UF/IFAS Extension

The Journey to Sustainability Begins with Education

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UF UNIVERSITY of FLORIDA
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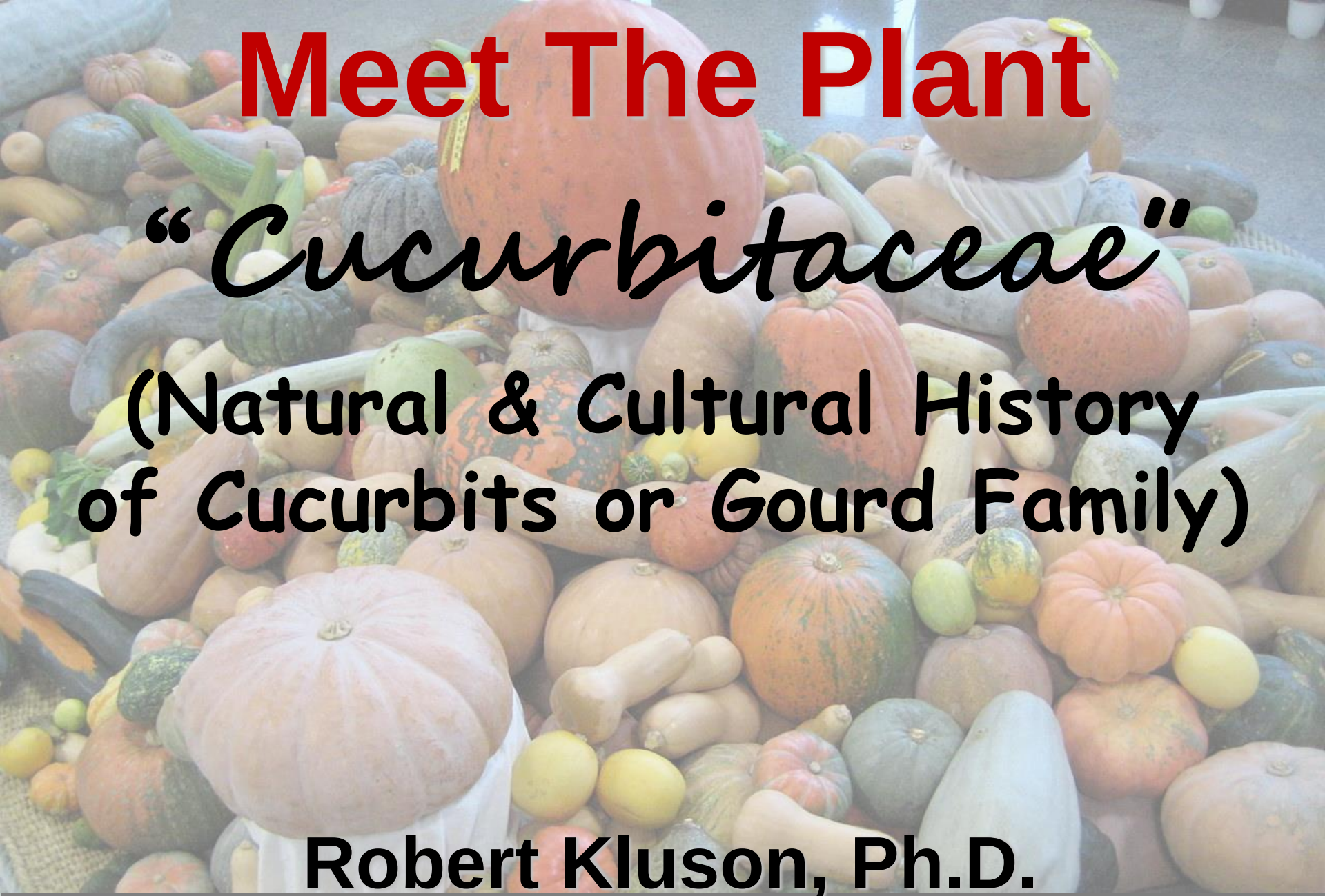
UF/IFAS EXTENSION SARASOTA COUNTY

- A partnership between **Sarasota County**, the **University of Florida**, and the **USDA**.
- Our Mission is to translate research into community initiatives, classes, and volunteer opportunities related to five core areas:
    - Agriculture;
    - Lawn and Garden;
    - Natural Resources and Sustainability;
    - Nutrition and Healthy Living; and
    - Youth Development -- 4-H

What is Sarasota Extension?



Meet The Plant

"Cucurbitaceae"

(Natural & Cultural History of Cucurbits or Gourd Family)

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OUTLINE

- Overview of “Meet The Plant” Series
- Introduction to Cucubitaceae Family
  - What’s In A Name?
- Natural History
  - Center of origin
  - Botany
  - Phytochemistry
- Cultural History
  - Food and other uses

Approach of Talks on "Meet The Plant"

- Today my talk at this workshop is part of a series of presentations intended to expand the awareness and familiarity of the general public with different worldwide and Florida crops.
- It's not focused on crop production.
- Provide background information from the sciences of the natural and cultural history of crops from different plant families.

“Meet The Plant” Series Titles (2018)

- Brassicaceae ← Jan 16th
- Cannabaceae ← Jan 23rd
- Leguminaceae ← Feb 26th
- Solanaceae ← Mar 26th
- Cucurbitaceae ← May 3rd

What's In A Name?

❖ Cucurbitaceae

➢the Cucurbitaceae family is also known as the cucurbit or gourd family.

➢a moderately size plant family consisting of about 965 species in around 95 genera - the most important for crops of which are:

- *Cucurbita* – squash, pumpkin, zucchini, some gourds
- *Lagenaria* – calabash, and others that are inedible
- *Citrullus* – watermelon (*C. lanatus*, *C. colocynthis*) and others
- *Cucumis* – cucumber (*C. sativus*), various melons
- *Luffa* – the common name is also luffa, sometimes spelled loofah

What's In A Name?

- Cucurbitaceae
  - Etymology:
    - The name Cucurbitaceae derives from the type genus *Cucurbita*, "the squash crops".
    - The genus name comes from c. 1300, from Anglo-French "gourde", Old French "coorde", ultimately from the classical Latin word "cucurbita" (gourd). It is of uncertain origin, perhaps related to "cucumis" (cucumber).

What's In A Name?

- Squash
  - Etymology:
    - gourd fruit, 1640s, shortened borrowing from Narraganset (Algonquian) "askutasquash", literally "the things that may be eaten raw," from askut "green, raw, uncooked" + asquash "eaten," in which the -ash is a plural affix (compare succotash).

- Zuchinni
  - Etymology:
    - 1915 in English cookery books, 1910 in travel books about Italy as an Italian word (defined as "an odd kind of little squash, very tender and palatable"), from Italian, plural of "zucchino", diminutive of "zucca" (gourd, squash) perhaps from Late Latin "cucutia".

What's In A Name?

❖ Pumpkin

➢ Etymology:

- 1640s, alteration of "pompone", "pumpion" (melon, pumpkin) (1540s), from Middle French "pompon", from Latin "peponem" (nominative pepo) (melon), from Greek "pepon" (melon)

- Pumpkin-pie is recorded from 1650s. Pumpkin-head, American English colloquial for "person with hair cut short all around" is recorded from 1781. Vulgar American English alternative spelling punkin attested by 1806.

What's In A Name?

❖ Cucumber

➢ Etymology:

- late 14c., from Old French "cocombre" (13c., Modern French "concombre"), from Latin "cucumerem" (nominative cucumis), perhaps from a pre-Italic Mediterranean language. The Latin word also is the source of Italian "cocomero", Spanish "cohombro", Portuguese "cogombro". Replaced Old English "eorþæppla" (plural), literally "earth-apples."

- "Cowcumber" was common form 17c.-18c., and that pronunciation lingered into 19c. Planted as a garden vegetable by 1609 by Jamestown colonists. Phrase 'cool as a cucumber' (c. 1732) embodies ancient folk knowledge confirmed by science in 1970: inside of a field cucumber on a warm day is 20 degrees cooler than the air temperature.

What's In A Name?

❖ Melon

➢ Etymology:

- late 14c., from Old French "melon" (13c.), from Medieval Latin "melonem" (nominative melo), from Latin "melopeponem", a kind of pumpkin, from Greek "melopepon" (gourd-apple - name for several kinds of gourds bearing sweet fruit), from melon "apple" + pepon, a kind of gourd
- in Greek, melon was used in a generic way for all foreign fruits (compare similar use of apple).

Cucurbitaceae Natural History

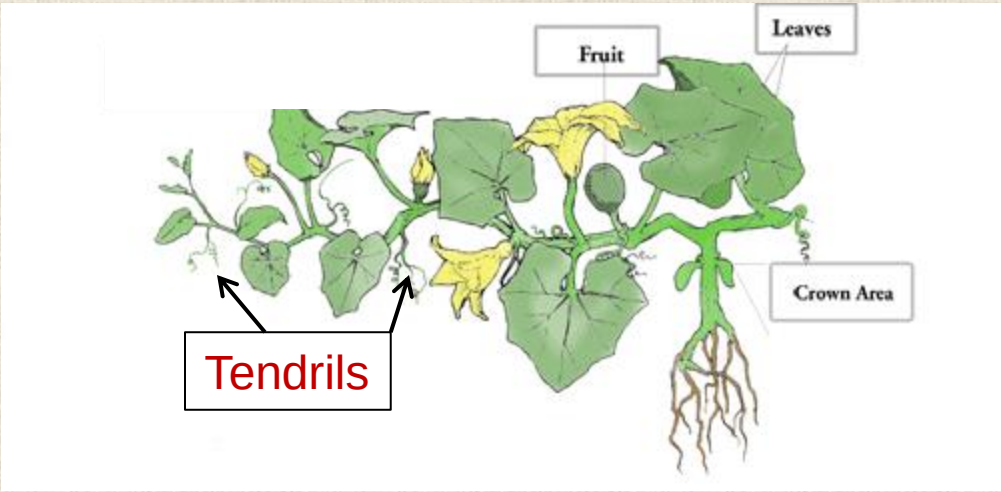
Natural History and Botany

- The Cucurbitaceae consist of mesophytic or xerophytic species, mainly found in tropical or subtropical regions.
- All species are sensitive to frost.
- Most of the plants in this family are annual vines, but some are woody lianas, thorny shrubs (*Acanthosicyos*), or trees (*Dendrosicyos*).
- Many species have large, yellow or white flowers with 5 petals. The stems are hairy and pentangular.

Natural History: Botany

- The plants grow as vines as either prostrate along the ground or climb using tendrils.
- Tendrils are usually four arched filaments coiling with an adhesive texture.
- Tendrils are present at 90° to the base of leaf petioles at nodes.

Tendril



Natural History: Botany

- Leaf shapes can range from simple to palmately compound.
- Those leaves that develop later are more deeply lobed and extra-floral nectaries are often found.

