



INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ



Inovace studijních programů AF a ZF MENDELU
směřující k vytvoření mezioborové integrace
CZ.1.07/2.2.00/28.0302

**Tato prezentace je spolufinancovaná z Evropského sociálního fondu
a státního rozpočtu České republiky**

Morphology of fruits tree species
Fruit-growing - Seminar
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Underground organs
= root system

- Taproot
- Lateral roots – primary, secondary, etc.
- Root hairs



1. Fruit tree species propagated from seeds
(generative propagation)

- Robust and deep root system
- Pole-like taproot
- Lateral roots

Root collar: Area where the roots join the
above-ground part of the tree

Generative propagation

A) Wild trees: Grown from wild forms of trees,
cultivated separately from cultivars; wild trees
commonly have thorns

B) Seedlings: From cultivars (varieties)



2. Vegetative propagation of fruit tree species

- No pole-like taproot
- Formation of adventitious roots
- Shallow root system

Significant in rootstock technology - rootstock types

Root collar

- Generative propagation: True root collar
- Vegetative propagation: Root collar depends on depth of planting



Underground system of fruit tree species

APPLE TREE

- Depends on type of rootstock
- Flat, shallow root system (in general)
- Generative propagation: Deeper roots

PEAR TREE

- Conical root system
- Roots go deep down in the soil

PLUM TREE

- Shallow root system
- Dormant buds have a tendency to sprout
 - Development of root layers

CHERRY TREE, SOUR CHERRY TREE, APRICOT
TREE, PEACH TREE

- Dense root system

HAZELNUT TREE

- Dense root system
- High regeneration capabilities

WALNUT TREE

- Deep root system

RASPBERRY

- Shallow roots
- Cluster of root hairs

BLACKBERRY

- Long, strong roots
- Active part of the roots in arable soil stratum

GOOSEBERRY, CURRANT

- Flat root system
- High regeneration capabilities

Above-ground system

Organs

Growth and support

Trunk and crown

Sprouts and annual shoots

Leaf buds and wooden buds

Assimilation

Leaves

Propagation

Flower buds

Blossoms

Fruits

Seeds

Tree: Trunk and crown

Shrub, subshrub: Branching on the soil surface

TRUNK

Unbranched part of the above-ground tree system

Formed artificially at the tree nursery

Growing height

Shapes according to trunk height

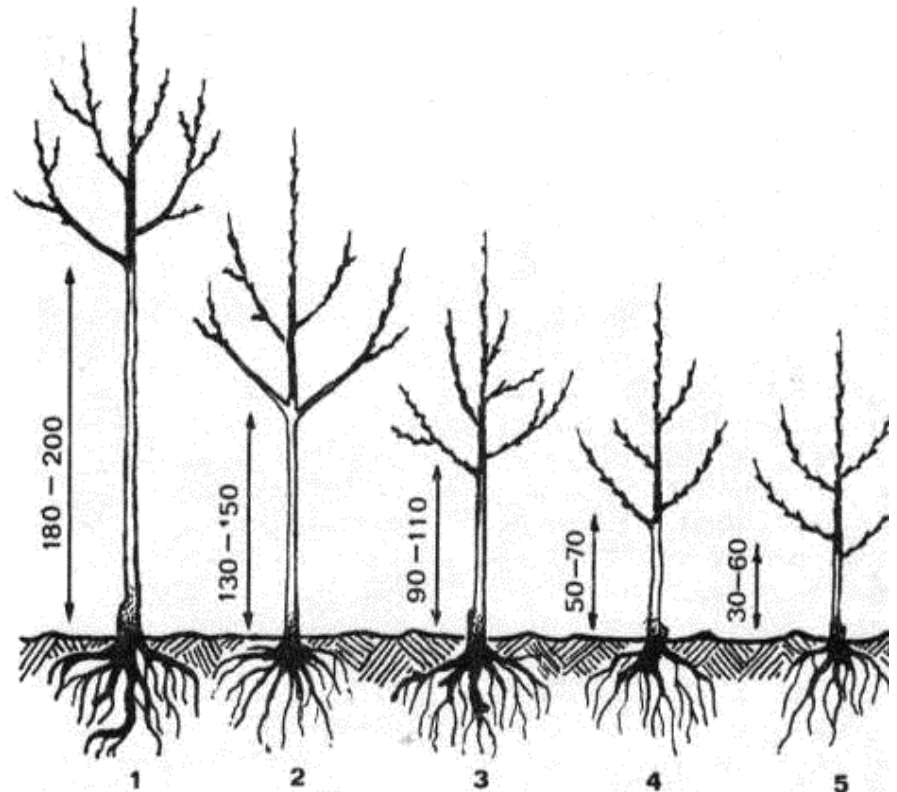
1 – Full standard (FS)

