Table grapes in cold houses
Toldam-Andersen, Torben

Publication date:
2016

Document version
Publisher's PDF, also known as Version of record

Citation for published version (APA):
Toldam-Andersen, T. (2016). Table grapes in cold houses. Department of Plant and Environmental Sciences, University of Copenhagen.
Table Grapes in Cold Houses

By
Torben Bo Toldam-Andersen

Compendium note for the course:
‘Fruit and Berry Crop Physiology and Quality’
Copenhagen University
Faculty of Science
Crop Science
at Department of Plant and Environmental Sciences

2016
Table Grapes in Cold Houses.

This compendium note is based on a chapter written by Baker, H and E.G. Gilbert in Wisley Handbook 8: ‘Apricots, Peaches Nectarines, Figs and Grapes’ published in 1972. The original text has been edited and extended with info on the growing, testing and descriptive work done on table grapes at Pometet.

In the following pages detailed information is given on growing vines in greenhouses without heat, on a month-by-month basis. Undoubtedly there are a great number of vines growing in unheated glasshouses that never give of their best, largely the result of neglect or errors in cultivation. It is assumed that the vines are well established and requirements regarding an ample rooting medium have been met.

![Image](image_url)

**Fig. 1. The tunnel at Pometet in early spring. The side flaps can be rolled up to allow ventilation. The green nets keep birds and insects out. Mechanical ventilation can be added with the large ventilator in the end. Photo: Torben T-A.**

**January** - Begin the New Year well by having both house and vines thoroughly cleaned; if for any reason the house has not been washed and the borders top-dressed, no time should be lost in carrying out these operations (see December notes). Provide maximum ventilation in order to keep the buds dormant.

**February** - A start can be made to maintain a slightly higher temperature, but the ventilators should be opened when this approaches 7°C. The buds will benefit from a light syringing with tepid water provided that this is carried out on sunny days only, before midday; it is important that the house and vines should be dry by evening. Do not allow the temperature to rise too high at this period as young growth should not be too advanced while there is still danger of severe frost penetrating to the inside of the house.

**March** - As the days lengthen it will be safe to allow the temperature to rise to about 10°C before admitting air. Continue the syringing of the cordons on all favourable occasions. Maintain a moist atmosphere by damping the border, paths and walls; on sunny days this may be necessary twice a day; no damping should be done on dull days. Aim at promoting
humidity on warm days and drier conditions when dull. Prevent patches of dry soil and guard against the opposite extreme. Examine the borders to a depth of 45 cm. and if dry give a good watering (30-40 mm), and eventually repeat it (10-20 mm) in a week, combined with manure water immediately after (never water manure on dry soil).

Fig. 2. New growths should be stopped as shown by the lines in the above photograph. This is usually 2-4 leaves beyond the embryo bunch.

April - Early in April the young growths should be about an inch long and at this stage they should be reduced to two shoots to each spur; the terminal one is usually the strongest.
and produces the best bunch. It is important to retain a fairly strong shoot near to the base of the spur with the object of pruning back to this shoot, so keeping the spur short (a desirable condition). Mildew is the common disorder of grapes growing in unheated houses. To prevent infection spray with a fungicide* when the shoots are 5 to 7 cm long, covering every portion of leaves and cordons, or use a sulphite smoke. Seasonal weather conditions prevailing, growth will be rapid at this stage, and before the end of the month it will be time to pinch the young shoots at two to four leaves beyond the bunch, the actual number depending upon the available space between the cordons (see fig. 2). Where roller blinds can be provided it is well spend as they afford valuable protection from eventually frost as well as glaring sunshine both in spring, in very hot summer days and in autumn.

**May** - The young shoots will naturally tend to grow towards the glass and if there is sufficient space (30 to 40 cm) between the cordons and the roof glass, no harm will result, but steps should be taken to prevent these laterals touching the glass and to bring them gradually down to the wires upon which the cordons are tied. Tie raffia at the end of the laterals and strain this to a wire, but only sufficiently to keep the point of these from touching the glass. There is a danger of the laterals snapping with the consequent loss of a spur so great care is necessary. From time to time the raffia should be pulled a little tighter until the shoot is finally brought down to the wires and secured with stronger raffia (see fig. 3). Towards the end of the month the flowers will open and at this period a fairly high temperature should be maintained, yet at the same time the top ventilator should not be entirely closed either day or night unless there is an exceptionally cold spell. During this period drier atmospheric conditions, especially before midday are desirable for drying the pollen so that it is more easily dispersed; the old idea of keeping the house entirely dry during the whole period is not recommended. After pollination the house should be damped down each day, provided the weather conditions are favourable.