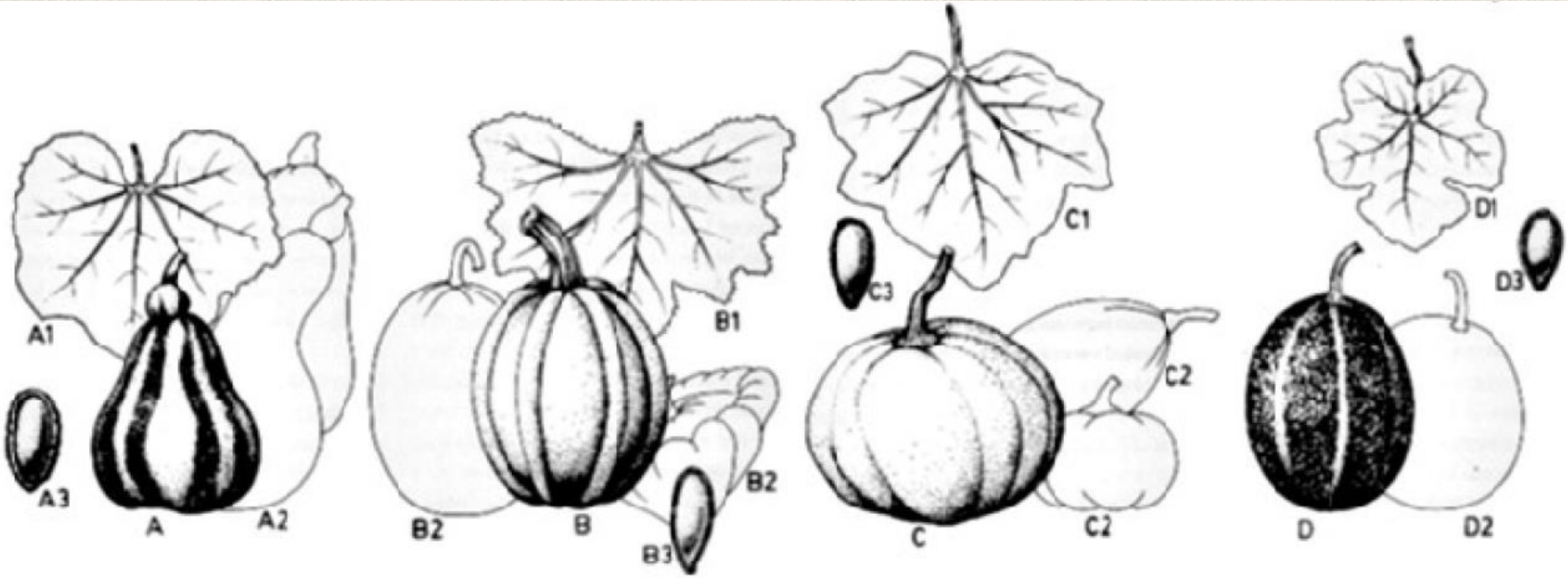
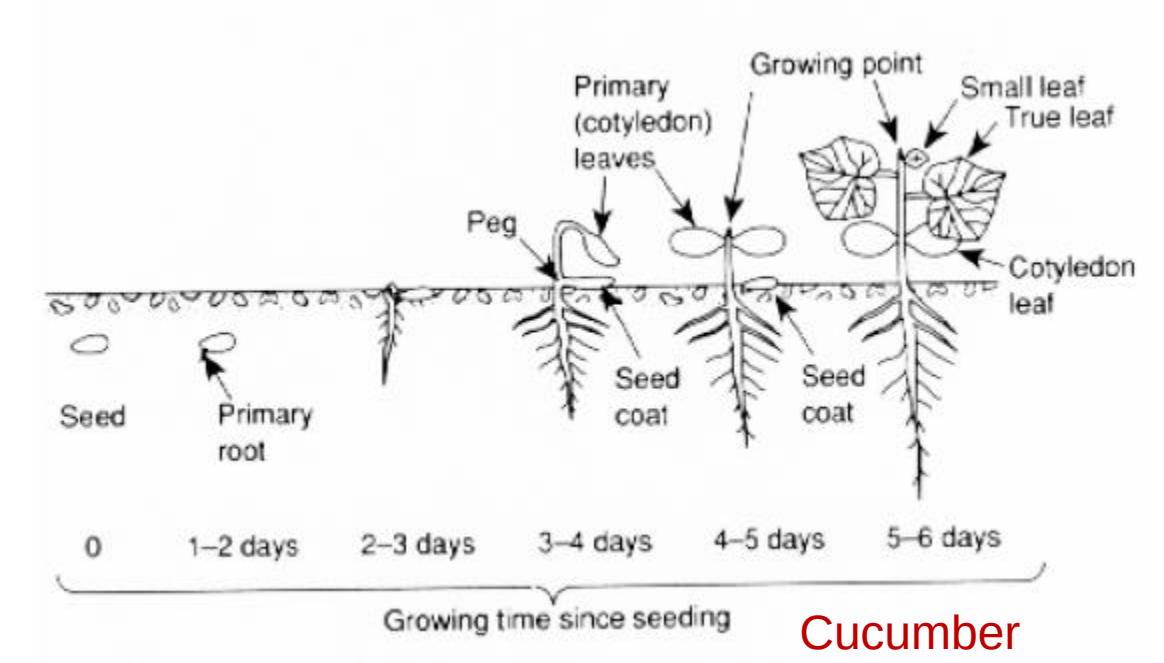


Figure 5 Mesoamerican cucurbits: A) *Cucurbita argyrosperma;* A1) leaf; A2) fruit; A3) seed; B) *C. pepo;* B1) leaf; B2) fruit; B3) seed; C) *C. moschata;* C1) leaf; C2) fruit; C3) seed; D) *C. ficifolia;* D1) leaf; D2) fruit; D3) seed

Natural History: Botany

- Roots
  - tap root type
  - capable of achieving a deep depth.



Cucumber

CLASSIFICATION BY ROOT DEPTH

1. **Shallow < 80 cm (3 ft):**

Cabbage, potato, lettuce, spinach, onion, sweet corn.

1. **Medium 80-160 cm (3-6 ft):**

Beans, eggplant, beets, summer squash, carrot, peas, cucumber.

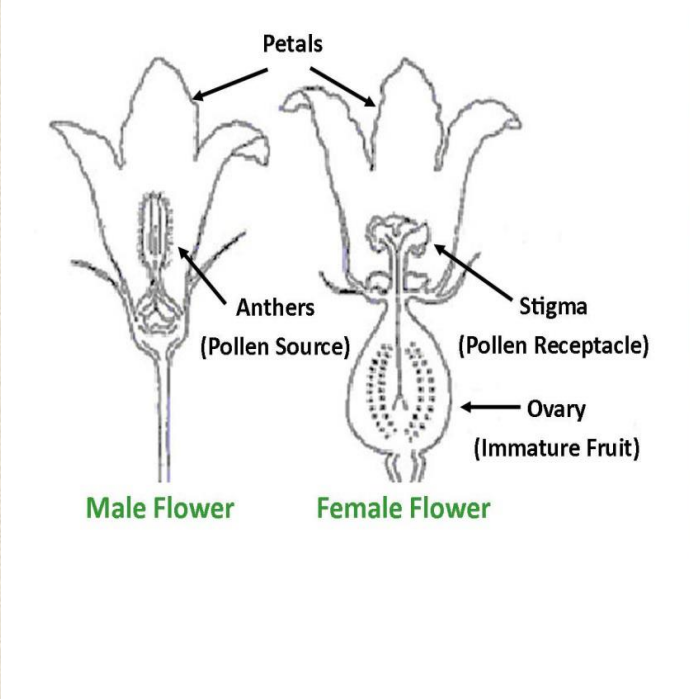
1. **Deep > 160 cm (6 ft):**

Artichoke, asparagus, melon, sweet potato, tomato, winter squash and pumpkin.

Natural History: Botany

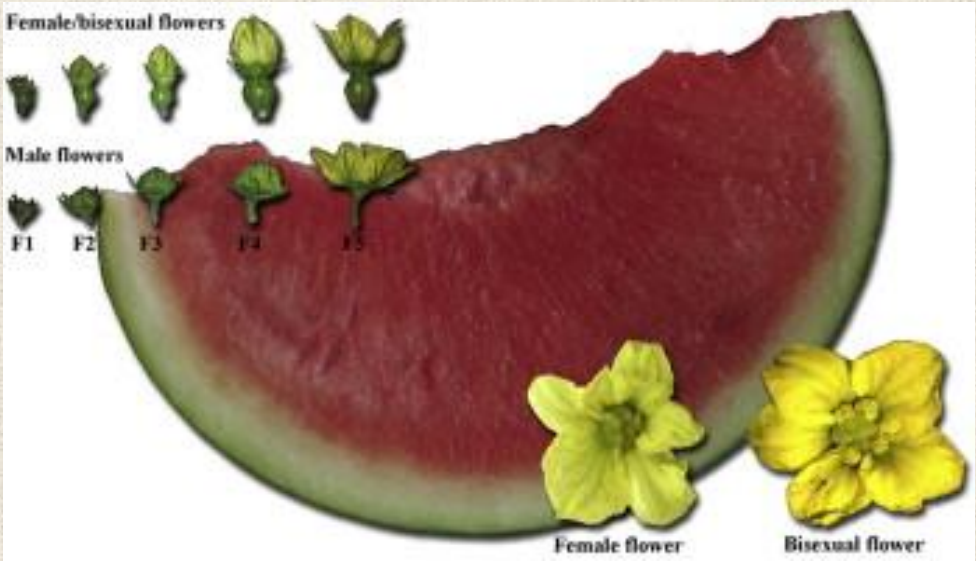
Flowers

- While they are extremely diverse in fruit and vine characteristics, their floral structures are in many respects very similar.
- In general, the family is characterized by the flowering habit known as monoecious.
- A monoecious species or variety is one that bears its pistillate or female organs of reproduction and its staminate or male organs in separate flowers, both kinds of flowers occurring on the same plant.



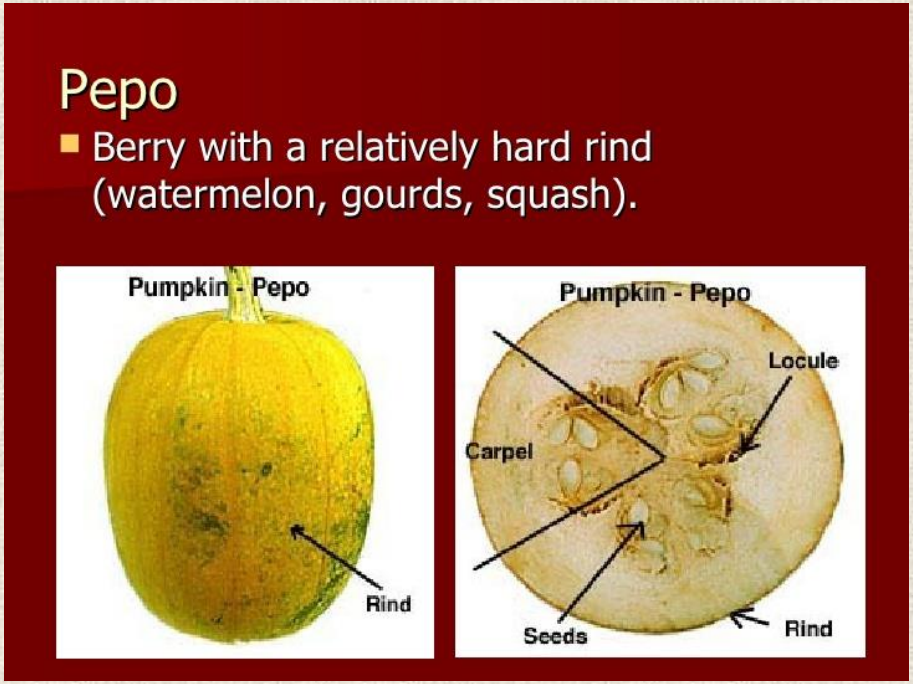
Natural History: Botany

- Flowers (cont.)
  - Cucumber, squash, and pumpkin are normally strictly monoecious, but certain varieties of muskmelon and watermelon show a modification of this condition that is termed andromonoecious.
  - An andromonoecious plant is one that bears bisexual or complete flowers, instead of strictly pistillate ones, in addition to purely staminate flowers.



