Floricultura
ORCHIDACEAE & ARACEAE

Cultivation manual
Odontoglossum hybrid pot plants

Cultivation

Odontoglossum hybrids are a group of intergeneric crossbreeds with a wide range of origins and growth characteristics. The species are selected on growth and fast flowering capacity. They can, in principle, flower within one year.

Light

The best results for Odontoglossum, in terms of both growth and flowering, can be obtained by exposing the plants to moderate light levels between 6,000 and 10,000 lux at plant level. Assimilation lighting in winter results in a far better development of the shoots, which means that the plant will reach flowering size sooner. Whitewash should be applied to the greenhouse roof from spring to late autumn to prevent an excess of light and excessively high temperatures. When using different types of whitewash, it is important to continuously monitor the light intensity in the greenhouse.

A maximum of 7,000 lux should be applied with regard to assimilation lighting. A light intensity of 100 – 150 µmol m^{-2} s^{-1} can be maintained during the vegetative phase. In the earliest stage this should be 100 – 120 µmol/m^2/sec. Once the seedlings have been planted in 11 - 12 cm pots this can be higher, but a maximum of 150 µmol/m^2/sec (4.5 - 5 mol/m^2/day) should be observed.

In the cooling phase, the light intensity should be reduced slightly, down to 100 - 120 µmol/m^2/sec (3.5 - 4.5 mol/m^2/day). A light intensity above 180 µmol m^{-2} s^{-1} should be avoided as this would result in excessively high leaf temperatures. Also, a day length of 12 hours is better than a longer day length of 14 hours or more, particularly in the vegetative phase.

Humidity

Good humidity is important for good growth and flowering. Excessively low humidity levels on sunny days and in spring inhibit growth. When observing the crop closely in such a case, you will see that the leaves fold together and/ or roll up, and start to exhibit a dull, greyish colour. The recommended RH is between 70 and 80%. As these percentages are light-dependent, a lower humidity is acceptable at a lower light intensity. At an intensity of 10,000 lux, 80% will still result in satisfactory growth, but 65% will not. Normally, more light also results in higher leaf temperatures and therefore lower humidity levels. When temperatures are higher (25-26°C) it is important to ensure higher humidity levels.

Humidifiers or roof sprinklers are excellent tools for improving the greenhouse climate. The biggest problems occur when humidity levels drop too quickly and when the amount of light increases significantly. In warmer regions, the use of Pad and Fan systems produces a highly positive effect on growth. Values above 80% can be accepted without problems, but in such cases it is necessary to ensure the adequate evaporation of moisture by slightly heating the greenhouse and simultaneously ensuring adequate ventilation (air circulation in the greenhouse).

Measuring the crop temperature with an infrared camera allows the humidity at plant level to be measured more accurately and subsequently better controlled.

Temperatures

The target temperatures can, in principle, be divided into two phases:

1. The target temperatures during the vegetative phase, should be 18 - 20°C at night and 20 - 22°C during the day.
2. The target temperatures during the spike initiation and flowering phase should be 14-16°C at night and 18-20°C during the day.

Make sure that the leaf temperature does not rise to more than 1°C above the ambient temperature in the greenhouse. This can easily happen if there is more light, whether natural or artificial. The leaf temperature can, in some cases, be 1 to 2°C lower.

Water

Water is one of the most important factors of the entire cultivation process. Only rainwater or water obtained through reverse osmosis is suitable for irrigation. Any other type of water will result in cultivation problems. Ensure an adequate water storage capacity, as a minimum weekly irrigation requirement of 15 litres per m^2 can be expected. The temperature of the irrigation water should lie between at least 15 and 20°C. Lower irrigation water temperatures lead to excessively low pot temperatures, which can cause stagnations in growth. The use of a tank in the shed or greenhouse in which the water is preheated or a counterflow device is therefore recommended. The plants are watered using an overhead rain pipe system to which artificial fertiliser can be added.

Fertiliser

The plants are given fertiliser and water simultaneously. The composition of the fertiliser depends on the time of year and the growth stage of the plants. Although either simple and/or liquid fertilisers can be used, the application of compound fertilisers is often more practical.

The composition of the fertiliser strongly depends on the type of substrate used. For plants in the vegetative phase that are grown on bark-based substrates, a combination of calcium nitrate, Plantprod or Peters 20-20-20 and magnesium sulphate, in a ratio of 2:6:1, is an excellent combination that can be administered via a dual tray system.

Plants grown on substrates without bark should be given approximately 30% less nitrogen. If the plant becomes overly lush, when they enter the flowering phase, or if they are grown in winter with less light, the N application (urea) can be reduced. Alternatively, you can switch to a fertiliser that is richer in potassium. The optimum EC values are between 0.5 and 0.8 EC. During periods of frost in winter, it is advisable to reduce the EC slightly to mitigate the impact of heating. The substrate will, of course, have a tendency to dry out in such cases.

