

Proper greenhouse climate with plenty of light

Managing greenhouse climate

Once planting is completed, keeping the soil at the right temperature is important. It should not be any lower than 5 to 8°C but not higher than 20°C. The optimum soil temperature is 15°C. Low soil temperatures will increase production time. High soil temperatures will reduce the forcing time but will also produce shorter plants. In the field, the optimum air temperature is 15 to 17°C; in the greenhouse, 12 to 17°C. In the Netherlands, for greenhouse production of ‘Blue Magic’, a temperature of 18°C is maintained for the first three weeks after planting and then kept at 15°C until harvest. The minimum temperature that irises can tolerate is 0°C and the maximum average daily temperature is 20°C.

Light is important for growth

Irises are sensitive to insufficient light intensity. Too little light can result in culls due to flower blast. During the

winter only plant irises in greenhouses with good light levels. Make sure that the glass or plastic film is clean. Replace old plastic. Encourage a healthy root system by frequent irrigation. Reduce greenhouse temperature during periods of low light levels to reduce growth rate. Excessively rapid growth during periods when the plant is growing slowly also increases the risk of flower blast. Avoid fluctuating greenhouse temperatures. The RH in the greenhouse can be reduced by adding heat combined with improving ventilation. This increases transpiration rate and decreases the risk of flower blast. Flower blast can occur during any stage of growth. It does not become evident until the flower bud fails to swell and a hollow leaf bud can be felt. Although the exact cause of flower blast is not known, periods of too little light, high temperatures and low RH increases the risk. Insufficient irrigation during production also leads to an increased risk of flower blast and pale flowers.

