



INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ



**Inovace studijních programů AF a ZF MENDELU
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CULTIVATION TECHNOLOGIES OF FRUIT TREE PLANTINGS

Cultivation procedures for pomaceous fruit trees (apple tree, pear tree)

Cultivation procedures for stone fruit trees (plum tree, cherry tree, sour cherry tree, apricot tree, peach tree)

There have been considerable changes in the development of fruit tree plantings and tree formations: Small, scattered orchards, higher trunk standards cultivated on vigorous rootstock, freely growing dwarf trees with less vigorous rootstock and today's plantings of flattened tree formations (palmettes) and very dwarfing ("slender spindle")

Current intensive plantings of basically all fruit trees are characterized by:

- Low cultivation forms with more trees per land area
- Rapid productiveness onset and regular productiveness
- Decrease in work costs per ton of fruit production (lower costs per pruning and harvest)
- Decrease in application of herbicides (by 30-40 %), higher overall protection quality
- Yield from young plantings is directly proportional to amount of planted trees

Critical tree density leads to:

- Stagnation of growth
- Decrease in fruit production
- Poorer fruit colouring
- Increase of amount of underdeveloped and unripe fruits

Innovated types of plantings are established using:

- High-quality planting material
- Formed crown and differentiated flower buds



Strip planting

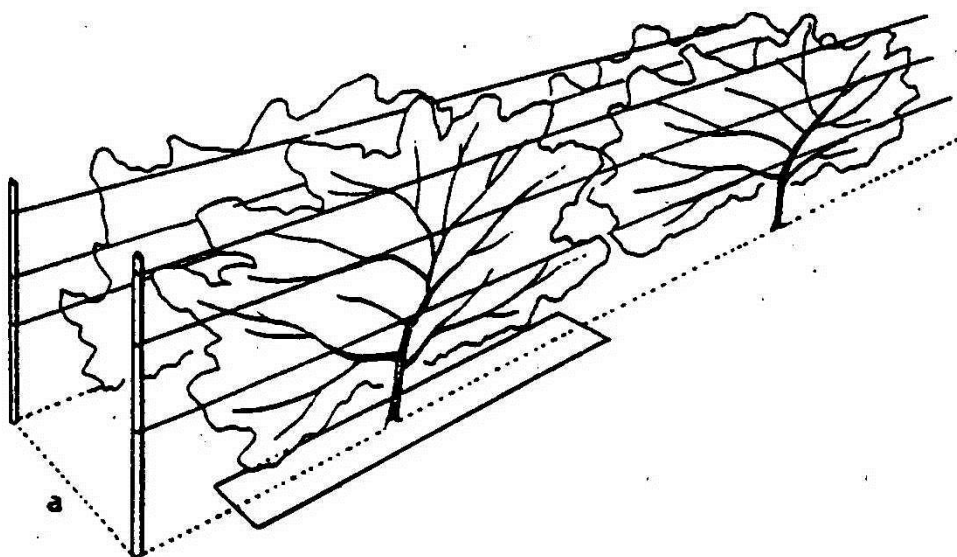
- Location conditions must be excellent
- Flattened ground area of the crown will form a compact strip in following years
- Cultivation first stages: Various supports might be necessary, depends on types of rootstock and varieties
- Walking path: Usually 2.5 m, must be spacious enough for the machinery (application of protection, herbicides, nutrition; pruning, irrigation, harvest) to pass through
- Types of cultivation forms depend on the fruit species (dwarf tree, quarter standard – stone fruit trees)
- Contour cutting for adjustment of height (2.5–3.0 m), strip width (max. 2.5 m) plus selective cutting



Espalier planting

- Most intensive type of cultivation
- Most common tree forms: slender spindle and palmette
- Common features: More strict formations, more dense spacing as well as rejuvenation pruning
- Individual support or wire support is necessary
- Max. height equals 2.5 m, and max. espalier width is 1.5 m
- Advantages: Higher production potential per land area, very early productiveness onset, larger and usually better fruits

