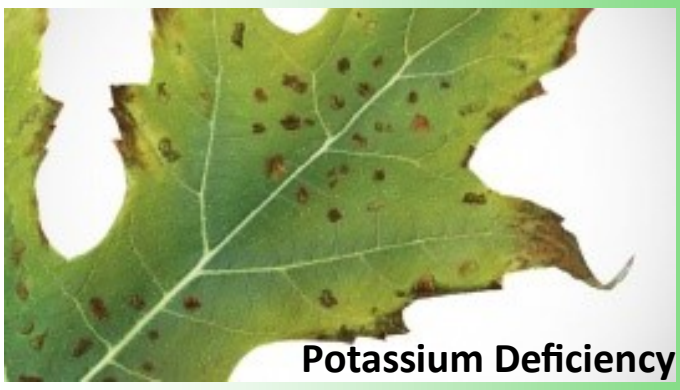
# Deficiency Guide

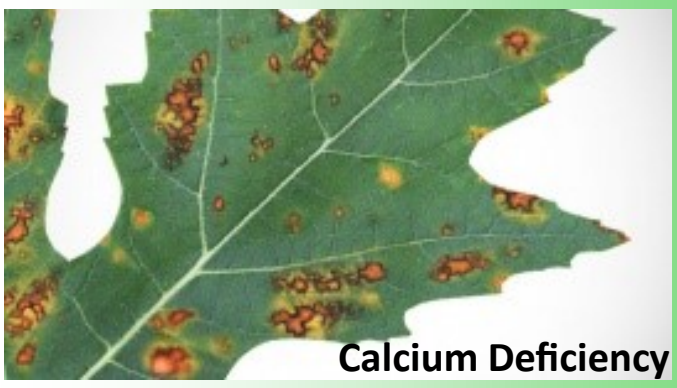

Sulphur Deficiency


Iron Deficiency


Magnesium Deficiency


Nitrogen Deficiency


Potassium Deficiency


Calcium Deficiency


Phosphorus Deficiency

**Calcium, Phosphorus, Nitrogen, Potassium, Sulphur, Magnesium and Iron** are the primary nutrients that plants need. If you come up against a deficiency in one of the elements in your plant(s), you are in some serious trouble.

Brown spots, yellow spots, burned leaves and leaves falling off are just some examples. And if you don't come up with a solution quickly, your beloved plant(s) may pass the point of no return.

The CANNA Deficiency Guide is a great help. It gives you a bit of background information about each nutrient, explains the symptoms, development and reasons for a deficiency, and provides you with a solution at the end.

# Sulphur deficiency guide

Sulphur is one of the molecular building blocks for a number of proteins, hormones and vitamins, such as vitamin B1. It appears in many important plant tissues, such as in seeds and in cellular moisture. In the form of sulphate, sulphur fulfils an important role in the *water equilibrium* in the plant, as well as in the soil.

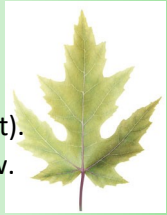
For **hydroponic gardening**, all the nutrients a plant needs are given while watering. As a result of this, fertilisers designed for hydro culture contain high concentrations of lime and sulphur. In order to prevent calcium and sulphur from reacting with each other so that poorly dissolvable gypsum is formed, the two materials are kept separate by manufacturers by means of "A" and "B" packaging.

**About sulphur in short …. what is it and what does it do?** Is one of the molecular building blocks for a number of proteins, hormones and vitamins. Fulfils an important role in the water equilibrium both in the plant and in the soil. **What do you see?....** decolouration of the leaves & strong purple colouration in the leaf stems. **What can you do?....** lower pH & add sulphur

### Symptoms of a deficiency

It would be expected that the earliest symptoms would first appear as a **light green colouring** in the young leaves. However, in practice, we've repeatedly noticed that the symptoms were the most obvious in the older leaves.