Natural History and Botany

- Fruits
  - soft, fleshy, indehiscent and a type of berry called pepo.
  - sometimes very large in size (*Citrullus* spp.; *Cucurbita* spp.).



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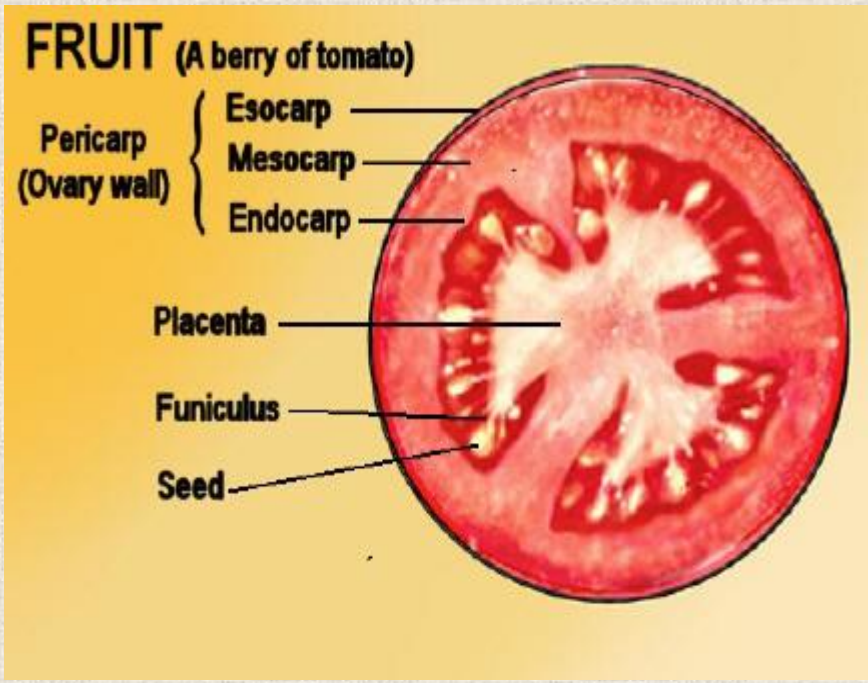
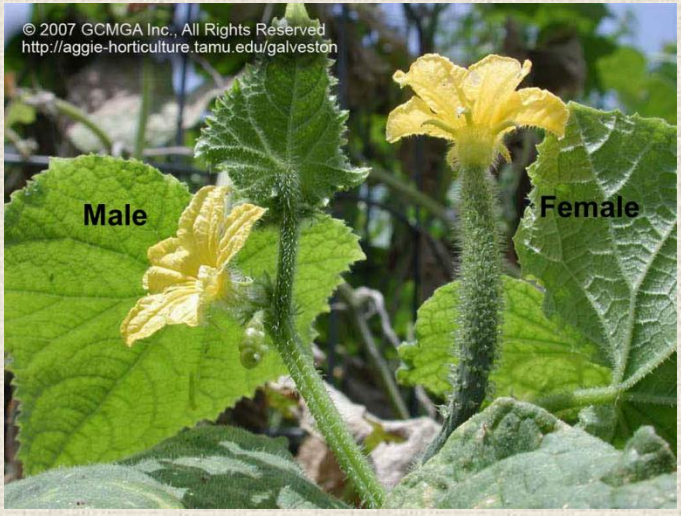


Natural History: Pollination

- Cucurbit flowers are short lived flowers that open a few hours after sunrise and are often closed by midday or early afternoon. Both male pollen viability and female stigmatic receptivity are at their highest when the flower opens and for the next few hours.



- Both pollen viability and stigmatic receptivity decrease significantly as the day progresses. It is important for the female flower to be pollinated as early in the day as possible.

Natural History: Pollination

- In cucurbits there is one key concept:
  - The quality of the fruit is a function of the number of seeds in the fruit. The number of seeds produced is a function of the number of viable pollen grains deposited on the stigma. The number of pollen grains deposited is a function of the number of visits by pollinators as well as by the type of bee visiting the flower.
- Because both male and female sexual parts are not in the same flower, pollen must be transferred from the male flower to the female flower. The pollen is too large and sticky to be transferred by wind and thus requires insect transfer. Bumble bees tend to deposit more pollen per visit than squash bees and squash bees tend to deposit more pollen per visit than honey bees.
- The UV-reflective flower petals direct the pollinators.

Natural History: Pollination

Bumble Bee on Cucumber Flowers

Squash Bee Ground Nest

Natural History: Pollination

How to Hand Pollinate Squash

Step 1: Identify the male (left) and female (right) blossoms. Male blossoms are typically more abundant and will begin to open before the female blossoms. Female blossoms have a small swollen ovary at the base of the flower that looks like a miniature squash. Once fertilized by the male pollen, the ovary will grow and develop into a fruit. If the ovary is not pollinated, principally by bees, it will shrivel and rot.

Step 2: In the morning, pick open male flowers. Remove the petals, avoiding the sticky pollen on the stamen (see left). Gently open the female petals and rub the male anther around the inside the female flower (right). Use several male flowers per female to increase pollination success.

Natural History: Pollination

Step 3 (for seed saving): If you are growing several varieties of the same species prevent crossing by taping flowers closed before they open. Once the females have been hand pollinated tape closed to prevent pollinators from traveling between flowers. Twist-ties and painter's tape work well. This step is not necessary if growing only one variety of a species. Save seeds from only the flowers taped closed.

The same basic principals work for other species in the Cucurbitaceae family including watermelons, melons, and gourds.

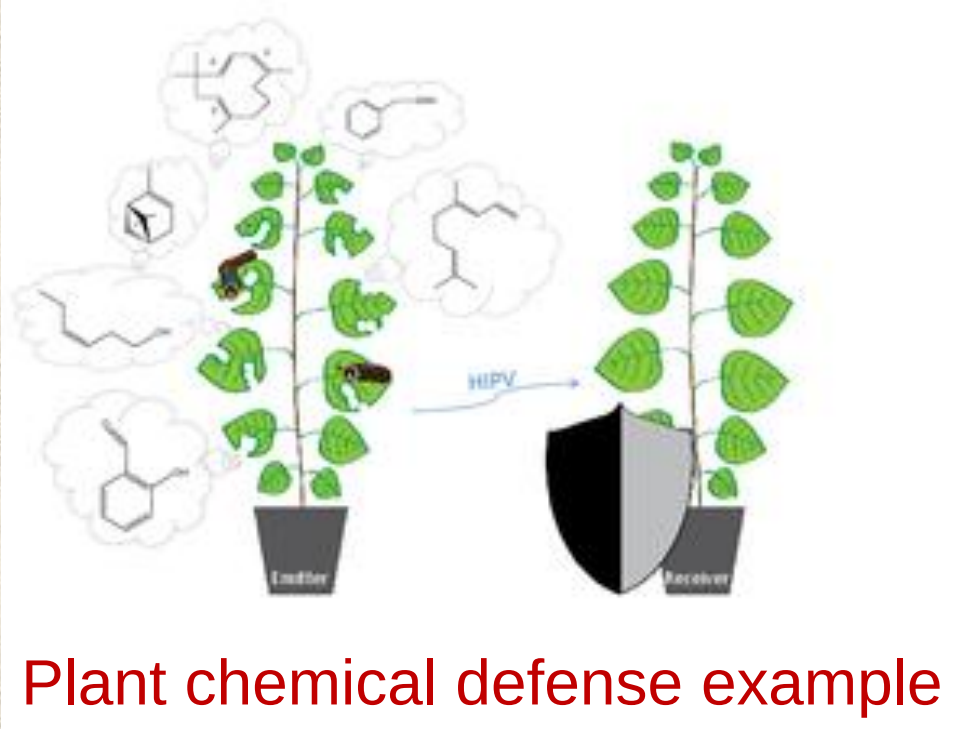
More information at nativeseeds.org

Natural History: Chemical Ecology

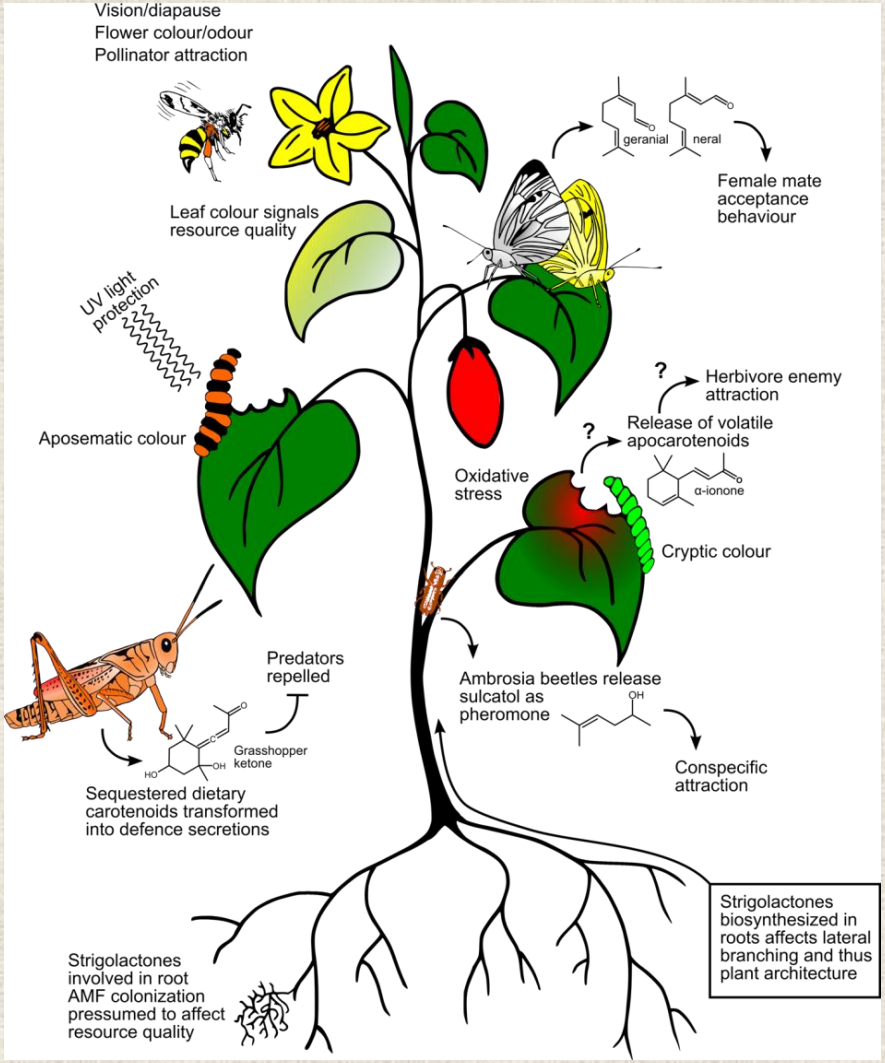
- Biologically active phytochemicals are found in Cucurbitaceae plants.
- They are produced by plant "secondary" metabolism that produces compounds such as caratenoids, alkaloids, flavonoids, anthocyanidins, terpenes and phenolics.
- Secondary phytochemicals are organic compounds that are not directly involved in the normal growth, development, or reproduction of an organism. Secondary metabolites often play an important role in plant chemical-based ecological interactions with their biotic and non-biotic environment.

