

Culture Instructions for *Primula vulgaris*

Substrate: pH value of 5.4 to 6.2 depending on the carbonate hardness of the irrigation water that is used. Hard water will increase the pH value, when using soft water or rain water the pH value will decrease. Therefore, with soft water have the pH value adjusted at a sufficiently high level.

Adding iron chelate makes sense, however it is only effective for a short time. It is better to permanently add it to the feed.

Do not cultivate primula in pure peat substrates, a small fraction of clay in the substrate produces more compact plants. The structure of the substrate should not be too fine and remain stable during the cultivation period as otherwise root problems might occur.

Despite the pricing pressure on the market the substrate is a decisive factor for the success of a culture.

For some years now a potassium-based Osmocote fertiliser has been available which is particularly suited for mixing in with the outdoor pre-culture. Here, it has been shown that an addition of 2kg/m³ is an appropriate admixture.

Then soil samples should be taken and the substrate analysed.

Talk to your substrate supplier or your representative about the exact substrate composition who will gladly advise you.

Fertilisation: Two to three weeks from potting complementary liquid food can be fed. A fertilising irrigation with 0.1%-0.2% of a potassium-based compound fertiliser has proved itself. The N:P:K ratio should be 1:2:3 or 1:1:3. If the plants are very small, they can be fed with an N:K ratio of 1:2.

In winter it is important to increase the concentration (up to 0.3%), as the fertilisation intervals are longer. The plants need sufficient nutrients even in low temperatures. Growth starts at temperatures above 5°C.

The selection depends on the irrigation water used. If the carbonate hardness exceeds 8° DH, fertilisers shall be used which reduce the pH value (nitrogen predominantly in ammonium form).

If rain water or irrigation water with a carbonate hardness below 8° DH is used, fertilisers shall be applied which stabilise the pH value. Feed nitrate-based fertilisers. With soft water provide an adequate Ca supply.

When using Osmocote bear in mind that the nutrients are only released at temperatures above at least 10°C (soil temperature). The plants, however, need nutrients at temperatures above 5°C. For this reason apply sufficient fertiliser during the winter months despite Osmocote.

Irrigation water: It is essential to know the salt content, the nutrient content and the carbonate hardness of the irrigation water.

Salts such as sodium and chloride can be harmful and even small amounts damage the plants. The damage is visible as rapidly proceeding necrosis of the older leaves.

Nutrients in the water exceeding a certain concentration must be included in the calculation. With higher fractions of nitrogen in water the use of a basic fertiliser is recommendable.

The carbonate hardness influences the pH value in the substrate decisively. This must be taken into account when selecting the fertilisers to be applied.

Temperature: In general, ventilate the greenhouse as much as possible. In winter maintain the temperatures between 3° and 5°C. To induce early flowering the temperature may be raised gradually to 12°C. Do increase not only the ventilation temperature but also increase the heating temperature accordingly, as otherwise precipitation might occur. During the cold and dark season it is advantageous to set a temperature that is higher during the night than during the day. Thus the flowering is induced but vigorous growth of young leaves is prevented.

In order to avoid precipitation ventilators can be employed. Furthermore, on bright days always water early in the morning to allow the plants to dry before nightfall.

With cold over-wintering, without any heating, losses are likely due to dry frost. The plants must be placed indoors in good time for root growth.

What must be observed with outdoor pre-culture:

1. If possible, the plants should be moved indoors before the first frost to avoid damage to the leaves. If this is not possible, they must be covered with fleece. Do not water the plants when they are frozen and do not move them indoors before they are completely thawed.
2. Depending on the amount of precipitation complementary fertilisation on outdoor growing areas is required frequently and at high concentrations (up to 0.3%) to provide the plants with sufficient nutrients. It might be recommendable to apply potassium-based Osmocote. Thus the provision with basic nutrients is ensured. (For further information please contact the company "ICL".)
3. Also fertilise wet balls. Nutrient deficiency causes the old leaves to turn yellow and losses occur due to diseased plants.
4. After moving the plants into the greenhouse soil samples should be obtained and the plants should be fed accordingly. Please note: Do not apply nitrogen-based fertilisers as this can cause disorders of the generative stage.

Cultivation errors that might occur when cultivating *Primula acaulis*:

Irregular blossoming Potting too early or too late

Non-blossoming plants: Growth arrests during cultivation (see to an adequate nutrient supply in the correct ratio during the autumn and winter months) A sufficient supply of potassium and phosphorus is essential.
Unfavourable weather conditions (very low temperatures in September/October)

Stem formation: In spring every now and then plants form a stem like *Primula elatior* caused by insufficient budding. If you observe the optimum culture parameters, this problem can be avoided.

Lateral shoots: Primarily in early and medium-early series the formation of lateral shoots can be seen. This is often due to a nitrogen-based fertilisation or nitrogen in water.

Cultivation tips: Uniform crops are achieved with a relatively dry cultivation method and problems with fungal diseases are prevented.
Growth regulators may conceal deficiency symptoms, therefore analyse the nutrient content in the substrate through soil samples.

Nutrient deficiency/nutrient excess

Calcium deficiency: The young leaves show browning at the leaf tips and often form a hook. At the time of flowering the flower stems collapse directly under the flower and the flower rots. Make sure that the Ca supply in the substrate is sufficient and that the conditions for the reabsorbing of Ca are ideal (Avoid a too high increase in air humidity and provide adequate air circulation). Furthermore, it is important that the other nutrients are at optimum levels to allow the plants to take up Ca easily and remain active.

Potassium deficiency: The older leaves show necrosis of the leaf margins, often they are lightly wilted. The damage spreads out quite rapidly. The potassium levels after the soil analysis should amount to at least 150mg/l. A potassium-based fertiliser should always be applied.

Nitrogen deficiency: This deficiency is almost exclusively observed in outdoor plants exposed to heavy rainfall. After bringing plants indoors do not apply a nitrogen-based fertiliser but use a potassium-based one. That way a disorder of the generative stage is avoided.

Iron deficiency: Leaf paling is visible but the leaf veins remain green. Check the pH value and add special iron fertiliser to the stock solution. A continuous iron fertilisation is essential. The containers for the stock solution should be kept closed as the chelates are not UV stable.

Sodium chloride

Damage: The older leaves show chlorosis and necrosis at the leaf margin which rapidly spread out over the whole leaf. *Primula vulgaris* takes up very high amounts of these two salts although they harm the plant. Problems with sodium or chloride are mostly due to the irrigation water and can be avoided when blending the water with rain water.