

**Annual maintenance  
operations  
(Annual management)**

# Soil management

- Weed management
- Aeration and warming of the soil
- Transmission of plant nutrients into usable form
- **Times of soil management:**
- **Autumn-winter:** It is done in December at the latest, 20-25 cm deep.
- **Spring-summer:** In February-March, 8-10 cm depth, surface management.

# In Vegetable Species

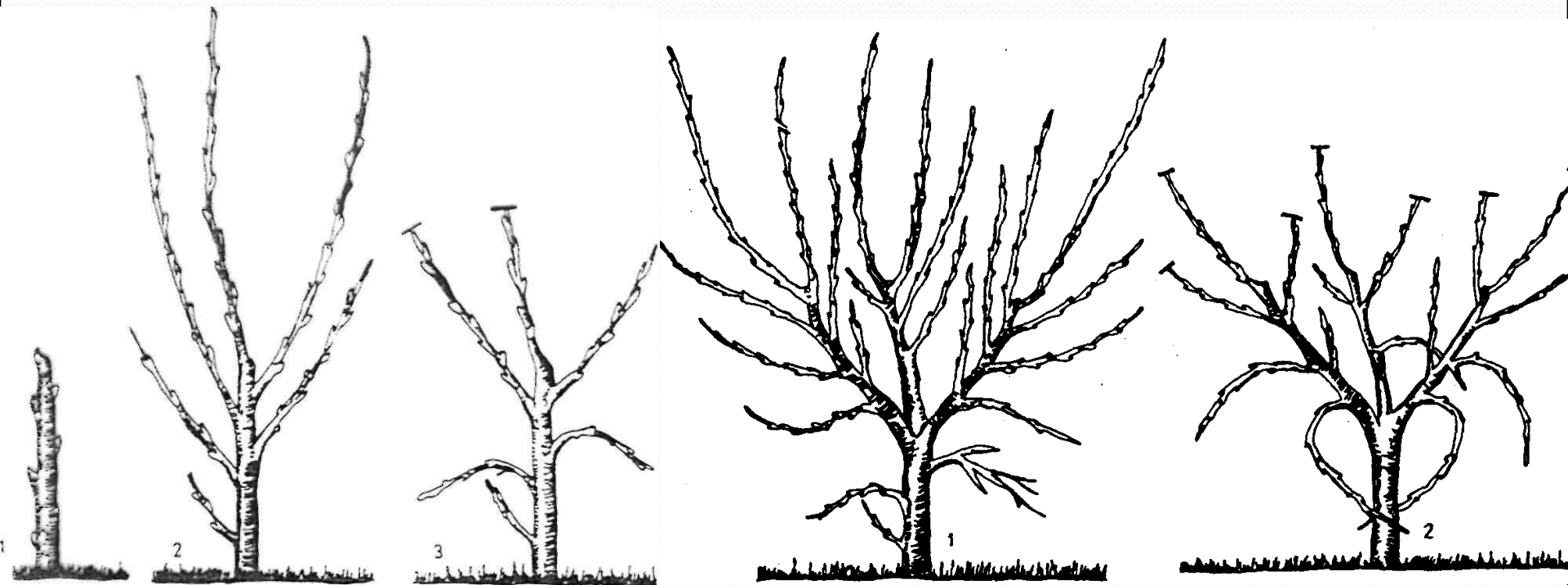
- We can apply three different soil management such as
  1. Deep soil management (40-60 cm in depth)
  2. Medium soil management (10-35 cm in depth)
  3. superficial soil management (8-10 cm in depth).
- The last one is preferred for preparation of seed bed, for controlling weeds on the land and for cracking the hard layer on the soil after irrigation in especially soils with high clay content.

# PRUNING

- Aims of the pruning:
  - Invest in yield as soon as possible and keep it productive for a long time
  - Maintaining balance between underground and aboveground organs
  - Facilitate cultural transactions
  - Reducing alternate bearing
  - Regulating product yield and quality