Natural History: Chemical Ecology

- Secondary Phytochemical Research:



Plant chemical defense example



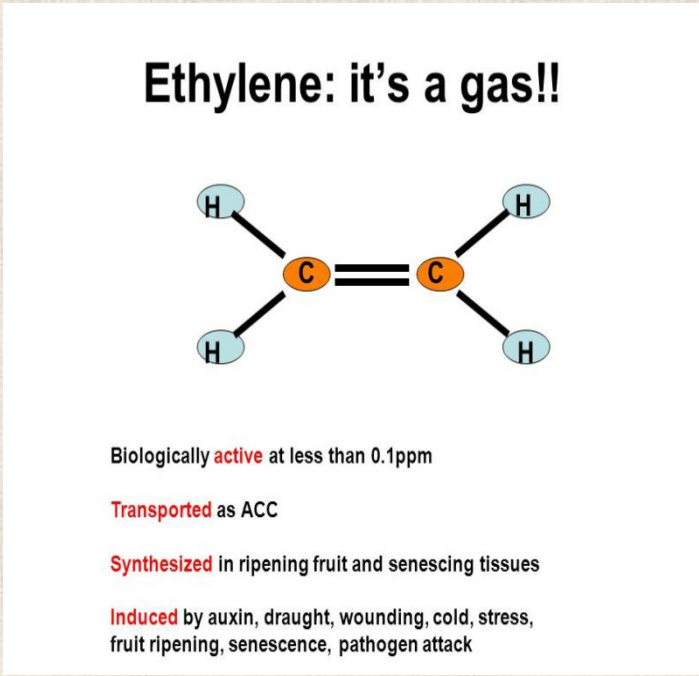
- Plant phytochemical research demonstrates multiple ecological processes for these metabolites.

Natural History: Chemical Ecology

❖ Flowers

➢ Watermelon Research

- the phytohormone gas ethylene regulates differentially two sex-related developmental processes:
  a) sexual expression, i.e. the earliness and
  b) the number of female flowers per plant, and the development of individual floral buds.



- the female flower requires much more ethylene than the male one to develop, and that bisexual flowers result from a decrease in ethylene production in the female floral bud.
- the occurrence of bisexual flowers was found to be associated with elevated temperatures in the greenhouse, concomitantly with a reduction of ethylene production in the shoot apex.

Natural History: Chemical Ecology

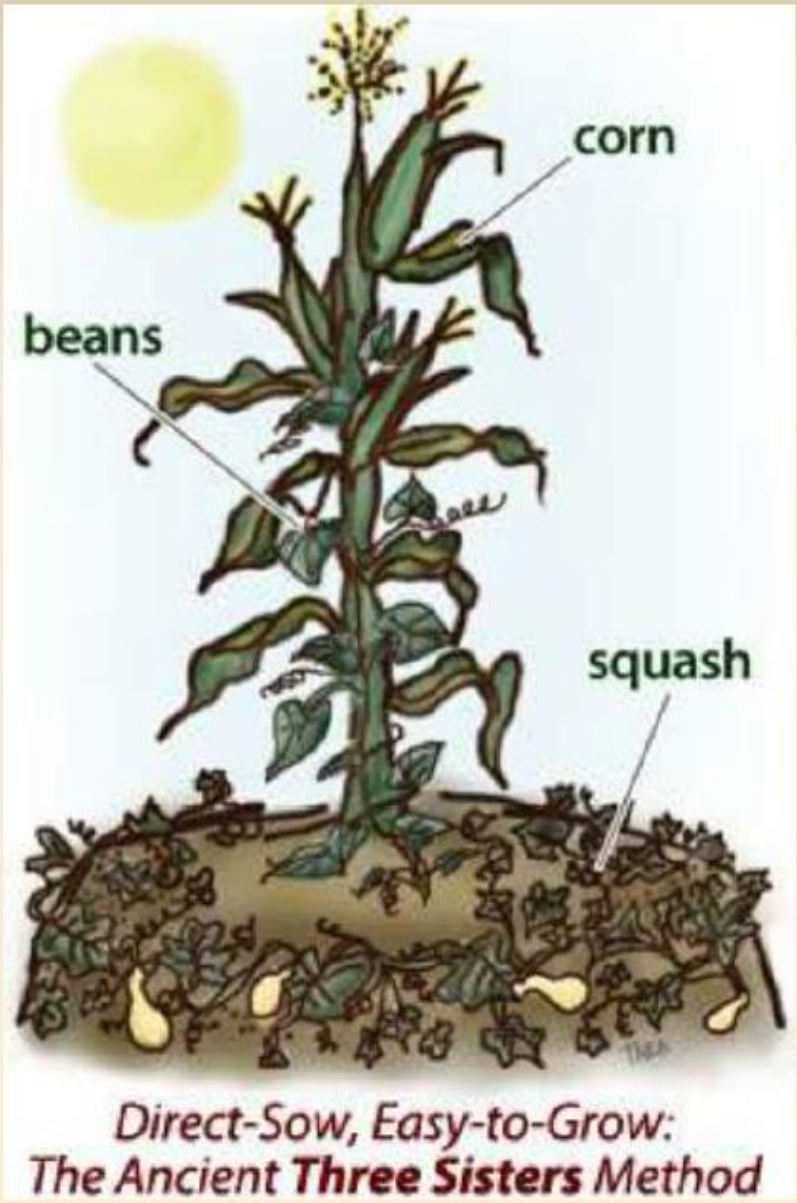
❖ Allelopathy

- Allelopathy is “the chemical warfare between plants,” It occurs when plants produce natural chemicals, known as allelochemicals, that inhibit the growth of competing species.

- Consider the ancient “Three Sisters” cropping system
  - three food plants traditionally grown together by native Americans, and the reasons why the crop combination works:

- the corn acts as a pole for the climbing beans; the beans fix nitrogen, thereby providing an important plant nutrient; and the squash inhibits weeds.

Companion Planting – the 3 Sisters – corn, beans, squash



Mutualistic interactions are the basis of this cropping systems

Natural History: Chemical Ecology

- Allelopathy (cont.)
  - Research has demonstrated the squash effect due to a combination of shading by the broad leaves and release of allelochemicals against the weeds.
  - For example, reduced germination and growth of a wide diversity of weeds has been demonstrated from extracts of cucurbit roots and shoots, and foliage leachates and volatiles. The effect increased with concentration.
  - Better yet, these chemicals often inhibit weeds more than they impact crop plants.

Natural History: Chemical Ecology

❖ Cucurbitacins

- Cucurbitaceae is phytochemically characterized by the presence of more that 20 extremely bitter and toxic oxygenated tetracyclic triterpenoids, the cucurbitacins (figure 1).

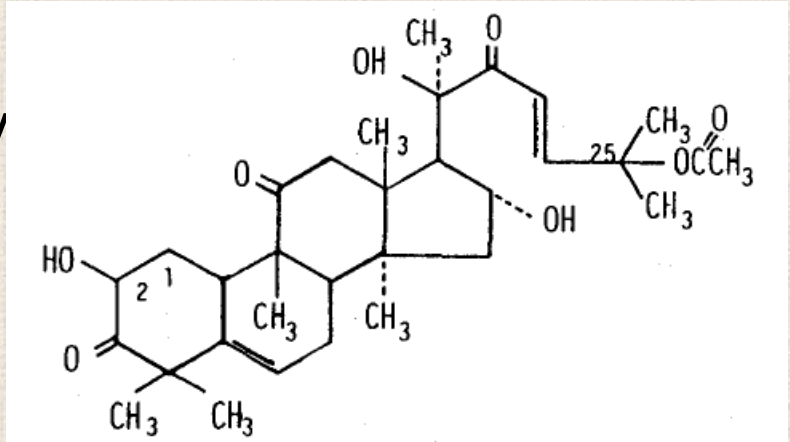


Figure 1. Cucurbitacin B. D is $C_{25}-OH$; E is $C_1=C_2$; F is C_2-OH, C_3-OH, $C_{25}-OH$; G is $C_{24}-OH$, $C_{25}-OH$; I is $C_1=C_2$, $C_{25}-OH$; L is $C_1=C_2$, $C_{23}-C_{24}$; $C_{25}-OH$.

- Cucurbitacins are typically found in the roots, stems, cotyledons, leaves and fruits of cucurbits. The concentrations increases with age.
- Research on cucurbitacins has shown them to be a taste deterrent in plants foraged by some animals and in some edible plants preferred by humans, like cucumbers.

Natural History

❖ As is the situation with all defense systems of plants and animals, a few specialized pathogens have co-evolved with plants and have overcome the chemical defense barrier.

❖ Furthermore, they are often attracted by a given plant phytochemical toxin.

❖ For example, The *Aulacophorites* and *Diabroticites* insect genera include some of the world's most destructive insect specialist for cucurbits.

Spotted cucumber beetle (*Diabrotica undecimpunctata howardi*)

Banded pumpkin beetle (*Aulacophora hilaris*)

Cucurbitaceae
Cultural History

Cultural History

- The Cucurbitaceae are one of the most important plant taxon economically and the most valuable in terms of vegetable crops, ranking among the highest of plant families for number and percentage of species used as human food.
- The plants in this family are grown around the tropics and in temperate areas, where those with edible fruits were among the earliest cultivated plants in both the Old and New Worlds.