The pH value of the irrigation water should be between 5.5 and 6. If the pH falls below 5, a solution must be found in reducing the amount of ammonium and/or urea. On warm, sunny days, we recommend applying 1 - 2 litres/m^2 of clean water immediately following irrigation with artificial fertiliser to prevent leaf spots or shoot rot. Dolokal should be added to the substrate beforehand. The recommended dosage for this is 3 kg per m^3 of substrate, depending on the composition of the substrate.

Substrate

A good substrate can be composed of a diversity of organic mixtures with good drainage and air retention properties. In the past, this was basically a mixture of 2/3 bark and 1/3 other components, such as sphagnum (10-15%), coconut fibre, peat fibre or chunks. Coco peat has become a more popular medium in recent years. This produces a somewhat finer, more compact, more workable substrate with the added advantage that potworm (Lyprauta cambria) is less likely to be encountered in this composition. Each substrate responds differently to water and fertiliser.

Diseases and cultivation problems

If the plants are grown under healthy conditions and there is sufficient control over the most common predators, the use of chemical protection agents will be the exception rather than the rule. Spider mites, thrips (there are several varieties) and lice are the most common fast-spreading pests.

- Root rot

Root rot occurs in poorly draining substrate that remains wet for too long and/or an excessively high EC. A pH of 5 or below or excessively cold water can also be the cause of root problems

- Potworms (Lyprauta)

Coconut substrate (peat or coir) can have a preventive effect against potworm. Biological alternatives are still few and far between. Mosquito larvae feed on root tips in a wet substrate. Scatter Stratiolaelaps scimitus (formerly Hypoaspis miles) onto the substrate immediately after potting; add nematodes to the irrigation water in the vegetative phase. It is better to start a little too dry than too wet in this phase. However, when adding nematodes to the irrigation water, the substrate should be moist enough for the nematodes to function properly. The application of nematodes is also more successful in dark weather.

- Spider mites

Spider mites can cause enormous damage in a short time due to their high reproductive capacity. Dull, grey leaves and stunted growth all point to a spider mite infestation. Spider mites often emerge in spring at low RH values, whereas natural predators for biological crop protection prefer a higher relative humidity. Neoseiulus californicus (preventive) and Phytoseiulus persimilis (curative) are effective natural predators for gaining control over an infestation of spider mites. Feltiella acarisugo (gall midge) can also be beneficial in combating spider mites.

- Red spider mite

A strongly discoloured underside of the leaves points to an infestation with the red spider mite (Brevipalpus spp. or red spider mite / Tenuipalpus spp. or false spider mite) Tenuipalpus pacificus Baker. A spray treatment with acaricides is recommended. Amblyseius swirskii as a biological pest control agent in the battle against false spider mites and also help combat various species of thrips.

- Thrips

Thrips damage flowers in flowering plants and transmit the Tomato Bronze Spot Virus (TWSV), which causes severe orbicular spots on the leaves. Amblyseius swirskii can be applied preventively on pollen at the onset of flowering. Predatory mites, however, are sensitive to chemical protection agents. Preventive scouting with sticky traps is an important tool for timely intervention or biological pest control. Predators like Orius (Laevigatus and Majusculus), Amblydromalus limonicus and vespiform thrips (Franklinothrips vespiformis) can also help suppress an infestation of thrips.

- Slugs and snails

Slugs and snails are attracted to wet plants. The answer is slug control and proper hygiene, such as the elimination of weeds under the benches. Snails can be caught in cups containing beer, cucumber and/or bran. A disadvantage to using bran is that it attracts mice. As snails can also crawl out of cups, be sure to empty the cups in due time.

- Mice

Make sure there are enough mouse traps on and around the premises. First, it is important to detect mice (e.g. with traps baited with cheese) and keep combating them as infestations increase. This can be done with rodenticides in the form of paste, grains or cubes. Try to keep the mice from building shelters on the premises. Kestrels can help with control infestations of mice outdoors. They can eat three or four mice a day. In the nursery, make sure that old sachets of biological pest control products are properly disposed of, or scatter the predatory mites directly onto the pot instead of using sachets.

- Leaf tips

Dead leaf tips can occur due to a lack of moisture in hot, dry periods. Avoid high leaf temperatures and direct exposure to light.

- Bud desiccation

Prevent bud desiccation (drying out) can be caused by ethylene (e.g. emitted by petrol-powered forklift trucks) and excessively high temperatures in combination with low humidity. This can also be very variety-dependent, but a sensitive variety can serve as a good indicator for dangerously low humidity levels.

- Harmonica leaf

Harmonica-shaped leaves are caused by a moisture deficiency in warmer, dry periods, and an excessively low relative humidity. Provide sufficient misting capacity or roof sprinklers. On extremely hot and dry days, the plants can briefly be sprayed with water as a protective measure. Make sure the plants have been given sufficient time to dry before spraying them again.

- Pinched or deformed buds

This can be caused by high temperatures during spike initiation and flowering, or a poor condition of the roots.