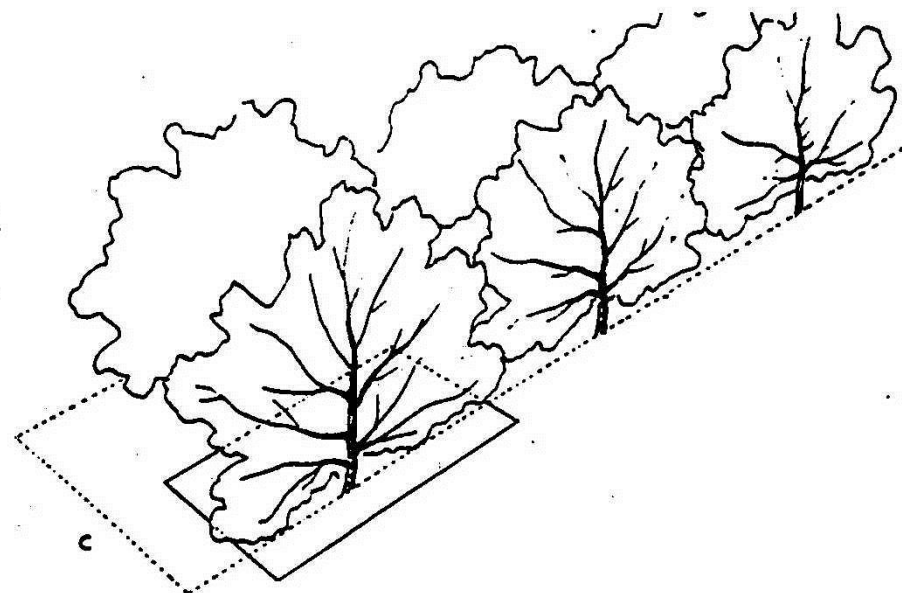
Stěnová výsadba



a) vzdálenost řad

b) šířka stěny

Pásová výsadba



c) vzdálenost řad

d) šířka pásu

Very dwarfing (“slender spindle”)

Central axis, the terminal, is trained and tied to the support.

Formation requires well-branched trees with high number of good sprouts growing in an obtuse angle to the central axis (the terminal) and which are less than half the width of the trunk below branching
Support structure is necessary throughout the planting lifetime (15-18 years)

Palmette

Training and tying of the annual shoots mostly with the help of wire supports provides the basic form of this tree formation.

Palmettes are named after a place of origin or a significant grower: Ruzyňská, Holovouská, Průhonická, Lepageova, Delbárdova.

Very dwarfing



CULTIVATION TECHNIQUES OF POMACEOUS FRUIT TREES

Low-growing forms, less vigorous rootstock, higher amount of trees per land area

Planting management

-System of soil management with grassed inter-rows, regularly mowed; compact growing grass

-Strips around the trees: Areas around the trunk are cultivated, minimum application of selective and leaf herbicides

-Fertilization: Based on chemical analysis of soil and leaves (system of checkpoints)

-Chemical, integrated protection with the help of biological protection, warning services and monitoring

-High fruit set: Thinning (chemical, mechanical)

-Thinning harvest with sorting and immediate storage in cooling chambers

-Final arrangement (commercial packaging)

Cropping practices

-First couple of years after the planting, trees are trained based on the desired cultivation form. Starting at 4 years of age, trees are fully productive and maintain-pruned. After 10 years since the planting, productiveness tends to decrease and rejuvenation pruning should be performed.

-Keep no weed in the rows under the trees, strip width: 0.8 m. Grow grass in the inter-rows (annual precipitation above 600 mm), or maintain cultivated dead fallow.

-During vegetation: Common cropping (nutrition, pests and diseases protection)

-Thinning of varieties bearing in clusters and thinning of excessive fruit set (two dates)

-After June blossom loss (insufficient pollination, deformed fruits)

-Early July (remaining and damaged fruits), distance: 100 mm, only two fruits per a cluster

-This will help us obtain uniform maturity, colouring and fruit size.

Harvest and storage

- Harvest maturity (fruits are fully coloured, kernels in the apple pulp are brownish)
- Autumn and winter varieties are stored at max. 5°C and 85 % air humidity



Types of apple tree plantings

Espalier planting (slender spindle, M9 rootstock)

Full-grown varieties - spacing: 3.5 x 1.2-1.5 m, 2,142 pc

Medium-grown varieties - spacing: 3.2 x 1.2-1.5 m, 2,344 pc

Low-grown varieties - spacing: 3.0 x 1.2-1.5 m, 3,055 pc

Strip planting

Full-grown varieties - spacing: 4.5 x 1.5-1.8 m, 1,357 pc

Medium-grown varieties - spacing: 4.0 x 1.2-1.5 m, 1,874 pc

Low-grown varieties - spacing: 3.5 x 1.0-1.2 m, 2,618 pc

Rootstock growth

M9 = J-TE-E

M9 + = J-OH-A (+5 %), J-TE-H (+10 až +15 %), M26 (+20 – 25 %), MM 106 (+30 %)