# TRAINING

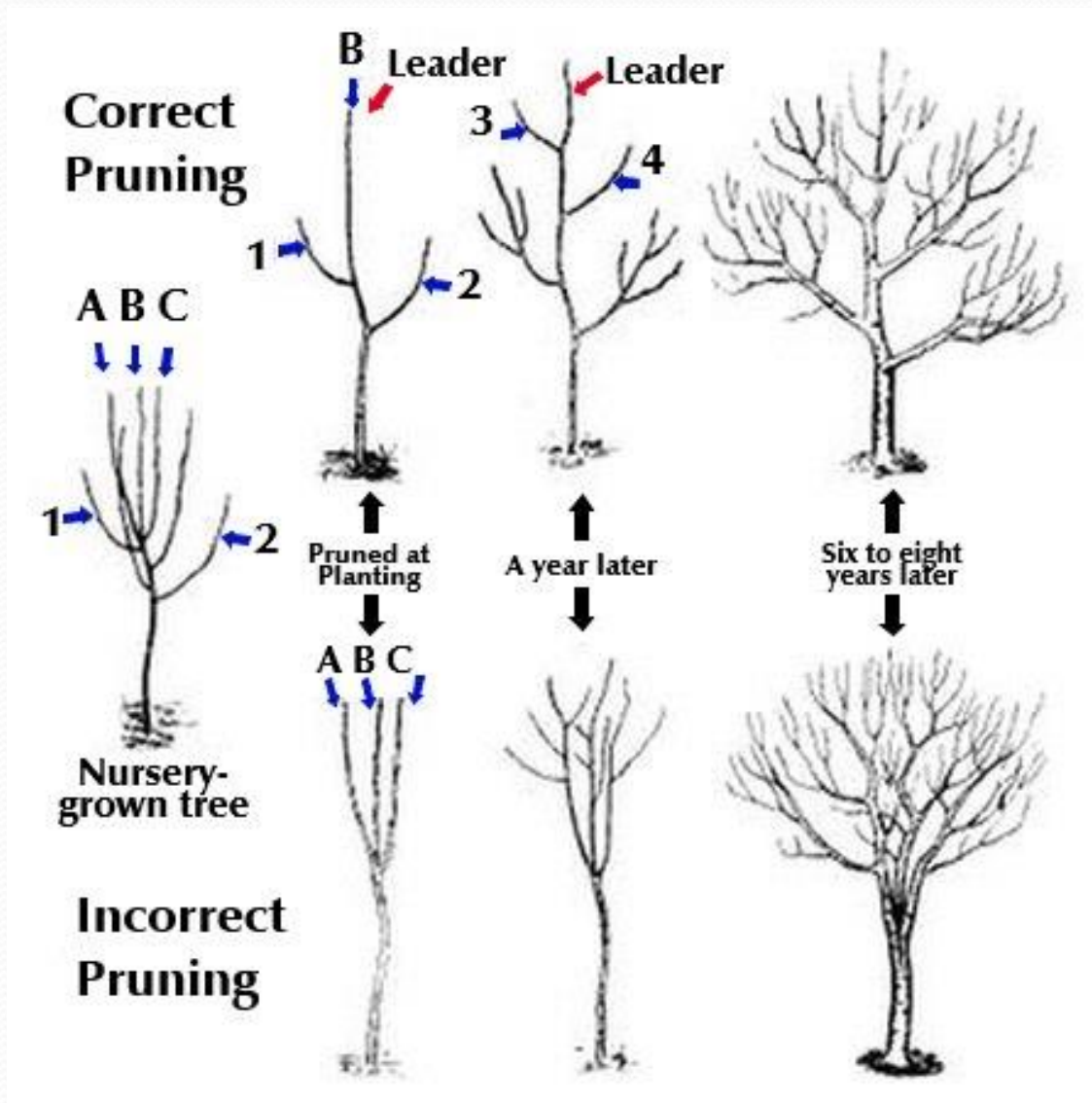
- GOBLE



- 1. year

2. year

# • DORUK DALLI



REMOVE COMPETING UPRIGHT SHOOTS

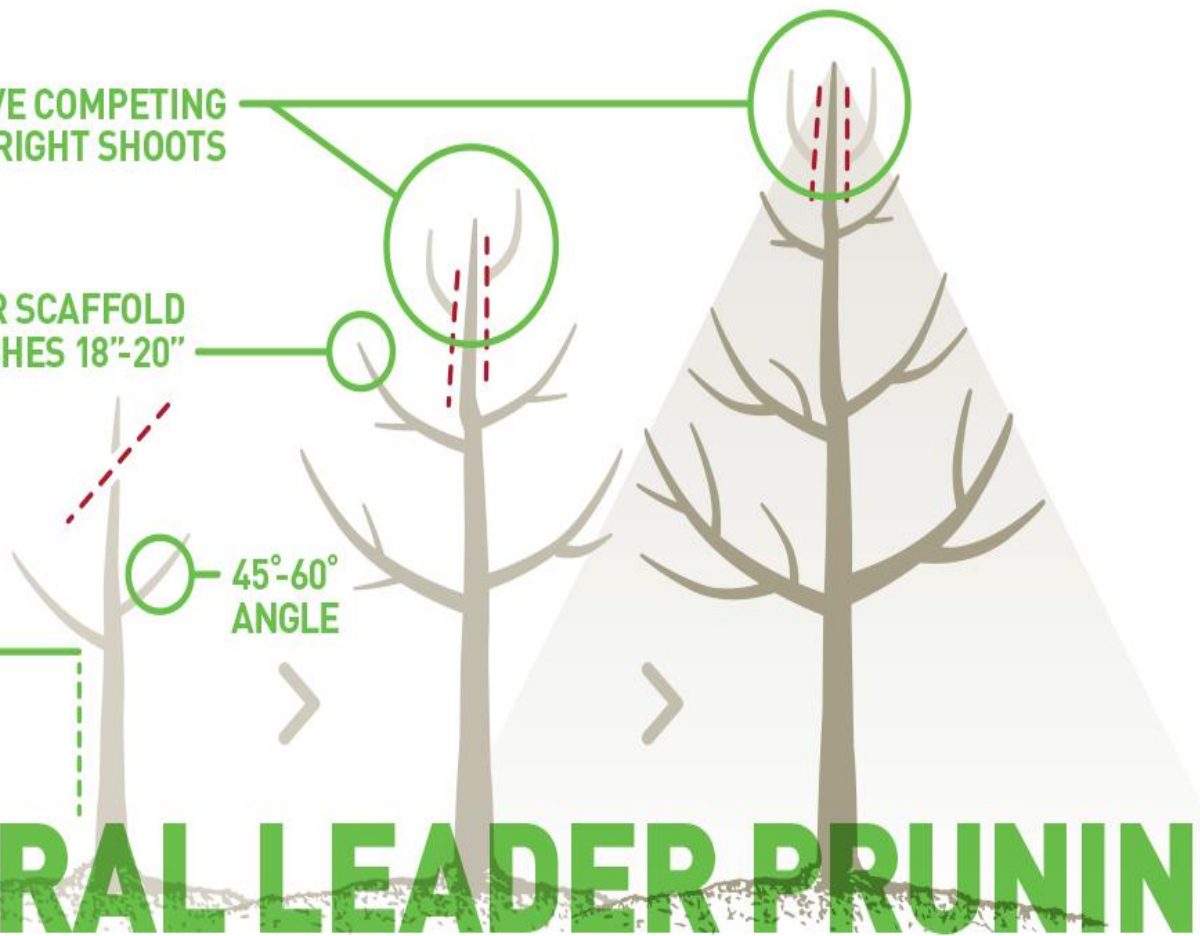
3-4 UPPER SCAFFOLD BRANCHES 18"-20"

3-4 SCAFFOLD BRANCHES 20"-30"

45°-60° ANGLE

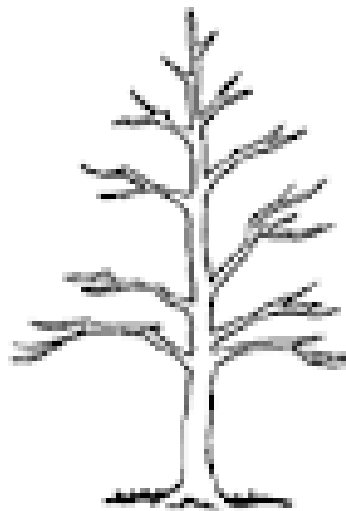
# CENTRAL LEADER PRUNING

CREATE A PYRAMID SHAPE WITH A SINGLE MAIN, VERTICAL TRUNK

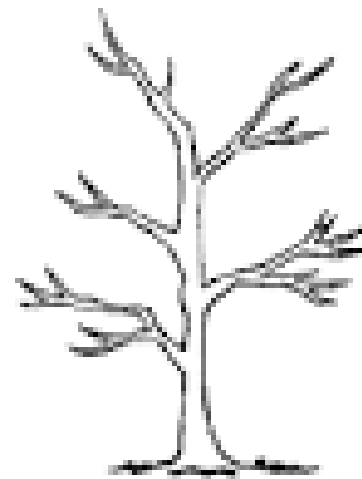




Open Center



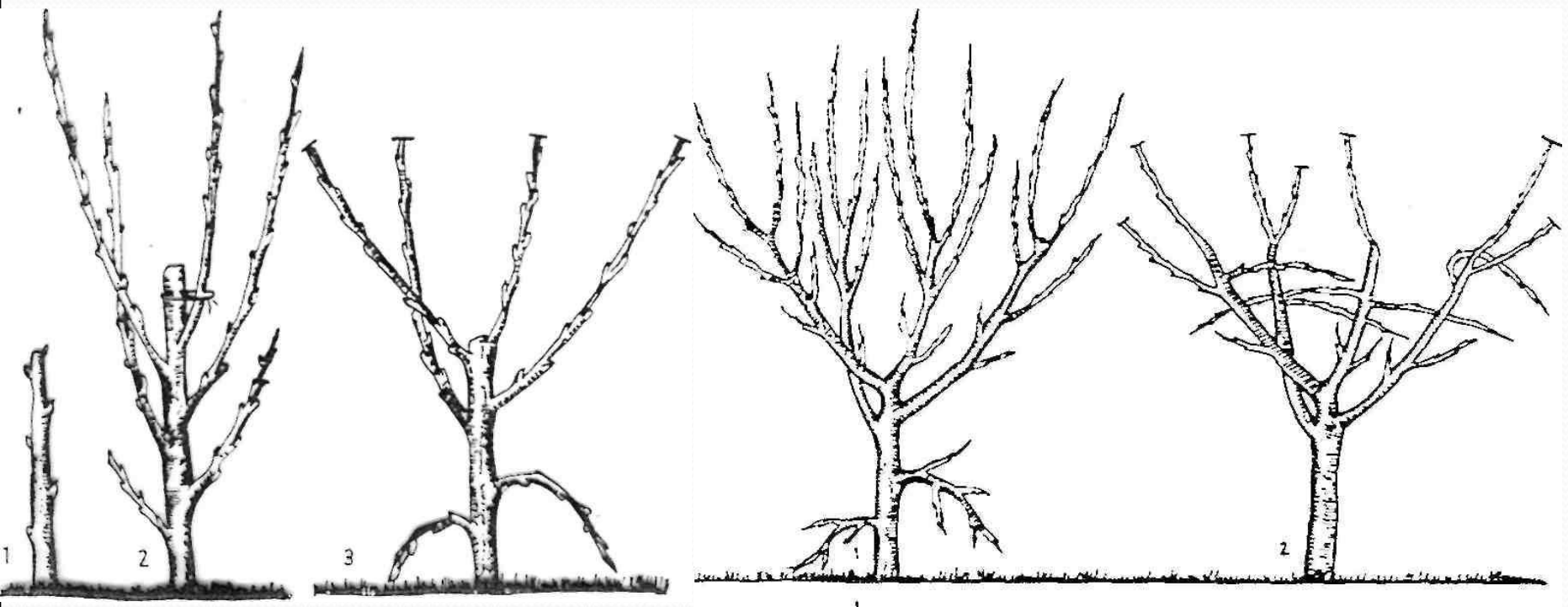
Central Leader

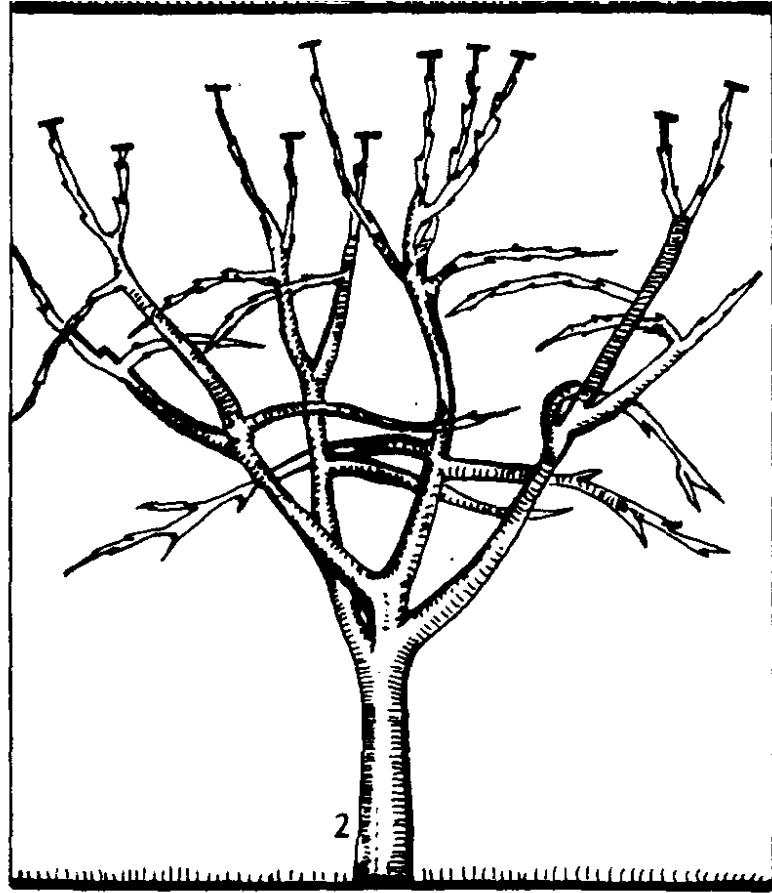
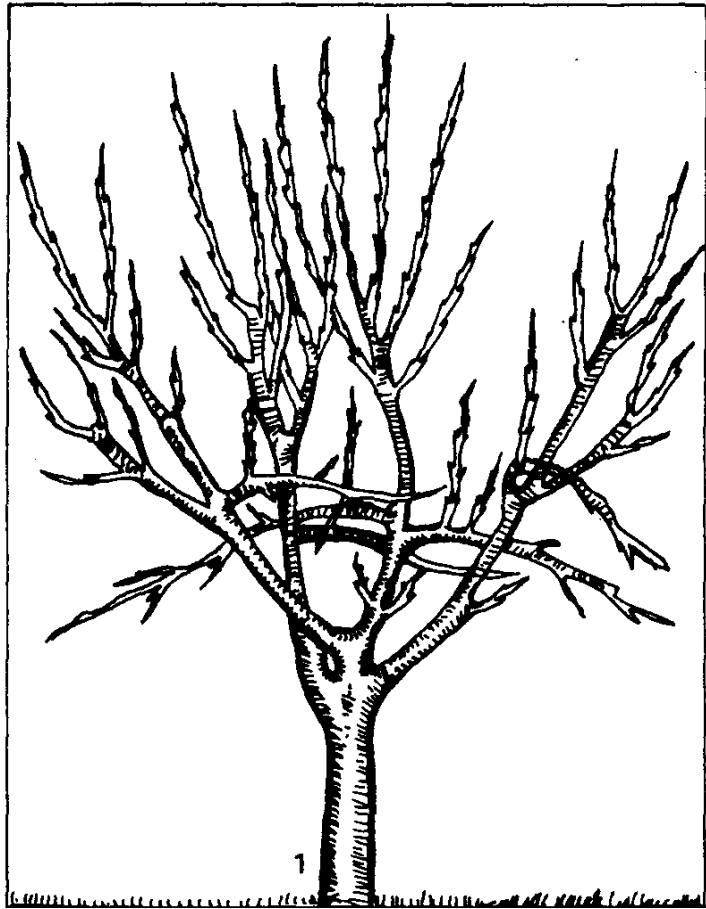