Careful harvesting and clearing out

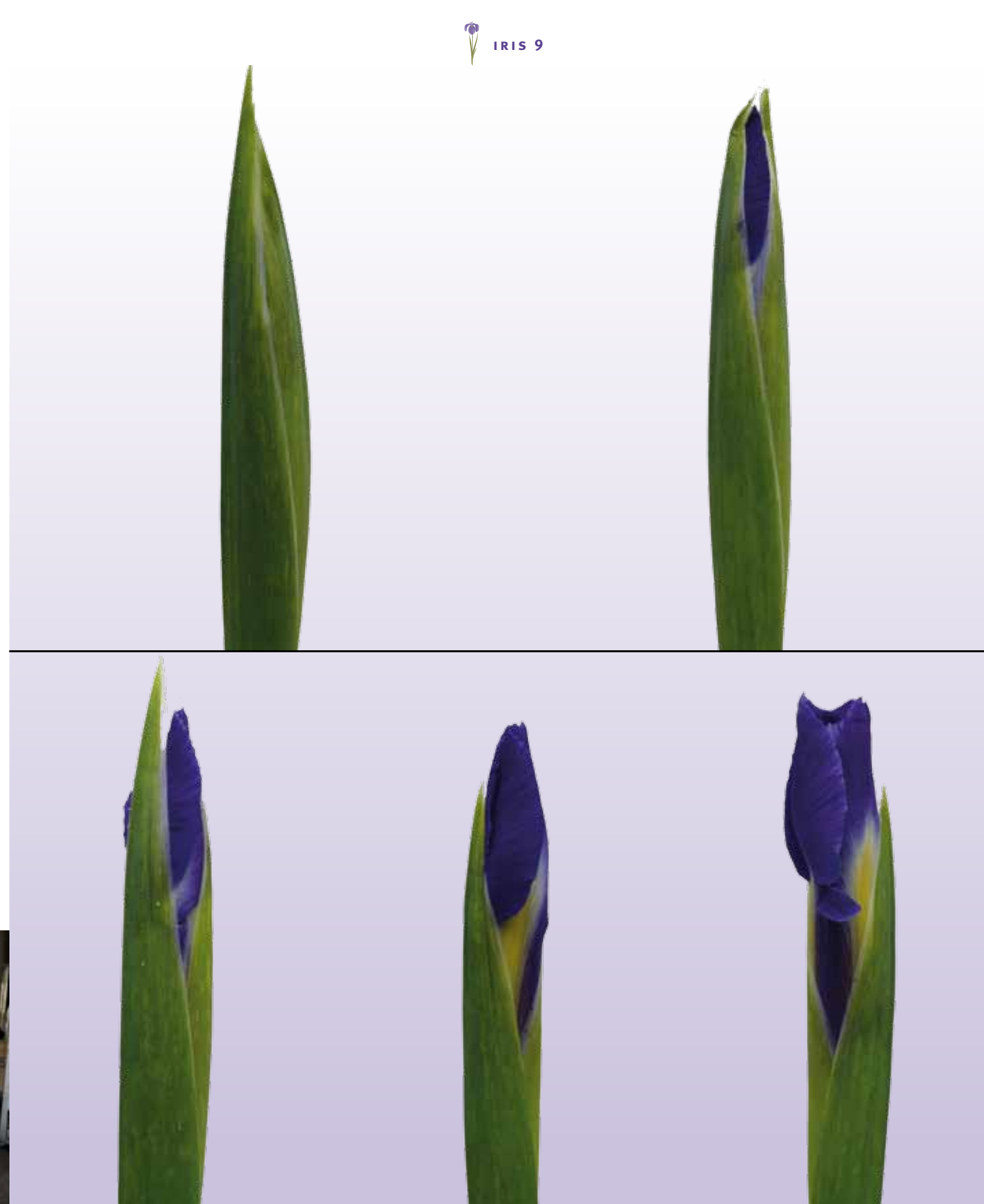
Harvest, processing and storage

Harvesting irises at the right time is crucial for flower opening and keeping quality. The correct time to harvest is as soon as the irises show colour. During the winter when light levels are low, irises have to show more colour before harvesting than during the summer. In general, harvesting once a day is sufficient. Under warm conditions during the summer, whether producing in the field or the greenhouse, harvesting twice a day may be necessary to obtain a more uniform product. The flowers are harvested by pulling the plants up bulb and all. Irises sometimes produce leaves that are too long or have withered, yellowish-brown leaf tips. These should be removed because they reduce ornamental value. Leaf tipping is easiest to do after bunching. It is usually done with a small knife. After bunching (and possibly binding) the flowers, it may still be necessary to remove dirt and mud from the lower

parts of the stems by rinsing in water. The flowers are then put into buckets of water and placed in cold storage. The optimum storage temperature is about 2°C. Having a cold store is absolutely essential. Keep the cold storage period to a minimum as it will reduce quality. Proper opening and keeping quality of irises can be improved by post-harvest treatment with BVB (Pokon & Chrysal).

Clearing out after harvest

After harvest, the support netting can be rolled up and hung up in the greenhouse. If the next crop is to be planted immediately without applying a general soil treatment first, it would be advisable to remove all leaf debris and bulbs from the soil. This should be done to prevent an increased risk of Fusarium, leaf blight or bacterial disease. If the soil is to receive a general soil treatment first, any remaining bulbs can be ploughed in.



Proper control prevents problems

CAUSE		SYMPTOMS	PREVENTION /CONTROL
Penicillium (Fungus)		Bulbs can become diseased during storage and transport. The bulb turns a grey-brown beginning at the root crown. Diseased bulb tissue is covered with a grey-green mass of spores. Diseased bulbs emerge late, if at all, and produce poor, if any, roots.	<ul style="list-style-type: none">Remove diseased bulbs during the planting process.Plant in moist soil to accelerate rooting and wound healing.
Fusarium (Fungus)		Diseased plants display crooked shoots. Bulb scales turn soft starting at the base and later turn grey-brown, sometimes covered with a fungal web. The base of the flower stem inside the bulb remains intact for a long time and often has a characteristic corrugated surface. If the plant is affected later in its development, growth is halted and the flower bud desiccates or turns pale.	<ul style="list-style-type: none">Remove diseased bulbs. Dip the bulbs in a fungicide immediately before planting.Infection from sources in the soil can be prevented by planting in fresh soil. Use crop rotation or apply a general soil treatment as needed.
Pythium (Soil-borne fungus)		The roots are infected during production by a fungus found in the soil. Growth among affected plants is retarded and flower buds desiccate. Some or all of the roots in the root system turn watery, rotten and sometimes brownish; this transformation usually starts at the tips.	<ul style="list-style-type: none">Use crop rotation; if this is not possible, apply a general soil treatment.Prevent wet areas by not watering too much at any one time.
Rhizotonia (Soil-borne fungus)		Damaged shoots look as if they have been eaten away. Growth among affected plants is retarded and the outermost leaves are the first to wilt. At a later stage, the entire plant will die off.	<ul style="list-style-type: none">Use crop rotation; if this is not possible, apply a general soil treatment.Keep the soil surface dry. Watering is best done in the morning.
Erwinia (Bacteria)		Affected plants display retarded growth. The sheathed leaves located just above the bulbs are watery and dark green in colour. The plant sometimes falls over. The shoot can easily be pulled from the bulb. Diseased bulbs may look healthy from the outside but when cut open will display a yellowish-white smelly mush.	<ul style="list-style-type: none">Do not work any plant remnants from a previous crop into the soil.Prevent the soil from crusting over.Be careful when irrigating; bacteria located on the soil surface can easily be spread by water splashing upward.