2 – Half standard (HS)

3 – Quarter standard (QS)

4 – Dwarf tree (DT)

5 – Very dwarfing (spindle) (VDT)



CROWN

pK – trunk extension

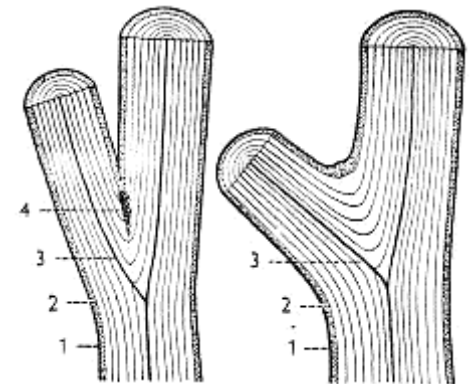
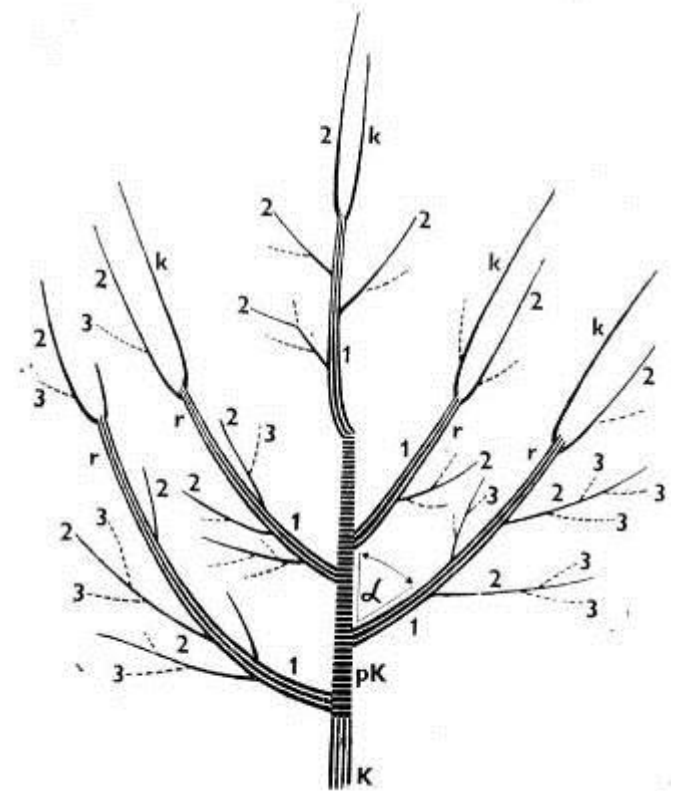
1 – Scaffold branches