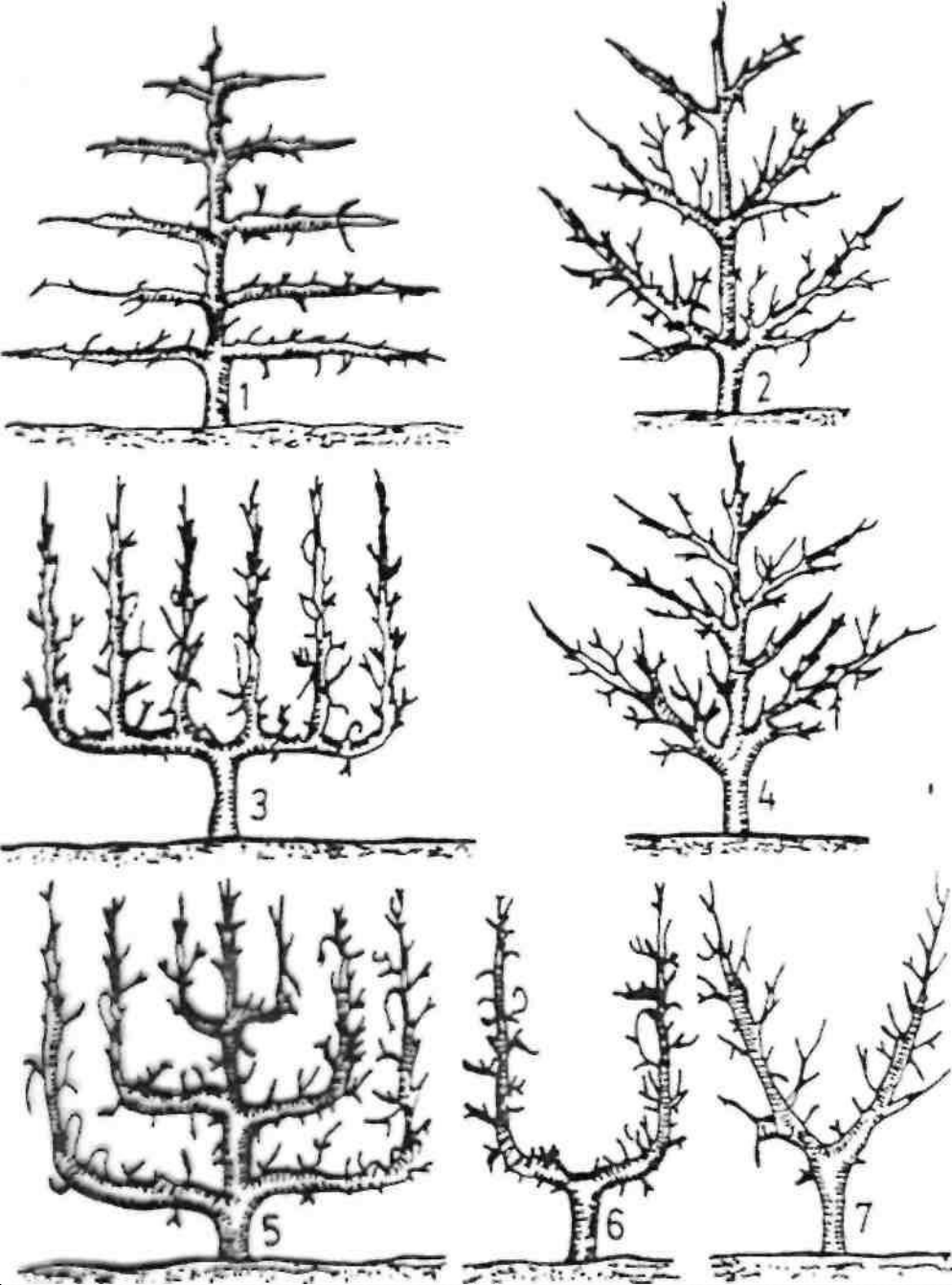
Modified  
Central Leader



# Piramid

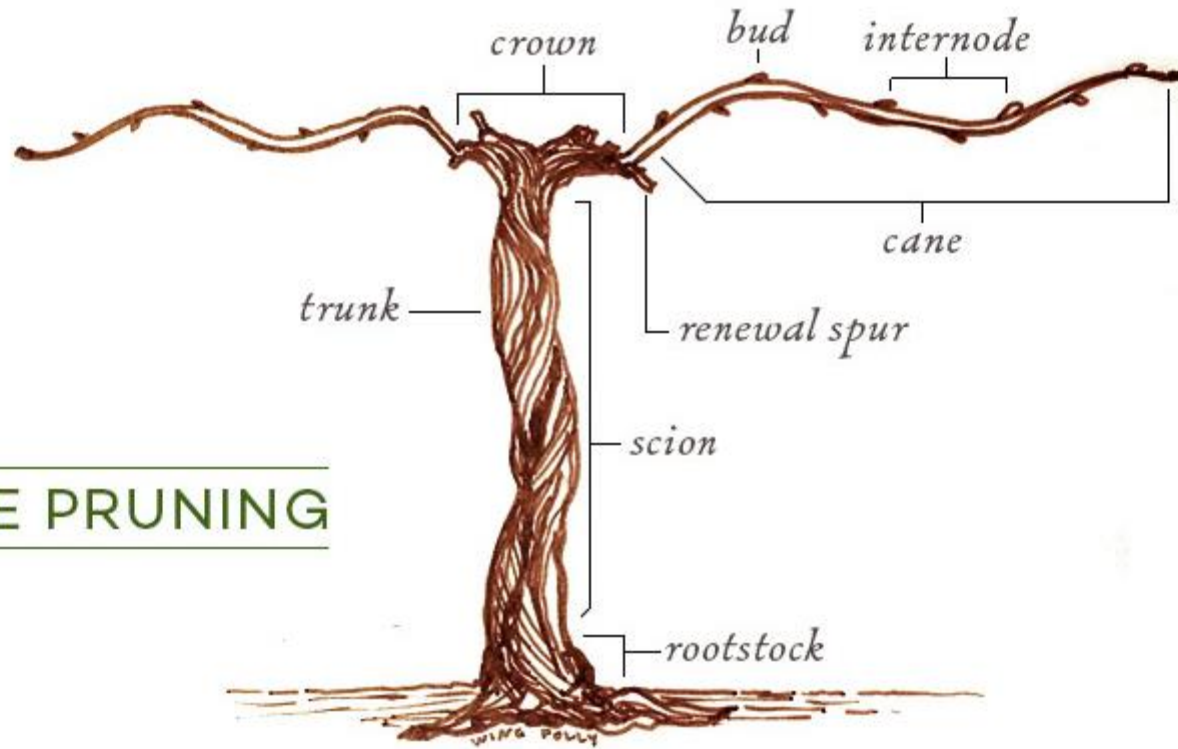




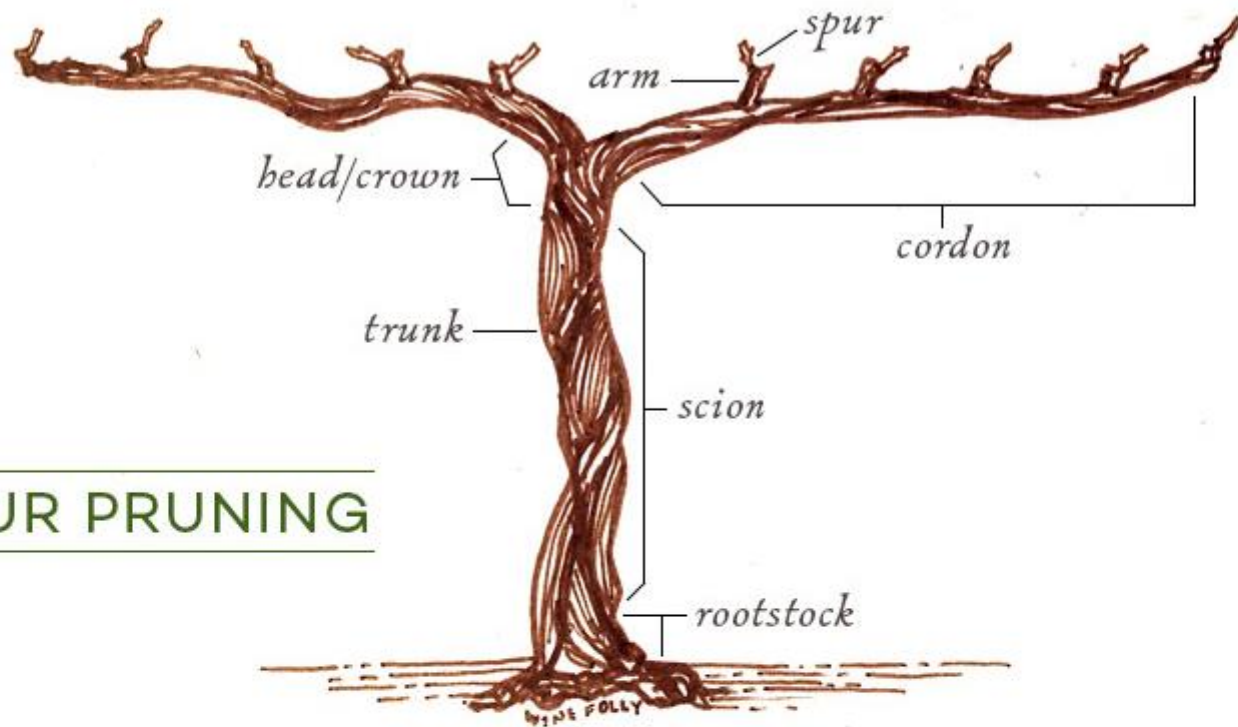


- Types of palmet:
- Horizontally branched palmette
- Inclined branched palmette
- Candlestick palmette
- Irregular folded palmette
- Yernier palmette
- U-shaped palmette
- Ipsilon (Y) shaped palmette