PRODUCING DUTCH IRISES FOR CUT FLOWERS

PRACTICAL TIPS FOR

- ▶ DECIDING ON THE RIGHT CULTIVAR AND PRODUCTION SCHEDULING
- ▶ EFFECTIVELY TREATING BULBS
- ▶ USING THE RIGHT GROWING CONDITIONS FOR CUT FLOWER PRODUCTION
- ▶ PREVENTING PROBLEMS DURING PRODUCTION



The right starting material and proper treatment

The minimum sieve size for saleable bulbs varies according to the type of bulb. Small bulbous-rooted irises are supplied in sieve sizes starting at 6 cm whilst large bulbous-rooted irises are supplied in sieve sizes starting at 7.5 - 8 cm. Bulbs sold for floriculture have never produced flowers during bulb production. These saleable bulbs are round and enclosed in three to four brown tunics that protect them from surface damage and drying during storage. There are saleable bulbs, however, that have produced flowers during bulb production. These can be recognised by their rather flat shape and a deep groove on one side where the flower stem was located. These bulbs are more vulnerable to desiccation and surface damage because they have only one tunic. Flat bulbs should be discarded.

Synchronising bulb treatment with flowering

The larger the sieve size, the greater the chance of complete leaf and flower initiation. Leaf and flower initiation, however, has to be stimulated by proper temperature treatment. The bulb supplier gives the bulbs a treatment designed to correspond with the location where the bulbs will be grown for flower production. By applying a combination

of temperatures, the preparation treatment will be coordinated to the development of the leaves and flower and their rate of growth. The preparation varies according to the time of year, production region, light intensity and temperature regime.

Storage of the bulbs after receipt

The supplier disinfects the iris bulbs before preparing them. The bulbs can be planted immediately upon arrival, but disinfecting them again before planting provides the best results. If immediate planting is not possible, the bulbs can be stored for up to two weeks at 2°C (no higher than 5°C). Storing the bulbs for too long increases the risk of damage from *Penicillium*. The supplier can also prepare iris bulbs in the Netherlands and then transport them in ice at -1.5°C. After thawing them, these bulbs can also be planted immediately. If not planted immediately, the bulbs can be stored an additional few weeks in ice. Iris bulbs can be forced in ice for about 8 weeks, including the number of weeks in transport. For more information about this, consult your supplier.

Careful scheduling and determining planting density

Year round production

With the right choice of cultivars and preparation treatments, these bulbs can be forced into flower year round. Depending on the climate, irises can be grown for flower production outdoors in the field, in plastic-covered tunnels or in greenhouses. The bulb size and planting density depends on the temperature and light level. In the summer, when temperatures and light intensities are high, smaller bulb sizes can be used than during the winter. The preparation of the iris bulbs and their planting density in the field are adjusted to these conditions. An important advantage of growing irises in greenhouses is that fluctuating weather conditions will have less impact on plant quality. Quality can be improved by the proper management of the greenhouse climate. Field production of irises is not possible in regions where frequent ground frosts occur. Producing irises takes about 8 to 12 weeks depending on the cultivar and the production conditions (field or greenhouse).

