

# ESTABLISHING OF ORCHARD AND VINEYARD -PLANTING SYSTEMS-

## Before establishing of fruit orchard and vineyard, we have to evaluate some parameters such as:

- 1- Site (land) selection
- 2- Species and cultivar selection
- 3- Rootstock selection
- 4- We have to know pollination requirement of species or cultivar which will be growth.
- 5- We have to decide the planting systems and planting density
- 6- Additionally we have to determine and decide type of nursery plant (grafted or non-grafted) and number of nursery plant type
- 7- Planting time
- 8- Land (soil) preparation before planting
- 9- Intercropping

# Factors affecting the successful in grape and fruit cultivation:

- Site selection
- Rootstock and cultivar s
- Economical conditions
- Soil management
- Planting systems and planting density
- Nursery plant type
- Parcellation and dug of planting pits
- Planting time
- Planting



# SITE SELECTION

- In site selection, valleys, proximity to large water surfaces such as lakes, heights, topography are important. If there is erosion possibility, we have to apply some precautions for preventing erosion. If the land is very sloping, terracing should be done.
- While choosing a site, the climate, soil characteristics and water availability of that place should be examined.

# Grape:


- A perennial garden plant.
- Economic life 35-45 years.
- Therefore, the facility should be planned very well.

# Climate

- Temperature
- Light period
- Rainfall
- Relative humidity
- Freezing
- Wind


# Climate

- Winter low temperatures, late spring and early autumn frosts are very important factors affecting species and cultivar selection. Moreover, meeting of chilling requirement period and duration of summer vegetation period should be taken into consideration in order to decide suitability of a site for fruit species and grape cultivation.

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- Vegetation period: The vegetation period is the period between the last spring frosts and the early autumn frosts. Flowers and small fruits of temperate climate fruit species are sensitive to late spring frosts, mature fruits and strongly developing shoots are sensitive to early autumn frosts. As latitude and altitude increase, vegetation period becomes shorter. In this type of areas, late spring and early autumn frosts are dominant. Late maturing fruit species cannot be grown in these regions.



- Accumulated heat unit requirement of the fruit species and grapes in order to ripen their fruits during the vegetation period must be met in the selected site where the fruit species and grape will be grown or cultivated. For example, Granny Smith apple cultivar needs a long development period with hot weather conditions and sites having similar climate conditions are very limited.

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- Low winter temperatures
  - Early fall (autumn) frosts
  - Late spring frosts
  - Duration of summer vegetation period should be evaluated before establishing of orchard.

# Vegetation period

Vegetation Period is the period between the last spring frosts and early autumn frosts. Flowers and small fruits of temperate climate fruit species are sensitive to late spring frosts. Strongly developing shoots with mature fruits are sensitive to early autumn frosts. As the latitude and altitude increase, the vegetation period gets shorter. In this type of areas, late spring and early autumn frosts are dominant. Late maturing fruit species cannot be grown in these regions.

# Accumulated Heat Unit

The demand for the total temperature required by the fruit species in order to ripen their fruits during the vegetation period.

The growing regions of fruit species that need a long and hot growing season are quite limited. For example, the Granny Smith apple cultivar.

# Soil

- The most suitable soils for fruit species have these characteristics:
- Deep,
- Productive,
- Well ventilated,
- Without harmful acid, alkali and salt accumulation,
- Not too heavy
- Easy to manage
- Sandy, sandy-loamy, clayey-loamy ones.

# We can find these kind of soils in some sites below:

- In deltas and river beds at the mouth of rivers
- Alluvial areas formed at the mouths of canyons opening to wide valleys.
- In rocky areas with very good drainage

# Site characteristics for fruit orchard:

- Soil depth should not be less than 120 cm,
- pH 5.5-6.5 is suitable for most fruit types.
- Chlorosis can occur when the pH is 7.3.
- Ground water; in the summer months, it is necessary to make drainage in places higher than 1 m.

# WATER AVAILABILITY

- In an area where an orchard will be established, there should be sufficient amount of water to allow regular irrigation.