# CANE PRUNING



## SPUR PRUNING



## COMMON VINE TRAINING METHODS



*single cordon*



*double cordon*



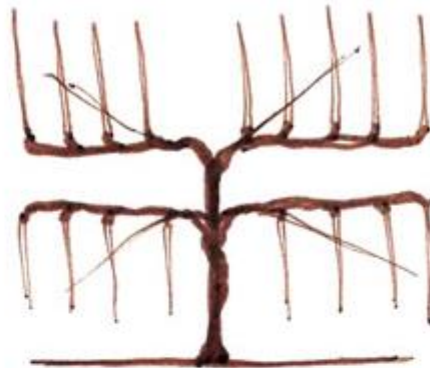
*single guyot*



*double guyot*



*geneva double curtain*



*scott henry*



*pergola*



*lyre*

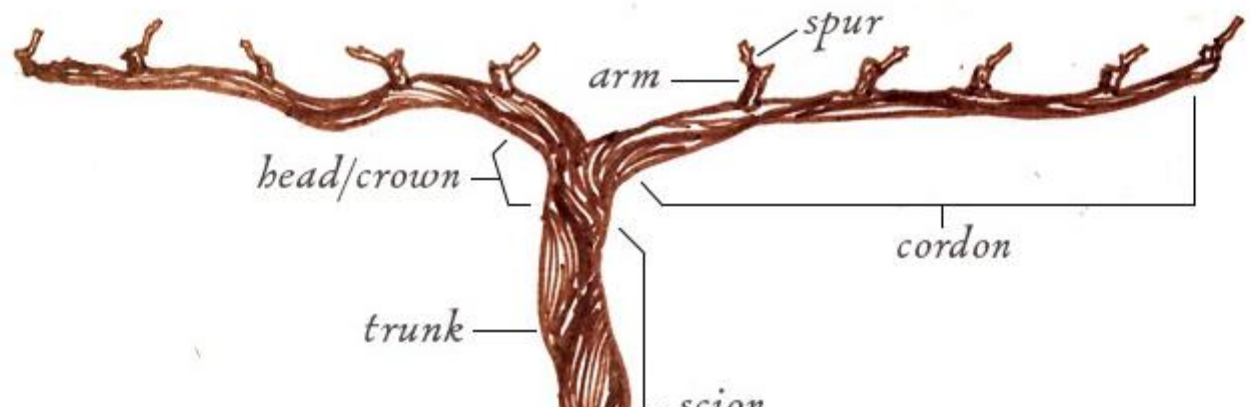
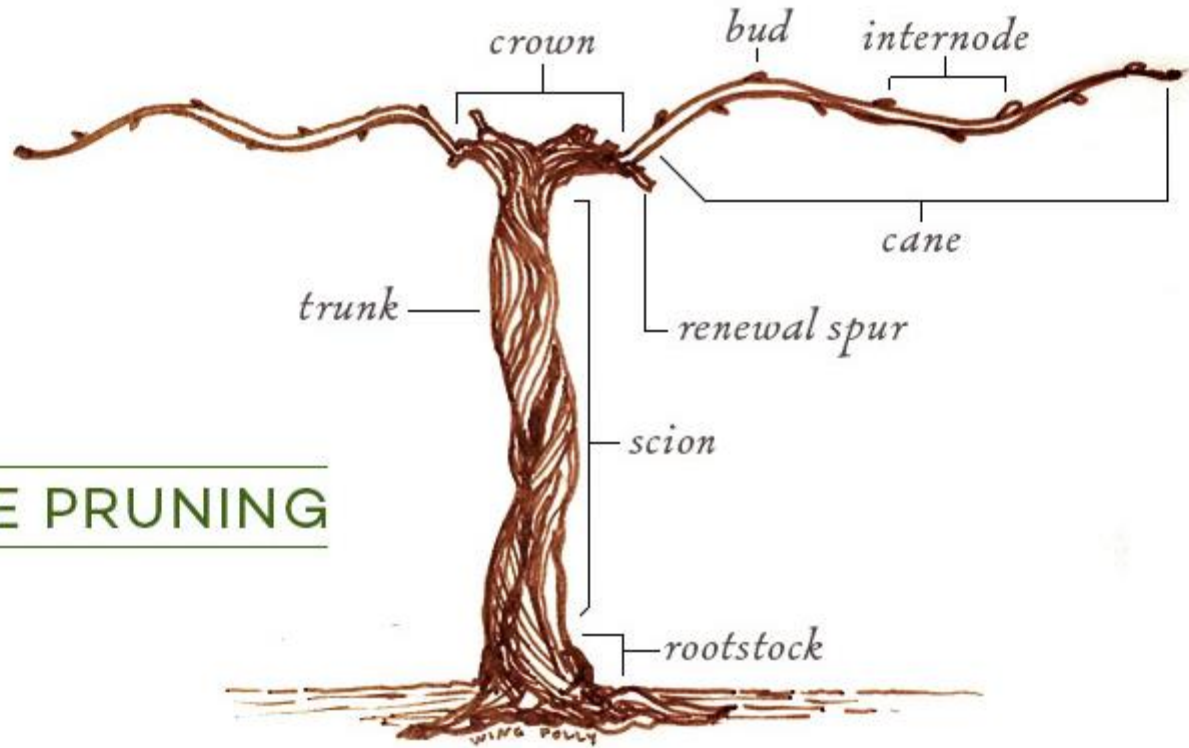


*goblet / head*

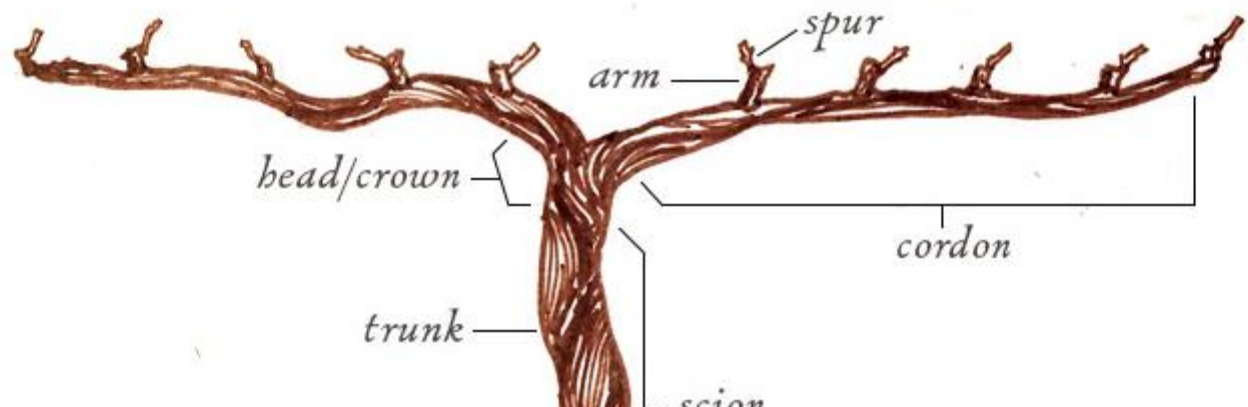
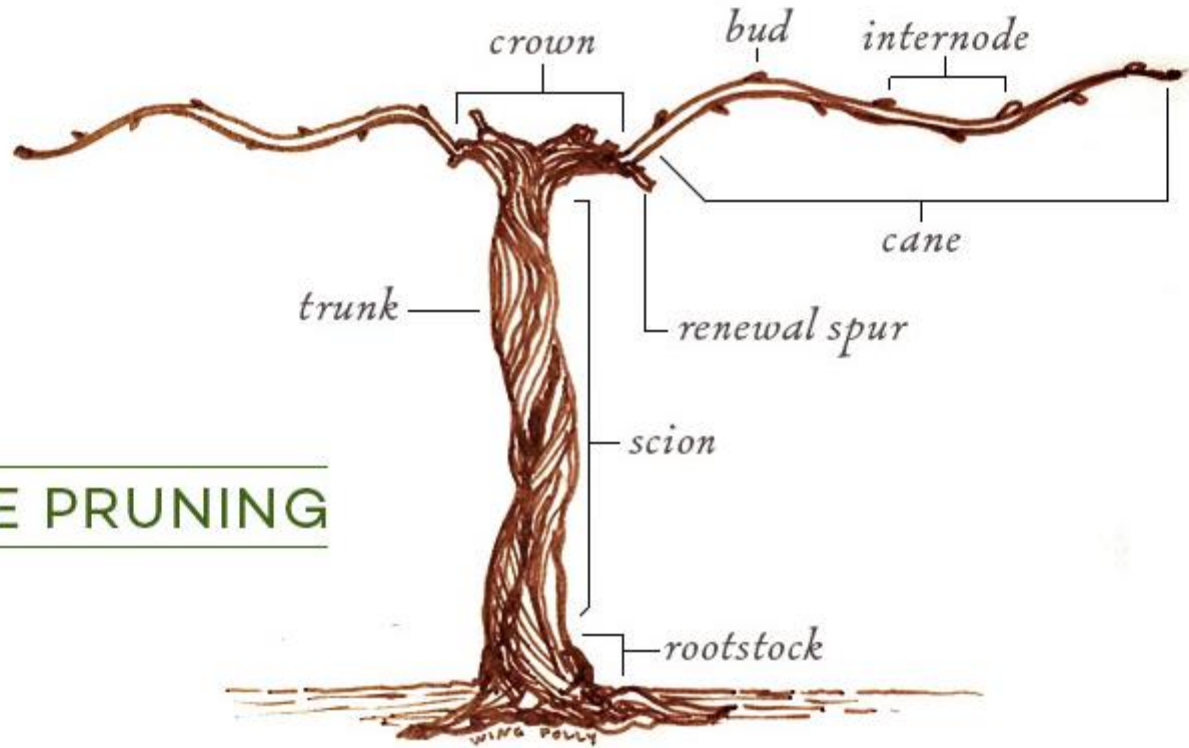