- Flower and leaf spots

Flower and leaf spots may occur as a result of intense incident light and high root pressure. This can be prevented by heavier shading and applying adequate ventilation in due time and using fans. Spray the plants with clean water without a wetting agent immediately after administering fertiliser.

- Bulb or shoot rot

Fusarium can be caused by prolonged water retention in the heart of the plant. This can worsen if the irrigation water is too warm and/or contaminated with fungi and bacteria. Other causes can be an excessively high greenhouse temperature, inadequate evaporation, or excessive moisture. A high EC at the top of the pot can also be a cause of fusarium. Have a CFU sample taken at least once a year from the water in your pipes, basin and – particularly important – the manure basins near the unit! A phytophthora infestation is usually visible at the base of the plant. This fungus can be identified through musty-smelling substrate and brown or black spots at the base of the plant.

We recommend consulting an expert with regard to the use of pesticides and their dosage.

Greenhouse equipment

A nursery must be equipped with at least two sections for the production of Odontoglossum pot plants, . One section must be reserved for plants in the vegetative phase, which takes 5 to 6 months to complete, and requires significantly higher temperatures than the other section.
The second section should be reserved for plants in the spike initiation and flowering phase, which lasts between 6 and 12 months. Some of the plants (supplied with leaf lengths of 10 - 15 cm) flower one year after potting, while other varieties need another six months or so. This depends on the variety and/or planting date. Because the plants in the flowering phase take up approximately twice as much space, the warmer section for plants in their vegetative phase should cover about 25% of the available surface area.

Benches or wheeled containers

The plants are grown on benches or wheeled containers with an open bottom. These can be made of various materials. We do not recommend using ebb and flow systems. Make sure that it is enough space to walk among the benches or containers for the purpose of inspecting the plants. Polystyrene bottoms are not recommended because mould and bacteria can survive on them, and they are difficult to disinfect.

Heating

The heating system must be suitable for achieving a minimum temperature of 22°C during the day and 18 to 19°C at night in the vegetative section. The temperature in the spike initiation and flowering section must be at least 18°C during the day and at least 15°C at night, regardless of outside temperatures.

Screening system

A screening system is an absolute requirement for an Odontoglossum nursery. This is not so much in the interest of saving energy but to provide protection against an excessive amount of light. A double screen is not necessary, but a second transparent screen can improve the climate in the vegetative section. Note: an external screening system is better than whitewashing for cultivation at cooler temperatures and allows more light to enter the greenhouse in dark weather. Whitewashing does, however, provide more security. It rarely gets too light anymore.

CO_2 system

A CO_2 system is an outstanding tool for optimal growth. Although no research has been conducted specifically on Odontoglossum yet, the crop will respond positively to this.

Assimilation lighting

Assimilation lighting is necessary in the flowering stage in order to achieve the required light intensity in winter. It is also of benefit during the vegetative phase, particularly with regard to improving shoot development so that the plant will be able to achieve flowering size more rapidly. The system must have a capacity of at least around 4,500 lux, with a maximum light intensity of 7,000.

Production

A successful yield, at a modern production facility with a space utilisation of 84% (which can be achieved by using wheeled containers or wheeled benches) depends on the variety, the cultivation methods, and the loss percentage, and lies between 30 - 40 plants per m^2. If fixed benches are used this is about 20% lower. The labour requirement is about 1,500 m^2 per employee per year. The average loss percentage is about 10%.

Supplied in a flask

Plants supplied in plastic containers, straight from the laboratory. The plants can be pricked out in sphagnum in small pots or plugs. After 8 to 10 months, the plants are usually big enough to be transplanted into their final pot.

Supplied in a plug

Plants supplied in plugs (in trays) with a leaf length of 10 - 15 cm. These should be potted immediately after delivery. Pot sizes can vary from 9 to 12 cm. There are growers who opt for an intermediate step by transferring these plugs to a 6 - 7 cm pot, where they grow for 3 - 4 months, and only repotting them when a bulb with side shoots has developed. The plants are irrigated with water and nutrients directly from an overhead rain pipe system. Manual adjustment is often necessary and also beneficial to inspection.

The plants are spaced closely together. In this way, if 11 cm pots are used, there can be approximately 70 - 75 plants per net m^2 for about 25 - 30 weeks. After 25 - 30 weeks, the plants are moved to the spike initiation and flowering section where both daytime and night-time temperatures are slightly lower. The plants are spaced wider apart here and, depending on the variety, this results in 40 - 50 plants per net m^2 for the next six months or so. Depending on the variety and the cultivation method, 50 - 66% of the plants will then be available for sale as flowering plants. The varieties that have not started flowering yet, but have grown in size, will be spaced even further apart to 25 - 30 plants per net m^2 and will be available for sale after another 6 to 8 months.

Utilisation of space

Transplanted to 11/12 cm pots

Phase	Plants net/m^2	Period in weeks	Space requirements in %
From potting to flowering	72	30	approx. 32
65% flowering + spacing	45	26	approx. 42
35% flowering + spacing	30	30	approx. 26