

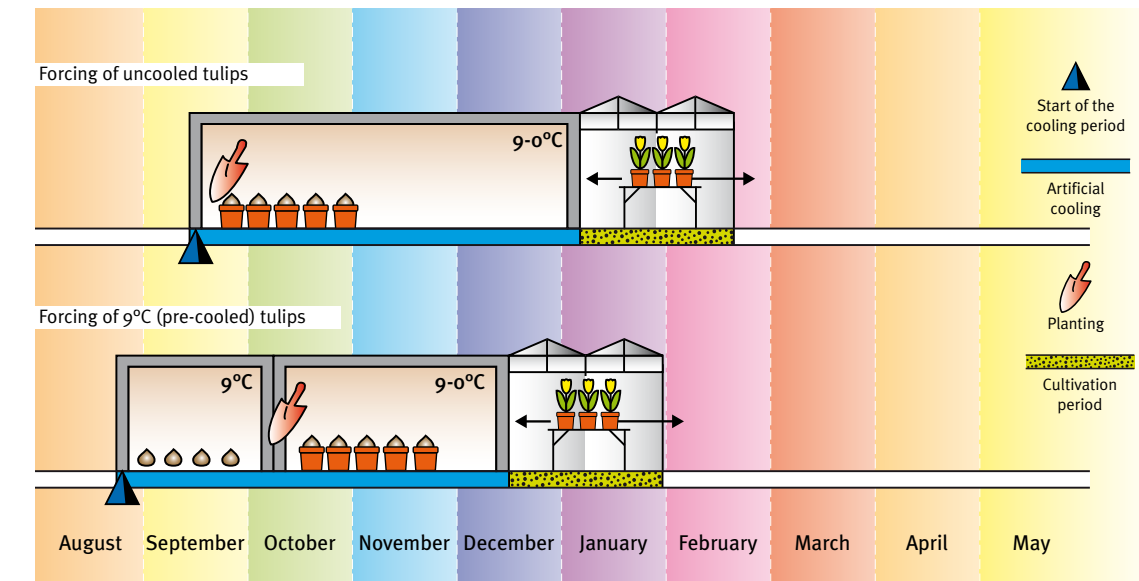
A forcing schedule makes it easier to plan

It is possible to draw up a forcing schedule as based on the duration of the required cold periods. To have marketable tulips in pots by the beginning of March, the number of weeks spent in the greenhouse and the number of weeks for the cold period must be subtracted to arrive at the proper planting date (which is also the beginning of the cold period). If the objective is to produce pot tulips over much of the winter, tulips can be planted and housed weekly. At some forcing operations, all the pot tulips receive a standard 14-week cold period so that planting and housing are done every week. Others try to get everything planted in November and then transfer the bulbs temporarily to a rooting room kept at 1 to -1°C when the shoots are tall enough.

The greenhouse period depends on the cultivar, the forcing period, and the greenhouse temperature. The length of the greenhouse period becomes shorter as the season progresses and depends on when the products are to be sold.

SAMPLE FORCING SCHEDULE

- Greenhouse period until the end of harvest: **3 weeks**
 - Cold period for cultivar: **14 weeks**
- Put tulips in refrigerated facility or plant them: **17 weeks before desired flowering period**



Once housed, be extra alert to how the crop develops

Housing

After receiving the entire cold period, the pots can be taken to the greenhouse. The greenhouse must admit enough sunlight to turn the shoots green. Upon housing, water the pots carefully and make sure that they remain moist. Too much or too little water results in root problems that can lead to the desiccation of flowers and leaf tips. Maintain a greenhouse temperature of 16 to 20°C and an RH of around 75%. Horizontally aimed fans in the greenhouse should ensure a uniform greenhouse climate and active crop transpiration.

The length of the greenhouse period is 2 to 4 weeks and depends largely on the cold period, greenhouse temperature, the cultivar and the forcing period (early or late). The greenhouse period is shortened by:

- a cold period that is longer and colder,
- a higher greenhouse temperature,
- or later forcing.