Major Cucurbitaceae Crops

- *Cucurbita pepo* – summer squash, acorns, Jack O' lanterns, 'Delicatas', patty pans
- *Cucurbita pepo* subsp. *ovifera*-yellow flw. gourds
- *Cucurbita maxima* – Hubbards, Buttercups
- *Cucurbita moschata* – Butternuts
- *Cucurbita argyrosperma* – most cushaws
- *Cucumis sativus* – cucumber
- *Cucumis melo* – melon
- *Citrullus lanatus* – watermelon
- *Lagenaria siceraria* – white flowered gourds

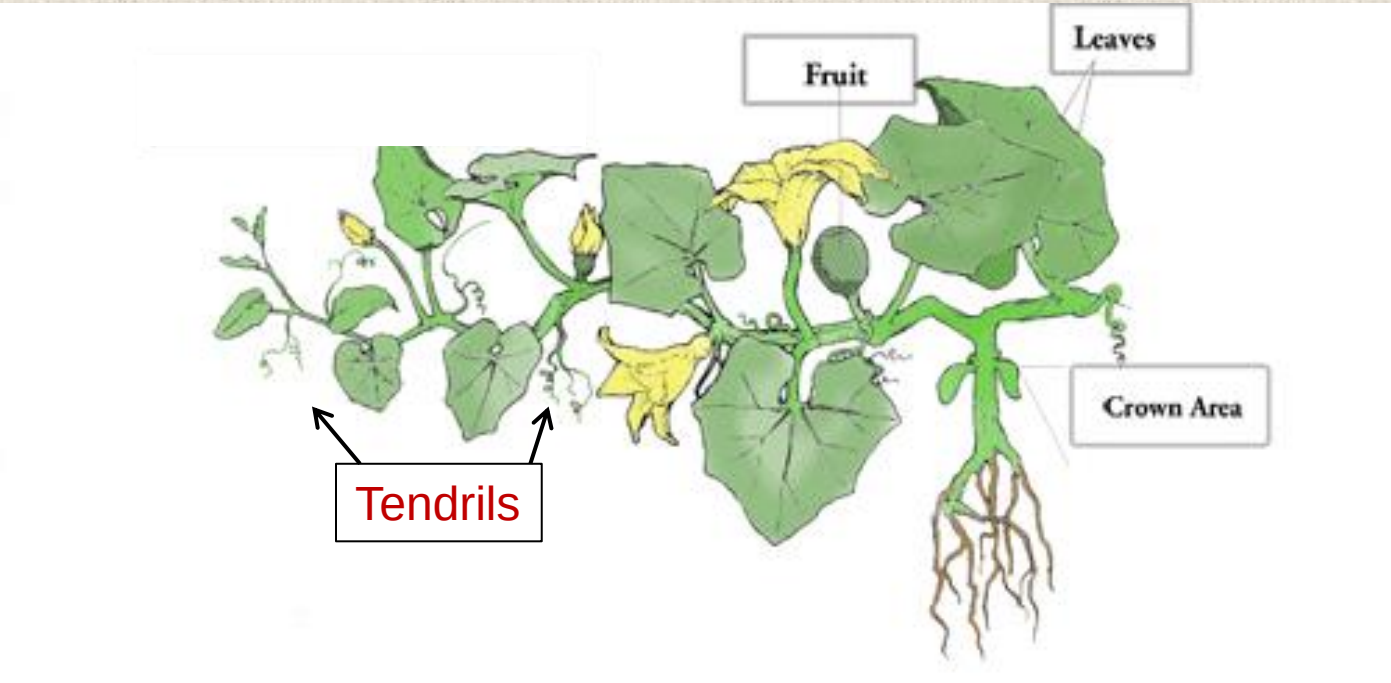
Cultural History

Uses of Cucurbit

- **Food Source**
  - Ice creams, puddings, pies
  - Salad, Soup
- **Medicinal Value**
  - Anti-diabetic
  - Anticarcinogenic
  - Anti-inflammatory
- **Cosmetics**
  - Soaps and Oils for dry and sensitive skin
- **Festivals**
  - Halloween
- **Art, Music and Literature**

Cultural History

- Fruits are the most commonly eaten part of the plant, but seeds, flowers, tendrils, very young shoots, and roots are also used for food.
- Cucurbits are utilized for other practical purposes as well, such as to store food (gourd) or to be used as a sponge (loofah).



Cucurbitaceae Crop Diversity

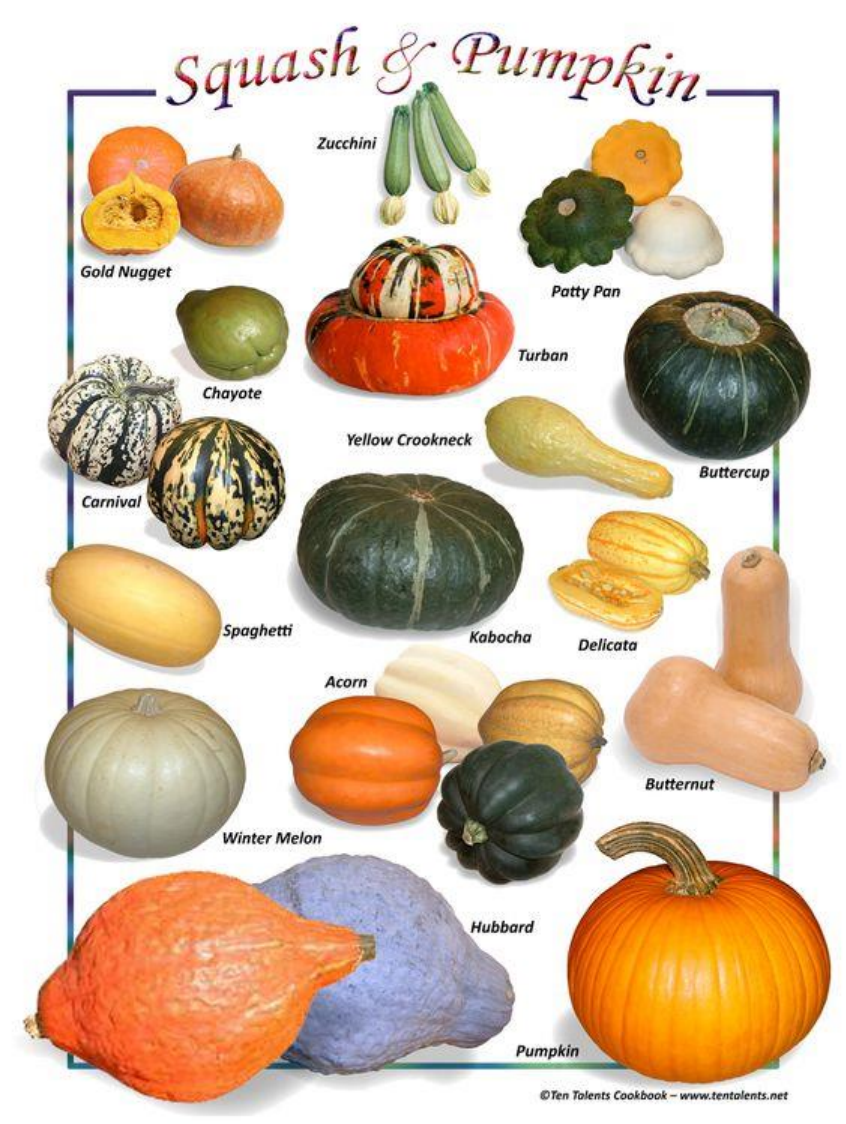
- It is estimated that humans have been growing and eating Cucurbitaceae food crops for thousands of years. Historical dates of example crops include:
  - Squash/Pumpkin (*Cucurbita. pepo*): 10,000 BCE
  - Winter Squash (*C. maxima*): 2,500 BCE
  - Butternut Squash *(C. moschata)*: 5,000 BCE
  - Cushaw (*C. argyrosperma*) 7,000 BCE
  - Cucumber (*Cucumis sativus*): 3,000 BCE
  - Melon (*Cucumis melo*) 3,000 BCE
  - Watermelon (*C. lanatus*) 2,000 BCE
- Although the exact number might be unknown, one can estimate that there are hundreds of varieties of Cucurbitaceae crops, including many local varieties that are not exported or grown worldwide.

Cucurbitaceae Crop Diversity

- How Did Cucurbitaceae Crops & Cultivars Originate?
  - Crop domestication = human-induced plant adaptation
  - *Centers of Origin* have wild relatives of the crop.
  - Hybridization and polyploid formation are important driving forces in crop evolution
  - In each *Center of Origin* numerous crops were domesticated
  - Genetic diversity can be measured at the molecular level

Cucurbitaceae Crop Diversity: Centers of Origin *

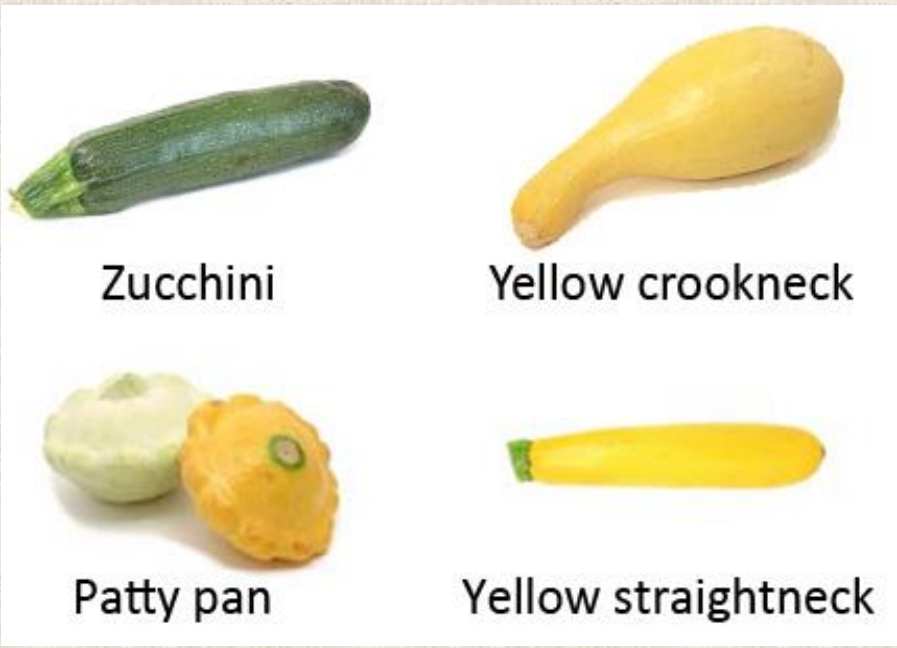
Squash and Pumpkin (*Cucurbita pepo*)



- The varieties of squash and pumpkin originated in various places throughout the Americas.
- *C. pepo* is the earliest form of squash discovered and one of the oldest, if not the oldest, domesticated species.

Squash (*Cucurbita pepo*)

- Squash has its origins in the New World, specifically central Mexico, Peru and the Eastern side of the United States.
- Native Americans cultivated squash heavily before European contact also; from trade and mixing, squash made its way to the Old World after 1492 with Columbus‘ exploration.
- Includes all “summer squash” from patty pans, zucchini, yellow squash/crooknecks.



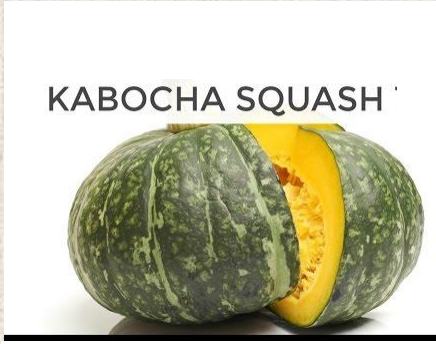
Pumpkin (*Cucurbita pepo*)

- Pumpkins were brought to the Old World soon after the commencement of the first European explorations of the New World and are mentioned in early European works starting in 1536.
- Pumpkins are cultivars of a squash plant that is round, with smooth, slightly ribbed skin, and deep yellow to orange coloration. The thick shell contains the seeds and pulp.
- Some exceptionally large cultivars of squash with similar appearance have also been derived from *Cucurbita maxima*.
- Specific cultivars of winter squash derived from other species, including *C. argyrosperma*, and *C. moschata*, are also sometimes called "pumpkin".
- In New Zealand and Australian English, the term pumpkin generally refers to the broader category called winter squash elsewhere.

