

Dendrobium Nobile pot plant

Production procedures

Substrate

The substrate for production of Dendrobium Nobile must be composed of organic mixtures with excellent draining properties, for instance bark (medium coarse), coconut shell pieces or a mixture of both. An addition of 10-15 % fibre peat or sphagnum or coir improves the moisture retention capacity.

Temperature

The optimum temperatures for the various phases are as follows:

	Minimum Night	Target value Day
Vegetative phase	24°C	26°C
Further development (SD)	23°C	25°C
Cooling	12°C	18-22°C
Flowerbud initiation to flowering	16°C	20-22°C

Light

Vegetative phase

During the vegetative phase, the light intensities must not exceed 20,000-25,000 lux, after that increasing to a maximum of 35,000 lux. An average of 300-350 $\mu\text{mol m}^{-2} \text{s}^{-1}$ is necessary, when the light intensities increase, shading or light whitewashing is required.

Further development-flower initiation phase

The maximum light intensities are 30,000-40,000 lux (500-700 $\mu\text{mol m}^{-2} \text{s}^{-1}$). Otherwise, shading or light whitewashing is required. During cooling, the light intensities can be considerably lower.

Water

Water is one of the most important factors in production. Only rainwater or reverse osmosis water is suitable. Any other kind of water will inevitably result in cultivation problems. Provide enough water storage capacity. Allow for a water requirement, including drainage from the plants, of up to 15 litres of water/m²/day on a hot day. It is important that the watering quantities can be adjusted for every cultivation phase. The vegetative phase starts with fewer litres and also during cooling the water application is reduced. Particularly in winter, the water must be warm enough. If irrigation water is not maintained at a minimum temperature of 12°C, various growth problems can develop. Higher temperatures are no problem as long as the water is kept below 25°C. A heated indoor intermediate tank or a counter-flow system is required.

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RH

The proper RH is important for proper growth and flowering of Dendrobium Nobile, with optimum values of 50-80%. Maintaining the recommended levels 24 hours a day is not necessary. Higher values than 80% are acceptable without any problems. Yet in that case it is necessary to ensure sufficient moisture discharge. Regularly increasing the bottom heating up to 40°C and using minimum venting levels will provide the necessary air circulation in the greenhouse. Dendrobium can easily tolerate lower RH levels. As long as the leaf temperature of Dendrobium is lower than around 27°C, the plant will continue to absorb water and transpire, even at a lower RH.

Fertilisation

Fertilisation during the vegetative phase is (20-20-20) + (calcium nitrate) + (magnesium sulphate) in the ratio 6:3:1; with 0.75-1.00 gr per litre of 0.75-1.00 EC. Stop giving the plants nutrients when a "pseudobulb" or "cane" length of 25-30 cm is attained. During the further development phase (from SD to cooling), fertilise with 0.25 gm per litre of 0.25 EC with 7-11-27 + CaNO₃ and alternate with clean water. Stop giving nutrients during cooling. Fertilisation in the spike initiation and flowering phases is the same as in the further development phase.

Flowering schedule

The flowering schedule for Dendrobium Nobile is:

Cooling period	Flowering period
October - November	December - January
November - December	January - February
December - January	March - April
February - March	May - June
June - July	September - October

A Short Day (SD) treatment can make the growing shoot stop and proceed to formation of a “cane” and ripening. Fertilisation is then stopped. After the development of the last leaf, the plant will need 4 to 8 weeks of further development before starting the cooling treatment. The top must become hard and round and get a light leaf colour. This is vital to achieving good initiation of flower buds from the bottom to the top of the “cane”.

Flower initiation occurs on a mature shoot (“cane”) after at least 6 weeks at a night temperature of 14°C. Flowering occurs 6-8 weeks after the cooling period at an average temperature of 20°C. Postponing flowering can be achieved by extending the cooling period.

At a natural cycle without lighting and SD section, transplanting is done from January to April (northern hemisphere). Leave to grow and ripen after the longest day without fertilisation until the plant can be cooled. Early-flowering varieties can be moved to a cooler section as from October, the later flowering varieties not until December and January. For the other varieties the same information applies as stated earlier.

Diseases and pests

Below follows a list of the diseases and pests that may occur in Dendrobium Nobile production with their causes and consequences.

