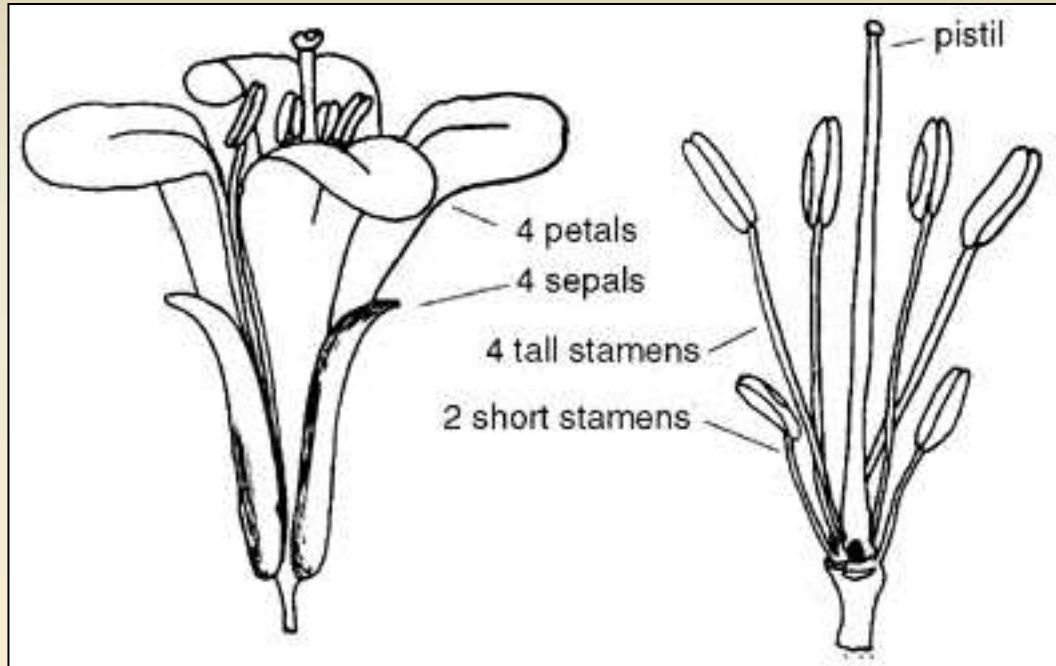
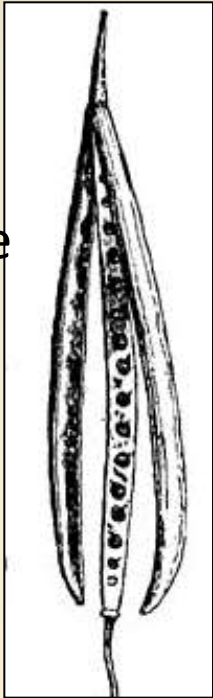
Mustard Family - Brassicaceae

- Leaves are **alternate** and **simple**.
- Flowers in **raceme**
- **sepals** 4
- **petals** 4, separate
- **Stamens** 6 , inner 4 long, outer 2 short (tetradynamous)
- Ovary divided by a **replum** or false partition.
- Fruit a narrow **silique** or a short **silicle**