*Fig. 3. Tying a lateral shoot. The loop-tie is shown, which is used to bring down the shoot gradually to the wire.*
* Check the local/national list of approved chemicals to be used
To pollinate, about midday draw the hand gently down the bunches. This transfers the pollen from bunch to bunch. Where more than one cultivar is growing in the same house cross-pollinate. Extra precautions should be taken in the case of cultivars which do not set freely by tapping the cordons sharply, with the fists about 9 a.m. to remove the flower caps and expel surplus moisture to enable the pollen to dry more quickly.

![Fig.4. A bunch is ready for the first thinning (left), and after thinning (right)](image)

**June.** Immediately the berries have set the number of bunches should be reduced, first disposing of the small misshapen and badly set ones, and in the case of shy setters the best set bunches should be retained rather than the largest. At this stage retain a small surplus over actual requirements in case of accidents. As soon as it can be seen that the berries are swelling, thinning should start using a special pair of scissors** for this work. (see fig. 4). This is done in two stages fist removing all seedless berries and those pointing towards the centre of the bunch. Retain all tip berries as these give form and size to the bunch. Do not remove the lower berries from the shoulders; at a later stage these shoulders can be suspended with raffia from the main bunch and when mature will increase the size of the bunch. There is considerable variation in the bunches of the different varieties; some have long foot-stalks to the berry, and form a loose bunch while others make a tight bunch; cultivars like 'Black Hamburgh' set freely, but 'Muscats' are often shy setters. In the case of the last mentioned, caution is necessary at this stage as it is difficult to be sure which berries have been properly fertilized (see fig. 5). Generally speaking a cultivar like 'Frankenthaler' two berries are cut out to every one retained but 'Muscat Bleu' might only require the seedless berries removed at this stage. It is most important that no time is lost in carrying out the first thinning as it is rather tedious work and the berries swell rapidly. By the time the last bunch is reached it will be getting towards the stage when berries become tight. Be aware plenty of atmospheric moisture may build up in the morning before the temperature rises combined with a stagnant atmosphere this may cause condensation and berry cracking. Careful ventilation should thus be ensured, so that a growing temperature may be kept up without checks from ventilators being opened wide at any time.
When it can be seen that the bunches are developing satisfactorily, the few spares should be removed. **It is most important that over cropping should be avoided.** It is difficult to state what constitutes a fair crop as the number of bunches to be retained will depend mainly upon the health of the vine and size of the bunches. Most vines produce many more bunches than should be retained and for vines growing on the single cordon system a rough estimate is a bunch for every foot (30 cm) of cordon from the basal spur. On a 3m vertical cordon this would mean five bunches to each side.

Maintain a fairly high temperature and a humid atmosphere in the house by damping the border, walls and path as frequently as weather conditions require. When watering is necessary this should be in sufficient quantity to soak the border thoroughly (20 mm). June is a suitable time to apply some fertilizer such as a mulch of farmyard manure can be applied which, besides supplying nutrients will also reduce the need for water. A word of warning is necessary with regard to applying manure in this form owing to the likelihood of the fumes burning the foliage; a certain amount of ventilation should be maintained day and night until the fumes have dispersed. Should mildew have been troublesome the previous year or if it should suddenly appear, spray or fumigate with sulphite or a fungicide*.