# Site characteristics for grape cultivation

- In Grape: Ripening begins when the daily average temperature rises above 10°C.
- It requires an average temperature of 18°C during vegetation period.
- Yearly average temperature should be higher than 9°C.
- Accumulated heat unit should be 900 day-degree.
- Vegetation period is 160 days.
- In places that heat up quickly and receive plenty of sun, the quality of the grapes will also be high.
- The vine requires 1300 hours of sunshine in a vegetation period.
- Grapes can be grown without irrigation in areas with an average annual precipitation of 500-600 mm.
- Winter and early spring precipitations affect the plant development positively, while precipitation during the flowering period prevents pollination and fruit set.

- Late spring frosts during the shooting and flowering period limit grape cultivation.
- The green organs is damaged because of temperatures lower than  $-1^{\circ}\text{C}$ .
- Early autumn frost: It causes freezing of the crop on the vine, and the shoots entering the winter before they are well matured. It causes shoots and young vines to dry out by being damaged by cold.
- In places where the winter is very harsh and the temperature drops below  $-20^{\circ}\text{C}$ , vineyards are damaged.

# Wind????

- Winds with a speed of 1-4 m/s help fertilization during flowering and pollination. Zararlı rüzgarlar;



# Soil conditions

- Soils with good water holding capacity, deep well aeration, salinity, calcification and a ground water height of less than 50-60 cm are suitable for vine cultivation.

# Directions

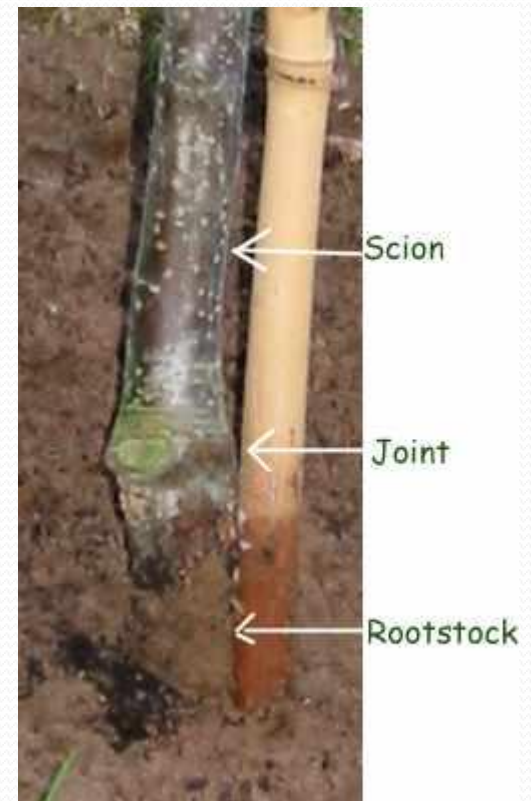
- South-southwest directions, where the sun's rays are steeper and warmer in regions with cold winters,
- In regions where late spring frosts are common, northern directions should be preferred to prevent early plowing.

# Selection of species or cultivar

- For this purpose, first of all, the varieties grown in the region should be carefully monitored.
- Species and cultivars should be selected by taking into account the characteristics such as earliness characteristics of the region, soil-borne diseases etc.

# Rootstock selection

- Soil structure
- Ground water
- Soil borne diseases are important characteristics
- E.g., peach seedlings, nemaguard rootstocks are sensitive to soils with high humidity.