2- Lateral branches 3 – secondary lateral branches

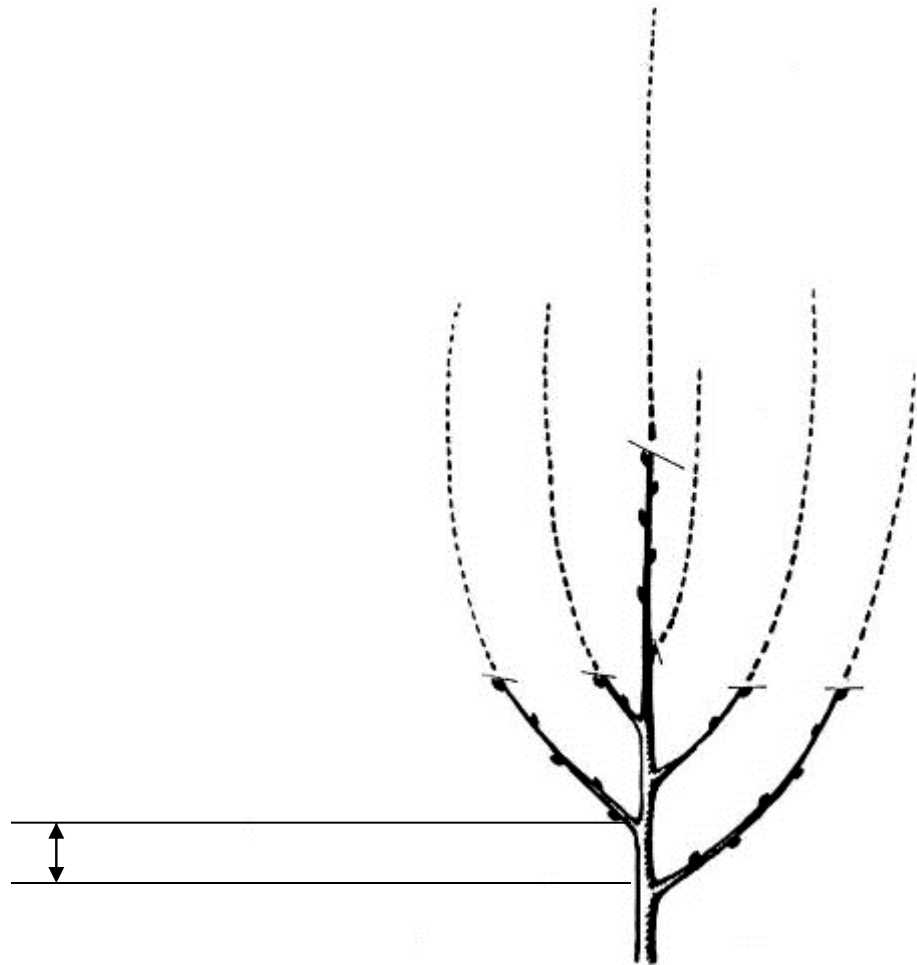
k – Competing sprouts

Crotch angle (α)

- Angle between a scaffold branch and the trunk
- Affects productiveness
- Optimum angle: 45°
- Branch training enhances productiveness

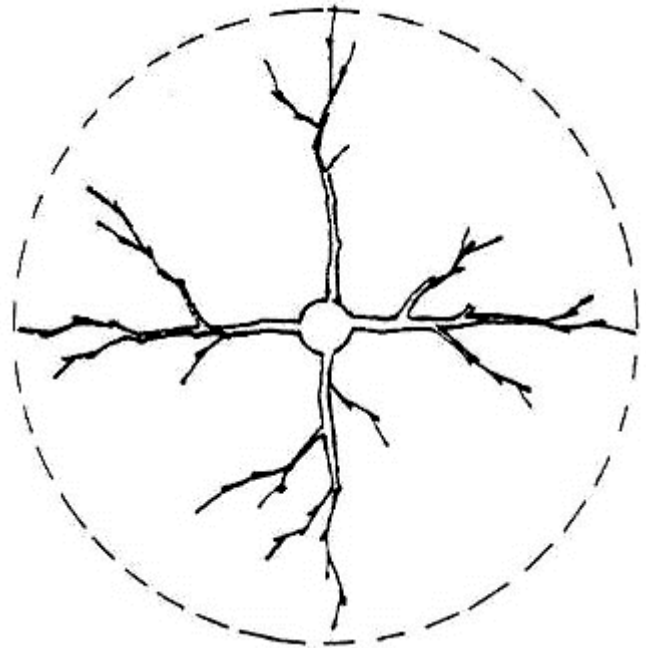
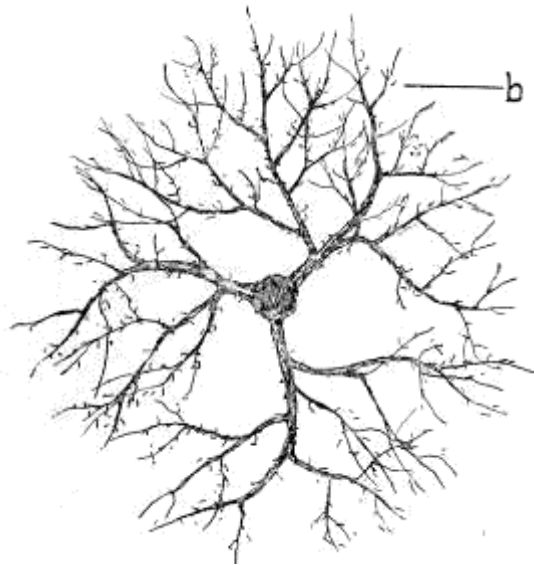
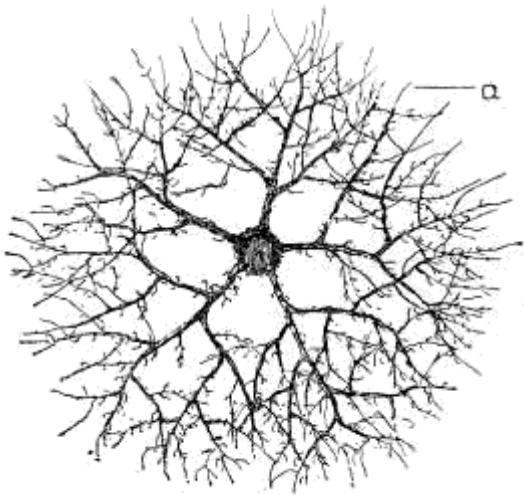


