

# Vegetable Gardening



David Cook



# Vegetables Versus Fruits



- A **vegetable** is generally described as a herbaceous plant cultivated for edible parts, such as roots, stems, leaves, flowers and also fruits.
- A **fruit** is actually the edible part of the plant that contains the seeds.
- In other words, a "fruit" is any fleshy material covering a seed or seeds.
- **Botanically speaking, fruits are the seed-bearing ripened ovary of a flower.**
- So, tomatoes are technically fruits, along with many other vegetables.
- The only thing that really matters is that you like to eat it, regardless if it can be called a fruit or vegetable or both.

# What Makes a Good Garden?

## **Paying Close Attention to the Details:**

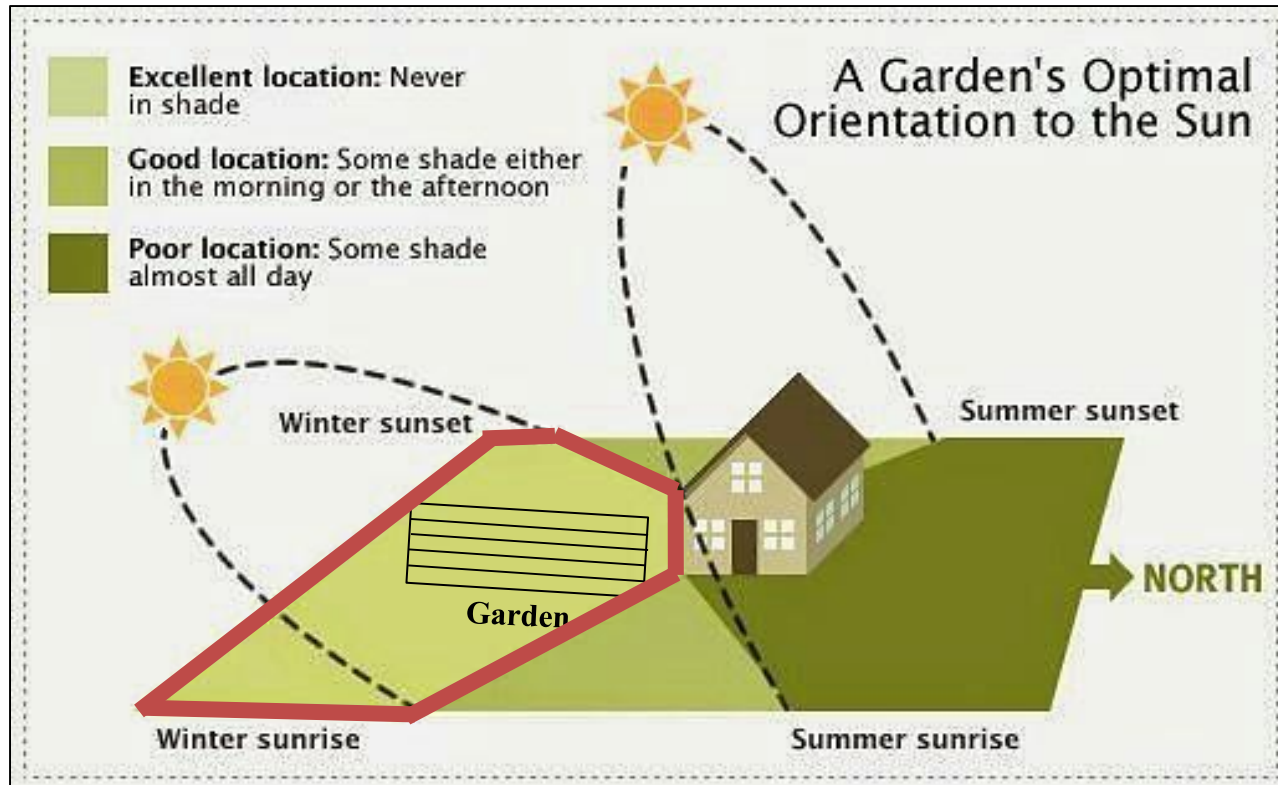
- The site: (sun, shade, & slope)
- The soil (pH, fertility & drainage)
- The correct planting times
- The viability of the seeds
- The correct planting depths
- The correct plant spacing
- Eliminating weed competition
- Managing insects and diseases

# Preparing the Garden Site

- The ideal garden soil is deep, fertile, well-drained and medium textured.
- **Six hours** of daily sunlight are the bare minimum for good production.
- A slight **slope facing south** speeds up warming and drying of the soil early in the spring.
- A slightly sloping site will also have **less frost damage**.
- Rows should run **north to south** for best sunlight.
- A **soil test** is the only accurate method of determining how much lime and fertilizer to apply to the garden site.

# Orientation to the Sun

- A north-south orientation allows the sun to shine on one side of the plants in the morning and the other in the afternoon.



# Vegetable Selection

- Consider how much space you have for a garden.
- Corn, squash, cucumber, pumpkin and watermelon need a lot of growing space.
- Plant **compact/bush varieties** for small gardens.
- Select **disease-resistant varieties**.
- Hybrid varieties are more disease-resistant.
- Plant cool-season vegetables in one area and warm-season vegetables in the other area.




# Starting with Seed

- Be sure to start with high-quality seed.
- Old seeds may or may not germinate.
- Some seeds are treated with an insecticide or fungicide and can be recognized by their pink color.
- Some vegetable seeds may be stored for several years if they are kept cool and dry.
- Plant at the proper time, depth and spacing.



# Seed Packets Contain Useful Information

- Planting time
- Planting depth
- Plant spacing
- Estimated days to harvest
- Possible disease resistance
- Year the seed was intended to be planted

Days to Germination	Days to Harvest	Planting Depth	Spacing: Hills/Row	Preserve By
7-10	75	1 in.	4 ft./4 ft.	Storage & Canning
<div> <div>May - June</div> <div>May - June</div> <div>April - June</div> <div>April - June</div> </div> 				

**Cowpeas**  
**California Blackeye #5**

1450

Bushy plants produce 7-inch long green pods filled with greenish-white peas marked with a prominent black eye. The most popular of all southern pea varieties. Tender and delicious! This packet will plant approximately a 16 foot row.