In the Netherlands, planting iris bulbs in the field for flower production can be done from early March through mid-July. Covering bulbs planted in March with plastic or horticultural fleece can reduce production time by a few weeks.

Planting density depends on the cultivar

Iris bulbs can be planted in chrysanthemum flower netting which is available in various lengths and widths. Openings in the netting measure 12,5 x 12,5 cm. The number of bulbs planted per opening is usually 3-5.

Iris bulbs can be categorised roughly into three types:

- Large bulbous-rooted irises ('Discovery' and 'Telstar' types)
- Large bulbous-rooted irises ('Blue Magic' types)
- Small bulbous-rooted types

The planting density selected varies according to bulb type, cultivar, planting date and production region. The preparation of the bulbs is another factor in planting density. With all these factors, it is difficult to provide a general recommendation for planting density for the various cultivars, bulb types and planting dates. In general, 3-5 bulbs are planted in each opening in the netting, which amounts to 256 bulbs per net m².

The right soil and fertiliser

Healthy soil is the best growing medium

Most soils are suitable for iris flower production but it is important to provide the soil with an effective drainage system. The soil must have been thoroughly worked and free of any hard (pan) layers. It is also important that the soil is not vulnerable to crusting over since this can result in wet spots which produce undersized bulbs. In principle, it is quite possible to produce irises in succession on the same soil. In between, another crop must be produced or the soil will have to undergo a general soil sterilisation such as steaming. If problems are anticipated in iris production (e.g. *Fusarium*) it would be advisable to apply a general soil treatment in advance. For field production of irises, fresh soil is recommended.

Be careful with fertilising

Due to the salt sensitivity of iris, applying a base dressing before planting is not advisable. Depending on the analysis of a soil sample, a small application of calcium nitrate may be advisable. Under conditions of high light intensity, the crop remains shorter. This is why a base dressing of 750 kg/ha of 12-10-18 is often applied to the soil prior to field production. Four weeks after planting, 250 kg/ha of calcium nitrate is applied to the irises. During the winter, irises are usually forced in greenhouses. Insufficient light intensity at this time will result in irises with excessive foliage and leaves longer than the flower stem. Since applying fertilising stimulates vegetative growth, it is practically never applied in greenhouse production.

High salt concentrations in the soil can be dangerous

The iris is a salt-sensitive crop. Excessively high salt concentrations in the soil often occurs after growing a crop requiring large quantities of fertiliser. A high salt concentration (> 1.0 mS/cm) will result in root burn that can lead to reduced moisture uptake resulting in flower blast. An excessively high salt concentration in the soil can be reduced by flushing the soil with 200 to 400 mm of water before planting.

Control weed development carefully

Proper management of moisture levels is important

To provide the roots with the proper moisture level it is important to water the soil thoroughly before planting. Watering should be done again immediately after planting to ensure that the soil comes into close contact with the bulb and roots. The soil must be kept sufficiently moist during production. Very dry soil during production will hinder growth and keep plants short. The quantity of water to be provided depends on the soil type, rate of growth, greenhouse climate and the crop's stage of development. It is impossible to provide a clear guideline. Providing too much water all at once can lead to problems with fungal diseases. This can be prevented by using drip irrigation for watering. Check the soil frequently to determine its moisture level.

Control weeds before they become a problem

For good yields, it is important to control weed growth during production. Weeds can be hosts for many diseases and increase the risk of damage to the crop. Ideally bulbs should be planted in soil free from pathogens and weeds.

Weed control is achieved by applying a pre-emergence application of a herbicide. Weeds can also germinate after the emergence of the irises and this usually occurs in three germination waves. Start spraying once the first weeds are visible and repeat for each new germination wave. Remove large weeds by hand.

Planting depth and mulching

The soil in which the iris bulbs will be planted must be thoroughly cultivated. Plant the bulbs so that they are covered by 5 to 7 cm of soil. The higher the temperature, the deeper the bulbs should be planted, but never deeper than 7 cm. Preventing excessively high soil temperatures can be achieved by mulching with a layer of straw, wood chips or sawdust after planting.



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