M9 - = J-TE-F (-20 %), M27 (-35 %), J-TE-G (-40 – 50 %)

Average yield

Espalier planting: 25-40 tons per ha

Strip planting: 18-30 tons per ha

Planting life cycle

Espalier planting: 12-15 years

Strip planting: 15-18 years

Types of pear tree plantings

Espalier planting

Full-grown varieties - spacing: 4.0 x 2.5-3.0 m, 916 pc

Medium-grown varieties - spacing: 3.5 x 2.0-5.5 m, 1,285 pc

Strip planting

Full-grown varieties - spacing – MA: 5.0 x 2.5-3.0 m, 733 pc

Medium-grown varieties - pear seedling: spacing 5.5 x 3.0-3.5 m,
562 pc

Full-grown varieties - spacing – MA: 4.5 x 2.0-2.5 m, 1,000 pc

Medium-grown varieties - pear seedling: spacing 5.0 x 2.5-3.0 m,
733 pc



CULTIVATION TECHNIQUES OF PLUM TREES

Low-growing trees with less vigorous rootstock, more trees per unit of land area

High-quality fruits production, no pests and diseases damage.

Average yield: 15-25 tons per ha

Location selection

-Plum tree requirements on soil moisture must be satisfied by selecting a proper variety and rootstock

-Apply additional irrigation in regions with less than 500 mm annual precipitation

Protection against plum pox

-Use virus-free planting material

-In the regions infested with plum pox, plant only varieties that are not overly prone to the plum pox

-Perform regular inspection, eliminate infested trees immediately

Cropping practices

- System of soil management with grassed inter-rows, regularly mowed; compact growing grass
- Keep the strips of land under the trees weed-free, apply selective herbicides
- Dry regions: Cultivate dead fallow
- Fertilization: Chemical analysis of soil and leaves (system of checkpoints)
- Chemical, integrated protection with the help of biological protection, warning services and monitoring
- Manual harvest and sorting, immediate distribution to retail stores
- Mechanized picking using an appropriate harvester, fruits are placed in proper containers based on processing requirements

Types of planting

Planting of low-growing forms

Rootstock: St. Julien A, Pixi (myrobalan plum – Stanley)

Planting spacing: 4.5-5.0 x 2.0-3.0 m, 667-1,000 pc

Tree height: 2.5 m

Manual picking

Quarter standard planting (1.0 – 1.2 m)

Myrobalan plum rootstock, MY-KL-A, MY-BO-1

Planting spacing: 6.0-7.0 x 4.0-5.0, 286-417 pc

Tree height: 4.5 m

Mechanized picking using harvesters

CULTIVATION TECHNIQUES OF CHERRY TREES

Low-growing forms, less vigorous rootstock, higher amount of trees per land area. Rootstock: P-HL-A, P-HL-B, P-HL-C, Colt and/or interstem grafting 0.9 m tall quarter-standard trunk is appropriate for subsequent processing of fruits

Location conditions

- High requirements on climate and soil
- Susceptible to late-spring frost damage of blossoms and small fruits
- Rainy weather during fruit maturation causes fruit cracking and harvest degradation
- Open terrain, no frost pockets

Pollination

- Almost all varieties are heterogamous (exception: Stella variety – autogamic)
- Select varieties blooming at the same time and capable of mutual pollination

Cropping practices

- Maintain dead fallow with gentle soil disintegration (after late-spring frosts, temperatures in the crown higher by 1-3 °C at night after blossom loss)
- Green manure mixtures and mowed grass may also be used
- Direct consumption: Cherries are picked manually into various containers with easily opened bottoms

Types of planting

Espalier planting

Medium-grown varieties - Spacing 5.0-6.0 x 4.0 m (Colt) 4.0-5.0 x 2.3-5.0 m (P-HL-A, B, C), 331-1,250 pc

Full-grown varieties - Spacing 5.0-6.0 x 5.0 (Colt) 5.0 4.0 m (P-HL-A, B, C) 331-1,250 pc

Strip planting

Medium-grown varieties - Spacing 7.0-6.0 m (bird cherry) 6.0 x 6.0 m (mahaleb cherry) 5.0-6.0 x 5.0 (Colt) 5.0 x 3.0 – 4.0 m (P-HL-A, B, C) 179 – 666 pc