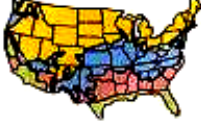
Days to Germination	Days to Harvest	Planting Depth	Spacing: Row/Plant	Preserve By
7 - 10	80	1 in.	3 ft./3 in.	Canning & Drying

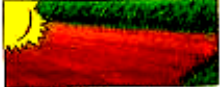

June

May - June

April - June

March - August




Sow directly in garden as full sun after soil warms. Plant 2 seeds every 3 inches.

Thin to 1 plant every 3 inches when they have 4 leaves. Keep soil moist to encourage growth.

Packed for Season:



11192 40377

SUGGESTIONS:  
For healthy vines, don't plant southern peas on same ground year after year. For dried peas, let the pods mature and dry on the vines.  
Recommended for warm climate areas.

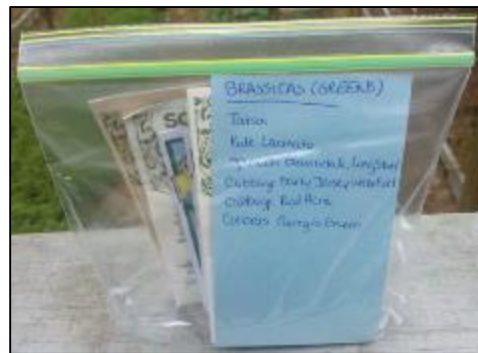
©1998 Ferry-Morse Seed Co.  
Fulton, KY USA 47041

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# Storing Vegetable Seed

- Ideal seed storage temperatures are between 40 to 50 degrees F, with desirable seed moisture for most crops around 10 to 12 percent.
- One of the more practical methods for storing small quantities is to place leftover seed in **sealable jars** or other **airtight containers** and store in a **cool, dark area** such as the **refrigerator (not the freezer)**.



# Storing Vegetable Seed

- Relative life expectancy under favorable storage conditions for certain crop groups is, in years:
- onion, parsley, parsnip - **1 year**
- peppers - **2 years**
- corn - **2 to 3 years**
- spinach, beets, carrots and chard - **2 to 3 years**
- legumes (beans) **3 to 4 years**
- tomatoes - **4 years**
- lettuce, endive and chicory **4 to 5 years**
- cucurbits (melons, squash) **4 to 5 years**
- crucifers (broccoli, cauliflower) **4 to 5 years**

# Transplanting

- High quality transplants can be produced only from high quality seed.
- Harden transplants to increase their ability to withstand **cold weather, drying wind** and **hot sunlight**.
- Extremely large transplants are more likely to suffer transplant shock.
- Set transplants into the garden on a **cloudy day** or **late in the afternoon**.



# Mulches

## Organic Mulch

- A 2 to 3 inch layer stops most weeds.
- Helps keep the soil cool.
- Use around warm season vegetables after the soil has warmed.



## Inorganic Mulch

- Black plastic is the most common material.
- Raises soil temperature 10 to 15 degrees.
- Place over fertilized & worked soil a week before transplanting.





# A Weed-Free Vegetable Garden





# Don't Grow Weeds!

- Weeds compete for water and nutrients.
- Remove weeds when they are small.
- Don't let weeds flower and go to seed.
- Mulch with newspaper and straw.

**Anybody seen the cucumbers?**





# Lawn Sprinkler Irrigation

- Quick to set up & inexpensive
- Supplies water too fast, which causes run-off and erosion
- Water is also lost from evaporation and wind drift
- Sprinklers also wet aisles, wasting more water
- Sprinklers wet plant foliage which encourages diseases



# Drip System Irrigation

- Are more expensive
- Conserves water
- Places water near roots
- Does not wet aisles or foliage of plants
- Reduces disease pressure
- Waters slowly to prevent run-off and erosion



# Fertilizers

- There are two types of fertilizers: **Slow-Release** and **Water Soluble**.
- Slow-release fertilizer is added at planting time and should be thoroughly incorporated into the soil mix.
- Water soluble fertilizers are added about mid-season, when the plants begin to produce.
- Starter fertilizers minimize transplant shock and provide 2 to 3 times as much phosphorus, which is essential for root growth.



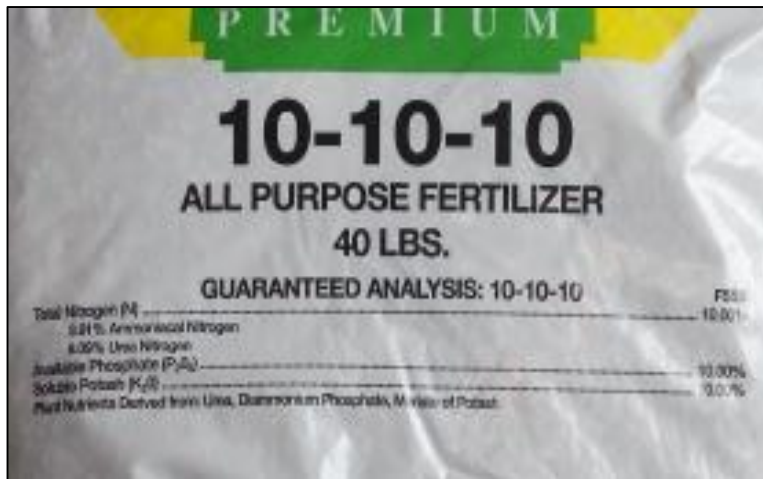
# Fertilizers (N, P & K)

- 20-10-5 (What do these numbers mean?)
- **A 50 pound bag of 20-10-5 fertilizer contains:**
  - 20% nitrogen ( $.20 \times 50 \text{ lbs} = 10 \text{ lbs}$ )
  - 10% phosphorus ( $.10 \times 50 \text{ lbs} = 5 \text{ lbs}$ )
  - 5% potassium ( $.05 \times 50 \text{ lbs} = 2.5 \text{ lbs}$ )
- **Nitrogen** promotes green stems and grass blades.
- **Phosphorus** encourages blooming and root growth.
- **Potassium** promotes strong plants and disease resistance.