During June growth will be active and the sub-laterals will require periodic attention. Where the laterals almost meet, pinch the sub-laterals at one leaf the object being to cover the roof glass with sufficient good leaves without overcrowding.
July. - The berries will swell rapidly until they are about half grown (BBCH 77); this is known as first swelling and then the berries remain more or less at a standstill for about two weeks (BBCH 77-79) while the stones are forming. This is a critical period and nothing in the nature of a stimulus or a check should take place. The temperature should not fluctuate; provide the necessary ventilation without lowering the temperature unduly. Do not close the ventilators entirely at any time during this period. After stoning the bunches should be examined with a view to removing any surplus berries. During this thinning suspend the shoulders with raffia to a wire or lateral in order that the berries can swell to the maximum. Damping and the attention to the sub-laterals should be carried out in the same manner as advised for June. After the stones have formed the berries will swell rapidly to their full size. (The second swelling, BBCH 80-89).
The berries of the cultivars ‘Osella’ and ‘Palatina’ are prone to split when colouring and from this stage the sub-laterals should be allowed to develop so minimizing the splitting. Immediately it can be seen that the berries are starting their second swelling (BBCH 83) the temperature can be increased by closing the ventilators fairly early in the day, provided this is accompanied by copious damping’s. Exercise care in ventilating the house in order to reduce the possibility of "scalding" the berries. At this period it is necessary for the ventilators to be opened slightly before the sun shines on the house in the morning. As a precaution it is advisable to open the top ventilator before nightfall in order to reduce condensation. A light shading of the roof glass is often necessary. Apply a second feed either in the form of liquid manure or one of the approved vine fertilizers (but never on dry soil).

**August.** - In an average season the berries of the variety 'Galanth' growing in unheated houses usually show signs of colouring early this month (BBCH 81). In table 1 an overview is given of the approximate BBCH stadiums for cultivars with a ripening from very early to very late. Towards the end of the month when the berries are approaching maturity, gradually reduce the amount of atmospheric moisture, especially towards nightfall; a current of air should be maintained both day and night. White grapes are improved by exposure to sunlight during the ripening process this is attained by tying back a few leaves from the bunches.

![Fig.8. 'Palatina' in mid August. Good naturally open cluster with now or minimal need of thinning and shaping. Photo Torben T-A.](image)

**September.** - Early in the month many cultivars should be ripe (BBCH 89) and if the bunches are to remain on the cordons for a considerable time, steps should be taken to maintain a free circulation of air and to reduce damping to a minimum; the roots should never be allowed to become dry. Choose sunny weather to carry out the necessary watering. Make a point of examining the bunches at least once a week to remove any rotting berries.

**October.** - Where the bunches are still hanging stop damping the borders from now onwards. The fruit should be cut as soon as possible as the berries are liable to rot in a low temperature. As long as the bunches remain on the vine continue to inspect them
frequently and cut out decaying berries to prevent wholesale rotting. As far as possible maintain a minimum temperature of about 10°C., and by careful ventilation promote a good circulation of air.

**Table 1. BBCH stages for vintivar with ripening from very early to very late.**

<table>
<thead>
<tr>
<th>Week no</th>
<th>Number days</th>
<th>Very early</th>
<th>Early</th>
<th>Early middle</th>
<th>Middle</th>
<th>Late</th>
<th>Very late</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>14 days</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>23</td>
<td>14 days</td>
<td>69</td>
<td>69</td>
<td>69</td>
<td>69</td>
<td>69</td>
<td>69</td>
</tr>
<tr>
<td>24</td>
<td>10 days</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>25</td>
<td>10 days</td>
<td>72</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>30 days</td>
<td>74</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>30 days</td>
<td>76</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>10 days</td>
<td>77</td>
<td>77</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>10 days</td>
<td>79</td>
<td>79</td>
<td>79</td>
<td>79</td>
<td>77</td>
<td>77</td>
</tr>
<tr>
<td>30</td>
<td>30 days</td>
<td>80</td>
<td>80</td>
<td>79</td>
<td>79</td>
<td>77</td>
<td>77</td>
</tr>
<tr>
<td>31</td>
<td>30 days</td>
<td>81</td>
<td>81</td>
<td>80</td>
<td>81</td>
<td>80</td>
<td>81</td>
</tr>
<tr>
<td>32</td>
<td>30 days</td>
<td>82</td>
<td>82</td>
<td>81</td>
<td>81</td>
<td>80</td>
<td>82</td>
</tr>
<tr>
<td>33</td>
<td>30 days</td>
<td>82</td>
<td>82</td>
<td>81</td>
<td>82</td>
<td>81</td>
<td>82</td>
</tr>
<tr>
<td>34</td>
<td>30 days</td>
<td>89</td>
<td>89</td>
<td>82</td>
<td>82</td>
<td>81</td>
<td>82</td>
</tr>
<tr>
<td>35</td>
<td>30 days</td>
<td>89</td>
<td>89</td>
<td>82</td>
<td>82</td>
<td>81</td>
<td>82</td>
</tr>
<tr>
<td>36</td>
<td>30 days</td>
<td>89</td>
<td>89</td>
<td>82</td>
<td>82</td>
<td>81</td>
<td>82</td>
</tr>
<tr>
<td>37</td>
<td>30 days</td>
<td>89</td>
<td>89</td>
<td>82</td>
<td>82</td>
<td>81</td>
<td>82</td>
</tr>
<tr>
<td>38</td>
<td>30 days</td>
<td>89</td>
<td>89</td>
<td>82</td>
<td>82</td>
<td>81</td>
<td>82</td>
</tr>
<tr>
<td>39</td>
<td>30 days</td>
<td>89</td>
<td>89</td>
<td>82</td>
<td>82</td>
<td>81</td>
<td>82</td>
</tr>
</tbody>
</table>