# The effect of rootstock on the growth of the cultivar

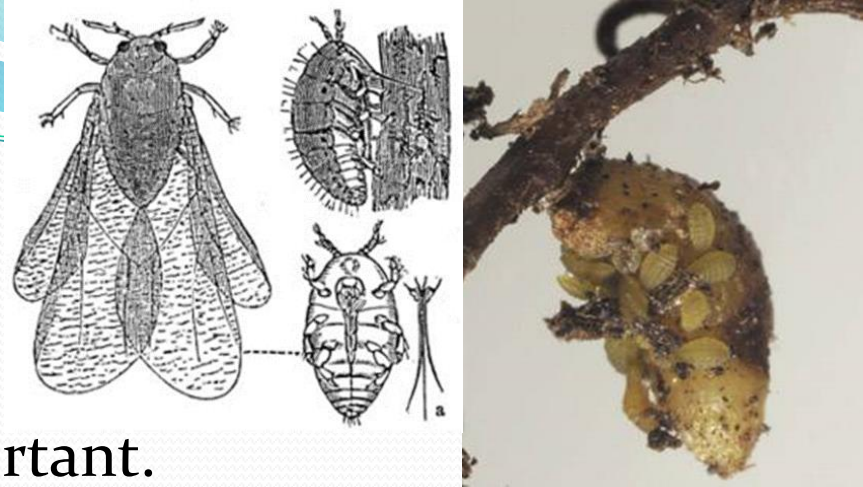
- Quince-pear combination







# In Grape



- Rootstock selection is very important.
- Because some of the soils can be contaminated with PHYLLOXERA ( a kind of small soil insect, *Daktulosphaira vitifoliae*).
- Some of the clonal rootstocks are resistant to this insects. If there is phylloxera problems, the resistant rootstocks should be used because the roots of the cultivars are not resistant to phylloxera.
- Moreover, there different clonal rootstocks for grape cultivars. They have different characteristics based on growth habit, tolerance to salinity or calcium levels in the soil.

# For cultivar selection:

- The cultivar:
- Should be well adapted to the region,
- Should have high market value,

# Pollination requirement for fruit trees


- Most fruit species are self-fertile.
- However, the pollination status of the cultivar must be known and accordingly, a pollinator cultivar should be placed in the orchard.

# PLANTING SYSTEMS AND PLANTING DENSITY

- Determination of planting spaces can be done based on these factors:
  - Growth and development of rootstock and cultivar
  - Planting type
  - Soil structure
  - Irrigation type
  - Soil and air humidity
  - Intercropping
  - Mechanization

Vineyards can be established with row spaces such as ;1.5 x 2.5m  
1.5 x 3m  
2x3m

Although 3 x 3 m row spaces are applied, 1.5 x 3 m and 2 x 3 m spaces are generally used.

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- Before planting, a planting plan should be prepared.  
Benefits of preparing a planting plan:
  - The locations of the cultivars in the orchard and the number of seedlings/nursery plants required for establishing are calculated.
  - Helps to irrigation planning and equipment use.
  - For example: for soil management equipment turning places are determined at the end of the rows.

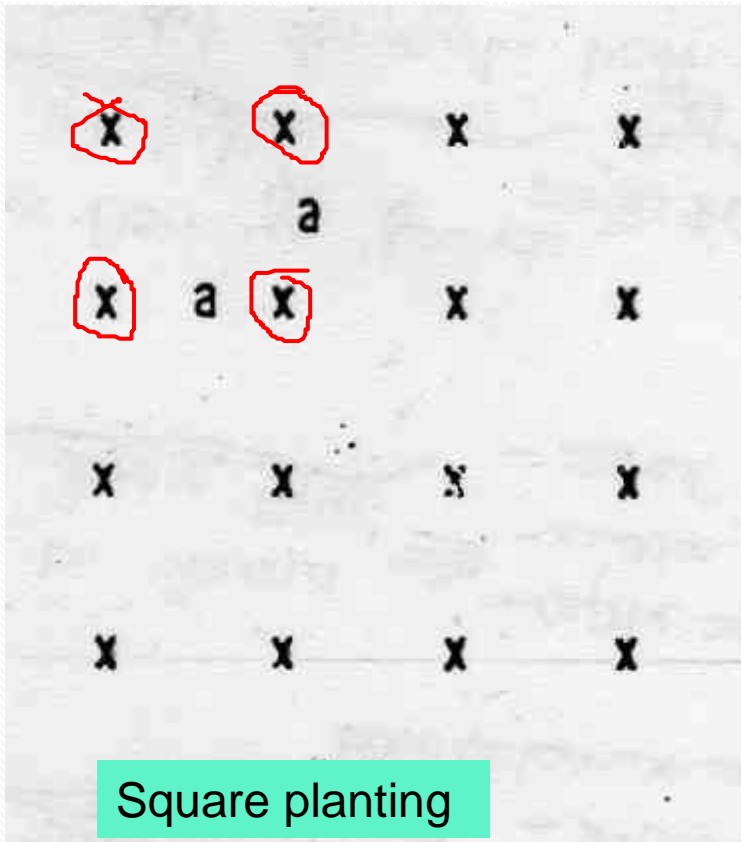


# Planting systems

- Square
- Rectangle
- Chess
- Triangle
- Contour
- Single wall system
- Multi-wall system

