Miltoniopsis pot plant

Floricultura® ORCHIDACEAE

Production procedures

Substrate

The substrate must consist of free-draining organic mixtures such as bark with 20% sphagnum or coir. Some substrates retain more nutrients, which may cause the EC to increase more quickly than is desirable for Miltoniopsis.

Vegetative phase

- Vegetative phase plantlets delivered in flasks

Plantlets are delivered in plastic flasks directly from the laboratory. Upon receipt, plants are deflasked into small pots or plugs filled with sphagnum. After 8-10 months, the plants will usually be large enough to transplant into a 10-12 cm pot.

- Vegetative phase plantlets delivered in plugs

Plants are delivered in plugs (plug trays) when the leaves are 10-15 cm in length. After delivery, the plantlets are immediately transplanted to 10-12 cm pots.
Various organic mixtures with good drainage and air retentive capacities can be used. The basis for such a mixture is usually finely textured bark supplemented with some sphagnum, coir, peat fibre or chunks. Each substrate has its own character with regard to providing water and fertilisers.
The plants should immediately receive water and nutrients by means of overhead watering. Hand watering is sometimes necessary and is also a good way to monitor the crop.
The plants are placed against each other in close association. That way there are approx. 70-80 plants per net m^2 for about 24-28 weeks. It is recommended to sort the plants during the vegetative phase. All plants with new shoots larger than 20 cm can then be moved to the spike initiation section. Plants that do not yet have shoots must remain in the vegetative section. After this period, the plants are moved to the spike initiation and flowering section where both night and daytime temperatures are somewhat lower. In this cooler section, spikes can then be initiated in the young shoots previously developed under warmer conditions. Then there are approx. 40-45 plants/net m^2 for 18-24 weeks. Dependent on variety and production system, some 95% can be delivered as flowering plants.

Temperature

As a rule, the target temperatures depends on the two phases:

1. Vegetative phase.
   During the vegetative phase, target temperatures are 19 to 20°C at night and no higher than 22 to 24°C during the day.
2. Spike initiation and flowering phase.
   During the spike initiation and flowering phase, target temperatures are 16-17°C at night and around 18-20°C during the day. The optimum average daily temperature is 18°C.

Higher temperatures (particularly in summer) can be prevented by heavy whitewashing, using an outdoor screen or roof sprayers and by ensuring sufficient air movement in greenhouse. The light intensity is less important during that period then striving after the right temperature. An air-conditioning system can ensure a programmed year-round production.

Light

The best growth and flowering results in Miltoniopsis are obtained by exposing the plants to moderate light intensities from 6000 to 10,000 lux on the plants. Growth lighting greatly improves shoot growth so that plants will reach flowering size sooner. The greenhouse must be kept whitewashed from spring through autumn to prevent excessively high temperatures. Various types of whitewashing are available with various properties with regard to light transmission. It remains important to monitor the light intensities by constant measuring.
The maximum growth lighting is 7,000 lux In the vegetative phase, light intensities of 100-130 µmol/m^2/sec (4-5.5 PAR daily sum) should be observed and in cooling somewhat lower light intensity values of 100-120 µmol/m^2/sec (4-5 PAR daily sum). Light intensities above 180 µmol/m^2/sec must be prevented because of too high leaf temperature. The RH does have to be optimal. If it is not, then observe approx. 30 µmol/m^2/sec lower values (see RH).

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.
Water consumption should be calculated as a minimum of 15 litres of water/m^2/week. Water used for irrigation must be between 15 and 18°C. During the vegetative phase, even 20-22°C is recommended.
Cooler irrigation water lowers the pot temperature and this can inhibit growth. Having a heated indoor intermediate tank or a counter-flow system is recommended. Water is provided by overhead watering to which fertiliser is added.