In total days: 75  80  85  90  95  100

For BBCH 70 to 89
November. - The bunches should be removed by this date and maximum ventilation both day and night should be given in order to rest the vines. Remove all sub-lateral growth in order to give maximum light and air to the laterals, so that they become thoroughly ripened. Do not prune until the leaves have fallen.

Fig. 9. Left an unpruned vine showing the laterals on a vertical cordon in a dormant stage and ready for pruning, and to the right the same vine pruned

December. - Prune immediately the leaves have fallen in order to reduce the risk of bleeding, cutting the lateral back to two buds (see fig. 9 and 10). Where there are extensions to the length of a cordon, shorten these according to requirements, but always to hard, well-ripened wood. Where mealy bug has been troublesome remove the loose bark only, before spraying with a 5 per cent tar-oil wash. All woodwork should be scrubbed, walls whitewashed (soft soap 0.5% and sulphur 0.5%), and glass washed both inside and out. After cleaning both house and cordons replenish the border soil by removing the top inch and replace this with a top-dressing made up of good turfy loam to which some well rotted manure, a little superphosphate and sulphate of potash have been added. Maintain the maximum ventilation.
Fig. 10. Left an unpruned wine with two horizontal cordons. Right demonstrates after pruning to short spurs or long spurs. This system is used for all plants in the tunnel at Pometet. Only the heights of the trunk vary from low, medium to high. See also fig 11.

Fig. 11. The general planting system in the tunnel at Pometet. Since all plants have the same shape – only different height of trunk – is pruning kept as easy as possible. The tall plants may be left out to allow for more sunlight to penetrate into the centre of the tunnel.

Pest and diseases.
Mealy bug was a most serious pest of the grape and most difficult to control until introduction of tar-oil washes. When applying this wash it is of the utmost importance that the buds be dormant, and if applied thoroughly at the correct strength it should be most
effective. Mealy bug is often introduced by placing host plants in the vineyard and should this pest appear on the vines during the growing season a spray should be given to control (check what is allowed to use). Small wads of cotton-wool tied round the stalks of the bunches will usually prevent the bugs from invading them. The spray against mealy bug will also control scale insects.

Red spider seldom makes its appearance on vines in cold houses. Provided the roots receive sufficient water and correct atmospheric conditions are maintained.

Mildew can be very serious in a cold greenhouse, especially if cultivation is at fault or in a season that is wet and cold. Prevention is better than cure and it is of the utmost importance that a fungicide be applied as recommended during April with a second application when the berries have set, if necessary.

Shanking (EBSN and NBSN) is not exactly a disease but a condition, which is probably brought about by one or a combination of cultivation errors. At the first stage of ripening odd berries or small groups of berries fail to colour and develop naturally - these are watery and sour, also the berry stalks shrivel. This is undoubtedly the result of an unhealthy condition of the roots such as might be brought about by these penetrating stagnant soil. Overcropping of the vines which puts an undue strain upon the rooting system is considered to be another cause. The remedy is to examine the roots and correct defects, at the same time reducing the crop for a year or two until the vine has gathered strength. pH level should not be too low and it is important to keep a good balance between K and Mg.