# Fertilizers

- Select the fertilizer according to the type of vegetable to be grown.
- For leafy vegetables, high nitrogen fertilizers, such as (10-10-10), (12-12-12), or (15-15-15) are appropriate.
- For vegetables grown for their fruits, seeds, roots, or bulbs, fertilizers such as (6-24-24), (6-12-18), or (8-16-16) are appropriate.



# Fertilizers

- **Excess nitrogen can:**
  - Cause delayed fruiting in okra, tomatoes, and peppers.
  - Cause small fruit drop in tomatoes and peppers.
- **Some vegetables need a nitrogen side dressing**
  - Plants with heavy leafy growth such as greens, cabbage and corn.
  - Plants that grow for a long time such as tomatoes, peppers and melons.



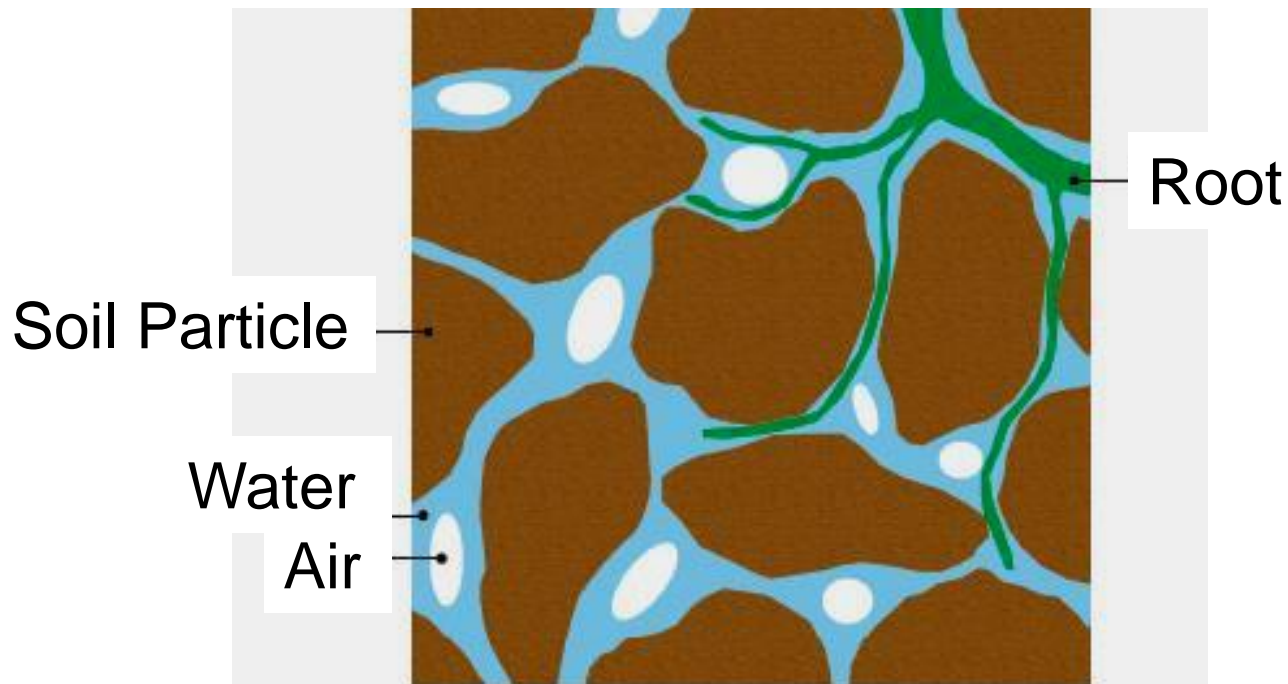
# The Soil is Alive

- To maintain the long term health of plants, you must avoid taking more from the soil than you are able to replenish by regular feeding with organic material.
- There are more microbes in a teaspoon of soil than there are people on the earth.



# Benefits of Compost

- Organic matter provides the microbes **energy for growth** and **carbon for the formation of new cells**.
- Organic matter **improves soil structure**, creating greater pore space for enhanced root growth.
- Increased pore space improves **soil drainage, water-holding capacity and soil aeration**.



# More Benefits of Compost

- **Returns nutrients** back to the soil.
- Helps to **hold nutrients in the soil** for plant use.
- Helps to **reduce soil borne plant diseases**.
- Provides sufficient quantities of organic matter to **aid in nitrogen fixation**.
- Organic matter provides the microbes **energy for growth** and **carbon for the formation of new cells**.

# When To Plant?

## Cool Season Vegetables

- Plant very cold hardy vegetables **4-6 weeks** before the last frost date.
- Plant moderately cold hardy vegetables about **2 weeks** before the last frost date.

## Warm Season Vegetables

- Plant warm season vegetables after the soil has warmed.
- This is the **first of May** for most vegetables.

# Cool Season Vegetables

**April 15: Last Average Frost Date**

## **Very Cold Hardy**

**4 to 6 weeks before frost date**

- Leaf Lettuce
- Spinach
- Mustard
- Collards
- Kale
- Radish
- Carrots
- Onions
- Cabbage
- English Peas

## **Moderately Cold Hardy**

**2 weeks before frost date**

- Turnips
- Beets
- Swiss Chard
- Broccoli
- Cauliflower
- Irish Potatoes

# Characteristics of Cool Season Vegetables

- Plants are shallow rooted.
- Plants are frost hardy or tolerant.
- Most are leafy, thus require more nitrogen.
- Seeds germinate and plants mature in cool soil or air temperatures.
- Plants will bolt, die or lose quality in heat.
- Vegetables are said to bolt when their growth goes rapidly from being mostly leaf based to being mostly flower and seed based.