RH

A good RH is important for good growth and flowering. A low RH on sunny days and in spring inhibits growth. When the plants under low RH are observed closely, it can be noted that the leaves fold together, roll up and take on a grey drab colour. Measurements have shown that if the plant gets stressed, then photosynthesis will not continue that day.
The optimum values are 70-80% relative humidity (RH). These percentages are light-dependent, so at lower light intensities a lower RH is acceptable, however at 10,000 lux 80% RH still results in good growth but 65% RH will not .
As a rule, more light also results in higher temperatures and thus a lower RH. If at higher temperatures (25-26°C) the RH is higher, the plant can assimilate better.
The leaf temperature does have to be the same as the greenhouse temperature. For that reason we recommend to use the VPD (Vapour Pressure Deficit). The VPD takes into account the greenhouse and leaf temperatures as well as the RH. Miltoniopsis can easily assimilate between 0.4 and 1.0 kPa. Above 1.0 kPa the RH is too low and the plant closes its stomata. Miltoniopsis then curls its leaves and will not easily open the stomata again that same day.
The use of air humidification or roof sprayers will improve the climate considerably. The biggest problems usually occur when humidity drops too suddenly and at the same time the light intensity increases strongly. In warmer regions the use of Pad and Fan cooling systems has a very positive effect on growth. Even better than air humidification.
Higher values than 80% are acceptable without any problems, yet in that case it is necessary to ensure sufficient moisture discharge by moderate heating and simultaneous ventilation (air movement in the greenhouse). The RH around the plant can much more easily be controlled by measuring the plant temperature with an infrared camera.

Fertilisation

Fertilising and irrigating are done simultaneously. The composition of fertilisers depends on the season and the growth stage of the plants. Although either simple and/or compound fertilisers can be applied, working with compound fertilisers is usually much more practical.
For the vegetative phase, a combination of calcium nitrate, Plantprod or Peters 20-20-20 and magnesium sulphate in a ratio of 3:6:1 would be a fine combination that could be supplied by a 2-tank system. When plants become too lush or start flowering or if production takes place at less light in winter, the N application (Urea) can be lowered or a potassium-rich fertiliser can be used. The latter will not be necessary when growth lighting is used. The best EC values are 0.6-0.8 EC. During freezing weather, reducing the EC somewhat would be advisable due to the effect of heating. When cooling it is recommended to lower the EC in the pot by providing clean water and subsequently reducing the EC application to 0.5 EC.
The pH value must be monitored closely; pH values below 6 will easily cause problems. The pH target value is 5.5-6. The solution is to apply less ammonium nitrogen and/or urea. On hot sunny days it is recommended to follow up fertiliser irrigation with clean water irrigation at 1-2 litres/m^2 to prevent the spot or shoot rot. You do have to add Dolokal to the substrate in advance. Depending on the materials used, Dolokal should be applied at the rate of 3 kg/m^3.

Diseases, pests and cultivation problems.

With sound cultivation and sufficient control of the most significant attackers, use of chemical control agents will be the exception rather than the rule. Red spider mites and Californian Thrips are actually the most important pests that can spread rapidly during Miltoniopsis cultivation.

- Red spider mite.
  Red spider mite causes dull and grey leaves, also on the underside, and inhibited growth.
- Californian Thrips.
  The presence of Thrips in the flowering phase causes flower damage in the form of watery spots. Thrips also pass on Tomato Spotted Wilt Virus (TSWV). TSMV causes circular leaf spots and grey leaves on the leaf underside.

In addition, the following diseases, pests or symptoms may occur during production:

- Bud desiccation.
  Bud desiccation occurs in the presence of ethylene or at too high temperatures. It is variety-dependent.
- Root rot.
  Root rot always has a physiological cause such as incorrect cultivation and/or low plant activity due to too little light or heating. The negative effect may be increased by:
  - a continually wet and/or badly draining substrate;
  - Use of too cold irrigation water;
  - too low pH;
  - too high EC;
  - a ‘still or dead’ greenhouse environment.