Branch spacing: Distance between two neighbouring scaffold branches (side view)



Scaffold spacing

- Angle between branches at the top of the tree (top view)
- Affects amount of light penetration



Types of branching

1. Monopodial

- Main axis is dominant, lateral branches are subordinate

CHERRY TREE, WALNUT TREE

2. Sympodial - monochasial

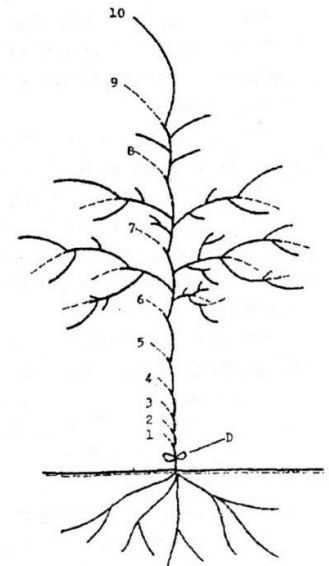
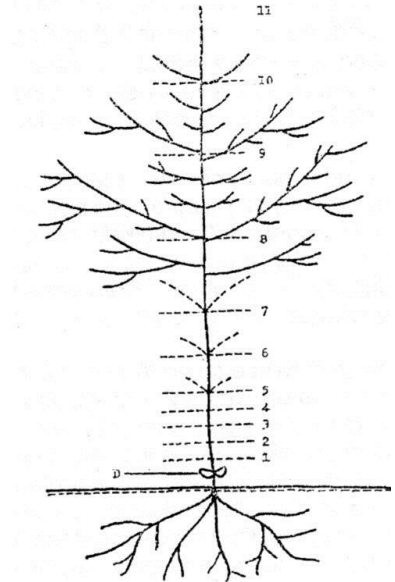
Main axis ceases to grow, overgrown by robust lateral branches