Scald which shows as discoloured sunken patches on the berries, and scorching of the foliage which results in large pale brown patches, is due to hot sun striking through glass on to moist tissues (p. 11 and fig. 12). Affected berries and leaves should be removed.

Fig. 12. Sun on the grapes and good air ventilation around the cluster enhances the fruit quality and reduce rot and berry splitting. High moisture combined with sun can cause scald problems.
A deficiency of magnesium frequently results in a yellowish orange discoloration between the veins. Later the affected areas turn brown, and these symptoms should not be confused with sun scorch. The trouble can be corrected by spraying with 250g magnesium sulphate in 10L of water, plus a spreader, two or three applications, be given at fortnightly intervals.

Vines are very susceptible to damage by hormone weed killers; affected leaves become narrow and tan-shaped, are frequently cupped and the shoots twist spirally. All ventilators should be closed if any spraying is to be carried out in the vicinity. No weed killers should be left in the greenhouse, and care should be taken to see that vines are not sprayed or watered with apparatus contaminated with a selective weed killer. Affected plants will normally grow out of the symptoms in due course.

Ventilation
A greenhouse used for grape-growing might be (a) span, (b) three-quarter span, or (c) lean-to. All should have ventilators at the top and at some point near the ground either as part of the glasswork or as a moveable shutter in the brick wall, near the ground. The span house usually has the ventilators arranged on both sides, top and bottom; a three-quarter span might have them either on one or both sides at the top but on only one side at the bottom, whereas the lean-to house at least has a top ventilator and often has one at the bottom also. The reason for ventilators is to control the temperature inside the house and this is more difficult in the early spring when the weather is changeable and the young growth tender. As the season advances and the weather becomes more settled and the foliage fully grown, the manipulation of the ventilators is less difficult and when the fruit is gathered they can be opened to the maximum both day and night as even a certain amount of frost will not harm the vines and can, in fact, be beneficial.

Starting in February when the temperature should be controlled the ventilators are brought into play for this purpose. In the early morning with the ventilators closed the temperature of the unheated house will be some degrees warmer than that outside, but as soon as the sun reaches the house the temperature inside begins to rise. When a certain temperature is reached (this varies according to the stage of growth) a start should be made to open a top ventilator, not for the purpose of lowering the temperature but rather to prevent it from rising unduly high. As the sun gains power the ventilation is increased to a maximum if the sun is warm enough. Early in the season the sun might not have sufficient power to cause the maximum amount of ventilation to be used, or again a prevailing cold wind will temper the sun's heat, but whatever the outside conditions are the temperature of the house should rise progressively with the day until the maximum is reached, usually between twelve and one o'clock G.M.T.

After the maximum outside temperature, has been reached and begins to fall, the ventilators should be gradually lowered until they are completely closed (except during the periods mentioned in the cultural notes) a little ahead of the sun departing from the house, the reason for this being to husband a certain amount of sun heat to maintain a comfortable temperature as long as possible into the night.

As the season advances and the power of the sun increases, the mean temperature will naturally increase. If the ventilators have been opened to their maximum, there is then very little danger even if the temperature in the house rises to a considerable height.
The foregoing is the principle upon which ventilators are used for regulating the temperature inside the house. This is very necessary during the early part of the growing season. It is of the utmost importance that the ventilators should not remain closed to force the temperature to rise unduly high, which will cause scorching of the foliage or scalding of the berries. It is better to be on the cool side rather than risk these conditions. Should it be difficult to give the necessary ventilation early enough it is advisable to leave a top ventilator slightly open all night to act as a safety valve. Where both top and bottom ventilators exist the principle to work upon is to use the top ones first before opening the bottom ones, in fact it is seldom necessary to use the last mentioned until well on in the season, except at the time of flowering. Should a cold wind prevail apply the ventilation on the leeward side of the house; sometimes it is necessary to use the top and bottom ventilators on the opposite side to the prevailing wind as it is most important to avoid a draught. Periods when it is advised to retain all night ventilation during the growing season are outlined in the notes dealing with cultivation.