Pumpkin (*Cucurbita pepo*) Variety Examples

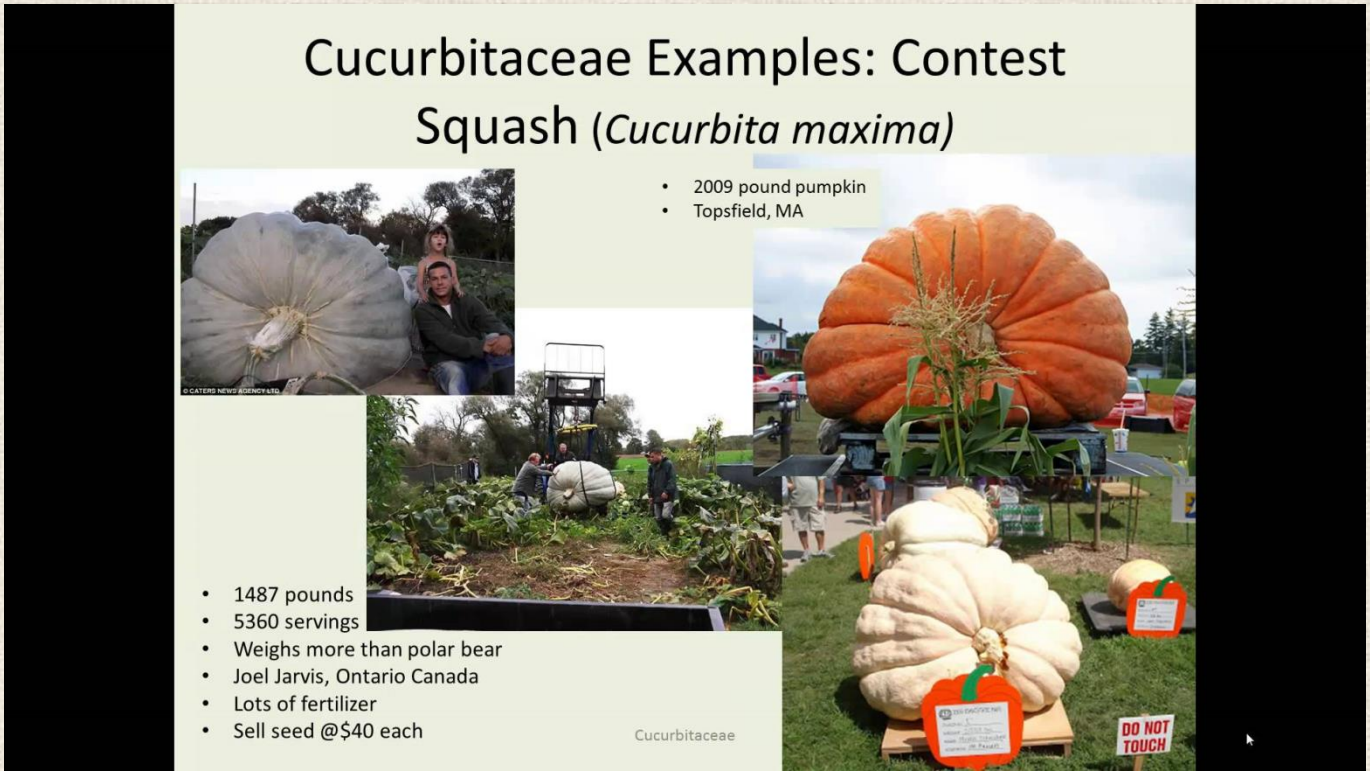
Winter Squash *(Cucurbita maxima)*

- Originally from the Andean highlands. *Cucurbita maxima* originated and was domesticated in South America. It has a less wide spread history, primarily found on the coast of Peru, with other remnants found in Argentina, northern Chile, and Paraguay.
- Adapted to moderate daytime temperature and cool night time temperatures
- Includes all Hubbard and Buttercup types
- All Japanese Kabocha/Hokkaido types



Winter Squash *(Cucurbita maxima)*

- Can produce the largest fruit on earth
- Includes the large “show” pumpkins like ‘Atlantic Giant’, ‘Hungarian Mammouth’, which all have a milky orange color



Winter Squashs

Acorn Squash

Banana Squash

Butternut Squash

Buttercup Squash

Calabaza Squash

Delicata Squash

Gold nugget Squash

Hubbard Squash

Spaghetti Squash

Fairytale pumpkin

Australian blue Pumpkin

Red curry Squash

Red Warty Thing Squash

Pie Pumpkin

Cinderella pumpkin

Turk turban squash

QUIZ


WHAT'S THE
DIFFERENCE
BETWEEN
SUMMER SQUASH
AND
WINTER SQUASH?

Quiz Answers

- First, it has nothing to do with when they are planted and grown!

- Second, here's how summer and winter squash are the same:
  - All varieties of squash can be sorted into two main types: summer and winter.
  - All squashes are warm weather plants that will not tolerate freezing temperatures.
  - Squashes start very well when directly seeded into the garden.
  - Transplanted squash can be stunted and produce very little if the roots are disturbed at transplanting.
  - All squashes make male and female flowers.
  - All squashes have edible flowers!

Quiz Answers (cont.)

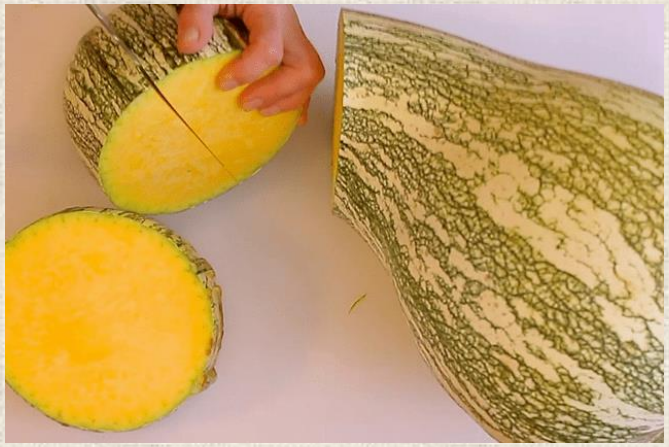
- Finally, here's how summer and winter squash are different:
  - Summer squashes
    - so called because they produce fruit that is ready for harvest and consumption during the warm summer months.
    - grow as large bushes and need at least 3 feet between plants.
    - will produce more fruit than a winter squash and will start producing earlier in the season (50-70 days)
    - tastiest when harvested young while the skin is still tender and the seeds inside are still immature.
    - cultivars of *C. pepo*

Quiz Answers (cont.)

- Finally, here's how summer and winter squash are different (cont.):
  - Winter squashs
    - so called because the fruit of these plants are often not ready for harvest until the end of the summer and many types will store very well so they can be eaten in the winter.
    - generally are large vining plants that may grow to 10 feet long or more. Leave at least 6 feet between winter squash plants.
    - plants only make 1 to 3 fruits per plant, and mature much later (120 days)
    - fruit should be left on the plant until fully mature: when the skin is hard and the plant has died.
    - fruit, except acorn squash, also need to be cured prior to eating them. The curing process allows the fruit to be stored longer and become sweeter.
    - cultivars of *C. maxima*

Cushaw Squash *(Cucurbita argyrosperma)*

- Species originated in the lowlands of Central America and Mexico
- Adapted to high daytime temperature and warm nighttime temperatures
- Fruit are very late maturing!
- *C. argyrosperma* (formerly *C. mixta*) include many of the “cushaws” (USA) and calabaza (Hispanic).



Butternut Pumpkin or Squash *(Cucurbita moschata)*

- Species typically cited as Mesoamerican in origin with unknown exact locations. It was thought that *C. moschata* was of Asiatic origin. However, it is now evident that it was domesticated in Latin America.
- Adapted to high daytime temperature and warm nighttime temperatures
- Fruit are very late maturing!
- Also includes many “cheese pumpkins”

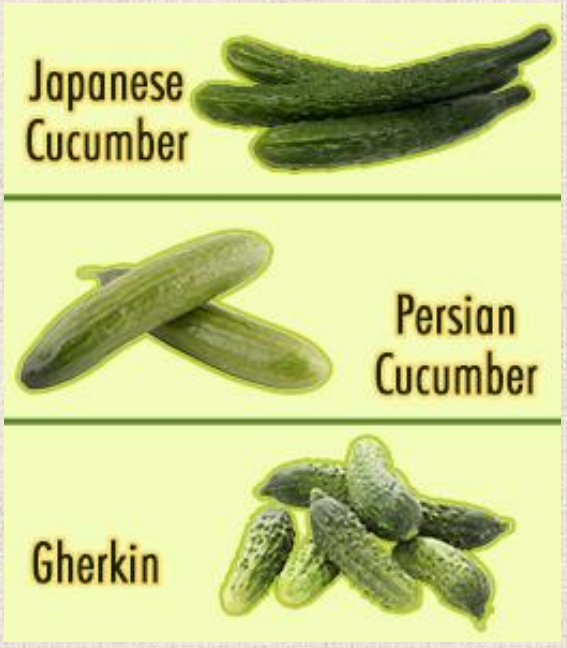
The genus *Cucumis*

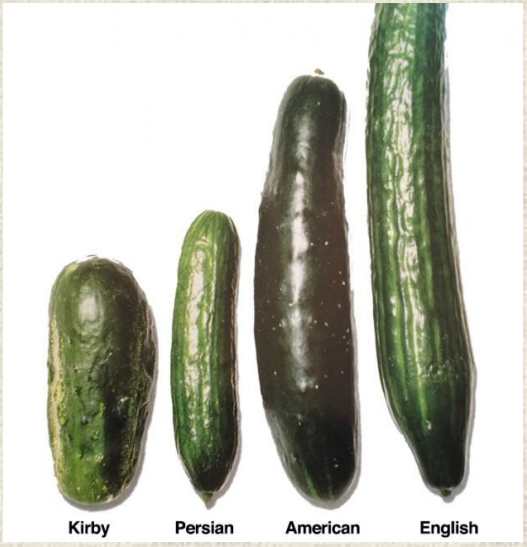
- *Cucumis sativus* – “true cucumber”
- *Cucumis melo* – “melons” (following types)
  - Reticulatus group–muskmelon, nutmeg m.
  - Inodorus group – honeydew, casaba
  - Flexuosus group – Armenian cucumber
  - Dudaim group – Queen Anne’s pocket m.
  - Chito group – vine peach, melon apple
  - Conomon group – Freeman cucumber
  - Cantalupensis group – true cantaloupes

Cucumber (*Cucumis sativa*)

- Domesticated in India & other parts of Western Asia. Wild plant relatives of the cucumber can be found in the foothills of the Himalaya Mountains, China and Near/Middle East.
- From India, the cucumber was carried to Greece and Italy, where it played a pivotal role in the Roman Empire. Spread to the rest of Europe by the Romans, the cucumber was later dispersed to the New World through colonialism and indigenous trade.
- In the New World the crop spread up to Florida and then out to the Great Plains through Native American tribes. Native American tribes such as the Iroquois adopted the cucumbers into their gardens soon after their introduction to the continent.
- Domestic versions of the cucumber were first found in North America in the 19th century and include: Arlington White Spine, Boston Pickling and Chicago Pickling.

Cucumber Variety Examples





Cucumbers of India

Armenian Cucumber (*C. melo*)

Melon (*Cucumis melo*)

- Based on genetic studies, crossing attempts with other *Cucumis* species, and world distribution of melon varieties, the origin of melon appears to be Africa.
- The domestication process of melon started in Egypt over 3,000 years ago.
- From this area, melon dispersed throughout the Middle East and Asia, where a secondary domestication and diversification development may have occurred.
- Among the major cucurbit vegetables, *C. melo* has one of the highest polymorphic fruit types and botanical varieties. This is a consequence of genetic diversity in this species.