Broccoli Bolting



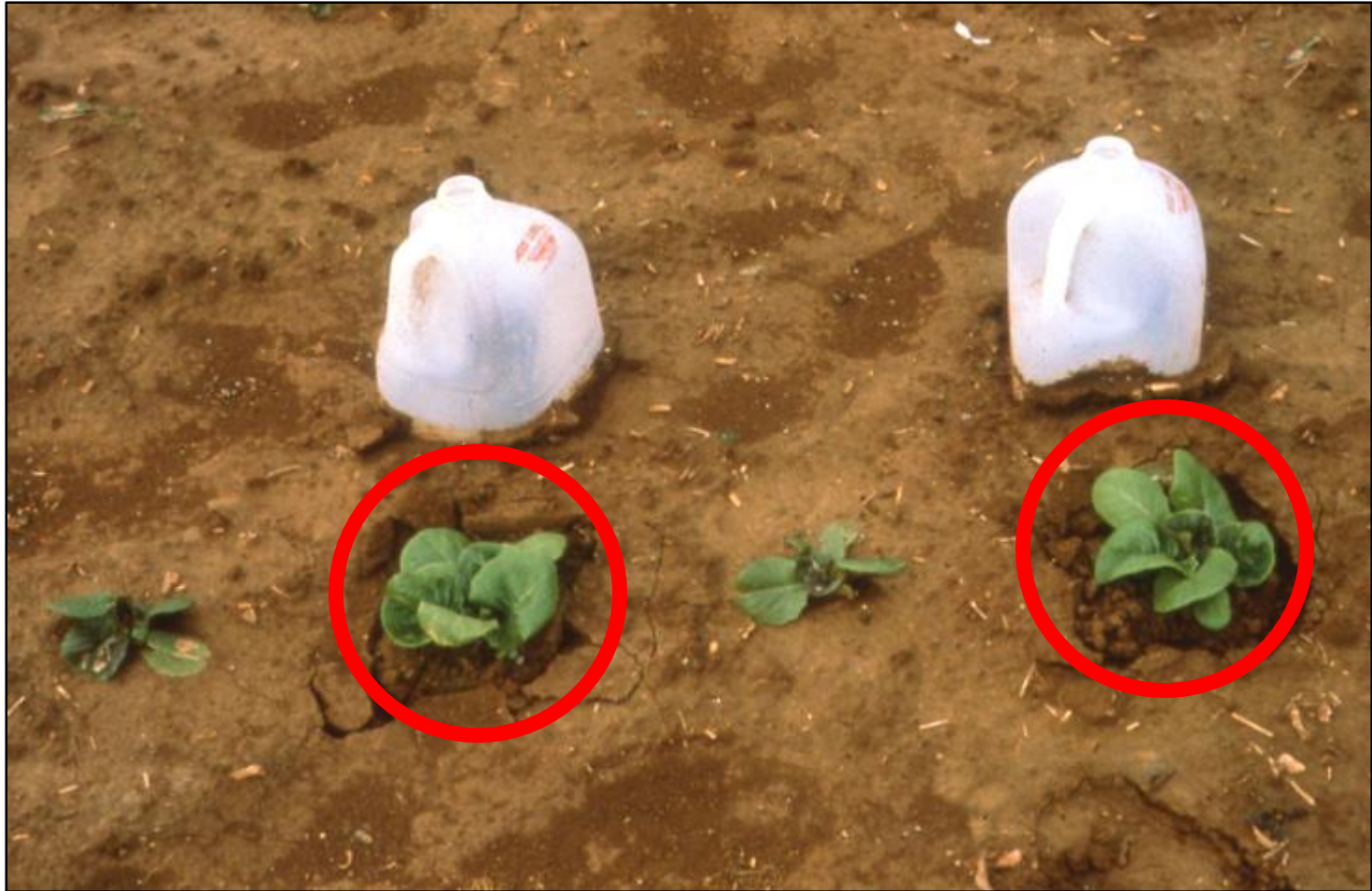


# Milk Jug Plant Protectors

- Use clear plastic jugs with the caps & bottoms removed.
- Place over frost hardy, cool season plants.
- Increases daytime temperature & protects from cold winds.
- Remove jugs during the day if air temperatures are too warm.



- These plants were protected from cold weather injury for a period of two weeks.



# Very Cold Hardy Vegetables

- Leaf Lettuce
- Spinach
- Mustard
- Collards
- Kale
- Radish
- Carrots
- Onions
- Cabbage
- English Peas



# Leaf Lettuce (Mediterranean area)

## (Very Cold Hardy)

- Seed Depth  $\frac{1}{8}$  to  $\frac{1}{4}$  inch, thin plants 3 to 8 inches apart.
- Does not form heads and the leaves can be harvested repeatedly.
- Sow a variety of colorful leaf lettuces thickly together and harvest premixed greens with scissors.
- Make several plantings 2-3 weeks apart to extend harvest.



# Spinach (Southwestern Asia)

## (Very Cold Hardy)

- Seed Depth ½ inch, thin plants 3 to 6 inches apart.
- Plant successive runs every two weeks for a continuous supply.
- Cut small leaves with scissors as needed for salads.
- Smooth-leaved varieties are easy to wash, but not as cold hardy as puckered-leaf varieties.





# Mustard Greens (Europe)

## (Very Cold Hardy)

- Seed depth  $\frac{1}{4}$  to  $\frac{1}{2}$  inch, thin plants 6 to 12 inches apart.
- Thinnings can be eaten, which have a milder flavor.
- Young leaves, four to five inches long, are mild-flavored and can be eaten raw in salads.
- The older leaves taste better when prepared as cooked greens.





# Collards (Northern Europe)

## (Very Cold Hardy)

- Seed depth  $\frac{1}{4}$  to  $\frac{1}{2}$  inch, thin plants 18 inches apart.
- Collards tolerate more cold weather than any other member of the cabbage family.
- Collards are sweetest after they've been hit by a light frost, which causes the plants to produce sugars.
- Harvest the larger leaves when the plants are 10 to 12 inches tall.



# Kale (Northern Europe)

## (Very Cold Hardy)

- Seed depth  $\frac{1}{4}$  inch, thin plants 12 to 18 inches apart.
- Kale is a member of the cabbage family.
- Kale leaves are also sweetest after they've been hit by a light frost, which causes the plants to produce sugars.
- Watch for outbreaks of gray-green cabbage aphids, which often gather in clusters within the folds of frilly kale leaves.