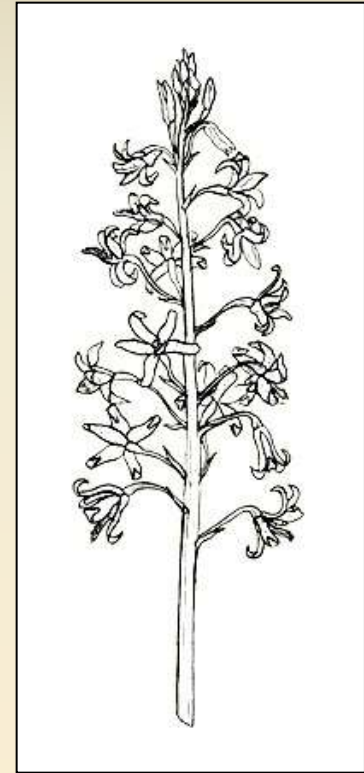


Mustard Family - Brassicaceae

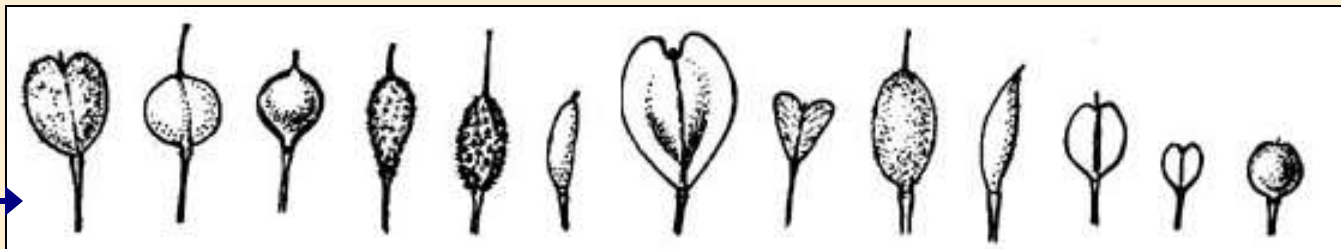
silique



raceme

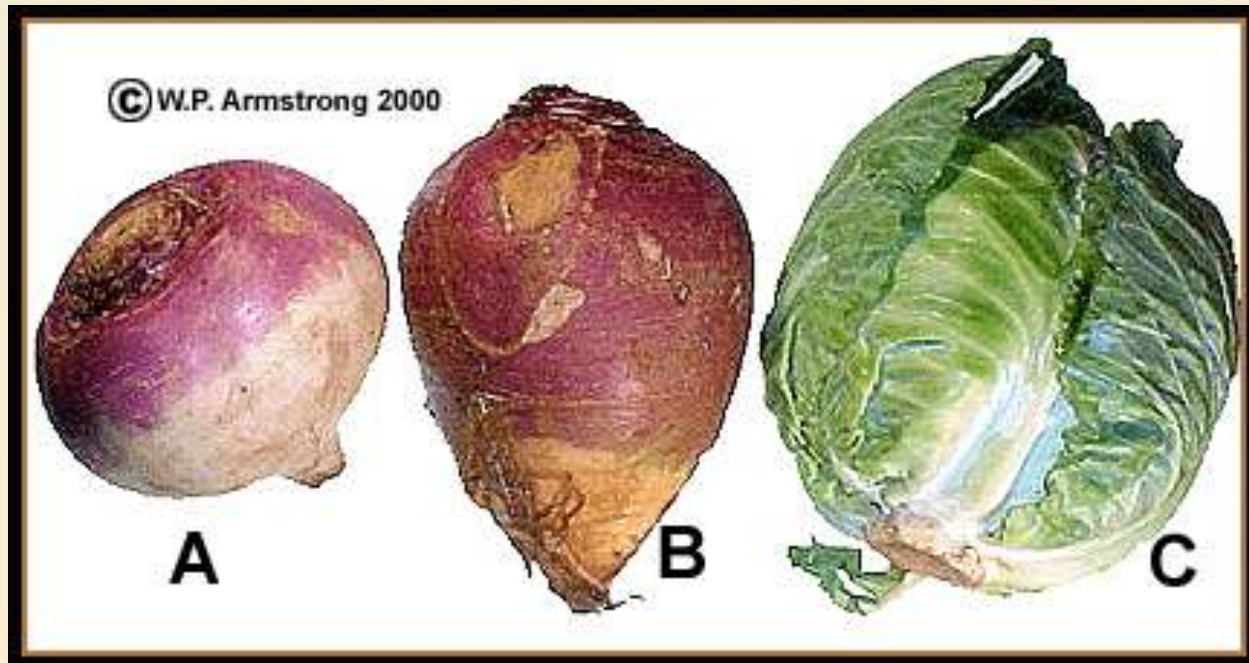


various silicles



Mustard Family - Brassicaceae

- Crops: cabbage, broccoli, cauliflower, turnips, kale, collards, mustard, brussel sprouts, rutabagas



Mustard Family - Brassicaceae

Edible Genera:

Brassica

kohlrabi

mustard

canola oil (rape seed oil)

cabbage, head of leaves

kale, without a head

cauliflower, flower buds

brussels sprouts, axillary buds

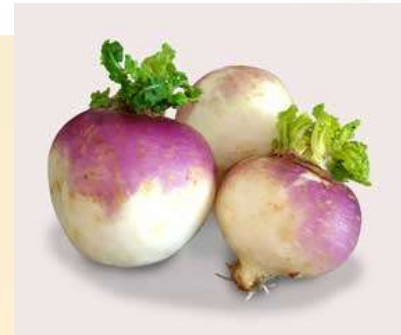
broccoli, flower buds

rutabaga

turnip

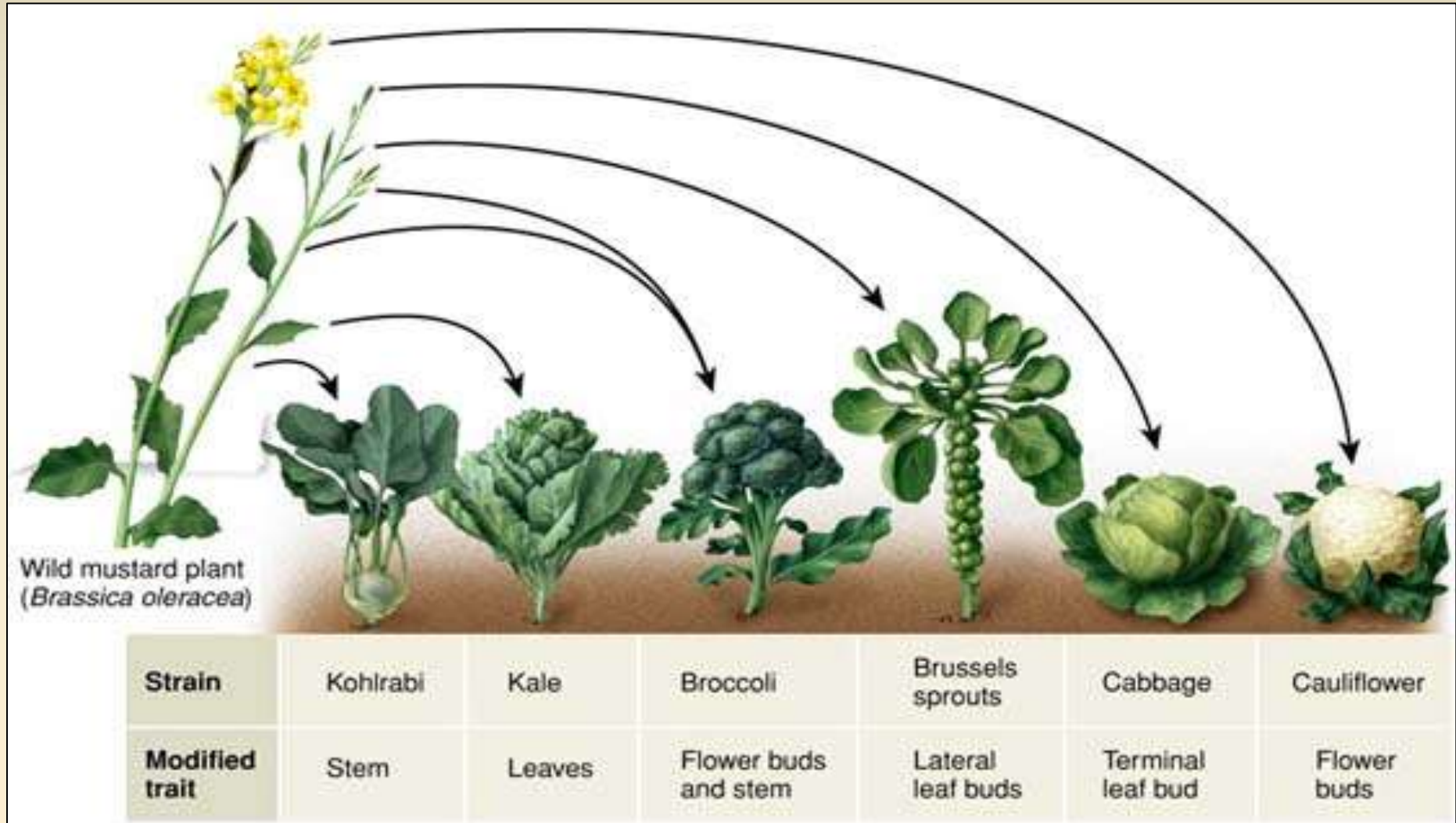
chinese cabbage

bok choy



Brassica oleracea – Wild Species

Cultivars all selected from different parts



Mustard Family - Brassicaceae

Other Edible Genera:

Armoracia rusticana

horseradish, root used to flavor foods



Eruca stiva

arugula



Nasturtium officinale

watercress



Raphanus sativus

radish

daikon



Cucurbitaceae

Squash Family - *Cucurbitaceae*

- Leaves **palmately veined** or **lobed**.
- **Monoecious** - separate male and female flowers (imperfect)
- Inferior ovary
- Ovary 3 carpels, single **locule** with **parietal placentation**.
- Fruit is a **pepo**, a berry with a hard rind.