Fig. 13. The ventilator is humidity controlled and for dry periods a water tube is tied up in the middle installed with nozzles giving ‘rain’ onto the 2 middle rows of concrete tiles. A timer can control a small addition of a few seconds of ‘rain’ repeated several times during the day depending on the conditions. Each plant has its own drip irrigation with fertilizer.

Watering
Many people fail to grasp the principles of watering, especially when dealing with vines growing in an open border. The common mistakes are not to give enough water during the growing season, and in thinking that watering should cease once the crop has been gathered. The frequency of watering depends upon the time of the year; naturally more water will be needed when the roots are active but the soil should never be allowed to become dry during the dormant season. During active growth watering might be necessary once a fortnight (20-30 mm), yet once in six or eight weeks may be adequate during the winter, these are approximations. Always give sufficient water to wet the border thoroughly (20-40 mm), and check occasionally by examining the subsoil.
**Damping**

It is necessary to maintain a moist atmosphere during the growing season and this is obtained by damping the border, walls and paths with water applied through a watering-can with a rose attached. As already explained in the notes dealing with cultivation the frequency and density depend upon the prevailing weather and temperature; during hot and sunny periods, damping once, twice or even three times a day may be needed, yet in dull conditions damping is not advisable. Between the ripening of the fruit and the start of a new growing season damping is not necessary. Guard against the border soil becoming pasty by over-damping and dusty by allowing dry patches to form under the stages and behind any existing hot water pipes. *Never confuse watering and damping; it is easy to apply too much water when damping and too little when watering.*

**Cultivars**

The cultivars tested in the tunnel at Pometet are listed in the following pages in table and examples in photos. Some details on the performed cultivar descriptions and tests are added and some tables concluding the overall results of the evaluation. Finally an example of a final cultivar description are also included.
### Tabel 1. Cultivars of table grapes in the tunnel at Pometet with a few comments on colour and quality.

**Group A: Vinifera types, (early ripening).**

- Beauty seedless
- Csabas Perle: Green
- Early Muscat: Blue, muscat flavour
- Favorit: Green, floral spicy flavour
- Irsay Oliver: Green, exotic citrus aromatic

**Group B: American hybrides (mid to late season)**

- Boskoop Glory: Blue, fruity flavour
- Einset: Rosé, seedless, aromatic
- Festivee
- Giant Jens: Blue, muscat flavour

**Group C: Interspecific resistant types (mid season)**

- Angela: Green, mild and juicy
- Artemis
- Birstaler Muscat: Green, neutral green herbal flavour
- Evita: Green, muscat flavour
- Eszter: Green, fruity flavour
- Fanny: Green, very large cluster, neutral green flavour
- Franziska: Green, fruity flavour, very large cluster (1500 g)
- Galanth: Blue, exotic fruit flavour
- Ganita: Rosé, light exotic flavour, thin peel crack easy
- Garant: Green, light floral muscat flavour
- Georg: Blue, mild fruity flavour
- Katarina: Rosé, fruity sweet
- Lilla: Green, fruity flavour, high quality
- Muscat Bleu: Blue, muscat flavour
- Nero: Blue, fruity flavour
- Osella: Blue, fruity flavour
- Palatina: Green, Muscat flavour
- Philipp: Blue, fruity flavour, decorative berry and cluster shape
- Sophie: Green, fruity sweet

**Gruppe D: Vinifera (mid season)**

- Augusta Louise: Green, neutral to light muscat flavour
- Cone Gliano 218: Blue, neutral flavour
- Muscat Garnier: Blue, muscat flavour
- Pirovano 15: Blue, light muscat flavour

**Gruppe E: Vinifera (late season)**

- Die Schöne Bosnerin: Blue, fruity flavour
- Frankenthaler: Blue, fruity flavour
- Super Ran Bolgar: Green, herbal light spicy flavour
- Tompa Mihaly: Green, very large cluster
Examples of table grape cultivars in the tunnel at Pometet. Photos: Torben T-A

