



GRAPE HYACINTHS AS POT PLANTS

Choice of right variety and proper planning are important

Varieties for producing pot plants

Muscari armeniacum and its cultivars are most often used for producing grape hyacinths as pot plants. In recent years, however, certain cultivars of *Muscari aucheri* ('Blue Magic', 'Ocean Magic' and 'White Magic') have become available. The advantage offered by these 'Magic' grape hyacinths is shorter leaves.

Scheduling the flowering period

Muscari armeniacum can be forced into bloom from January through April. After lifting and drying, the bulbs are stored at 20°C, the temperature at which flower initiation occurs most quickly. For late-season flowering (March/April) the bulbs should be stored at 17°C from 1 October. A cold period lasting 15 to 16 weeks is necessary for proper flower production. Do not start the cold period before the

end of August. Compared with other bulbous plants, flower initiation in grape hyacinths occurs a little later in the season. Starting the cold period too soon will prevent all the individual flowers in the inflorescence from being initiated. For forcing purposes, this will result in inflorescences with a white top and desiccated flowers. The earliest bloom requires 16 weeks of cold to produce good flowering results without flower desiccation. Bulbs intended for flowering in February can be held a week less in cold storage and still produce good flowering results quickly. Store the bulbs under dry, ventilated conditions. If the RH is too high, fungal growth (Penicillium, etc.) can appear on the bulbs. In the early stages, the symptoms will only result in a less attractive bulb. Eventually, however, the fungus can damage the bulb enough to keep it from growing properly.



Prevent tall leaves by lowering cold treatment temperature or planting later

Using cold treatment to prevent tall leaves: should bulbs be stored dry or planted?

An important point to consider when forcing *Muscari armeniacum* is its leaf development. In some cases, the leaves can grow taller than the flowers, thus making the pots look unattractive. When the bulbs are planted before they go into cold treatment and spend this entire time in a planted state, their leaves will grow too tall. There are two ways to prevent excessively tall leaves. A commonly used method is to leave the bulbs unplanted and maintain a constant temperature of 9°C during the cold treatment until 4 to 6 weeks before housing. At that point, plant the bulbs and continue the remaining cold treatment at 9°C to allow the bulbs to root. Another method is to lower the temperature of the cold period in steps: start the cold period at 9°C for the first 4 to 5 weeks; then lower it to 5°C and even to 1-2°C later. This

procedure will retard leaf development. Do not, however, subject the bulbs to 2 to 5°C throughout the cold period because this will result in a very long housing period and tall leaves. Some companies, however, leave the bulbs unplanted throughout the entire cold period. After planting, the pots are put into the greenhouse but are kept there at a temperature not exceeding 10°C. Should the greenhouse temperature be too high, the leaves can emerge before the roots develop, thus resulting in desiccated flower buds. The major advantage of forcing grape hyacinths at a cooler temperature is that the leaves remain short and spread out quickly to reveal the flower bud at the centre of the plant. This produces a visually attractive product, but forcing at this low greenhouse temperature will of course also increase the number of days spent in the greenhouse.



Proper care for the highest quality

Coordinating bulb size and planting density

Various bulb sizes are available for forcing purposes: 6/7, 7/8, 8/9, 9/10 and 10/+ cm. in circumference. For *Muscari armeniacum*, sizes 6/7 and 7/8 will usually produce one flower stem/bulb. Size 8/9 will produce an average of 1.5 to 2 flower stems/bulb, and sizes 9/10 and 10/+ will produce 2 to 3 flowers. Table 3 provides an indication of the number of bulbs/pot.

Number of greenhouse days

The two important factors determining the number of greenhouse days are the temperature and the degree of maturity at which the pots will be sold. If the grape hyacinths are to be sold as sprouted bulbs, they sometimes require only a few days in the greenhouse at 18°C. The other extreme is waiting until the buds start to display colour; in this case the pots will be housed in a cold greenhouse (10-12°C). Depending on the season, this can take 3 to 5 weeks (see Table 2).

Table 2. Cold treatment (both duration and temperatures) for each flowering period. The length of the housing period is based on a greenhouse temperature of 9°C.

BLOOM DATE	COLD TREATMENT	START OF COLD TREATMENT	HOUSING PERIOD AT 18°C
January	16 wks. 9°C or 5 wks. 9°C + 11 wks. 5°C	Mid-August to mid-September	5 weeks
February	15 wks. 9°C or 4 wks. 9°C + 10 wks. 5°C	2 nd half of September to mid-October	4 weeks
March	15 wks. 9°C or 4 wks. 9°C + 10 wks. 5°C	2 nd half of October to mid-November	3.5 weeks
April	15 wks. 9°C or 4 wks. 9°C + 10 wks. 5°C	December	3 weeks

As mentioned under 'Varieties for producing pot plants', the leaves of *Muscari aucheri* (the 'Magic' cultivars) are genetically shorter than those of *Muscari armeniacum*. The cultivars of this species are usually potted up a few weeks earlier without having to be concerned about tall leaves.