Watermelon (*Citrullus lanatus*)

- The watermelon is a cucurbit that originated in northeast Africa, where it is found growing wild.
- Evidence of the first cultivation of *C. lanatus* in the Nile Valley has been found (2,000 BCE), and seeds have been found at Twelfth Dynasty sites and in the tomb of Pharaoh Tutankhamun
- Watermelon cultivation then spread to India (700 CE), China and Spain (1,000 CE) and Europe (1,600 CE)
- European colonists and slaves from Africa introduced the watermelon to the New World. Spanish settlers were growing it in Florida in 1576.
- The more than 1200 cultivars of watermelon range in weight from less than 1 kg to more than 90 kilograms (200 lb); the flesh can be red, pink, orange, yellow or white.

Seedless Watermelon (*Citrullus lanatus*)

- Seedless watermelons are sterile hybrids that develop fruits, but no seeds.
- The seeds for growing them are produced by crossing a normal watermelon with one that has been changed genetically by treatment with a chemical called colchicine.

- The seeds from this cross will produce plants that, when pollinated with pollen from normal plants, produce seedless melons because they are infertile polyploids (3N instead of 2N).

TYPES OF MELONS


(Juan) Canary Melon


Cantaloupe


Casaba


Crenshaw


Charantais


Christmas Melon


Derishi


Galia


Honeydew


Horned Melon / Kiwano


Melon-pear


Musk Melon


Net melon


Ogen melon


Pepino Melon


Persian Melon


Russian/Uzbek Melon


Santa Claus


Sharlyn


Seedless Watermelon


Sweet Melon


Tree Melon / Papaya


Watermelon


Wax Melon

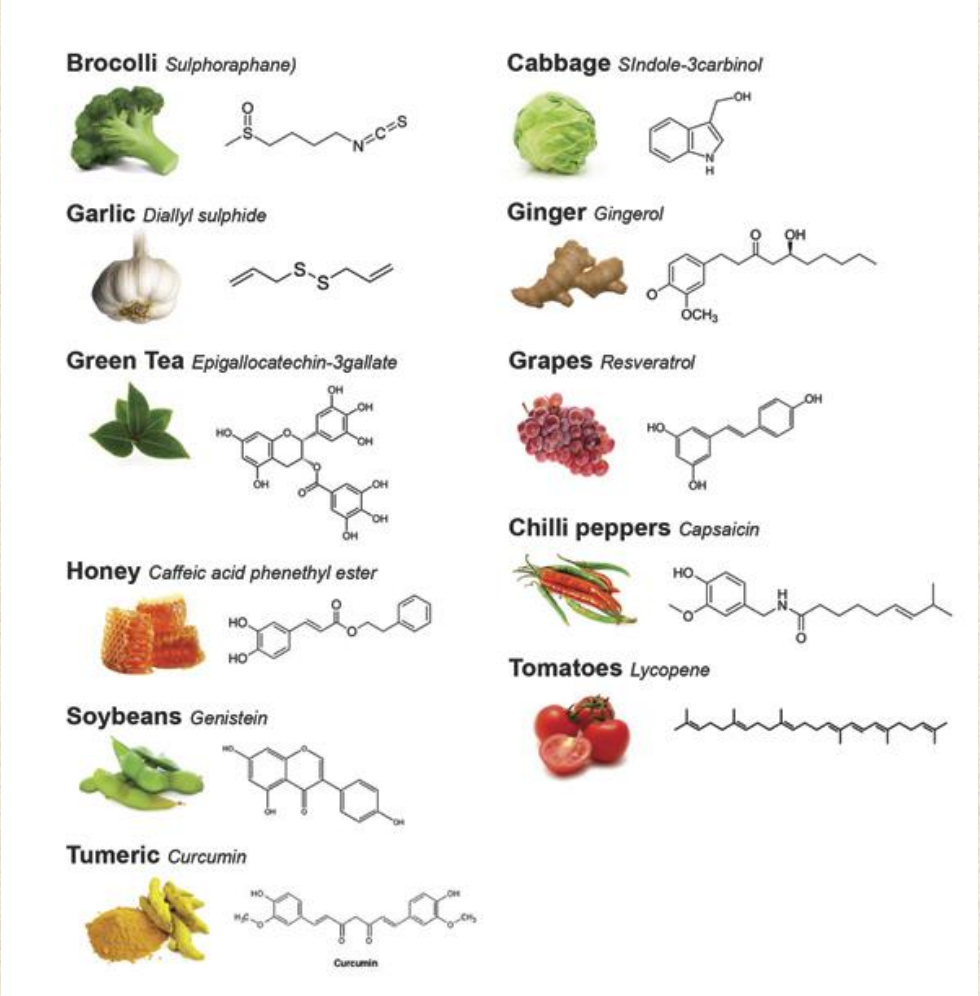

Winter Melon


Yellow Watermelon


Xigua

Cultural History

- Cucurbitaceae crop breeding history included both selection for & removal of natural phytochemicals found in wild types in centers of origin.
- For example, the medicinal use of phytochemicals from different plant families has a long history with human populations, a.k.a. “food as medicine”



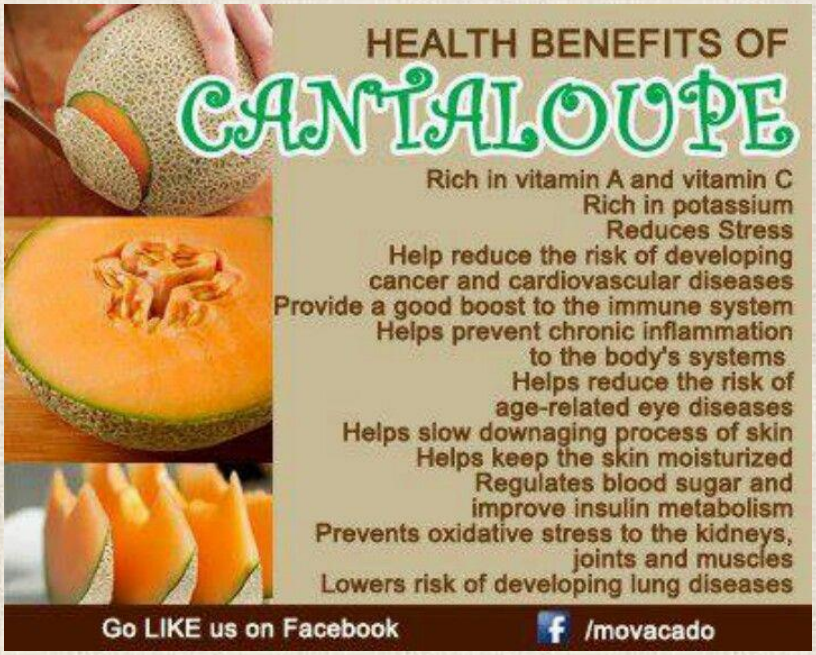
- Picture shows examples of crops bred from wild plants with medicinal phytochemicals.

Cucurbitaceae Crops

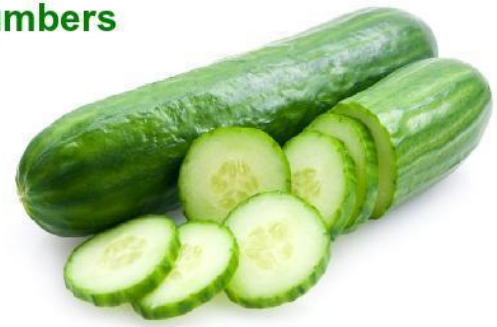
- Medicinal Foods
  - The current trend to a healthier food and the continuing quest for new drugs explain the attention given to cucurbit crops as a source of bioactive compounds that can serve as candidates for medicinal foods and/or pharmacological drugs.
  - For example, some cucurbits such as *Cucurbita andreana* are exploited as medicines, which have chemical compounds (cucurbitacins) with anticancer and anti-inflammatory activities.

Cucurbitaceae Crops

- Medicinal Foods (cont.)
  - In China, fruits and roots of *Cucurbita melo* are taken as an emetic, the leaves and seeds used to treat hematoma, and the stems to reduce hypertension.
  - The pulp of *Citrullus colocynthesis* is used as a purgative and for intestinal disorders, such as dropsy.
  - Research has generally shown different cucurbit secondary metabolites, such as triterpernoids, alkaloids, and others, which are responsible for biological activity as antidiabetic, antitumoral, antiparasitic, antibacterial, and anti-inflammatory compounds. Therefore some substances are considered useful scaffolds for developing new drugs.



Health Benefits of Cucumbers



- Keeps the Body Hydrated
- Low Calorie Vegetable
- Reduce Constipation
- Reduces Blood Pressure
- Health Drink
- Promotes Joints Health
- Reduces Cholesterol Level
- Good for Weight Loss
- Improves Digestive System
- Remedy for Chronic Constipation
- Fight cancers
- Prevents Bad Breath

10 Health Benefits of... Pumpkin (Squash)

1. Rid Round/Tapeworms (Seeds)
2. Good Zinc Source (Seeds)
3. Regulates Blood Sugar
4. Lowers Cholesterol
5. Anti-Inflammatory
6. Anti-Depressant
7. Highly Alkaline
8. Healthy Heart
9. Anti-Oxidant
10. Anti-Cancer

EatHealthLiveFit.com

Organic Facts

BENEFITS OF SQUASH

Boosts immune system	Improves bone & eye health
Helps reduce gastric & duodenal ulcer	Effective in managing diabetes
Gives relief from asthmatic conditions	Helps to improve blood circulation
Effective in preventing heart diseases	Reduces risk of lung cancer & emphysema

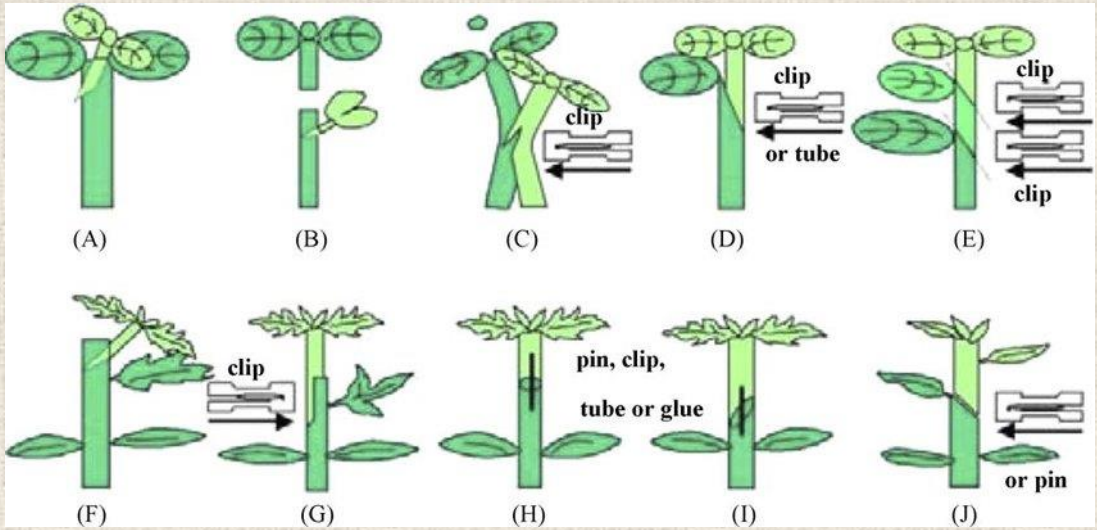
Cucurbitaceae Crops

- Misc Uses
  - The hard woody pericarp of *Lagenaria ualgaris* is used in the manufacture of excellent flasks, primitive vessels, utensils, snake blow pipes, drum for tambura, soraja, and in the construction of other musical instruments.
  - The vines of this family are used for ornamental purposes.