# Radish (China)

## (Very Cold Hardy)

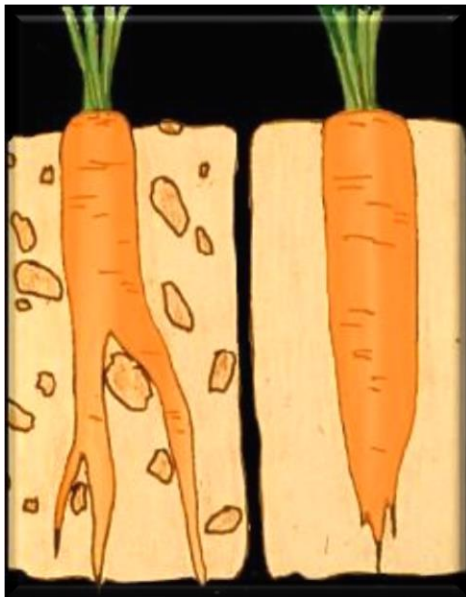
- Seed depth ½ inch, thin plants 3 inches apart.
- They mature in such a short time that you can get two to three crops.
- Hot weather and drought encourage the development of spicy flavor compounds, which are similar to those found in horseradish.
- As companion plants, radishes are used to draw aphids, flea beetles, and other pests away from peppers, squash, and other vegetables.



# Carrots (Afghanistan)

## (Very Cold Hardy)

- Seed depth ½ inch, thin plants 3 inches apart.
- The secret to success with carrots is loose, deep soil.
- Overwatering causes cracks and splits, underwatering makes them tough.
- The carrot is the second most popular vegetable in the world after the potato.





# Onions (Central Asia)

## (Very Cold Hardy)

- Seed depth  $\frac{1}{4}$  to  $\frac{1}{2}$  inch, thin plants 2 to 3 inches apart.
- Bulbing of onions is controlled by variety, temperatures, and length of day.
- Unfavorable growing conditions may result in onions bolting or sending up flower stalks.
- If flower stalks should develop, carefully cut them from the plant immediately or bulbing will be reduced.





# Onions (Very Cold Hardy)

- Plant onion sets 1 inch deep, space sets 2 inches apart.
- An **onion set** is a small bulb up to 1 inch in diameter.
- The term green onion describes an immature onion.
- Any standard onion variety or hybrid can be used for green bunching onions if harvested at the proper stage of maturity.
- An **onion transplant** is a plant between 8 to 10 weeks old, which has not gone through the bulbing process, and if planted at the right time will produce large bulbs.



# Cabbage (Northern Europe)

## (Very Cold Hardy)

- Seed depth  $\frac{1}{4}$  to  $\frac{1}{2}$  inch thin plants 18 inches apart.
- For best results when growing cabbage, plant transplants and keep the topsoil moist at all times.
- Harvest when the head is firm.
- Cabbage **originated in the Middle East** and varieties come in red, purple and green.





# Green Peas (Central Asia)

**(Very Cold Hardy)**

- Seed depth 1 1/2 to 2 inches deep, thin plants 6 inches apart.
- There are two types of green peas: English peas and edible podded peas (Snow peas or Chinese peas).
- English peas must be removed from the pod.
- Late-planted green peas will bloom when the weather gets hot, but will not set fruit.



# Moderately Cold Hardy Vegetables

- Turnips
- Beets
- Swiss Chard
- Broccoli
- Cauliflower
- Irish Potatoes

# Turnip Greens & Turnips (India)

**Moderately Cold Hardy**

- Seed depth  $\frac{1}{2}$  inch, thin plants 3 to 4 inches apart.
- Like other root crops, turnips prefer a loose or well-worked soil.
- Harvest turnip greens and small turnips about 30 days after seeding.
- The roots taste sweeter once there has been a light frost.





# Beets (Mediterranean)

## Moderately Cold Hardy

- Seed depth ½ inch, thin plants 3 to 4 inches apart.
- Beets don't transplant well and are always planted from seed.
- The beet seed in packets is really clumps of 4-6 seeds.
- You can plant the whole clump and thin after germination.
- While mainly for their roots, beet foliage may also be harvested for greens.



# Swiss Chard (Mediterranean)

## Moderately Cold Hardy

- Seed depth ½ inch, thin plants 12 inches apart.
- Swiss chard is a **type of beet**, but grown only for the leaves.
- Will **tolerate more summer heat** than other greens and can grow through fall until killed by a hard freeze.
- It can also be grown just as an ornamental plant.
- To harvest, cut off outer leaves near the base of the plant to allow center leaves to develop.





# Broccoli (Mediterranean)

## Moderately Cold Hardy

- Seed depth  $\frac{1}{4}$  to  $\frac{1}{2}$  inch, thin plants 18 inches apart.
- Does best when set out as transplants rather than planted from seed.
- Prefers daytime temperatures that are between 65 and 80° F.
- Harvest the center green flower bud cluster while still tight and before any yellow petals begin to show.
- **Cut** the central stem five to six inches below the head.



# Cauliflower (Mediterranean)

## Moderately Cold Hardy

- Seed depth  $\frac{1}{4}$  to  $\frac{1}{2}$  inch, thin plants 18 inches apart.
- Cauliflower is unique in that it has to be blanched (kept away from light) to keep the curds white.
- Some cultivars of cauliflower are self-blanching types where the leaves naturally grow and cover the head as it begins to form.
- This is a process where the leaves are gathered and **tied** around the head when it begins to form.