Squash Family - *Cucurbitaceae*



female

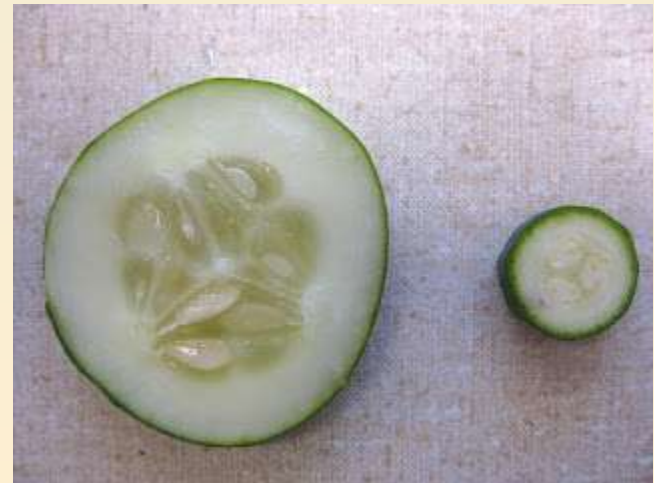
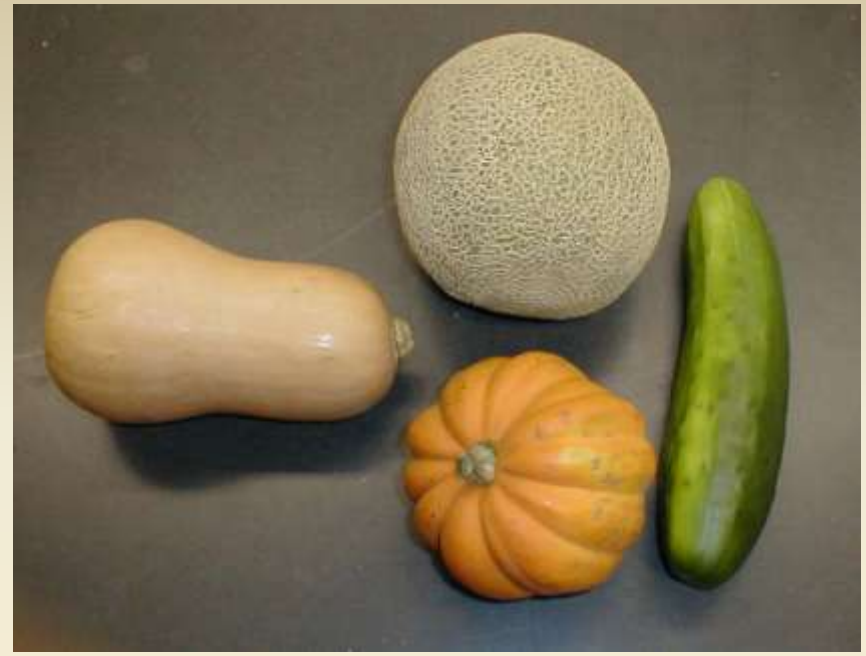
male