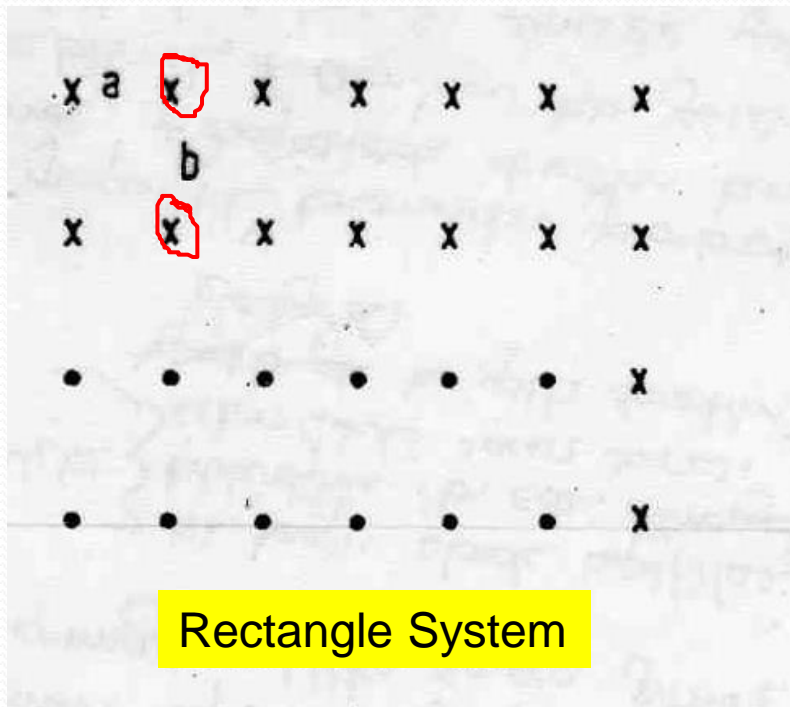


# Square system



- Number of seedlings/nursery plants required for one acre  
area =  $1000 / a^2$
- a: length of one side of the square (m)

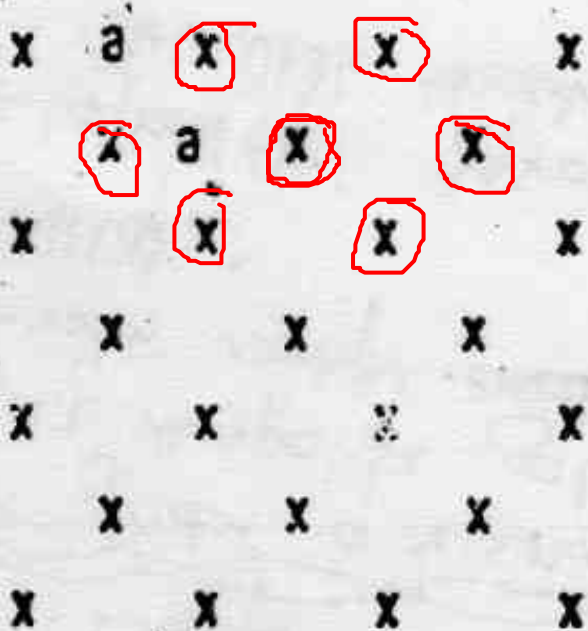
# Rectangle planting system



- Number of seedlings/nursery plants required for one acre area =  $1000 / a \times b$
- a: short side length of rectangle (m)
- b: long side length of rectangle (m)

# Chess Planting System

- It is a form of planting done to get more products and income in the early period. Trees planted in the center of the square are removed before the garden becomes denser.