# Irish Potatoes (Peru, South America)

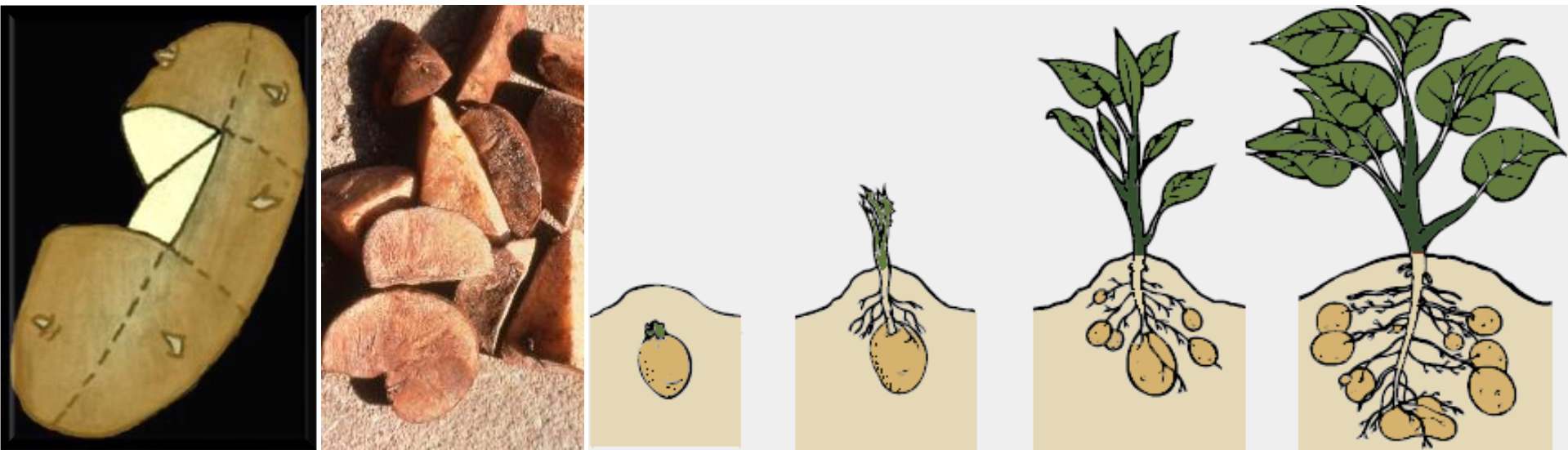
## Moderately Cold Hardy

- Seed piece depth 1 to 3 inches, thin plants 12 inches apart.
- Are native to the cool, tropical highlands of western South America.
- Grow best in a light, sandy, well-drained loam with a pH of 6.0 to 6.8
- To harvest potatoes that will store well, wait until the plants die back.



# Suberized Irish Potatoes

- Start with seed potatoes or certified, disease-free potatoes that will be cut into pieces for planting.
- Cut seed potatoes into 1 ½ to 2 inch square pieces with each piece having 1 or 2 eyes, which are actually buds.
- Let pieces be exposed to air (2 to 3 days) until they look calloused; this exposure will guard against rot.
- As the potato plant grows, soil is continually hilled up along the sides of the plants. This keeps the soil around the developing tubers loose and keeps the surface tubers from being exposed to sunlight, which will turn them green and somewhat toxic.



# Characteristics of Warm Season Vegetables

- Mostly produce edible fruits rather than vegetative leaves.
  - Are fairly deep rooted plants.
  - Are fairly heat tolerant, but not cold tolerant.
  - Will not germinate or grow in cold soil.
- Okra
  - Beans
  - Field Peas
  - Tomatoes
  - Peppers
  - Eggplant
  - Sweet Corn
  - Sweet Potatoes
  - Squash
  - Cucumber
  - Cantaloupe
  - Pumpkins
  - Watermelon

# Warm Season Vegetables

## From Seed

- Beans
- Field Peas
- Okra
- Sweet Corn
- Squash
- Cucumber
- Cantaloupe
- Watermelon
- Pumpkins

## From Transplants

- Tomatoes
- Peppers
- Eggplant
- Sweet Potatoes



# Tomatoes

- Tomato plants are **native to South America**.
- They should be planted only after all danger of frost has passed.
- Tomato plants will develop roots along the stem and should be set deeply at transplanting.



# Tomatoes (Determinate)

- Determinate tomatoes, or "bush" tomatoes, are varieties that grow to a compact height (generally 3 to 4 feet).
- All the tomatoes from the plant ripen at approximately the same time (usually over period of 1- 2 weeks).
- They require a limited amount of staking for support and are perfectly suited for container planting.





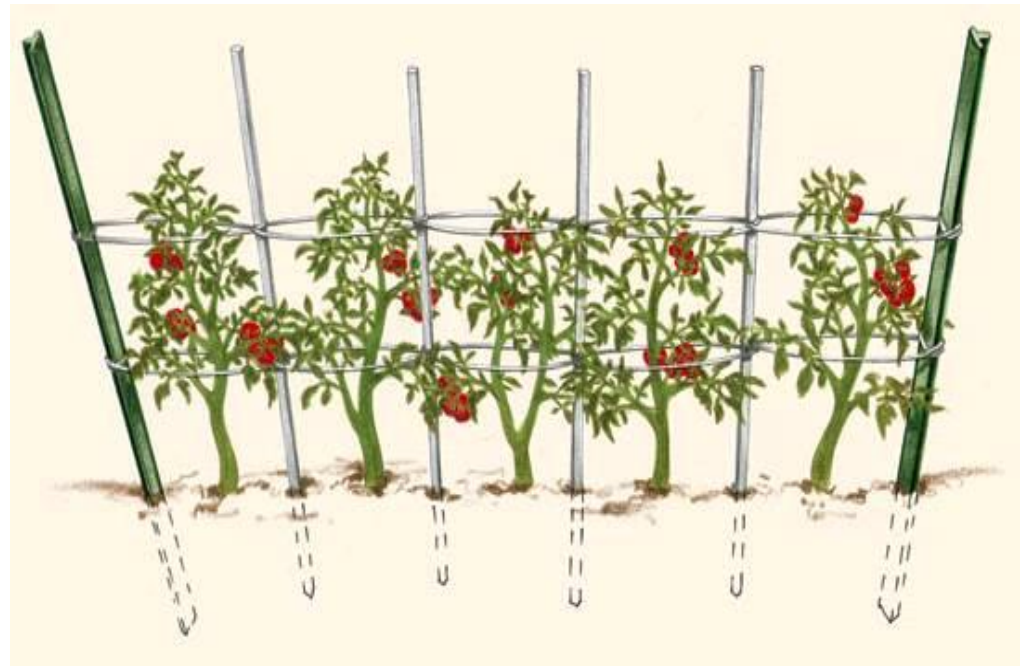
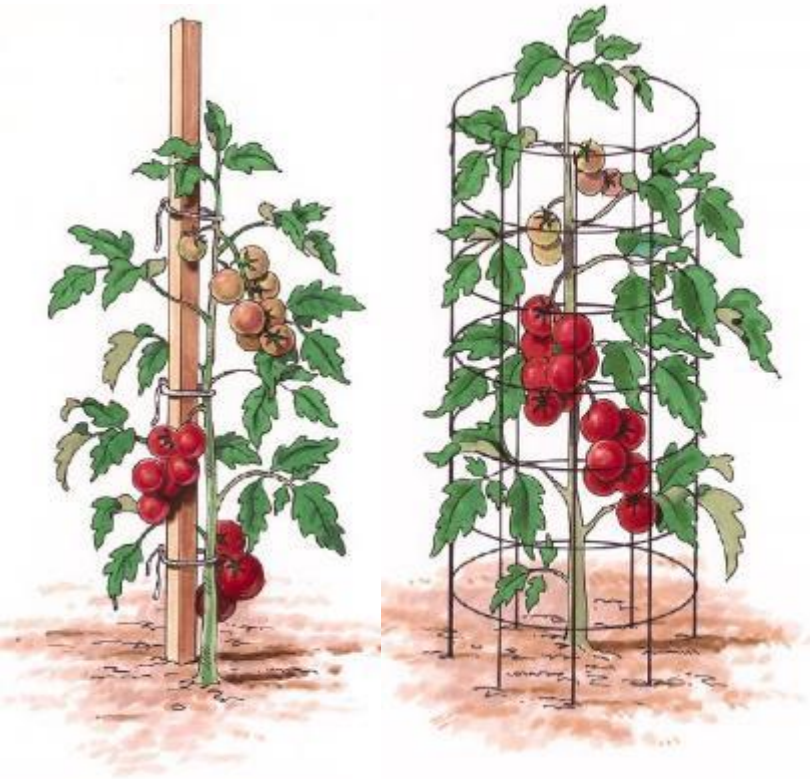
# Tomatoes (Indeterminate)