Cucumbers, melons,
squashes, zucchini,
gourds, pumpkins,
loofahs

Fruit type - **pepo**

3 carpels

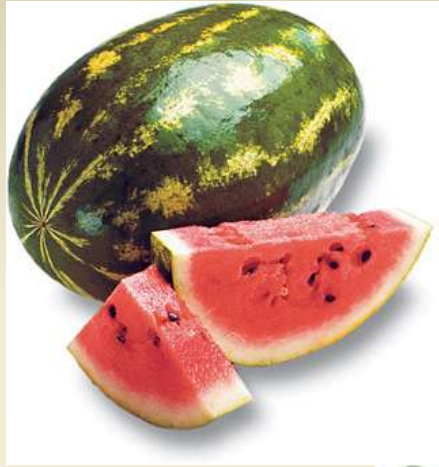
Parietal placentation



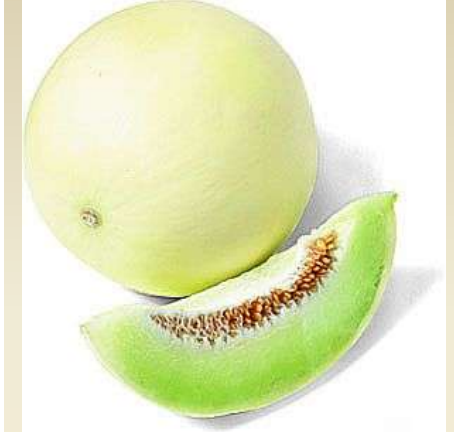
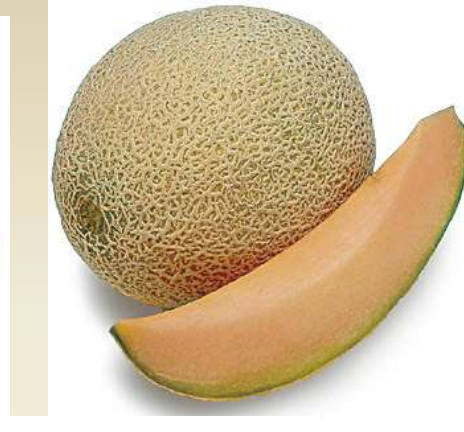
Squash Family - *Cucurbitaceae*

Edible Genera:

Citrullus lanatus
watermelon



Cucumis
cantaloupe
honey-dew
cucumber



Cucurbita
pumpkin
squashes



Squash, Pumpkins, and Gourds – *Cucurbita*



Apiaceae

= Umbelliferae

Carrot Family - Apiaceae

- Carrots, parsnips, celery
- Herbs: chervil, angelica, dill, caraway, coriander, cumin, fennel, parsley, aniseed, cilantro, rhubarb
- Old name: Umbelliferae



Carrot Family - Apiaceae

- **Compound leaves, petioles sheathing**
- Flowers borne in dense, flat-topped **umbel**.
- **sepals, petals** and **stamens** of an individual flower are each five.
- **ovary inferior** made up of 2 **carpels**, 1 **ovule** in each.
- Fruit develops into a **schizocarp**, splits in 2
- aromatic oils in leaves and fruit

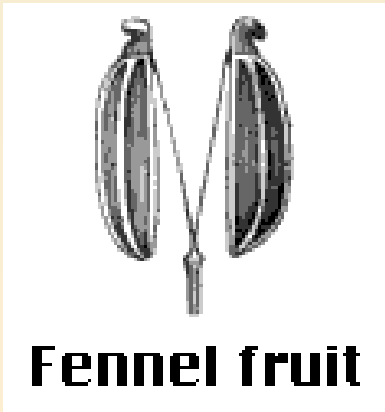




compound umbels



schizocarp



Fennel fruit



**Fennel fruit
x-section**



1 mm
Mericaarp Cumin

Schizocarp

Mericaarp

Carrot Family - Apiaceae

Edible Genera:

Anethum graveolens

dill



Apium graveolens

celery (petiole, root)



Carum carvi

caraway, herb and spice with edible leaves and roots. Can be used medicinally as an antispasmodic



Coriandrum sativum

cilantro

coriander



Cuminum cyminum

cumin



Carrot Family - Apiaceae

Edible Genera:

Daucus carota

carrot, cultivar of the wild variety, grows a tap root during its first growing season and then produces flowers and seeds during the next



Foeniculum vulgare

fennel, with edible petioles



Pastinaca sativa

parsnip



Petroselinum crispum

parsley



Pimpinella anisum

anise



Carrot Family - Apiaceae

Other Notable Genera:

Cicuta maculata

water hemlock, the deadliest plant in North America affecting the central nervous system and causes paralysis of the lungs. A tiny piece is enough to kill a human, contains large amounts of **cicutoxin**



Conium maculatum

hemlock, also extremely deadly and is said to be the plant that killed Socrates



Heracleum mantegazzianum

giant hogweed, causes painful blisters on contact with human skin



Carrot Family - Apiaceae



End