*basket / kouloura*

# CANE PRUNING

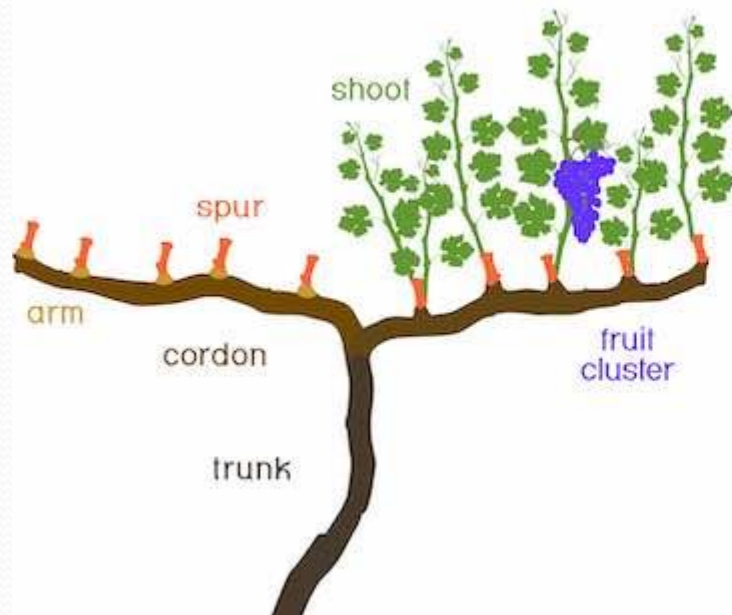


# CANE PRUNING

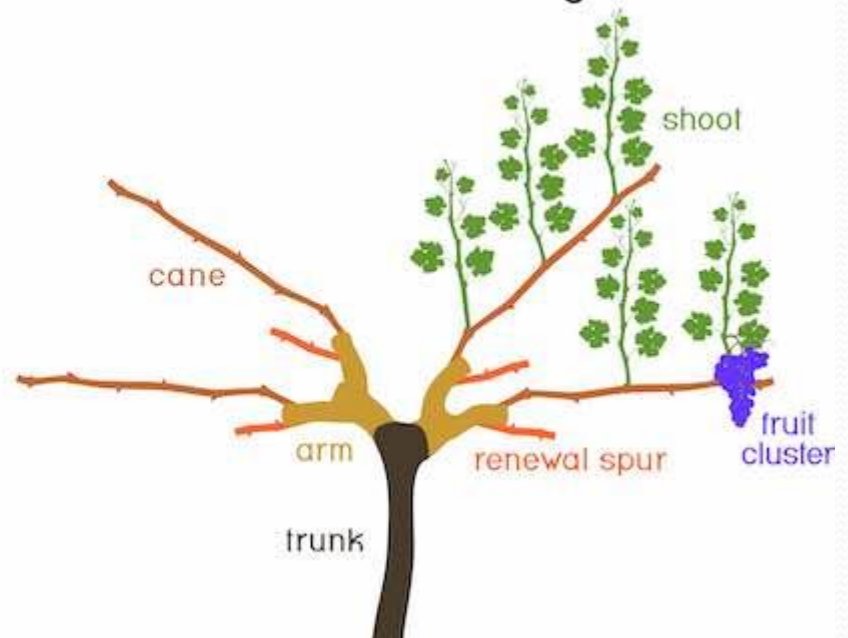




spur pruning



cane pruning



# Yield pruning

- After the training process, the physiological balance is established in the trees. Yield pruning is done in order to maintain this balance for a long time.

# Principles:

- More severe pruning is required as trees age (Short cutting)
- Branches that grow excessively on the main branches should be shortened.
- The formation of new branches is encouraged by cutting the main and auxiliary branches short.
- Dry, diseased and weakened branches are removed.
- If too many fruit branches are formed on a main or auxiliary branch, thinning is done.
- Branches that have been opened due to the weight of the fruit are restored by connecting to other branches.

# Please read

- <https://extension.psu.edu/fruit-tree-pruning-basic-principles#:~:text=There%20are%20two%20types%20of,and%20for%20removing%20excess%20shoots>.

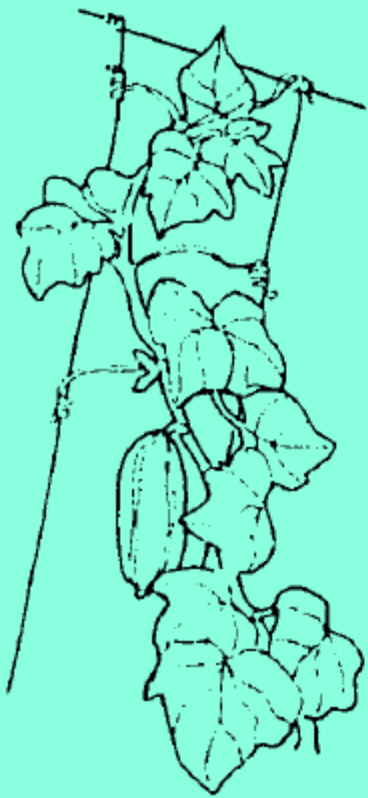
- Pruning based on the pruning time in horticultural plants:
- 1. Winter pruning (during dormancy period, one-year shoots are pruned)
- 2. Summer pruning (green pruning-during vegetation period, removing of leaves, fruit thinning etc.)

# PRUNING IN VEGETABLES

- Training and pruning are done only in some vegetable species such as tomatoes, cucumbers and melons.
- They are mostly applied under greenhouse cultivation conditions.

# Stacking

- With few exceptions, all viny vegetables are staked. There are three types of plants for purposes of staking: 1. Plants (such as cucurbits) with special structures such as tendrils which allow them to climb;
- 2. Plants that twine (such as yard-long beans)
- 3. Plants (such as tomatoes) that do not have the natural ability to climb and must, therefore, be tied to the stakes.
- Staking facilitates management operations, such as irrigation, inter tillage, pest control, and harvesting.
- It also helps produce better products.



A



B



C

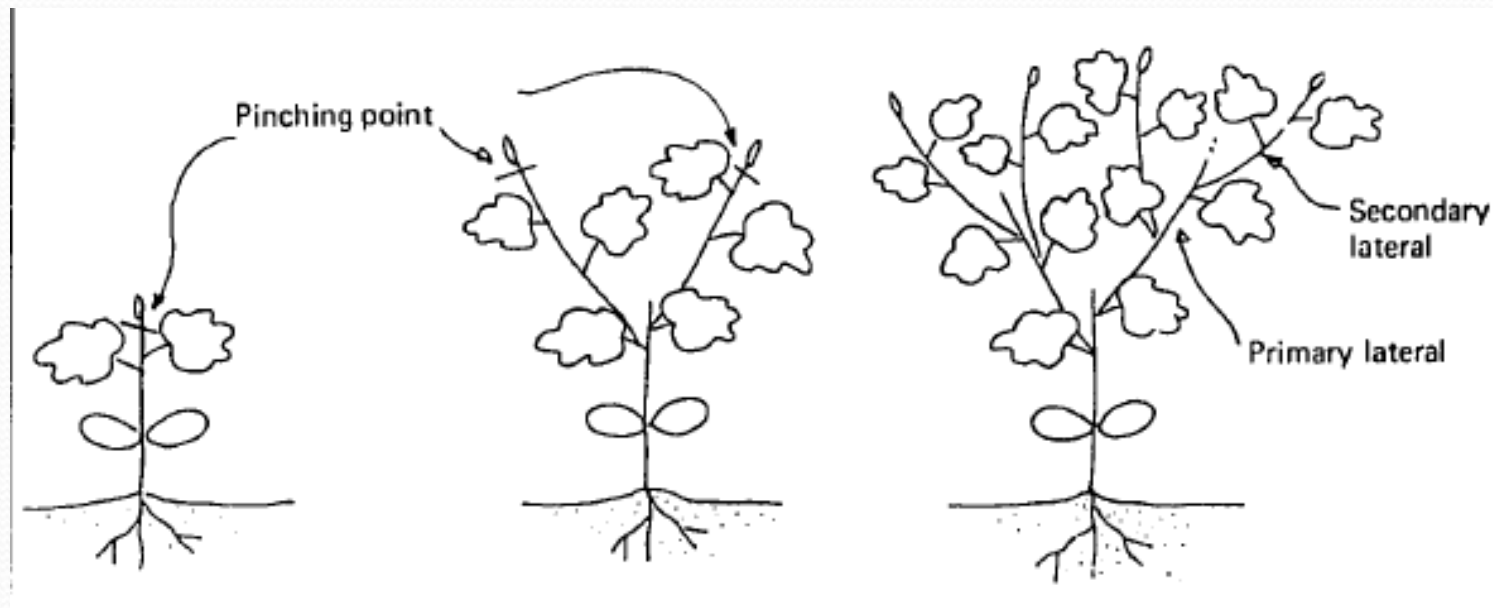
- Methods of staking: (a) for climbing plants, (b) for twining plants, and (c) for plants that do not have the ability to climb or twine.



