

Water and fertilise with care

Production measures

After planting, provide enough water for the soil to make good contact with the tubers. This encourages quick rooting and a good start. After this initial watering, keep the soil slightly moist. Watering lightly once or twice until the shoots emerge is usually enough. Soil that is too moist can lead to rotten roots and culls. Once the first leaves start to open, the crop will require somewhat more water. During this period, the leaves can turn glassy because the plant is absorbing more water than it transpires. This is more often seen in the morning. It can be prevented by keeping the soil drier and by ensuring enough air circulation in the greenhouse. Start providing more water depending on the moisture in the soil and the crop development. Prevent fluctuations in the moisture of the potting soil. It would be better to water twice with smaller quantities of water than once with a larger quantity. Check the moisture levels in the potting soil on a regular basis. It is better to water the crop in the morning so that it will be dry by that night.

Fertilising can be done in various ways. Sometimes, a slow-release fertiliser is worked through the potting soil before planting. An example would be 600 grams of Osmocote 12.5-15-27/m³ of potting soil. Another option would be to apply a liquid fertiliser during cultivation. Often used for this is a fertiliser containing twice as much potassium as nitrogen with an EC of 1.8 to 2. Providing less nitrogen as compared to nitrogen keeps the crop from starting to stretch and produce too much foliage. A crop that receives too much nitrogen is also more susceptible to infection by Erwinia.



Keeping pot plants compact

Growth retarding

Keeping the habit of pots plants compact requires a growth retardant. The most effective active ingredient in these products is paclobutrazol. The quantity needed depends on the cultivar, time of year, quantity of light, etc. Applying 1 to 4 ml of Bonzi* (4 gm. paclobutrazol/l) dissolved in 100 ml water per pot is usually enough. Depending on growing conditions, repeating this may be desired after 10 to 14 days. To keep the growth retardant from running off the tops, it would be best to apply it one or two days after watering when the upper layer of potting soil is still moist. Apply the growth retardant when the shoots are 3 to 6 cm tall. Applying it earlier can result in an extremely short plant, but applying it later can be less effective. When the emergence of a crop is very uneven, it would be advisable to separate all the pots with shoots that are 3-6 cm tall and treat them separately. The other pots can then be treated at a later time.








*** 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.

Sending off the plants

The plants can be readied for sending off from the time that the first flowers are displaying good colour. According to the Association of Dutch Flower Auctions, this is stage 3 (see the photo series). Because the crop will not flower uniformly, the most mature plants will have to be taken from the greenhouse over some length of time. Usually, the plants are sleeved to protect them from damage during transport. If plants have to remain on site for a while, it would be best to store them at a cool temperature in a greenhouse where they can receive light.

Proper hygiene produces healthy plants

This chart lists the most important diseases (and pests) and the methods to control them. Erwinia is one of the most important and commonly occurring diseases. Operating preventively and using proper hygiene largely reduce the risk of infections.

CAUSE	SYMPTOMS		PREVENTION/CONTROL
Erwinia (bacteria)		Affected leaves and stems turn dark green, display rotten spots, become slimy and eventually fall over. The tubers will also begin to rot and become malodorous.	Plant undamaged bulbs and prevent stress during growth. Plant in fresh soil or potting soil that is free of pathogens. Prevent mechanical damage to the crop and tubers as well as high temperatures combined with a high RH. Do not provide too much nitrogen when fertilising; prevent the growth of too much foliage.
Rhizoctonia (soil-borne fungus)		This fungus damages the shoot at the point at which it emerges from the soil and exhibits as spots that look eaten away.	Use fresh soil or potting soil that is free of pathogens. Soil suspected of being infected should be treated with a fungicide.
Pythium (soil-borne fungus)		This fungus causes root rot that keeps the plant from absorbing water properly.	Use fresh soil or potting soil that is free of pathogens. Prevent infection by limiting the quantities of water provided. Soil suspected of being infected should be treated with a fungicide.
Penicillium (fungus)		This blue-green fungus grows on and sometimes in the tuber during storage. Infection develops particularly on places where the tuber has suffered mechanically damage and usually occurs under moist conditions. Infected tuber tissue is grey or brown.	Store tubers under dry conditions and prevent mechanical damage. Provide sufficient air circulation to prevent the microclimate surrounding the tubers from developing a high RH.
Thrips and aphids (insect pests)		Thrips cause elongated spots or strips on the flowers; aphids leave round green spots. Both these pests can also transfer viruses.	Prevent weeds during cultivation; control weeds outside the greenhouse as well. If thrips or aphids are identified, spray immediately before flowering with an insecticide.