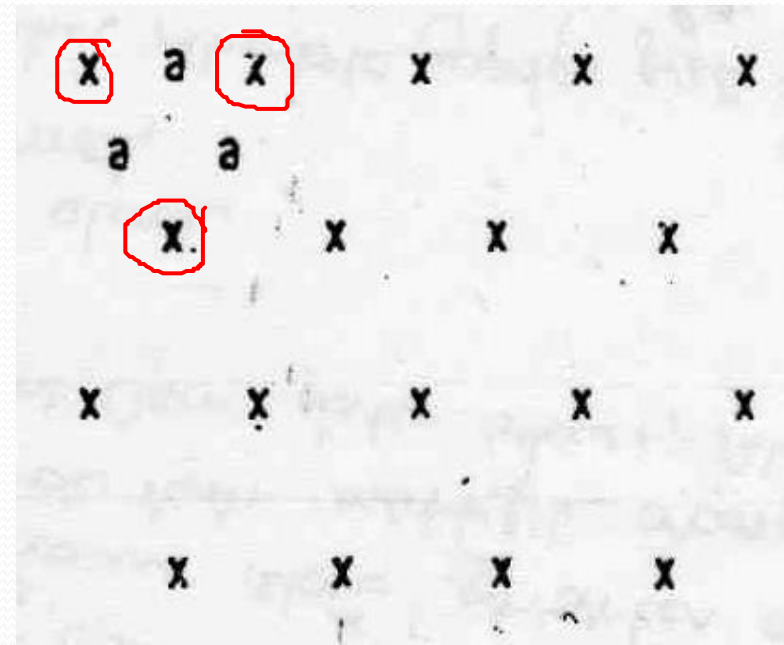


Chess system

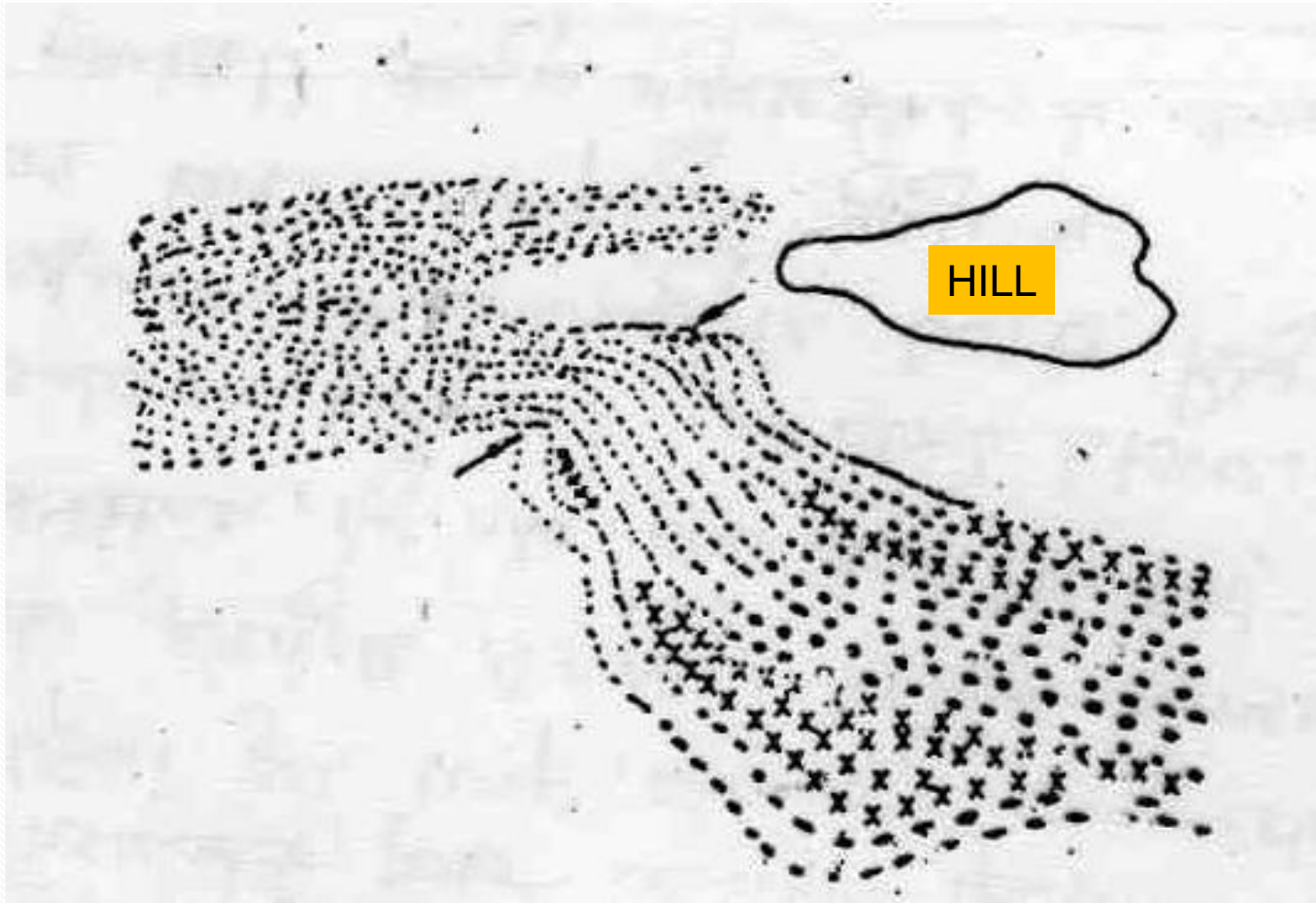
# Triangle Planting System

- Number of seedlings/nursery plants required for one acre area=  $(1000/a^2)1.15$

- Equilateral triangle



# Contour Planting System

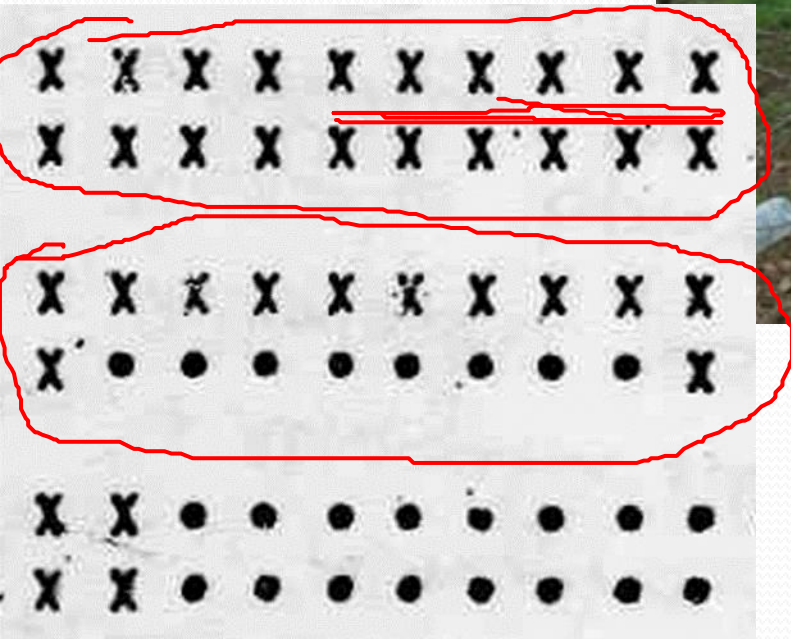








# Wall System



# Seedling/nursery plant type:

- Seedlings/nursery plants should be ordered at least 9 months before planting.
- 1 year old seedlings should be preferred for planting. Because;
- An old seedling is cheaper.
- It is easier to transport.
- Planting is easier as the plants are small.
- Growth begins earlier.
- The grower has the opportunity to choose the branch he wants to form the top of the tree.
- Trees grows stronger and healthier.