- Pruning has many uses in vegetable production. In indeterminate tomatoes, pruning results in single-stem plants which can easily be tied to the stake. The fruits are consequently larger because the plant's nutrients are not diverted to the branches. More plants can also be grown in an area.

- In the case of cucurbits, such as *Luffa*, pruning of the tip of the seedling stimulates early branching and fruiting on lower nodes. A distinct method of pruning is done on mature plants that have declined in productivity. In this case, the main stem is cut 20 cm from the ground and stimulated to produce new branches by applying fertilizer and irrigation. The result is a ratoon crop, which starts to produce fruits sooner than if seed planting is done instead. However, the yields are usually lower. The practice of ratooning works very well with some varieties of okra and eggplant during the wet season.

Pruning should be done with a sharp blade to minimize damage to the plant tissues and to facilitate recovery. To prevent spread of diseases, the blade should be dipped regularly in detergent solution.



- Procedure for pruning of Luffa: a) pinching of main stem, b) pinching of primary lateral, c) secondary laterals are formed.

# Fruit Thinning

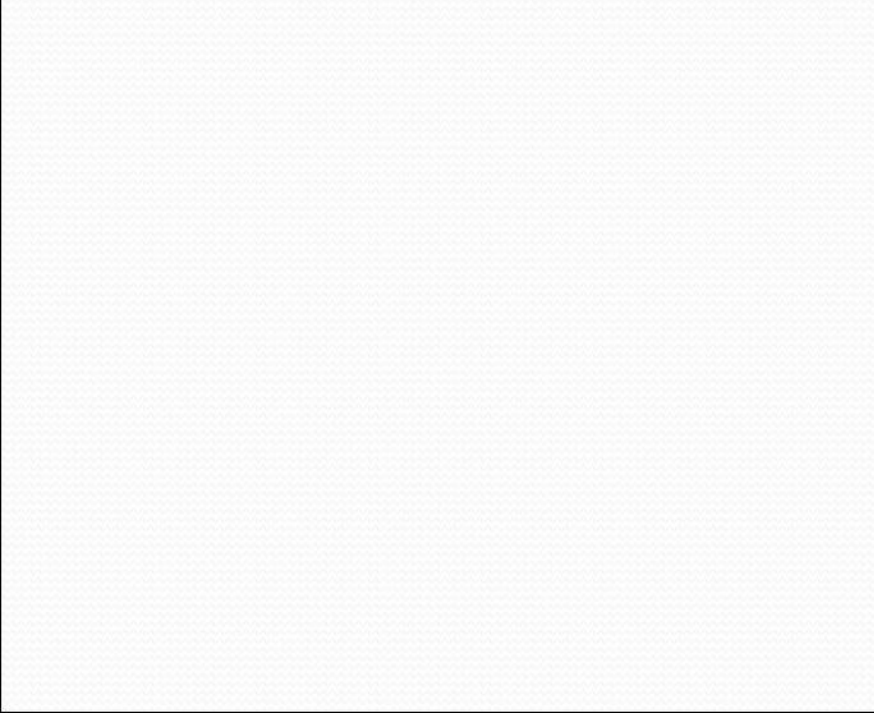
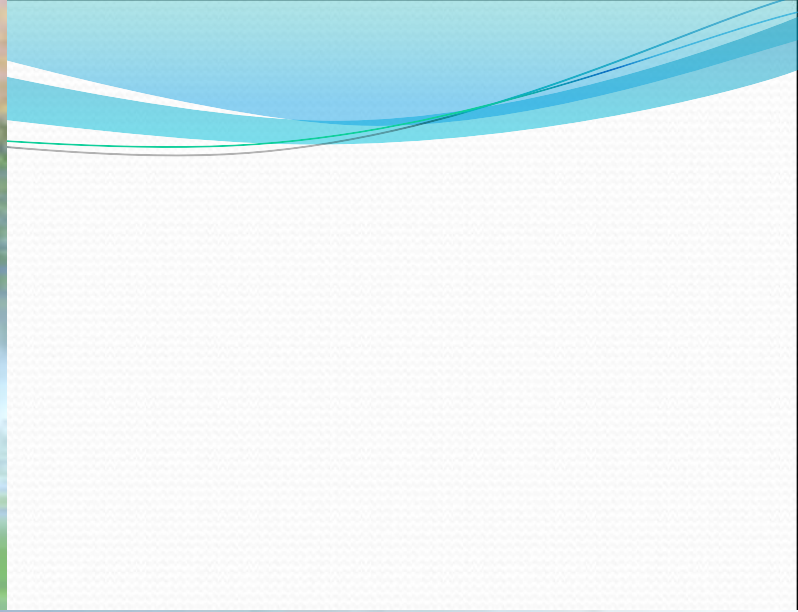
- To control fruit size, some fruits are removed before they enlarge. Some plants, particularly cucurbits, produce female flowers and set fruit so early that vegetative growth is still insufficient to support the normal growth of the fruit.
- When this happens, further vegetative growth is restricted, while additional fruit setting and development is equally affected.
- To promote the formation of bigger and better fruits, the first one or two fruits on the vine is removed. The number of fruits per vine is subsequently limited to one. The practice of fruit thinning is widely used in melons and watermelons

# Promoting fruit set in vegetables

- Promoting fruit set. When tomatoes are grown under unfavorable conditions, such as during summer in tropical countries, the usual problem is low fruit set. The problem is due to high night temperatures (above 22°C) and high humidity which result in poor pollination and flower fertilization. Although the problem is solved with the use of heat tolerant cultivars, these are inadequate under extreme conditions. Application of plant growth regulators has been shown to improve fruit setting, particularly in varieties that have low level of heat tolerance.
- Synthetic plant growth regulators (PGRs), such as 4-chlorophesoxycetic acid (CPA) now used commercially in Korea, Japan, and China are known to influence fruit setting in tomatoes. These are applied at 50 mg/L as a spray on flower clusters when they are in bloom. Spraying is usually done on each cluster at 7-to 14-day intervals, starting with the first cluster. It is claimed that the treatment increases fruit set and fruit size and induces early yields. However, it may cause puffy fruits at high concentrations or under
- high temperatures.

# IRRIGATION-time-density

- It has an important effect on the many physiological events in horticultural plants.
- Drip irrigation
- Flood irrigation
- Avoiding excessive irrigation
- Critical irrigation times:
  - 1. At the beginning of the vegetation period
  - 2. During fruit ripening
  - 3. After harvest





20. 11. 2023



# Determination of irrigation time

- For determination of irrigation time we have to measure humidity in the soil.
- We have to make irrigation when the soil water capacity decreased to 50-25%.
- Another way to determine irrigation time is to observe the situation of plant. But this is not a good method. In this method we can check yellowing in leaves, wilting but this time can be late for irrigation and the plant can be die because of lack of water.

# Irrigation time

- In perennial plants:
  - Winter irrigation : It is necessary in places which do not have enough winter rainfall.
  - Spring irrigation
  - Summer irrigation
  - Autumn irrigation
- For vegetable species, irrigation time depends on:
  - Soil structure
  - Water requirement of plant
  - Development stage and root depth of plant
  - Temperature, humidity and wind.