<table>
<thead>
<tr>
<th>'Philipp' (at time of version)</th>
<th>'Galant'</th>
</tr>
</thead>
<tbody>
<tr>
<td>'Evita'</td>
<td>'Super Ran Bolgar'</td>
</tr>
<tr>
<td>'Augusta'</td>
<td>'Fanny'</td>
</tr>
<tr>
<td>'Ganita'</td>
<td>'Lilla'</td>
</tr>
</tbody>
</table>
Ranking of the tested table grape cultivars

Based on a description of the cultivars with 25 culture technical parameters and 36 technological parameters the quality of the cultivars was possible to rank. Each of the parameters were arranged on a 1-9 scale with 1 being the poorest, less wanted, less attractive and 9 the best, most wanted, most attractive. Examples of culture technical parameters:

- C1 Vigor
- C2 Growth habitus
- C3 Formation of laterals
- C6 Fruit fullness from the second eye
- C8 Need of cluster shaping
- C11 Need of berry thinning
- C14+C15 Resistance to early and late bunch necrosis
- C17 Resistance to perenospera
- C20 Resistance to skin cracking
- ….

Examples of technological parameters:

- T1 Cluster length
- T4 Cluster uniformity
- T5 Cluster weight
- T9 Berry shape
- T10+11+12 Skin color (10: green cv, 11 red cv and 12 blue cv)
- T19 Resistance to pressing until skin fracture
- T20 Pits (level of….
- T23 Sugar content when ripe
- T24 Acid ….  
- T30-32 Aroma (30: type, 31: balance, 32: intensity)
- T33 Aftertaste (flavor)
- T34 Harvest time
- T35 Harvest duration
- ….
### Very high ranked cultivars

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Ripe from</th>
<th>Skin color</th>
<th>Resistance to diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Augustostuzi Muskotaly</td>
<td>36</td>
<td>Light yellow</td>
<td>High</td>
</tr>
<tr>
<td>Conegliano 218</td>
<td>36</td>
<td>Blue with dark violet</td>
<td>Medium</td>
</tr>
<tr>
<td>New York Muscat</td>
<td>37</td>
<td>Blue with dark violet</td>
<td>High</td>
</tr>
<tr>
<td>Muscat Bleu</td>
<td>38</td>
<td>Deep blue</td>
<td>High</td>
</tr>
<tr>
<td>Lilla</td>
<td>38</td>
<td>Green with yellow tint</td>
<td>High</td>
</tr>
<tr>
<td>Galanth</td>
<td>38</td>
<td>Deep blue</td>
<td>High</td>
</tr>
<tr>
<td>Bosnerinen</td>
<td>38</td>
<td>Blue with dark violet</td>
<td>Medium</td>
</tr>
<tr>
<td>Palatina</td>
<td>38</td>
<td>Golden with amber tint</td>
<td>High</td>
</tr>
<tr>
<td>Evita</td>
<td>39</td>
<td>Green with yellow tint</td>
<td>Medium</td>
</tr>
</tbody>
</table>

Sugar content is in all high (score 7) = about 19 % brix
Acid levels medium to high (score 5-7) between 6 to 6.8 g/L
High ranked cultivars

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Ripe from Week</th>
<th>Season</th>
<th>Skin color</th>
<th>Resistance diseases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eszter</td>
<td>35</td>
<td>Early</td>
<td>Deep blue</td>
<td>High</td>
</tr>
<tr>
<td>Augusta</td>
<td>36</td>
<td>Early-medium</td>
<td>Yellow</td>
<td>Medium</td>
</tr>
<tr>
<td>Super Ran Bolgar</td>
<td>36</td>
<td>Early-medium</td>
<td>Warm yellow</td>
<td>Medium</td>
</tr>
<tr>
<td>Osella</td>
<td>36</td>
<td>Early-medium</td>
<td>Deep blue</td>
<td>High</td>
</tr>
<tr>
<td>Sophie</td>
<td>38</td>
<td>Medium-late</td>
<td>Light yellow</td>
<td>High</td>
</tr>
<tr>
<td>Fanny</td>
<td>38</td>
<td>Medium-late</td>
<td>Green with yellow tint</td>
<td>High</td>
</tr>
<tr>
<td>Festivee</td>
<td>38</td>
<td>Medium-late</td>
<td>Blue with dark violet</td>
<td>Medium</td>
</tr>
<tr>
<td>Jakobsberger</td>
<td>38</td>
<td>Medium-late</td>
<td>Yellow</td>
<td>Medium</td>
</tr>
<tr>
<td>Garant</td>
<td>38</td>
<td>Medium-late</td>
<td>Green with yellow tint</td>
<td>High</td>
</tr>
<tr>
<td>Muscat Garnier</td>
<td>39</td>
<td>Late</td>
<td>Blue with dark violet</td>
<td>Medium</td>
</tr>
<tr>
<td>Georg</td>
<td>39</td>
<td>Late</td>
<td>Deep blue</td>
<td>High</td>
</tr>
<tr>
<td>Philipp</td>
<td>40</td>
<td>Late-very late</td>
<td>Deep blue</td>
<td>High</td>
</tr>
</tbody>
</table>