GROWING ZANTEDESCHIA FOR POT PLANT PRODUCTION

PRACTICAL TIPS FOR

- ▶ CHOOSING THE RIGHT PLANTING MATERIAL FOR PRODUCTION
- ▶ GETTING PRODUCTION OFF TO A GOOD START
- ▶ PRODUCING FLOWERS OF HIGH QUALITY
- ▶ KEEPING THE CROP HEALTHY





Goal-oriented planting and scheduling

A beautiful cut flower and pot plant

The coloured Zantedeschia (also known as the Calla) can be used for cut flower production, pot plant production and for planting in gardens. After a growth period of 6 to 8 months, the tubers are formed, the aerial parts of the plant die back and the tubers enter a dormant period lasting at least 3 months. Once dormancy is broken, the tubers can be replanted and the growth cycle will repeat itself.

Preparation of tubers

After the tubers have been grown in the field or the greenhouse, they are stored for at least 3 months. The tubers are ready to plant when shoot development is clearly visible. Upon planting, the tubers will already have shoots longer than 1 cm. At the time the supplier delivers the tubers, they will be ready to plant upon arrival but will usually display no shoot development. This has been done intentionally to prevent mechanical damage during transport. If the planting readiness is unknown and there is scarcely if any visible shoot development, the bulbs will have to be activated by storing them for 2 to 4 weeks at 17-22°C at an RH of 80-85%. During this warm storage, the shoots will start to emerge; the tubers will also start growing faster after planting. If the tubers cannot be planted immediately after receipt, they should be stored at 17-20°C under conditions providing enough air circulation to prevent fungal growth.

Flowering period

Depending on the local climate, zantedeschias can be produced as pot plants year-round in the greenhouse or outside. In temperate regions in the Northern Hemisphere, they can be forced into flower from 1 March to 1 December. The earliest planting date for tubers grown in the Netherlands is mid-January. Forcing during the darkest period of the year is not really feasible yet. Outside, the crop starts flowering there on 1 July and continues until 1 October. In subtropical climates, it is possible to realise year-round flowering by combining greenhouse and outdoor production under shade cloths. In both climate regions, and depending on the cultivars being forced, shading to cut light intensity by 30% will be needed during warm periods to prevent overly warm temperatures. The usual method used to distribute flowering over time is to plant at various times. Most zantedeschias grown in pots in the Northern Hemisphere are produced from spring through summer (March through August).



Time spent in production depends on planting date

The period from planting to flowering depends on the time of year, how long the tubers were stored, the growing conditions (the choice between greenhouse and outdoor production), and the cultivars being used.

Time of year

When planting in the greenhouse in spring, the time from planting to the start of flowering is 75-110 days. This time spent in production is fairly long because growth takes place during a cool period with little light, and the tubers have been in storage for a short period of time. When tubers are planted outdoors at the end of the spring or early summer, production takes 55-70 days. In this case, production takes less time due to more sunlight and higher temperatures. In addition, production runs more smoothly because the tubers were stored longer. During the autumn, the crop will take 60-90 days to start flowering. The crop will grow quickly at first due to higher temperatures and plenty of light, but development will slow down toward the flowering period due to decreasing amounts of light and lower temperatures.

Time spent in storage

When production takes place in the spring and early summer, the tubers have been stored longer, so the crop grows faster and production time is shorter. If the tubers have been stored for longer than 6 months, however, their development will be somewhat slower.