PLUM TREES

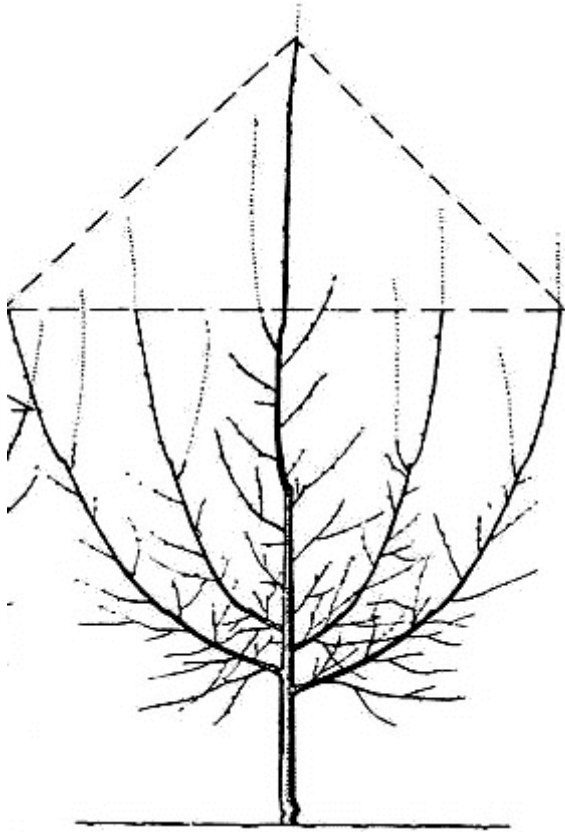
APPLE TREES

At first, monopodial branching

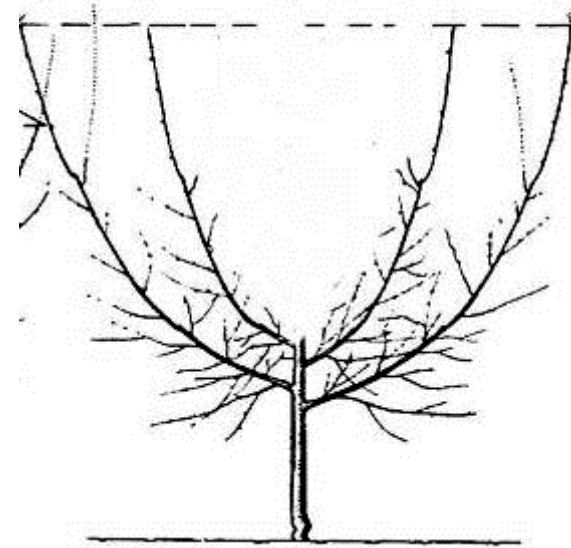
Later: False dichotomous and sympodial branching