Sugar content between (score 6-7) = about 18-19 % brix
Acid levels between (score 5-8) about 6 - 7,3 g/L

Example of a full cultivar description based on the evaluations

Cultivar: AUGUSTA

Origin:
New cultivar from Rumaenia (Institut Agronomic "N. Balcescu", Bukarest, of M. Georgescu, 1984), from a cross of ‘Italia’ and ‘Königin der Weingarten’.
‘Augusta’ provides a qualitative and quantitative improvement in relation to its famous parents. It is interesting primarily for commercial growing under foil, but can also be grown in field in protected conditions (wall, garden).

Morphologic characteristics:
YOUNG SHOOT TIP: Almost open; Light green color; Few hairs.
ADULT LEAF: Length and width just below medium; Round shaped with dark green upper side; Almost flat; Thin; Very few hairs both on the upper and the lower leaf sides; Hand looped; Petiole sinus slightly open (lyre shaped); Medium long leaf stalk with medium hairs.
CANE: Furrowed bark; Round transversal cut; Yellow colored bark; Few bark lenticels; Thin internode; Internode length just below medium and with medium hairs; Node diameter medium and medium hairs; Shoot strength when bending until breakage is just above medium.

Culture technical characteristics:
GROWTH: Medium vigor; Medium development of laterals; Upright growth; Not a high need for shoot topping before flowering; No need for extra laterals after verison; Above medium fruit fullness from eye no 2; Good fruit setting; No need for cluster shaping; Tight cluster; Above medium need off berry thinning; Berry uniformity is medium;
ROBUSTNESS: Need of supplementary fertilizer (Mg) above medium; Below medium resistant against EBSN; Good resistance against NBSN; resistance against Oidium, Perenospera and Botrytis is above medium; Good resistance against berry cracking and sunburn; Ripens after approx. 80 days from flowering (group 5 = medium = week 37 in plastic tunnel); Grafting on S04; Winter resistance is above medium; Productivity above medium.

Technological characteristics:
CLUSTER: Length is above medium; Normal conic shape without wings; Harmonic geometry; Cluster circumference is uniform over medium; Large cluster weight (780 g).
BERRY: Below medium berry stalk length; Very large berry weight; Below 15 berry/100 g; Small elliptic berry shape; Straw yellow berry skin color and golden on the sun exposed side; Berry skin thickness above medium; Skin is fully adherent to the flesh; The wax layer is well formed and good visible; Berry skin is easy to bide through and very crunchy; The berry flesh is almost whitish-green colored and with a very fine crunchy structure (crunchy with a "high sound"); Fleshy and still juicy, very high eating quality; Good resistance against pressure; Soft and not disturbing pits; The berry stalk is yellow-green, not lignified, thin and delicate, attractive; The berry resistance against detachment is above medium.
TASTE: Sugar content above medium; Acid content medium; Fine balanced S/s-index; Medium sweetness level; Above medium sourness degree (fresh); Above medium astringency (pleasant tannin).
AROMA: Fresh fruit with almost neutral character (apple, cherry); Acceptable balance between taste and aroma; Medium short aftertaste.
HARVEST: Begins in week 37 (plastic tunnel); The length of the harvest period when kept on the wine in plastic tunnel is above medium (approx. 6 weeks); Above medium resistant to aroma degradation during the storage period.