# The Planting Time

- The planting time can change based on these factors:
  - Climate
  - Species
  - Soil conditions
  - Water

# When???

- For fruit trees and grapes:
- If the winter season is cold and dry, if there is no thick snow cover on the soil, the planting time is SPRING.
- WINTER months should be preferred if the soil does not freeze deeply in winter, if there is a thick snow cover on the soil, and if the winter months are warm.

# Before planting:

- If there are pit cuts in the orchard facility area, leveling must be done.
- The soil should be cultivated at a depth of at least 50 cm.
- Parcellation should be done. Parceling is the marking of the places where the seedling/nursery plants will be planted.
- Planting pits of the nursery plant should be dug in the places marked with parceling, where the plants will be planted.

# Size of pits

- The pits where seedlings/nursery plants will be planted should be opened with a width of 75 cm and a depth of at least 30 cm.
- However, if 2 and 3 year old seedlings/nursery plants are used, the pit depth can be increased up to 60 cm.

# Before planting:

- A good root pruning should be applied to the seedlings/nursery plants.
- Diseased and damaged roots should be cut,
- Overlapping roots should be diluted,
- Wounding should be done on capillary roots because wounding encourages new root formation.

# Grape nursery plant before planting

Before pruning

After pruning



# Planting

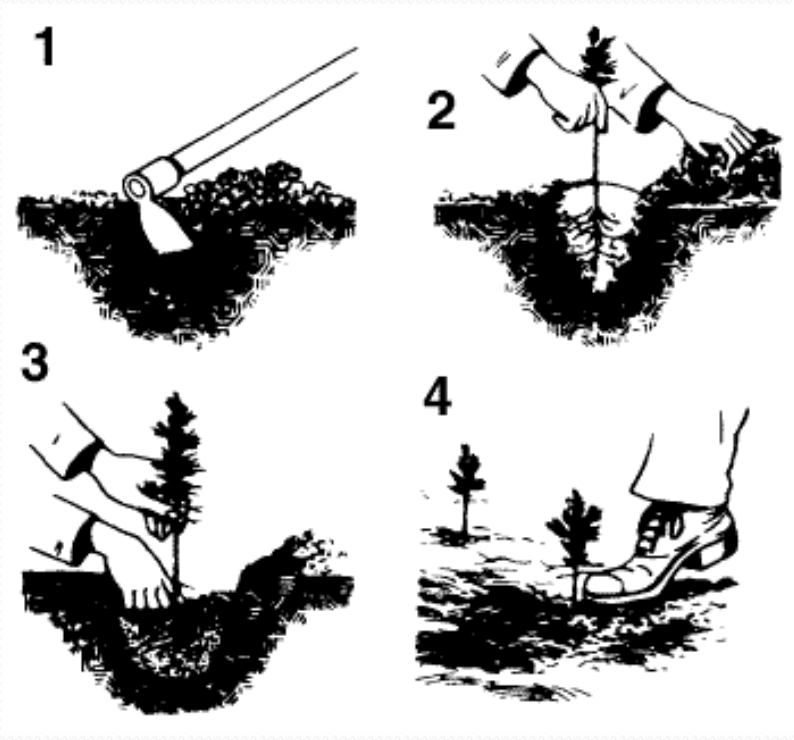
# During planting;

- The roots should be in close contact with the soil, the soil should be well compacted.

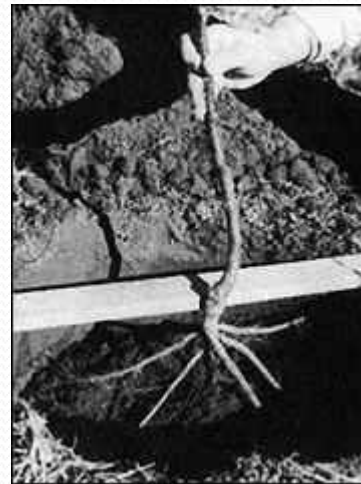


- During planting, organic matter should be supplemented around the roots. For this purpose, 1 shovel of burnt barn manure should be placed in each plant pit. However, when the fertilizer is not burned, it can cause the roots of the plants to burn and the seedling/nursery plants to die.
- The grafting site (point) of the nursery plant should remain 5 cm above the soil surface during planting.
- After planting, the plants must be irrigated. This first water is called the «water of life». Life water helps the roots to come into contact with the nutrients more quickly. The next should be done 10 days after planting.