- **Foot and root rot.**
Foot and root rot may occur at a high RH, with poor ventilation, badly draining potting soil and a high EC. We recommend to water with a fungicide in the event of infection.
- **Californian Thrips.**
CalifornianThrips may cause deformation of leaves and flowers as well as flower spots. Spraying or atmospheric treatment with various insecticides can prevent and control infections.
- **Brevipalpus (red mites).**
Brevipalpus causes discolouration of undersides of the leaves. Spraying with Acaracides is recommended.
- **Red spider mite: see Brevipalpus.**
- **Coccoidae.**
Coccoidae can be controlled by spraying with various insecticides.
- **Caterpillars.**
Leaf damage caused by caterpillars can be controlled with various control agents.
- **Leaf spot (Phyllostictina).**
Leaf spot is caused by excessive RH or a nutrient deficiency. This can be controlled by heat-drying and, if necessary, spraying with a fungicide.
- **White worms (Lyprauta).**
White worms are caused by a soggy substrate. Use biological control by directly spreading Macro-mite Macrocheles robustulus upon transplanting. Ensure sufficiently fast drying of the substrate in the pot or give less water. The mosquitoes can be controlled through chemical vaporization in the internal greenhouse atmosphere.

It would be best to consult an expert with regard to which chemical control agents to use and what the application dosages are and we recommend to carefully read the labels.

Greenhouse systems

Sections

A nursery needs at least 4 sections for producing Dendrobium as pot plants:

Vegetative phase:	35% area
Short Day phase (SD):	35% area
Cooling phase:	15% area
Flower initiation phase	15% area

Benches or mobile containers

Production takes place on benches or mobile containers with an open mesh bottom. Dendrobium pot plants cannot be produced on an ebb-and-flow system or a system with a sealed bench. That will always cause losses due to Phytophthora and/or Pythium. Make sure there is space to walk between the benches or have mobile containers for inspecting the plants.

Heating

Equivalent lower and upper network with a capacity of at least 24°C greenhouse temperature is necessary during the vegetative phase.

Water storage

Provide enough water storage capacity. Only rainwater or reverse osmosis water is suitable.

Counterflow system

A counterflow system or small heated indoor intermediate tank is required for heating the irrigation water.

Shading system

A shading system that admits about 50% of the light is required.

Sprinkler system

A sprinkler system with fertiliser metering is required with at least 2 fertiliser tanks.

Growth lighting

During the vegetative phase and in winter at least 10,000 lux ($120 \mu\text{mol m}^{-2} \text{s}^{-1}$) installed capacity is recommended.

Roof sprayers

Roof sprayers are not necessary, but they are useful during hot periods because of growth improvement under intense light.

Production

Yields in a modern facility using 84% of its space, as realised by mobile containers or mobile benches, will be 45-50 plants/m² of greenhouse space/year for 12 cm pot size. Factors in the yield will be cultivation rate, loss percentage, and control of cooling temperatures.

In one production year, a 40-60% with two flowering “canes” is achievable; the rest will flower with one “cane”. It is also possible to grow last year’s plants with multiple flowering “canes” in the next season.

Early varieties flower rather easily within 1 year. The later varieties take a little longer. The average loss percentage is 5%.

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Space utilisation diagram greenhouse (production in 12 cm pots)

Cultivation phase	Plants/net m ²	Period (in weeks)	Space requirement (%)
Transplanting to SD	70	18-20	approx. 35
Ripening in SD	50	12-16	approx. 35
Cooling	50	6-8	approx. 15
Flower initiation to flowering	40	6-8	approx. 15

Plantlets come in plugs with a shoot length of 10-15 cm. The main shoot is topped at a length of 10-15 cm. Then the plants are transplanted to a 12 cm final pot. There are an average of 60 plants per net m² in the vegetative phase and ripening during 30 to 36 weeks, dependent on the variety.

Cultivation starts with 70 plants per m² and after 20 weeks on spacing out and ripening to a hard “cane” the plant density is 50 plants per m². On spacing out, the plants directly get stakes. Use plasticised stakes to prevent rotting.

After elongation and ripening of the “canes” in the short day section, the plants are cooled for 6-7 weeks. Then there are 50 plants per net m². Following the cooling period, the plants will produce buds and flower within 6-8 weeks. Then there are 40-45 plants per net m².

Labour requirement

Dependent on the degree of mechanisation, the labour requirement is approx. 800-900 m²/worker/year.