Pyramidal crown: Central axis is dominant



Hollow vase: No central axis



Tree crown storey: cherry tree, pear tree, apple tree

Tree crown shape: habitus

A – Columnar

B – Conical

C – Spherical

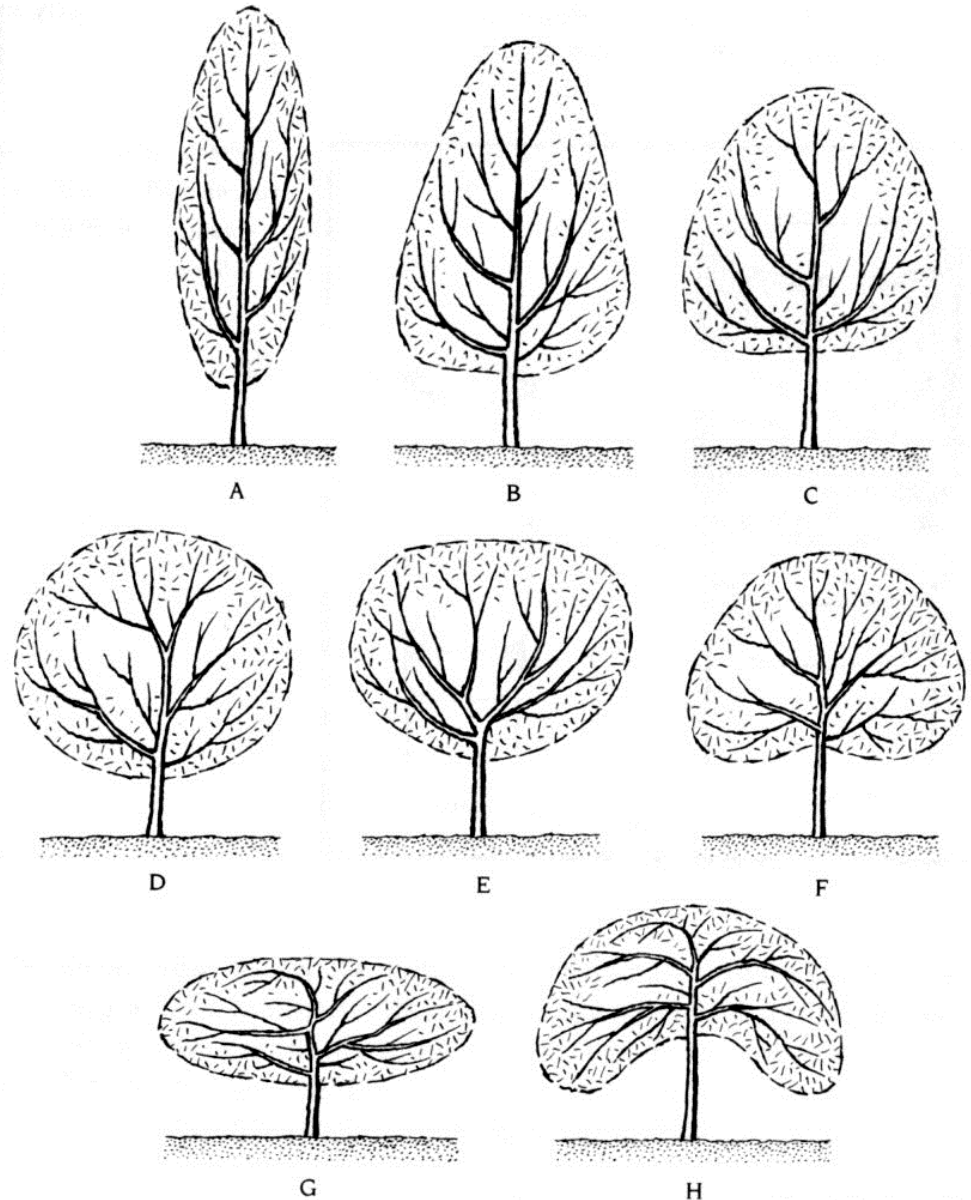
D – Circular

E – Flat circular

F – Spherical weeping

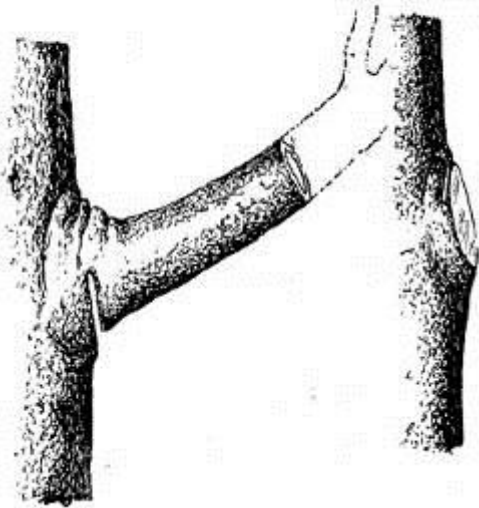
G – Flat

H – Weeping

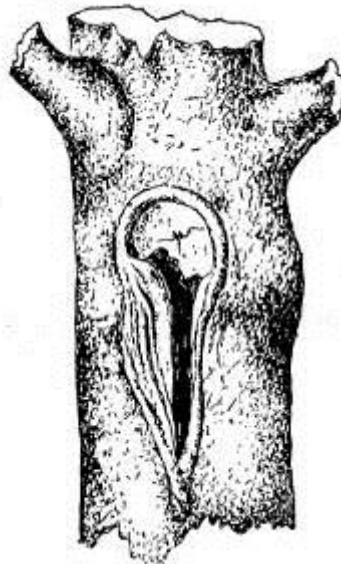


Branch collar

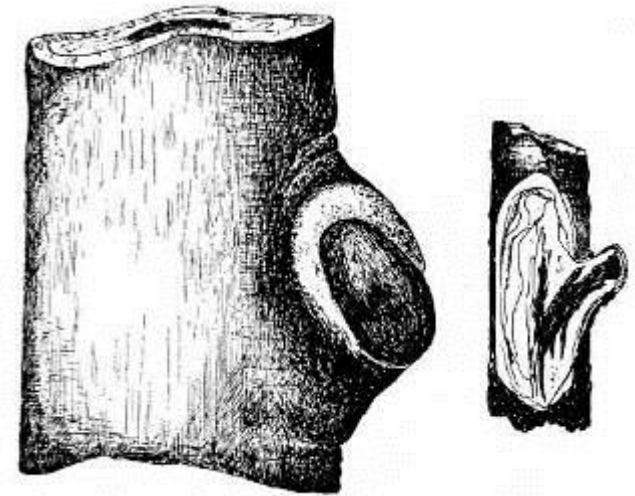
- Attachment of various types of axes
- At the lateral branch base - thickening
- Significant for pruning: Cut healing