- Mites.
  Mite infection causes leaf deformation and/or ‘split heads’. There are various mite species, including white mites that, particularly in hot weather, mainly puncture the growing points of young shoots. This is worse in humid conditions. Spray the plants one or two times with an Acaricide shortly before transplanting.
- White worms (Lyprauta).
  Lyprauta larvae flies feed on root tips in soggy substrates. Ensure quick drying of the substrate. Spread Macro-mite Macrocheles robustulus directly when transplanting.
- Harmonica leaf.
  Harmonica-shaped leaves are caused by a moisture shortage during hot and dry periods. A VPD above 0.9 kPa causes evaporation problems.
- Flower spots.
  Flower spots may be caused by the presence of Californian Thrips or by dry pots that suddenly receive a lot of water with little or no fertiliser, resulting in excessive root pressure. This is most likely to occur after a sunny period and a too high RH and a low flower temperature.
- Leaf spots.
  Leaf spots usually occur from mid-July until late September. The average daily temperatures and a higher RH leave the plants wet for too long, increasing the risk of Fusarium development. The remedy is to provide sufficient ventilation and drying heat. Growth lighting will ensure that the crop dries even better and faster. It is also recommended to irrigate with 1-2 litres/m^2 of clean water after irrigating with fertiliser; Do not use a wetting agent.
- Snails and slugs.
  Snails and slugs may be found in wet plants and then control measures should be taken. Ensuring proper greenhouse hygiene, such as removing any weed growth under the benches, is important as well .

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 2 sections for producing Miltoniopsis as pot plants:

- The vegetative phase.
  During the vegetative phase it takes some 5 to 8 months to grow a small plant of a few centimetres from the flask to a leaf length of 10-15 cm. Then from a leaf length of 10-15 cm, the plants grow for another 5-6 months in a considerably warmer climate. The vegetative phase covers roughly 35-50% of the available space.
- The spike initiation and flowering phase.
  The spike initiation and flowering phase takes 4.5-6 months. Because the plants occupy about twice as much space during the flowering phase, the section used for the cooling and flowering phase has to accommodate about 50- 65% of the entire production.

Benches/mobile containers

Production takes place on benches or mobile containers with an open bottom. Various materials are possible. We advise against the use of ebb-and-flow systems. Make sure there is space to walk between the benches or mobile containers for inspecting the plants.

Heating

The heating system must be suitable to keep the section in use for vegetative cultivation at a minimum temperature of at least 22°C during the day and 18-19°C at night whilst maintaining the section in use for spike initiation and flowering at a temperature of at least 18°C during the day and at least 15°C at night, regardless of outdoor temperatures.

Shading system

A shading system is required in Miltoniopsis production. both for energy savings during the vegetative phase and to prevent too much sunlight. The advantage of a double screen is more accurate control of the light intensity and if it is a type LS10, better RH control as well.
Miltoniopsis are easier to produce when the day length can be controlled. In other words, a blackcloth installation to reduce the day length during long days (LD) has a positive effect.
An external shading system offers a good way to cultivate at a lower temperature without whitewashing.

CO_2 system

A CO_2 system will provide an effective supplement for optimum growth. CO_2 enables the plant to produce more assimilates and it reduces problems with high light intensities. There could be measured values of 800-1,000 ppm. Use pure CO_2 to prevent damage from NO_x and ethene (ethylene).

Growth lighting

Growth lighting will be necessary during winter months to achieve the required light intensities for the spike initiation phase. It also provides advantages during the vegetative phase, particularly with regard to better shoot growth so that plants are quicker to reach flowering size. The lighting system must have a capacity of at least around 4,500 lux with a maximum of about 7,000 lux. Tests show that up to 7,000 lux increases the number of spikes. In this situation it is highly important that the plant temperature is not more than 1°C higher than the greenhouse temperature. Otherwise a modified greenhouse temperature is required.

Production

Production at a modern facility with mobile containers or benches and a space utilisation of approx. 84% depends on various factors. Using growth lighting increases the rate of growth, reduces the loss percentage, improves flowering results, and makes a yield of approx. 35-40 plants/m^2/year feasible. Yields resulting from unlighted production will be around 25 plants/m^2/year. As a rule, the loss percentage is between 5 and 10%. The labour requirement is around 1,500 m^2/worker/year.