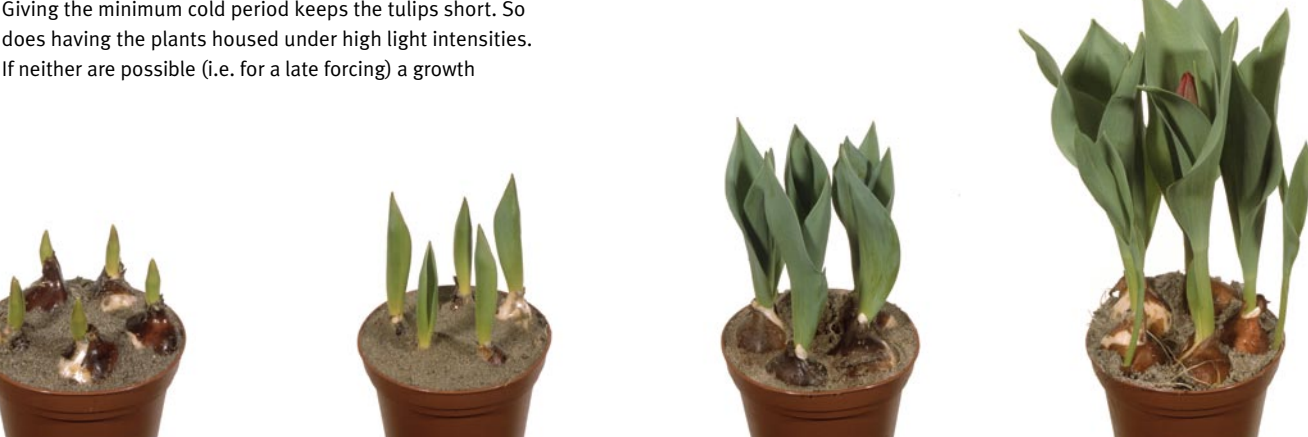
Ensuring a short crop

Giving the minimum cold period keeps the tulips short. So does having the plants housed under high light intensities. If neither are possible (i.e. for a late forcing) a growth

regulator such as Bonzi* (brand name) could be used. The application of growth regulators is not advisable for early forcing. Application: Make up a solution of Bonzi* according to the instructions and sprinkle upon housing. *** Warning:** Growth regulators (including the brand Bonzi) are not permitted in some countries. This agent is extremely persistent and remains in the soil for a long time. For this reason, be careful when reusing soil that has been treated with it.



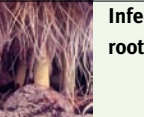



The right stage for selling

The pot plants are marketable from the time the shoots display a good green colour to the time the buds are displaying colour. The minimum stage of maturity for the Dutch flower auctions is indicated in a series of photo. The pots can be packaged in plastic sleeves along with a photo of the tulip and care tips. It is possible to postpone harvesting or store the pot plants in a refrigerated room at around 1°C (light is not necessary).



Using proper hygiene prevents problems

Many problems can be prevented by a careful choice of material and the proper handling of the bulbs before and during production. The following chart lists the leading pathogens and how to deal with them. In large part, working preventively reduces the risk of infections.

CAUSE		SYMPTOMS	PREVENTION/CONTROL
Botrytis cinerea (fungus)		Infected bulb scales Infected bulb scales are off-white to light brown. Rotten spots display white fungal weft and black sclerotia.	Prevent physical damage to the bulb and prevent roots from growing beneath the scales by loosening the root crown.
		Spotted shoots Upon housing, spots are found on the young yellow shoots.	Keep roots that emerge from the pot from drying out. Maintain a high (95%) RH in the rooting room by keeping the floor wet.
		Infected roots Roots at the bottom of the pot are glassy or display a dark brown root rot, sometimes with a white fungal weft and black sclerotia.	Prevent excessive root growth in the pot and use new or clean pots.
Rhizoctonia solani (soil-borne fungus)		Orange to brown spots on the young yellow shoot. As the leaves grow, they display splits and holes.	Use fresh potting soil and clean/new pots. Do not cover bulbs with soil but leave the noses uncovered.
Pythium (soil-borne fungus)		Roots display rot and brown stripes and break off easily. The plants remain short and thin. Flowering is poor or nonexistent. Flower blast can occur.	Use fresh potting soil and clean/new pots. Use clean containers or disinfect them first.
Trichoderma (soil-borne fungus)		Results in rotting roots. Infected roots break off easily, have a creamy colour and are sometimes covered in fungal hyphae. The leaves of infected plants start desiccating from the tip.	Limit excessive root growth by: <ul style="list-style-type: none">not planting too earlya lower temperature in the rooting roomputting sand at the bottom of the pot and also mixing sand through the potting soil



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GROWING TULIPS AS POT PLANTS

PRACTICAL TIPS FOR:

- CHOOSING THE RIGHT BULBS AND BULB TREATMENT
- SUCCESSFUL FORCING AND SCHEDULING
- PRODUCING POT PLANTS OF HIGH QUALITY





Choosing the right cultivar, bulb size and flowering period

Low-growing cultivars:

Not all tulip cultivars are suitable for use as pot plants. In fact, the best choices are limited to genetically low-growing cultivars or botanical tulips since these remain short and have dense habits. Some commonly used cultivars are listed in Table 3 but there are also more suitable, commercially available varieties. Keeping tulip plants short for use as pot plants can also be accomplished by reducing the length of the cold treatment or applying growth regulators such as Bonzi.

Choosing the right bulb size

Producing tulips in pots requires large bulbs of good quality. This is because the failure of even one bulb to emerge and flower properly results in the loss of a whole pot or one of second-grade quality.

For early forcing (flowering before 1 March), bulb sizes (sift sizes) 12+ are used; these sizes as well as smaller sizes (11/12) can be used successfully for later forcing. The exceptions to this rule are the tulip cultivars that produce genetically small bulbs such as the botanical varieties. For these varieties, sift sizes of 10/11 and sometimes even 8/9 (depending on the individual cultivars) are suitable. See Table 3.