Correct



Wrong: Too deep



Wrong: Too shallow

Annual shoots and shoots

- Annual shoot: Annual growth during vegetation period, covered with leaves
- Shoot: Mature tree structure formed after leaves fall from the annual shoots
- Premature annual shoots (the so called “prýty”) – peach tree, sour cherry tree

Buds

- Annual shoot buds
- Basis for future buds
- Shoot buds



Types of buds

- Leaf bud, flower bud, wooden bud
- Mixed (both leaves and flowers) – pomaceous fruits
- Apical (terminal)
- Axillary
- Accessory: secondary buds formed beside a principal bud
- Dormant: at the base of the shoot (at the genetic spiral)
- Adventitious: Formed on various parts of the tree (roots, trunk)

Bud internodes:

- Distance between two buds
- Shorter at the base, longest in the middle

Flower buds:

- On fruit-bearing wood
- Typical for particular fruit species
- In general: Larger and more round than leaf and wooden buds



Fruit-bearing growths of pomaceous fruits

PRIMARY

1 – Spur

2 – Long spur (5-15 cm)

3 – Brindle (15–60 cm)

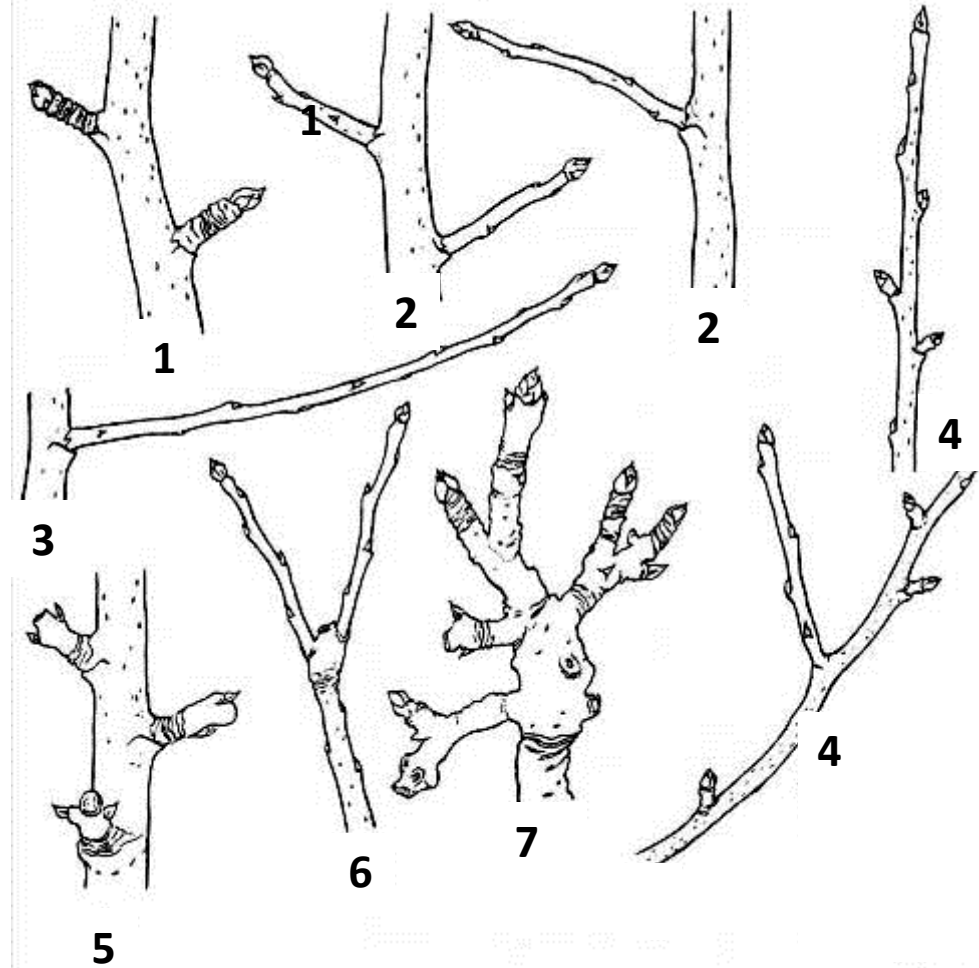
4 – Annual shoots with flower buds
or sessile spurs