Plant carefully and monitor moisture level

Grape hyacinths sold as pot plants are usually planted with their noses just above the soil surface so that consumers can see that they are bulb plants. This also ensures additional ornamental value. Make sure, however, that no more than 1/3 of the bulb is exposed. Leaving too much of the bulb above the soil surface can result in uneven rooting rates that will then lead to uneven crop development. Watering the bulbs thoroughly or immersing them before planting stimulates even rooting and prevents uneven crop development.

Provide sufficient light and water with care

Once housed, water the bulbs once but thoroughly and then keep the soil moist but not too wet. Wet soil increases the risk of Pythium, a soil-borne fungus. A drier soil will produce beautiful short dense plants. Not providing enough water, however, will produce a very uneven crop. If the bulbs are sufficiently rooted when brought into the greenhouse, a temperature of 18°C is best. If the bulbs are not yet sufficiently rooted, the greenhouse temperature should be kept a few degrees lower to prevent flower desiccation. Provide high light intensities in the greenhouse to promote flowers with good colour. A greenhouse that provides insufficient light will result in light blue flowers. Make sure that the soil in the pots is sufficiently moist so that the plants will have enough moisture during the marketing and distribution phase.

Table 3. Number of bulbs/pot.

BULB SIZE	POT SIZE			
	9	10	12	16
10/+	4	5	6	12
9/10	5	6	8	15
8/9	6-7	7-8	9-10	17
7/8	7	8	10	20
6/7	8	9	11	21

PRODUCING GRAPE HYACINTHS (AS CUT FLOWERS AND POT PLANTS)

PRACTICAL TIPS FOR

- ARRIVING AT A WELL-CONSIDERED CHOICE OF CULTIVAR, BULB SIZE AND POT SIZE
- TREATING THE BULBS PROPERLY BEFORE THE PRODUCTION PROCESS
- PROVIDING THE RIGHT HORTICULTURAL PRACTICES TO YIELD A COMPACT PLANT FOR CUT FLOWER AND POT PRODUCTION
- PREVENTING PROBLEMS THROUGHOUT THE PRODUCTION PHASE



Choice of right variety and proper planning are important

Varieties for producing cut flowers

Although there are several varieties of Grape Hyacinth, *Muscari armeniacum* and certain of its cultivars are the ones primarily used for producing cut flowers. *Muscari latifolium*, however, is also sometimes used. This manual focuses on the use of *Muscari armeniacum*.

Scheduling the bloom period

Muscari armeniacum can be forced into bloom from January through April. After lifting and drying, the bulbs are stored at 20°C, the temperature at which flower initiation occurs most quickly. For late-season bloom (March/April) the bulbs should be stored at 17°C from 1 October. A cold period lasting 15 to 16 weeks is necessary for proper flower production, but an extra week of cold is acceptable. Do not start the cold period before the end of August. Compared with other bulbous plants, flower initiation in

grape hyacinths occurs a little later in the season. Starting the cold period too soon will prevent all the individual flowers in the inflorescence from being initiated. For forcing purposes, this will result in inflorescences with a white top and desiccated flowers. The earliest bloom will require at least 16 weeks of cold to produce good flowering results without flower desiccation while still keeping the number of days in the greenhouse to a minimum. Bulbs intended for flowering in February can be held a week less in cold storage and still produce good flowering results quickly. Until the cold period begins, store the bulbs under dry, ventilated conditions. If the RH is too high, fungal growth (caused by *Penicillium* or other fungi) can appear on the bulbs. In the early stages, the symptoms caused by *Penicillium* will only result in a less attractive bulb. Eventually, however, the fungus can damage the bulb enough to keep it from growing properly.

Table 1. Cold treatment (both duration and temperatures) for each flowering period. The length of the housing period is based on a greenhouse temperature of 18°C.

BLOOM DATE	COLD TREATMENT	START OF COLD TREATMENT	HOUSING PERIOD AT 18°C
January	16 wks. 9°C or 5 wks. 9°C + 11 wks. 5°C	End of August to mid-September	3 - 3.5 weeks
February	15 wks. 9°C or 4 wks. 9°C + 10 wks. 5°C	2 nd half of September to mid-October	2.5 - 3 weeks
March	15 wks. 9°C or 4 wks. 9°C + 10 wks. 5°C	2 nd half of October to mid-November	2.5 - 3 weeks
April	15 wks. 9°C or 4 wks. 9°C + 10 wks. 5°C	December	2 - 2.5 weeks



Prevent tall leaves by lowering cold treatment temperature or planting later

Using cold treatment to prevent tall leaves: should bulbs be stored dry or planted?