Much can be controlled by the right temperature

Paying attention to temperature

For botanical and other low-growing cultivars, the preparation for producing pot plants is practically the same as for cut flower production. Do not, however, subject the bulbs to an excessively long cold period since this makes them too tall. Both uncooled bulbs as well as bulbs cooled to 9° - 2°C can be used for this purpose. The preferred method for early forcing is to refrigerate the bulbs in the dry state for part of their cold period and then to plant them two months before housing. This method prevents excessive root growth. Too many roots in the pot increases the risk of roots being damaged by fungi and involves a risk of abnormalities due to excessive moisture absorption, sweating and hollow stems.

Since these problems are unusual in late forcing, uncooled bulbs can be planted and then spend their entire cold period in the planted state. Excessive root growth can be prevented by applying lower temperatures after rooting.

Slower growth and a longer greenhouse period are typical of an early forcing period. When forcing for early flowering, a shortened cold period can sometimes even lead to flower blast.

For flowering at Christmas, special cultivars that have received a special treatment for this purpose are used.

Treatment after receiving the bulbs

It would be advisable to have the bulbs delivered when they are ready to plant. This eliminates the need for storage and the danger of storage damage.

If the bulbs cannot be planted or are not ready to plant upon delivery, they will have to be stored in a facility that is dry, cool and properly ventilated. Never store the bulbs in their original packaging. The best procedure, when using prepared bulbs that have already had a period of cold, is to keep them at the desired cold temperature of 9 or 5°C. Store uncooled bulbs at 17°C combined with dry conditions and a high air circulation rate until planting or keep them under refrigeration at 9, 5 or 2°C to complete the desired cold period. Consult with your supplier about these options.

Table 1. Optimum temperatures for dry and planted bulbs during the cold period.

PERIOD	TEMPERATURE
Until 20 October	9°C
20 October – 10 November	7°C
Starting on 10 November	5°C
Starting on 1 December	1 – 2°C



Use fresh potting soil and cover with mats to prevent problems

Provide good potting soil

The soil used to fill the pots must be of good quality and meet the following requirements:

- good water to air ratio (max. 80% water and at least 10% air)
- must not shrink
- pH 6-7
- EC < 1
- Fresh (free of pathogens)

A mixture of approx. 60% garden mould + approx. 40% peat soil is commonly used as potting soil. Added to this is 15% sand.

Applying fertilisers is usually unnecessary. Side dressing is needed only for cultivars that are subject to sweating and hollow stems. These cultivars, Monte Carlo and its sports being good examples, are side dressed with 0.5 kg calcium nitrate per m³ during forcing or 50 grams/ m² upon housing.

Number of bulbs per pot

Various kinds of plastic pots can be used for producing tulips in pots. The number of bulbs per pot depends on the size of the pot. One bulb is planted in 7 cm. pots; three or five bulbs are planted in round pots 9 to 13 cm. in diameter. What is important is to have at least 5 cm. of soil beneath the bulb for good rooting and for providing the roots with the proper amounts of water and air.



Good preparation: the basis for success

Synchronising planting time to flowering

The planting time depends on the desired flowering period. Planting must be done early for early flowering around Christmas or in January. As a rule, the later the desired flowering, the later the bulbs should be planted.

Outside in a standing ground, soil temperature determines the planting time. By using rooting rooms, batches meant for early forcing can be planted much earlier because the temperature can be controlled. This is not always possible when using a standing ground because in some years, the temperatures in the soil are still too high. Under such conditions, the cold treatment would be cut short and there would be more risk of damage due to pathogens. A soil temperature of around 9 °C is best for planting. (Read more

in 'A forcing schedule makes it easier to plan'.)

Keeping air circulating in the rooting room

These dark refrigerated rooms allow the bulbs to root and complete their cold period.

It is important to keep the temperature uniform throughout the room. This means that trays filled with pots are stacked in such a way as to permit good air circulation. Proper air

circulation is also enhanced by leaving at least 10 cm. between the stacks and the wall.

A temperature of 9°C is best for rooting. Later, it would be better to let the temperature drop to 5°C and then 2°C (see Table 2 for planted bulbs). Long shoots and too many roots are undesirable, so this growth is retarded by lowering the temperature to 1.5°C or even lower. The temperature may not drop too far below zero; temperatures below -1.5°C increase the risk of frost damage.

To prevent the soil and roots from drying out, an RH of 90-95% is maintained. In a rooting room with such a high RH, watering the plants will not be needed until housing.

Table 2. Optimum temperatures in the rooting room for planted bulbs before and after rooting.

PERIOD	ROOTING TEMPERATURE	TEMPERATURE AFTER ROOTING
Until 20 October	9°C	9°C
20 October - 10 November	7°C	7°C
From 10 November onward	5°C	5°C
From 1 December onward	5°C	1- 2°C



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