**The amount of water to be given in each irrigation consists of meeting the losses caused by evaporation and transpiration.**

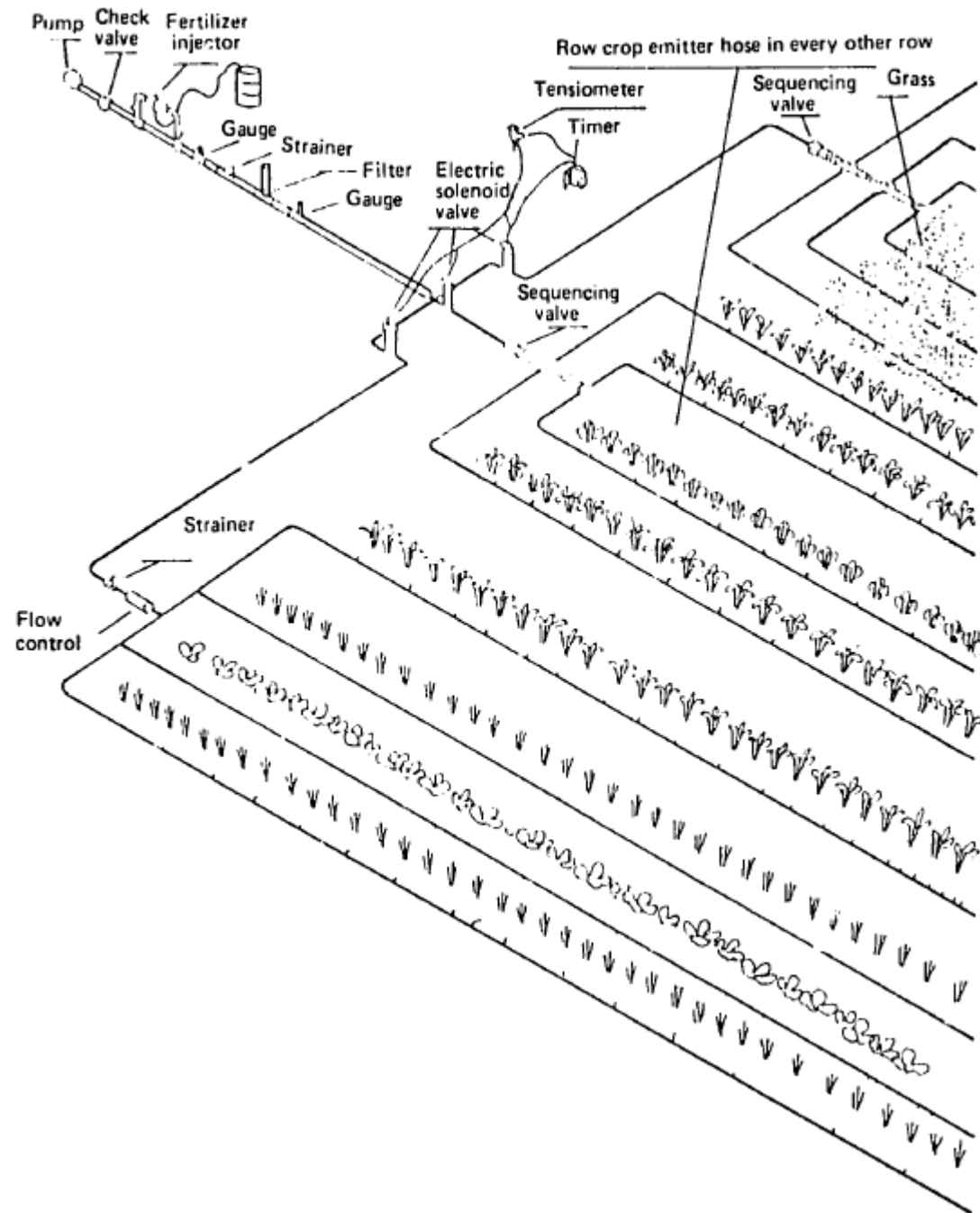
# Quality of irrigation water

- It shouldn't be cold
- It must be ventilated
- It should not have foreign matter
- It should not be salty or chalky (salinity 2-10 mmhos/cm)

# Irrigation in vegetable species

- Vegetables are very sensitive to water because they are herbaceous plants, grow very fast, contain a lot of water in their body, and their roots are very close to the surface of the soil.
- Every irrigation type can be applied in the cultivation of vegetable species.
- For irrigation water:
- Salinity must be between 0-7.5 mL/L.
- 7.5-17.5 mg/L can be used for many types of vegetables if drainage conditions are good.
- Irrigation water temperature should be 1-2°C above the soil temperature during irrigation procedure.
- Irrigation water must be clean.

**Drip irrigation is better for also vegetable species. Drip irrigation layout in vegetable garden.**



# FERTILIZATION IN HORTICULTURAL PLANTS

- Giving the nutrients required by the plant to the soil or to the plant in different ways is called "fertilization".

# Nutrients

- The plants need 16 different nutrients for optimum growing:
- CO<sub>2</sub>: obtained from atmosphere
- H<sub>2</sub> ve O<sub>2</sub>: obtained from water and atmosphere
- Other nutrients can be taken from the soil:
- N, P, K, Ca, Mg, S: macro nutrients
- Fe, Mn, Zn, B, Mo, Cu, Cl: micro nutrients

# Nutrient deficiencies in leaf of tea plant

Calcium

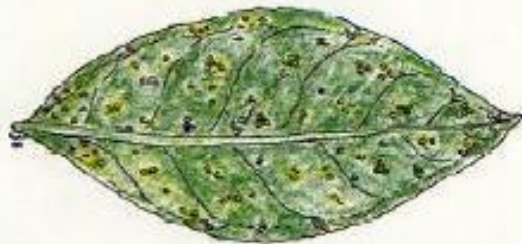


Magnesium



Boron

(under-side of leaf; oily spots)



Manganese





# Calcium deficiency in tomato fruit (blossom-end rot)



Bitter pit in apple fruit because  
of low Ca/Mg rate



# Fertilizer types

- Organic fertilizers: They are made from natural and organic materials—mainly manure, compost, or other animal and plant products. These fertilizers are a great source of nutrients, though there isn't a measurable amount of any specific nutrients. Organic fertilizers tend to work slowly and over the long-term. It can help to build up your soil over time.
- They can help to make better the soil structure.





- 2. Inorganic fertilizers

- Inorganic fertilizers are made of up chemical components that contain necessary nutrients.
- Nitrogen Fertilizers
- Phosphate Fertilizers
- Potassium Fertilizers

- The nitrogen fertilizer should be applied during spring, phosphate and potassium fertilizers should be applied at the end of autumn or beginning of the winter in perennial plants.
- In vegetable cultivation:
- Organic fertilizers are applied in autumn, phosphorus fertilizers are applied at planting time, nitrogen fertilizers should be applied by dividing into 2-4 sections.

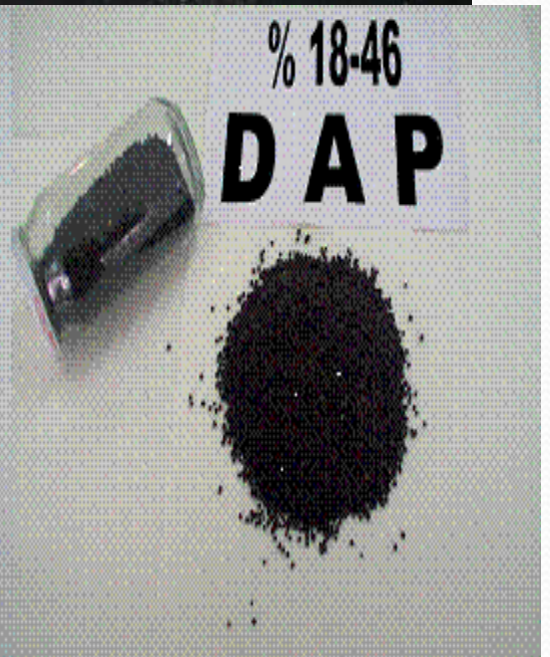
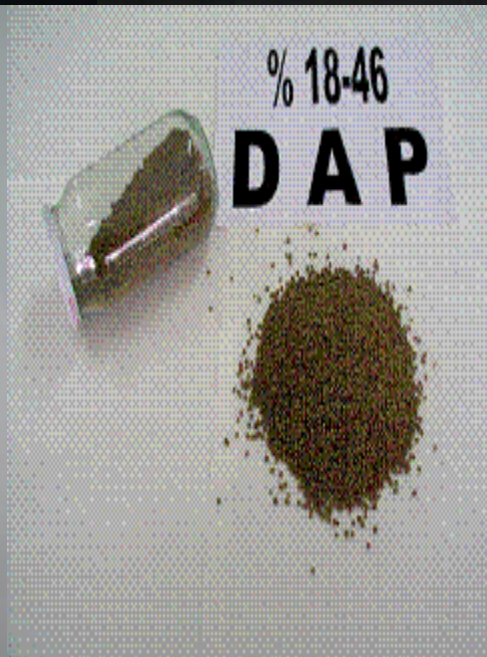
# Fertilizer Forms

- Fertilizer comes in a few different forms. There is liquid, powder, and granular. Liquid fertilizers are often diluted with water. Spreading them is similar to watering in the orchard, usually done with a hose attachment.
- Powdered fertilizers also need water to be productive. Usually they are spread by hand and watered to complete absorption. Granular lawn fertilizers can easily be spread on top of soil.

# Classification of fertilizers

- Single nutrient ("straight") fertilizers
- Multinutrient fertilizers
- Micronutrients







# Before applying fertilization

- **It is necessary to make soil and leaf analyses to check the nutrient status.**
- If there a lackness of a nutrient we have to apply the fertilization.
- But in soilless cultivation, fertilization is necessary for every time for optimum growing.
- Fertilizers can be applied as solid (on the ground or into ground) or as liquid (to the leaves, foliar application)

# Nitrogen fertilization to the ground



# Weed, pest and disease control

- Managing weeds in horticultural plant production, whether in field soil, greenhouses, or outdoor containers, can be difficult but is essential to successful production.
- Weeds not only compete with the crop for plant nutrients and sunlight but are also unsightly and do not meet clean nursery quality standards. In addition, horticultural plants infested with certain noxious weeds cannot be sold because of quarantine regulations.

# Weed, pest and disease control

- Because of the high value of ornamental crops and the limited number of herbicides available, growers often resort to costly hand-weeding. However, many of the strategies used in vegetable row crops or tree crops can be adapted for use in field-grown trees and cut flower production.
- For example, planting in rows allows the field to be more easily cultivated by hand or mechanically. The use of drip irrigation in tree or shrub production greatly reduces excessively wet areas, thus reducing the germination and growth of weeds.