An important point to consider when forcing *Muscari armeniacum* is its leaf development. In some cases, the leaves can grow taller than the flowers, and this makes it difficult to harvest the flowers. When the bulbs are planted before they go into cold treatment, and spend this entire time in a planted state, their leaves will grow too tall. There are two ways to prevent excessively tall leaves. The first is to lower the temperature of the cold period in steps: start the cold period at 9°C for the first 4 to 5 weeks; then lower it to 5°C and even to 1-2°C later. This procedure will retard leaf development. Do not, however, subject the bulbs to 2 to 5°C throughout the cold period because this will result in a very long housing period and tall leaves. A second method is to leave the bulbs unplanted and maintain a constant temperature of 9°C during the cold treatment until 4 to 6 weeks before housing. At that point, plant the bulbs and continue the remaining cold treatment at 9°C to allow the bulbs to root. Leaf development will then be retarded because the root system will not be as fully developed after just 4 to 6 weeks of rooting.

Bulb size and planting density

Various bulb sizes are available for forcing purposes: 6/7, 7/8, 8/9, 9/10 and 10/+ cm. in circumference. Sizes 6/7 and 7/8 will usually produce one flower stem/bulb. Size 8/9 will produce an average of 1.5 to 2 flower stems/bulb, and sizes 9/10 and 10/+ will produce 2 to 3 flowers. For cut flower production, the smaller sizes are often preferred because harvesting more than one flower from a single bulb (when these flowers usually mature in rapid succession) is difficult. As to planting density, the bulbs are usually planted almost touching one another. Depending on bulb size, this will mean a planting density ranging from 1000 to 400/m².



Provide sufficient water, but not too much

Plant carefully

The bulbs are usually planted in forcing boxes (containers measuring 60 x 40 cm.). A non-specific potting soil mixture similar to that used for forcing tulips, daffodils and hyacinths is also suitable for grape hyacinths. Ten percent sand is often added to the potting soil to assist proper drainage of excess water. Plant the bulbs just beneath the soil surface or with the tip of the nose just above the soil. After planting, water the bulbs and soil once thoroughly. This promotes fast uniform rooting and will produce uniform crop development. Ensure that the soil remains moist but not too wet during the cold period. If the bulbs are planted outside, make sure that the soil is properly drained and cannot dry out. Mulch with straw so that the bulbs will not freeze during the winter but can be housed later.

Sufficient light during housing

Once housed, keep the soil moist but not too wet. Wet soil increases the risk of *Pythium*, a soil-borne fungus that can damage the roots, and this must be prevented. Not providing enough water, however, will produce shorter plants that

would be undesirable for use as cut flowers. If the bulbs are sufficiently rooted when brought into the greenhouse, a greenhouse temperature of 18°C is best. If the bulbs are not yet sufficiently rooted, the greenhouse temperature should be kept a few degrees lower to prevent flower desiccation. Provide high light intensities in the greenhouse to promote flowers with good colour. A greenhouse that provides insufficient light will result in light blue flowers.



Attractive presentation of the bunch

Harvesting takes place when a few of the individual flowers in the inflorescence are displaying good colour. Sometimes, only the flower stems are harvested and then bunched 10 to a bunch. At other times, the leaves are cut as well and included in the bunch. If the latter is the case, make sure that the flowers project above the leaves in the bunch. This may take more work but presents the product more attractively. To prevent the tops of the inflorescences from growing crookedly, always place the bunches of grape hyacinths in an upright position. If stored and transported under refrigeration, placing the bunches in water is not necessary. The product is not suitable for long storage.



Optimum production conditions prevent problems

Two fungal diseases can occur when producing grape hyacinths for pot plants and for cut flowers. Proper production conditions and effective monitoring can help prevent many problems.

CAUSE		SYMPTOMS	PREVENTION/CONTROL
Penicillium (a storage fungus)		During storage, a <i>Penicillium</i> infection is displayed as a white and later blue-green fungal weft on the bulb tunics. The fungus can penetrate the bulb through the bulb scales or the basal plate. An infection is usually found at spots where the bulb had received mechanical damage. If the fungus penetrates the bulb, the bulb tissue turns soft, grey and spreadable. Eventually, the entire bulb disintegrates. (Storage Rot)	Avoid mechanical damage to the bulbs. Provide sufficient air circulation and keep the RH below 80-85% both during storage and when dry bulbs are receiving their cold treatment.
Pythium (a soil-borne fungus)		This fungus attacks the roots, resulting in the partial or entire rotting of the roots. This damage to the roots hinders water absorption and plant development. (Root Rot)	When growing under natural conditions, grape hyacinths are not susceptible to this fungus. Excessively wet potting soil, however, can lead to an attack by <i>Pythium</i> . Using well-draining potting soil and avoiding overwatering will usually prevent these problems.



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