SECONDARY

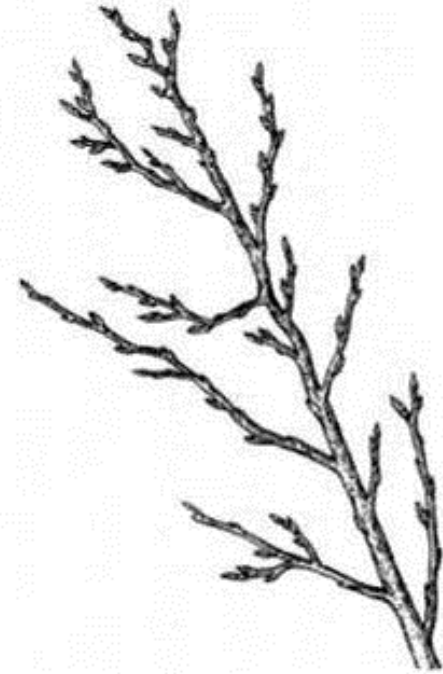
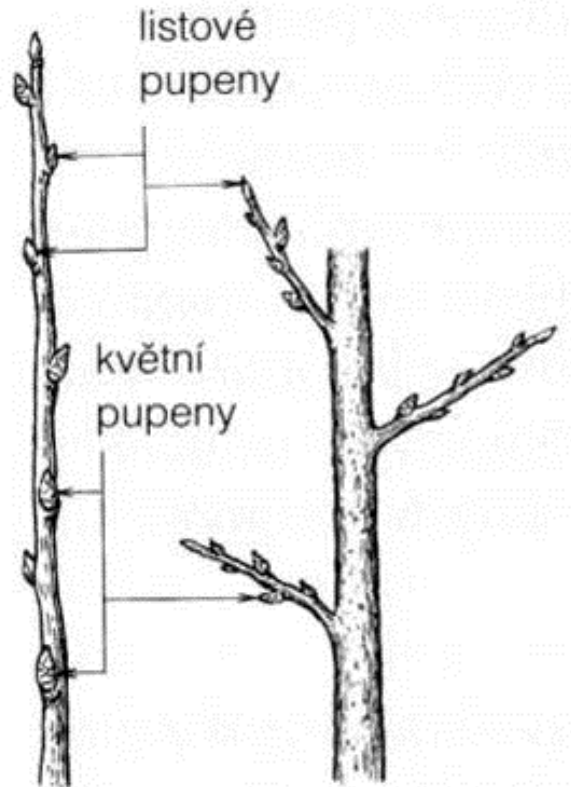
5 – Cluster base with leaf buds

6 - Cluster base with long shoots

7 - Compound spur



Fruit-bearing growths of stone fruits: Plum tree



One-year old shoot Two-year old twig Three-year old twig

Flower buds of apricot tree:
Fruiting shoots



Flower buds of a cherry tree:
Cluster base



- Peach tree: Along the one-year old shoot

Fruit-bearing growths of nut trees

- Form on one-year old wood
- Different-sex buds

Common walnut

- Male flower: Central part of the shoot
- Female flower: Commonly formed from the terminal bud

Common hazel

- Male flower: Catkin (type of inflorescence)
At the end of on the side of the shoot
- Female flowers (glomerule)



Fruit-bearing growths of berries

Cluster base: Two-year old wood (currant, gooseberry)

Fruiting buds on one-year old wood: Currant, raspberry, blackberry

Fruiting buds on annual shoots: Remontant raspberry varieties

Flowers and inflorescence

- Majority of species are androgynous
- Unisexual: Hazelnut, walnut



Walnut



Hazelnut

Dioecious plants: sea-buckthorn, actinidia
Separate-sex plants: Male and female



male

female



Leaves

Simple leaves: Majority of species

Compound leaves:

- Common walnut
- Service tree, European mountain-ash tree
- Blackberry, roses