- Indeterminate tomatoes will grow and produce fruit until killed by frost and will require substantial staking for support.
- They can reach heights of up to 12 feet, although 6 feet is normal.
- Indeterminate tomatoes will bloom, set new fruit, and ripen fruit all at the same time throughout the growing season.



# Staking Tomato Plants

- The main reason for staking and supporting tomato plants is to keep plants and fruit off the ground.
- This reduces losses from fruit rots when fruit touch the soil and from sunburn when fruit are not shaded by foliage.





# A Sucker Born Every Day

- Tomato suckers, or side shoots appear in the crotch between the stem and a branch.
- If left to grow, they will become another main stem with branches, flowers, fruit and more suckers of their own.
- If suckers are not removed the plant will produce more tomatoes, but the fruits will generally be smaller in size.
- Removing suckers will result in fewer, but larger fruits.



# Paper Bag Plant Protectors

- Pound a stake in the ground next to the plant and pull the sack over the stake.
- Will help protect plants 2 to 3 degrees from frost injury.
- Bags can be left in place for 2 or 3 days.





# Peppers (Peru, South America)

- Peppers are native to **Central and South America, Mexico, and the West Indies.**
- Extremely high temperatures (90 degrees F or above) during flowering often results in blossom drop.
- A shortage of water at bloom time can also result in blossom drop or failure to set fruit.
- Peppers are easily damaged when laden with fruit, staking will help.



# Eggplant (India)

- Eggplant is **native to India** and is in the same plant family with tomatoes, peppers and potatoes.
- The fruits of the eggplant are edible from the time they are one-third grown until ripe, and should be harvested when the skin is shiny.
- Eggplants are prone to falling over when loaded with fruit, so you may want to tie plants to stakes to keep them upright.





# Bush Beans (Peru, South America)

- Seed depth 1 to 1½ inch, thin plants 3 to 4 inches apart.
- Soaking seeds overnight before planting will speed up germination.
- Sow every 2 weeks until 8 weeks before fall frost.
- They need no support and can be picked whenever your are ready to cook them.



# Pole Beans (Peru, South America)

- Seed depth 1 to 1½ inch, thin plants 3 to 4 inches apart.
- Soaking seeds overnight before planting will speed up germination.
- Pole beans are vine-growing plants and will require staking.
- Pick when pods are nearly mature, but beans are not fully developed and pods are still crisp.





# Okra (West Africa)

- Okra, a relative of hibiscus, is **native to Africa** and was brought to North America in the 1600s.
- Seed depth ½ to 1 inch deep, thin plants 1½ to 2 feet apart.
- Harvest pods when they are 2 to 4 inches long with a sharp knife.
- Four or five plants produce enough okra for most families unless you wish to can or freeze some for winter use.

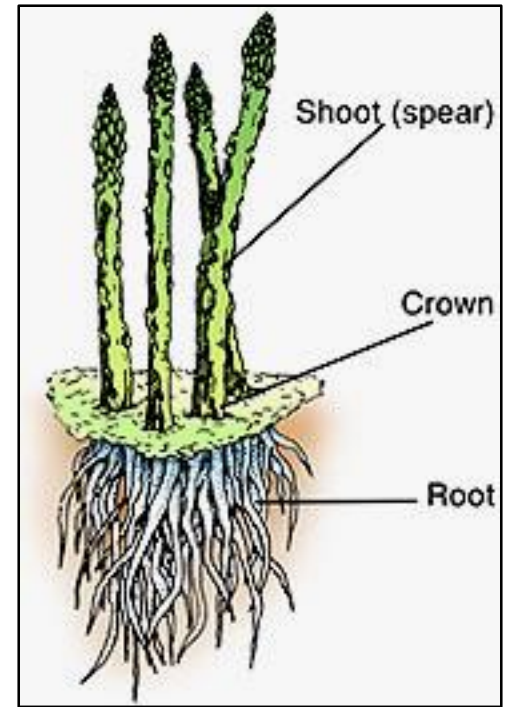




# Asparagus

(Europe, Northern Africa, Western Asia)

- Asparagus is a **perennial vegetable** grown for its delicious young shoots that can be productive for 15 or more years.
- Asparagus plants are either male or female.
- Select all-male hybrid asparagus varieties such as Jersey Giant, Jersey Prince, and Jersey Knight which produce abundant yields.
- Starting asparagus from 1-year-old crowns gives you a year's head start over seed-grown plants.
- Two-year-old crowns are usually not a bargain since they tend to suffer more from transplant shock and won't produce any faster than 1-year-old crowns.