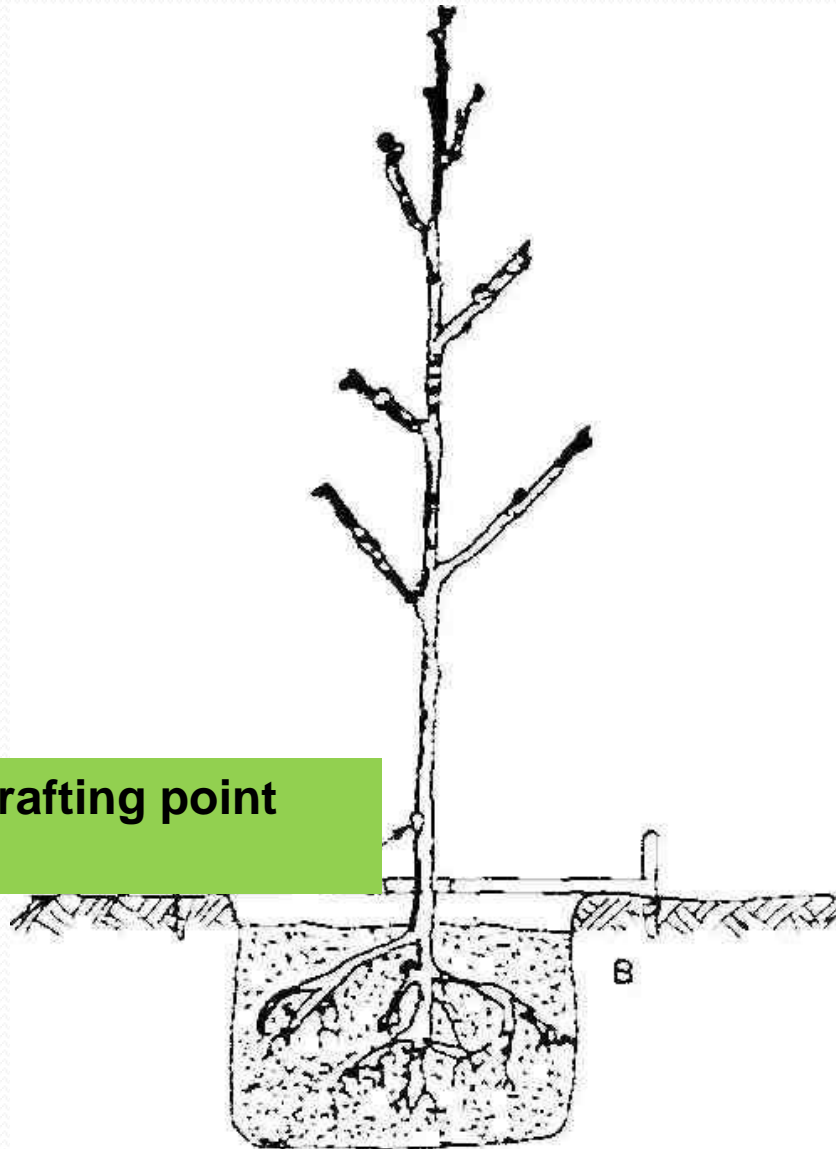
# Planting of small plants



# Planting of fruit nursery plants



**Grafting point**

















- [https://www.youtube.com/watch?v=zyO\\_c6kIXCk](https://www.youtube.com/watch?v=zyO_c6kIXCk)
- <https://www.youtube.com/watch?v=IjZILcRf3q8>
- <https://www.youtube.com/watch?v=JhkUuooejao>



# Intercropping

- Intercropping: Cultivation done in the empty spaces between rows in the first years of orchards.
- It is removed as the trees grow. Because intercropping during the 3-years retards the development of nursery plants for 1 year.
- For intercropping, beans, melons, strawberry, herbs can be cultivated.