Cucurbitaceae Crops

❖ Grafting

- Grafting of cucurbits is now possible to provide protection from root pathogens for increased crop introductions and production.



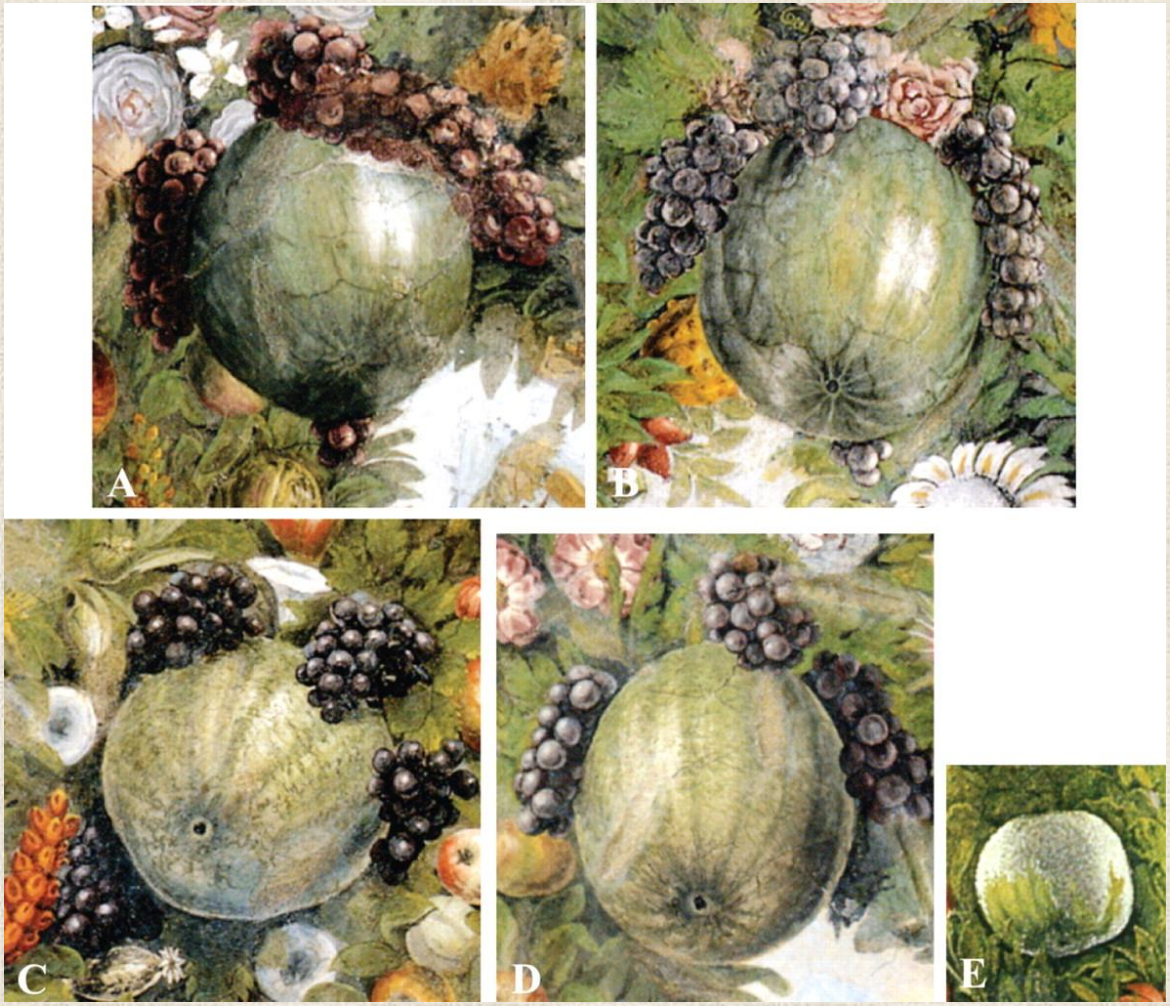
Major grafting methods in cucurbits (and solanaceous) vegetables: (A and B) hole insertion grafting; (C) tongue approach grafting; (D, E and J) splice grafting; (F, G) cleft grafting; (H and I) pin grafting.

Now a Gallery of Cucurbitaceae Art…

The Cucurbit Images (1515–1518) of the Villa Farnesina, Rome

The Cucurbit Images (1515–1518) of the Villa Farnesina, Rome

Images of Watermelons in the Festoons



The Cucurbit Images (1515–1518) of the Villa Farnesina, Rome

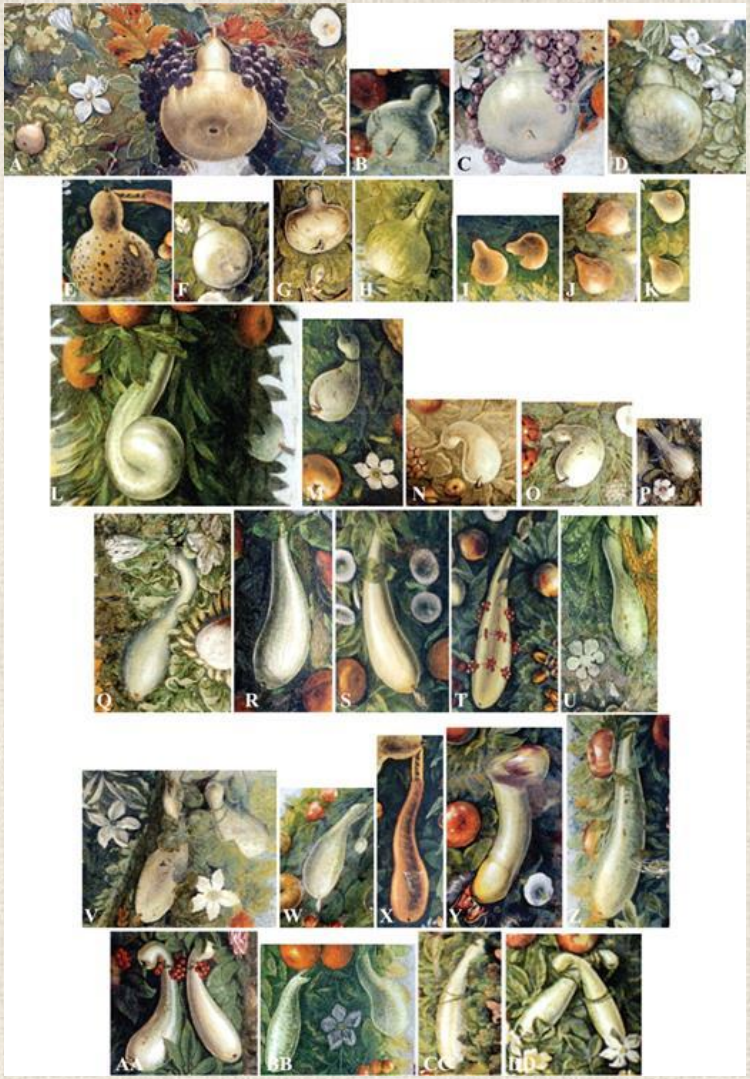
Images of Melons in the Festoons

The Cucurbit Images (1515–1518) of the Villa Farnesina, Rome

Images of Cucumbers in the Festoons

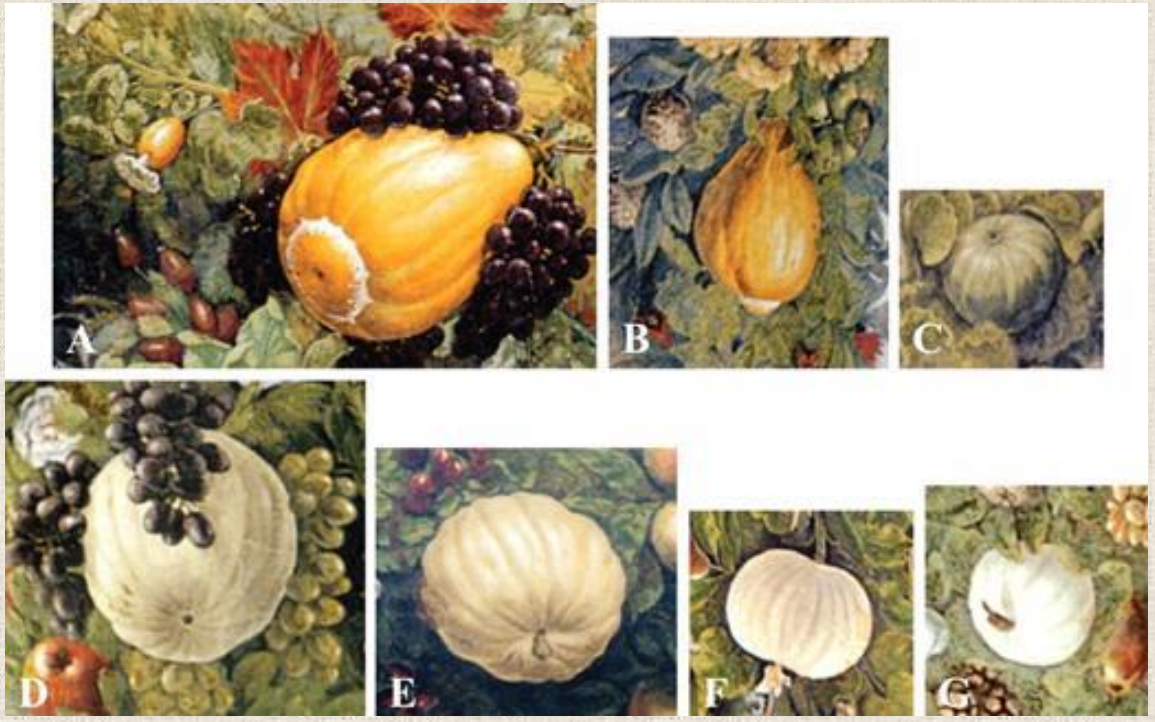
The Cucurbit Images (1515–1518) of the Villa Farnesina, Rome

Images of Gourds in the Festoons



The Cucurbit Images (1515–1518) of the Villa Farnesina, Rome

Images of Pumpkins in the Festoons



Still Leben mit Kurbissen
ca. 1650

Archimboldo Autumn 1573

Cucumber

Squash

Thank You !

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Video Resources

- Univ of MI Squash Bee Project. Squash Bee Identification and Squash Bee Natural History Video – see http://vegetable.ent.msu.edu/squash-bee-project/
- Vimeo Video
  a) Pollination 2-2 — Cucumber, Squash, Melon –
  see https://vimeo.com/147809017
- Youtube Video
  a) Cucurbitaceae – see https://www.youtube.com/watch?v=X0PNbQvVoD0
  b) How to Graft Cucurbits – see
  https://www.youtube.com/watch?v=XVVM-bUj574
  c) Seedless Watermelon — You'll Never Guess How It's Grown – see
  https://www.youtube.com/watch?v=ohN0y03yMco
  d) Squared Watermelons – see
  https://www.youtube.com/watch?v=2JNSpMhJLvg
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