# Asparagus

- To plant asparagus crowns, dig trenches 12 inches wide and 6 inches deep down the center of the prepared bed.
- Apply 0-46-0 (triple superphosphate) or 0-20-0 (superphosphate) fertilizer in the bottom of the furrow before planting.
- Space the crowns 1-1/2 feet apart in the row and fill with soil, but do not compact the soil as this will interfere with shoot growth.





# Summer Squash (Central America)

- Plant anytime after the danger of frost has passed, from early spring until midsummer.
- Sow four or five seeds 1 inch deep, in hills 48 inches apart.
- When the plants are 2 to 3 inches tall, thin to one vigorous plant or no more than two or three plants per hill.
- Summer squash should be harvested when small and tender for best quality.





# Male and Female Flowers

- Although summer squash has both male and female flowers, only the female flowers produce fruits.
- Bees are necessary for pollination.



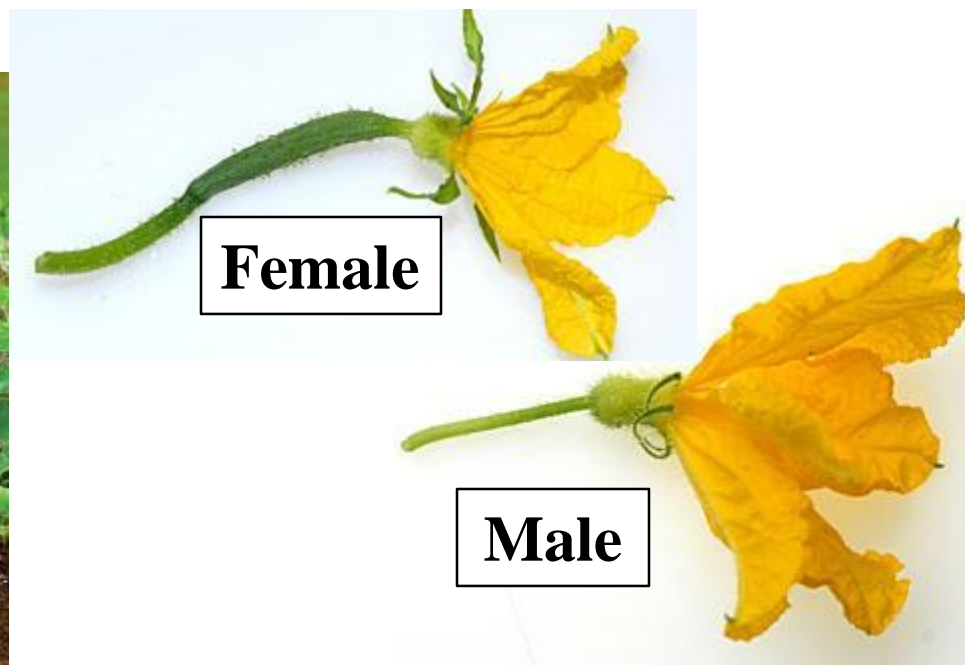
**Female**



**Male**

# Cucumbers (Southern Asia)

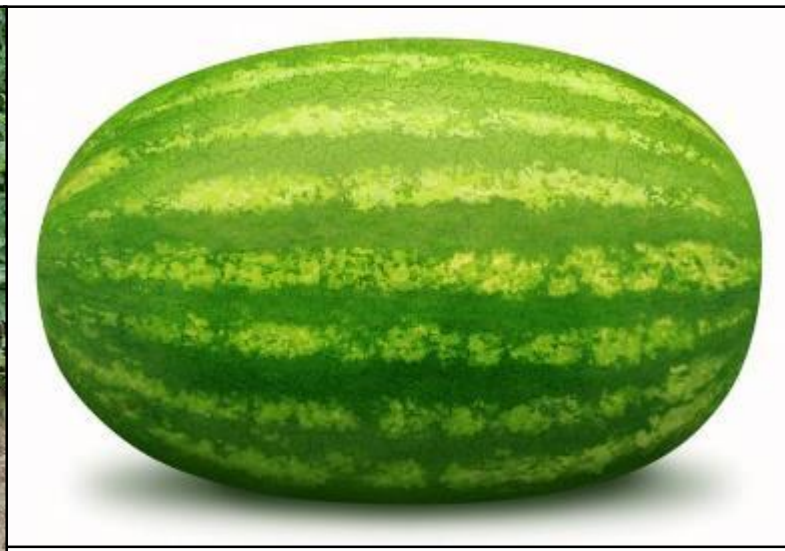
- Plant seeds 1/2 to 1 inch deep and thin the seedlings to one plant every 12 inches in the row or to three plants every 36 inches in the hill system.
- Cucumber plants have shallow roots and require ample soil moisture at all stages of growth.
- A cucumber is of highest quality when it is uniformly green, firm and crisp.





# Watermelons (Southern Africa)

- Watermelons are originally **from the African tropics** and were found growing wild by David Livingstone in 1854.
- Plant 4 to 5 seeds one inch deep in hills spaced 6 feet apart, thinning seedlings to the best 3 plants per hill.
- The biggest problem is knowing when the watermelon is ripe.
- The tendril next to the melon will dry before it is ripe.
- The underside will turn slightly yellow and the surface color will dull.





# World Record Watermelon

- The world record watermelon weighed in at **350.5 pounds** at the 2013 Pumpkin and Fall Festival in Hamilton, Ohio.
- The growers were Janet and Chris Kent from Sevier County, TN.



# Pumpkins (Central America)

- Plant 4 to 5 seeds, one inch deep in hills spaced 6 feet apart, thinning seedlings to the best 2 to 3 plants per hill.
- Most vines wilt under the bright, hot afternoon sun, but if you see foliage wilting before 11:00 a.m., that's a sign that they need water.
- Pumpkins can be harvested whenever they are a deep, solid color (orange for most varieties) and the rind is hard.
- Cut pumpkins from the vines carefully, using pruning shears or a sharp knife and leave 3 to 4 inches of stem attached.





# World Record Pumpkin

- The world record pumpkin weighed in at **2,624.6 pounds** at the European Championship Pumpkin Weigh-off in Germany in 2018.
- The grower was Mathias Willemijns.





# Thank You