# Prevention of weed growth

- The most important factor in overall weed control is to prevent weeds from developing seed and perpetuating the weed problem.
- Sources of weed introduction include weedy stock, weed seeds in the growing area or nearby, or plant propagules in manure, soil, uncomposted yard waste, or other organic matter sources.

# Prevention

- Many growers cultivate or treat the margins of the property with herbicides to reduce the number of windborne or water-carried seeds that can move to the growing area. Screens on open-water inflow sources can be installed to keep out water-borne seeds. When using fine-mesh screens, increasing the surface area of the water intake and periodic debris removal may be needed to avoid clogging of the water flow.
- We can control the weeds as mechanically or chemically (using of herbicides).



# Pest and Dieases

- Integrated pest and disease management has been suggested in recent years.
- chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.fao.org/3/i5475e/i5475e.pdf
- Please download and read and learn

# Integrated Pest and Disease Management

- IPM (integrated pest management)
- is a sustainable approach to managing pests by combining
- biological,
- chemical,
- cultural, and
- physical tools
- in a way that minimizes economic, health, and environmental risks.

# What is a Pest?

- A plant or animal that is out of place
- This includes: Diseases, Weeds, Arthropods, Reptiles, Mammals, etc.
- Pest management toolbox:
  - Cultural control
  - Physical control
  - Biological control
  - Chemical control

# Cultural Control

- Use pest free plants
- Use resistant cultivars
- Destroy refuse

Stressed plants are generally  
more susceptible  
to pest attack

# Physical control



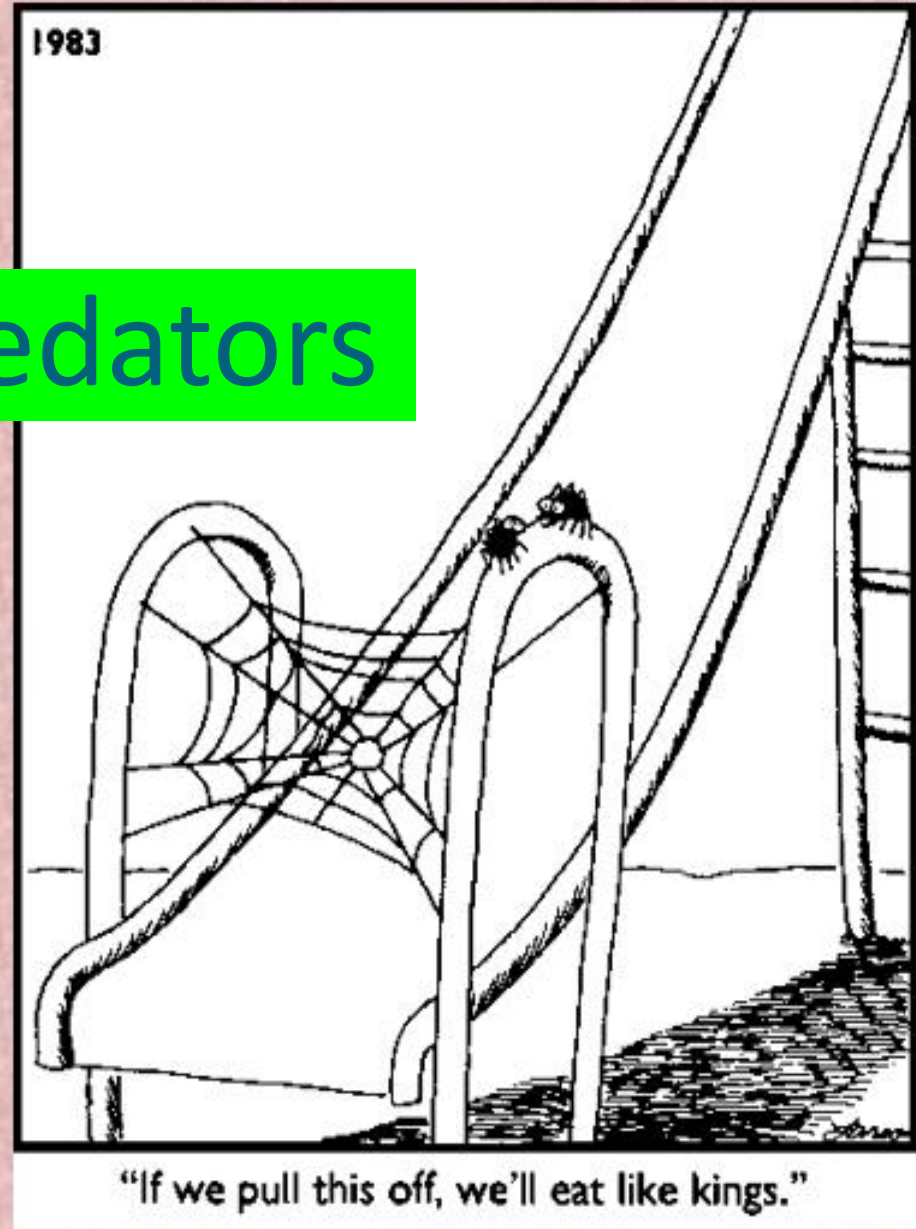
Usually most labor intensive

# Biological Control

- The use of living organisms to control pests

Predators

- **Predators**
- **Parasites**
- **Pathogens**



# Parasite

- Very stealthy and often small
- Leave a trail of bodies
- Very specialized
- Develop from eggs laid in or on host (think “Aliens”)



**Parasitized  
aphids**

**Healthy  
aphids**

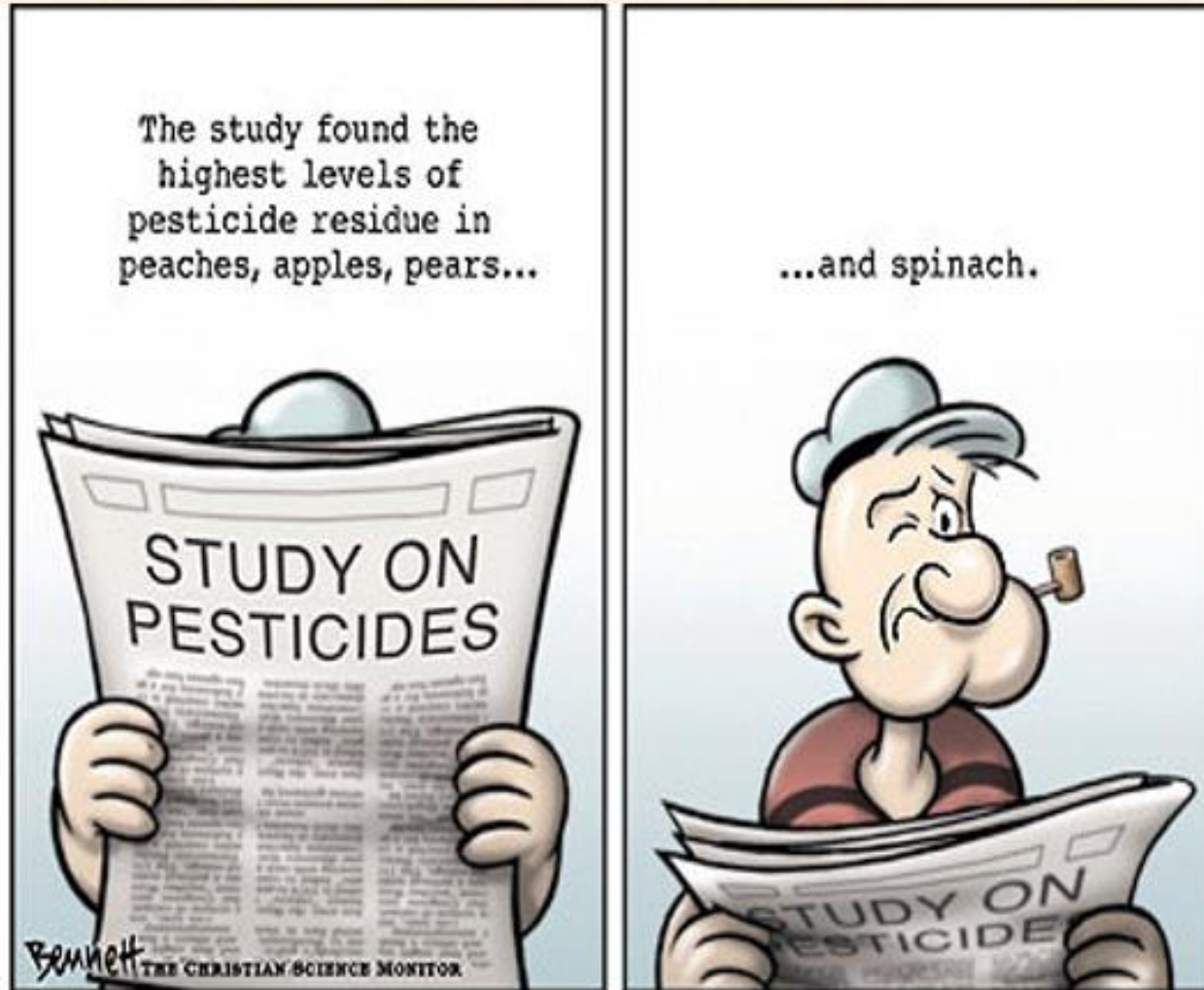
# Pathogens



- Usually very specific
- leave a trail of bodies
- may take a few days to provide control (lag time)
- kill, reduce reproduction, reduce insect health



# Chemical control



- Should be used as a last resort and with the lowest impact on natural enemies and YOU!