Full-grown varieties - Spacing 8.0 x 7.0 m (bird cherry) 7.0 x 6.0 m (mahaleb cherry) 6.0 x 6.0 m (Colt) 6.0 x 5.0 m (P-HL-A, B, C) 179 – 666 pc

Growth: Comparison with the bird cherry tree

P-HL-A (-60 – 70 %)

P-HL-B (-50 %)

P-HL-C (-80 – 90 %)

Colt (-20 – 30 %)



CULTIVATION TECHNIQUES OF SOUR CHERRY TREES

One of the least demanding fruit trees

Less demanding than cherry trees

More resilient to winter frost

More stable and reliable yields

May be grown in drier regions, if grafted on mahaleb cherry rootstock

Pollination

-Autogamic, heterogamous, and partially autogamic varieties are all cultivated

-Select proper pollinators blooming at the same time

Types of planting

Strip planting

Medium-grown varieties - Spacing 5.0 x 4.0 m 5.0
3.0 m, 179-666 pc

Full-grown varieties - Spacing 8.0 x 7.0 m (bird
cherry) 7.0 x 6.0 m (mahaleb cherry) 6.0 x 6.0 m
(Colt) 6.0 x 5.0 m (P-HL-A, B, C) 179 – 666 pc

CULTIVATION TECHNIQUES OF APRICOT TREES

High demands on temperature, especially in July and August

Optimum locations for cultivation: north-east and north slopes
(trees sprout later)

High requirements on fruits quality, yields, individual care for the intensive plantings (fruits thinning, summer pruning, annual shoot tying, thinning harvest, sorting, fruits packaging)

Pollination

-Most of the varieties are autogamic and do not require any pollinator plantings

-To ensure higher productiveness, mixed plantings are preferred

Cropping practices

- Management depends on local conditions
- Combination of dead fallow with mixtures for green manure (purple tansy, mustard) are used
- Rotation of grassing and mixtures in individual strips is useful

Types of planting

Espalier planting

Medium-grown varieties

Spacing 4.5 x 3.0 m (apricot seedlings, myrobalan plum)

740 pc

Spacing 4.5 x 2.5 m (St. Julien A)

870 pc

Full-grown varieties

Spacing 5.0 x 3.0 m (apricot seedlings, myrobalan plum)

666 pc

Spacing 4.5 x 3.0 m (St. Julien A)

740 pc

Strip planting (quarter-standards)

Medium-grown varieties

Spacing 5,0 – 6,0 x 3,0 – 4,0 m (apricot seedlings, myrobalan plum) 41-666 pc, spacing 5.0 x 3.0 m (St. Julien A) 666 pc

Full-grown varieties Spacing 5,5 – 6,0 x 4,5 - 5,0 m (apricot seedlings, myrobalan plum), 333-454 pc Spacing 5,0 - 5,5 x 3,5 m (St. Julien A) 666 pc

CULTIVATION TECHNIQUES OF PEACH TREES

Long vegetation period, demanding on moisture, susceptible to low temperatures

Peach trees: Demanding on location, temperature fluctuations round the year (negative impact on buds). Flower parts are the most susceptible, especially in varieties with bowl-shaped flowers (freeze at $-3\text{ }^{\circ}\text{C}$, bell-shaped freeze at $-5\text{ }^{\circ}\text{C}$)

Pollination

-Most of the cultivated varieties are autogamic. 1-2 bee colonies are required for proper pollination of 1 ha.

Cropping practices

- Most important: Fruits quality, increase in intense cultivation, and yields
- Manual labour concerning fruits thinning, summer pruning, annual shoot tying, harvest thinning, sorting and fruits packaging is expected to rise
- Most common soil cultivation method: dead fallow and annual sowing of mixtures for green manure
- Maintenance pruning for successful growth and productiveness of the planting; the so called standardization of productiveness helps stabilize the production of high-quality fruits
- Excess harvest weakens the tree, reduce amount of developing fruits manually or chemically

Types of planting

Strip planting of flattened spindles

Medium-grown varieties - Spacing 4.5 x 2.5 m, 888
pc

Full-grown varieties - Spacing 5.0 x 2.5 m, 800 pc

Strip planting of palmettes, dwarfing trees and very dwarfing trees with open-centre crown

Medium-grown varieties - Spacing 45.0 x 3.0 m, 500 – 666 pc

Full-grown varieties - Spacing 5.5 – 6.0 x 3.0 – 4.0 m, 416 – 606 pc



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