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Grapevine Canopy Management

- Most important works affecting quality and health condition of the grapes
- Canopy management requires the most manual labour
- Czech Republic: Vertically growing canopy is the most common type of training – allows for even light penetration of the whole canopy throughout the day and during the whole growing season

Basic principles of canopy management

- Architecture of canopy and microclimate of leaves and berries affect all physiological processes
- The higher the vine loading, the less vigorous is the growth; tipping promotes growth of lateral shoots
- Vigorous growth induces dense foliage and has a negative impact on a vine microclimate
- Medium to maximum light reception – optimum cluster ripeness
- Secondary metabolites have a decisive impact on wine quality

Canopy management includes:

- Removal of leaves growing on a trunk
- Shoot thinning
- Training of shoots using trellis
- Tipping of shoots
- Partial removal of leaves from a grape zone
- Crop thinning during a growing season

Arrangement of canopy

- Vertical canopy – photosynthesis on all sides of the canopy
- Height of the canopy: ca. 1.30 m, 13-15 leaves per shoot
- Number of shoots is reduced by thinning; varieties with dense foliage and sites promoting vigorous growth: no more than 12 shoots per 1 m of trellis
- Canopy management: Horizontal arched cane is optimum
- Good foliage should grow early in the growing season
- Fruit zone, leaves and shoots must grow evenly, and should be at approximately the same height

Removal of leaves growing on a trunk

- A first task after the bud break (manual or partially mechanized work)
- Trunks must be free of all undesired, soft-wood growths (developing on the trunk and trunk base)
- Removal is repeated twice a year (buds do not break at once but gradually throughout the year)
- Ideal length: 10-15 cm; growths must not lignify!
- Special machines (10-20 cm long shoots, trunk height: more than 60 cm, age: more than 5 years)

Shoot thinning

- Helps control fruit set; conducted only manually
- Shoot thinning must have good timing; early timing is a key aspect for production of wines with additional quality attributes
- Number of breaking winter buds is closely related to wintering of the vine (frost damage, damage from drought and pests)
- Shoot thinning is performed when shoots may be easily removed without damaging the remaining shoots
- Varieties with short internodes (Traminer, Sauvignon Blanc): Remove shoots from every other bud, this facilitates better air flow

- Varieties with long and very long internodes: Leave two shoots from one winter bud
- Target: Good distribution of shoots within the canopy
- Optimum density per 1 m of canopy: 10-14 shoots
- Shoot thinning must be also conducted on old wood, trunk head, and cordon arms

Tipping of shoots

- Affects transport of assimilates to the benefit of flowers / grapes (depends on timing of the tipping)
- Intensive growth: Assimilates are mostly exported to the shoot tips
- If the main shoot axis is cut, more lateral shoots develop creating a new foliage
- Tipping of shoots maintains optimum canopy height
- Optimum canopy height in vertically trained vines is 1.2-1.4 m

- Tipping before blooming enhances blossom loss and berry set
- The later the first tipping is performed after blossom loss, the higher the grape quality
- Shoots in a vineyard may be tipped 2-4 times per growing season, depending on course of precipitation and growth intensity
- Tipping is mechanized (one-sided or tunnel tipping machines)

Training of shoots into a trellis

- For vertically trained canopy
- Current trends: Use of shoot lifters or mobile double support wires
- Mobile double wires are moved frequently, before tendrils develop; first double wire is mobile, the other wire is fixed
- Mobile double wire systems are used for training of vine together with metal posts and slots for the wires
- Shoots are tied 2-3 times, if the vine growth is intensive
- If the shoots are tucked manually to double wires, it is good to clip the double wires together, mobile double wires may be lifted with machines

Partial removal of leaves from a fruit zone

- Removal of main basal leaves and lateral shoots from the fruit zone – for better cluster distribution in the canopy
- Removal of lateral shoots in the canopy zone improves microclimate and resistance to fungi diseases
- Quality of fungicide application is improved
- If removal of leaves is conducted shortly after blooming, the loss is soon compensated and does not affect berry growth and development
- If removal is conducted during fruit set, loss is not very well compensated (used for vigorous varieties)

- Late timing may significantly decrease grape sugar content
- Removal of leaves in the fruit zone increases berry temperature and decreases content of malic acid
- Sun scald damage is a damage caused by high exposure to sunlight and high temperatures
- Leaves above the cluster must protect the fruit from very intensive sunlight

Removal of leaves – in practice

- Most importantly, lateral shoots are removed in the fruit zone; shoots are left above the fruit zone and later tipped
- Czech Rep. – 1-3 leaves are removed in the fruit zone

Crop thinning during a growing season

- Targets of crop thinning:
  - Improve grape quality (sugar content, acids, aromas and phenols)
  - Promote grape ripening
  - Improve grape health condition
  - Minimize stress induced by high yields

- Timing of crop thinning stems from stages of berry development; thinning is performed between the stages of fruit set and verasion
- Fruit set thinning before blooming is risky; manual labour (red wine grape varieties with a large cluster, not prone to blossom drop)
- Use of bioregulators, gibberellic acid (GA 3); affects synthesis of gibberellin and reduces its natural concentrations in the plant
- Crop thinning - removing half the cluster – used in large, long clusters where berries in the lower half of the cluster ripe poorly

- Optimum timing - between fruit set and lag phase; tools – scissors for harvesting with a sharp tip (a part of the cluster is cut off, lower half or a third of the cluster)
- Red wines from clusters cut in half are full-bodied and harmonious
- Crop thinning – removal of the whole grape clusters (cluster thinning); optimum timing – between fruit set and verasion; good for wine grape varieties

- One cluster per shoot or two to one cluster per shoot along the whole cane. Higher positioned cluster is removed.
- Efforts for full mechanization of thinning; use of harvesters and a system of minimum pruning; thinning intensity cannot be set, stalk and berries are often damaged; performed during warm and dry weather.