Proper tuber treatment for best results

The tubers

Treating the tubers on site after they arrive depends on the agreements made with the supplier and how long it will be before the tubers are to be planted. Upon receipt, inspect the tubers for size, mechanical damage, chalking, Penicillium and softness caused by Erwinia. Remove any chalked and soft tubers. This keeps soft tubers from infecting others. If tubers are infected by the Penicillium fungus, they will have to be inspected to see if the fungus is simply on the outside of them or has also turned the inside of the tuber itself grey or brown. If a tuber is cut open and is no longer white, it will have to be discarded. If the fungus is only on the outside, the tuber can be used if stored under dry conditions with proper air circulation and if it is planted fairly soon.

If the tubers still display scarcely if any shoot development, it would be advisable to maintain them at 17-22°C for another 2 to 4 weeks, preferably at an RH of 80-85%, to start activating them.

Each main shoot can produce two flower stems. The number of main shoots per tuber depends on the bulb size, cultivar and growing season. At the same tuber size, a small-flowering cultivar will produce more flowering shoots than a large-flowering cultivar. In general, flower production per m² is lower when the cultivar being grown produces large flowers and the crop is tall.

Increasing the number of flowers

More flowers are obtained by dipping the tubers in a solution of gibberellic acid (a growth regulator available under the brand name of Berelux GA3) for 15 minutes before planting. The tubers are usually dipped twice: once, during the last two to three weeks before planting, in a solution of 1 tablet to 11 litres of water, and a second time, immediately before planting, in a solution of 1 tablet to 7 litres of water. Do not use the dipping solution any longer than three days. After a long storage period, the tubers will produce fewer flowers, so it would be advisable to use a somewhat stronger concentration for these. Just like an excessively long storage, a dip in a stronger concentration of GA3 will increase the number of flowers but will also increase the risk of misshapen flowers. It would be wise to treat the tubers for fungi such as Penicillium at the same time. To do so, add the fungicides to the dip according to the instructions.



Coordinating cultivar and tuber size with pot size

Cultivars

Zantedeschia is available in many cultivars and many colours. Within the assortment, a distinction is made between the large-flowering and small-flowering varieties. The small-flowering varieties are often used for pot plants because most of them remain shorter than the large-flowering varieties and, at the same tuber size, produce more flowers. In recent years, however, large-flowering varieties that remain short have also become available and are thus perfect for pot plant production. All varieties currently available still require the use of a growth retardant* to maintain a short, dense habit.

Medium and pot

A peat mixture sometimes containing up to 50% coir is often used as a potting soil substrate. It is important that the substrate provides good drainage but also retains enough water. The soil may not contain too much salt (EC < 1.5), must have a pH of 5.5-7, and must be free of pathogens. Pots used are usually tall with a protruding edge on the bottom that keeps the pot raised above the surface on which it is placed, thus allowing for the run-off of excess water.

Planting

The tubers have to be planted deeply enough because the roots emerge on the top of the tuber before growing downward. Usually, one tuber is planted per pot. Plant the tuber approximately 2/3 of the way from the bottom of the pot

and with 5 cm. on top of the tuber. It is important to plant the tubers with the growing point at the top. Planting the tubers on their sides or upside-down results in an uneven emergence, an uneven crop and more chance of culls. The table indicates which pot sizes should be used for the various tuber sizes. The planting density given is simply an indication since it will have to be modified according to the season and the quantity of foliage the plants produce. An excessive amount of foliage will result in a taller crop that often produces fewer flowers. The pots are usually put in the greenhouse immediately after planting. If temperatures are very high, the pots can also be put in a refrigerated chamber at 18°C to root until the first shoots emerge. They must then be housed quickly where exposure to light will prevent them from growing too tall.

Table 2. The use of pots for various tuber sizes.

TUBER SIZE IN CM OF CIRCUMFERENCE	POT SIZE IN CM OF DIAMETER	NUMBER OF POTS/M ²
24/+	20	16
20/24	17-15	18-22
16/20	15-13	22-24
14/16	13-14	24
12/14	11-12	25



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