### Development of a deficiency



- Light green coloration in one or more large/older leaves.
- Strong purple coloration in the leaf stems (due to the production of anthocyan pigment).
- More leaves change colour, and the light green colour changes in places to deep yellow.

When the shortage is extreme, the plant has lots of deep yellow leaves with purple stalks and leaf stems. Additionally, growth and flowering are inhibited.

### Reasons for a deficiency

With outdoor cultivation, a shortage of sulphur rarely occurs. In potting soil, a sulphur deficiency can occur when the pH is too high, or too much calcium is present.

### Solutions for a deficiency

- It is easier for the plant to take up sulphate at a lower pH level. Check the pH of the medium, and lower it if necessary with sulphur, saltpetre, phosphor or citric acid.
- When there is a deficiency, the best thing to do is add sulphur in an inorganic form with a fertilizer containing magnesium, Epsom salts for hydro, and kieserite in soil.
- If organic fertilising is preferred, composted mushroom fertilisers, and fertilisers from animal sources can be used. Sulphur is only absorbed by the plant in the form of sulphate, which appears in the soil during decomposition of organic sulphur compounds. This process takes time. Therefore preventative work is advised, along with a well composted fertiliser.

# Potassium deficiency

It is necessary for all activities having to do with water transport and the opening and closing of the *stomas*. Potassium takes care of the strength and the quality of the plant and controls countless other processes such as the carbohydrate system.

## About potassium in short...What is it and what does it do?

Potassium takes care of the strength and the quality of the plant & controls countless other processes such as the carbohydrate system. **What do you see?...**Dead edges of the leaves**. What can you do?...** In case the EC in the substrate or soil is high, you can rinse it with clean water and add potassium yourself.

## Symptoms of a deficiency

*Evaporation* is reduced if there is a shortage of potassium. A consequence is that the temperature in the leaves will increase and the cells will burn. This occurs mostly on the edges of the leaves, where normally, evaporation is highest.

## Development of a deficiency

- Tips of the younger leaves show grey edges.
- Leaves turn yellow from the edge in the direction of the veins and rusty-coloured dead spots appear in the leaves.
- The tips of the leaves curl up radically and whole sections of the leaves begin to rot. The leaves keep on curling and ultimately fall off.
- An extreme shortage produces meagre, unhealthy-looking plants with strongly reduced flowering.

## Reasons for a deficiency

- Too little, or the wrong type of fertiliser.
- Growing in potassium-fixed soils.
- An excess of sodium (kitchen salt) in the root environment, as sodium slows down potassium intake.

## Solutions for a deficiency

- In case the EC in the substrate or soil is high, you can rinse with water.
- Add potassium yourself, either in inorganic form: dissolve 5 – 10 grams of potassium nitrate in 10 litres of water. In acidic soils, you can add potassium bicarbonate or potassium hydroxide (5ml in 10 litres of water).
- Add potassium in organic form: add a water solution of wood ash, chicken manure or slurry of manure (be careful not to burn the roots). Extracts of the grape family also contain a lot of potassium.

## For your information

Potassium is absorbed quickly and easily by the plant. In a hydroponic system results get visible within several days. Potassium supplementation by leaf fertilization is not recommended.

Too much potassium will cause salt damage, calcium and magnesium deficiencies and acidification of the root environment!

# Nitrogen deficiency guide

Nitrogen is one of the important elements a plant needs. It is an important part of proteins, chlorophyll, vitamins, hormones and DNA. Because it is a component of enzymes, nitrogen is involved in all enzyme reactions and plays an active role in the plant's metabolism.

**Nitrogen** is mainly absorbed by the plant in the form of nitrate and ammonium. It can also be absorbed via small organic molecules. It is important that the balance between nitrate and ammonium is correct in the feeding otherwise the pH in the rhizosphere (environment immediately surrounding the roots) will become too high or too low. Plants with nitrate as their source of nitrogen have a higher organic acid content. This has an influence on the taste and storage life of the harvest among other things.

Nitrate is converted into ammonium in the plant by the *nitroreductase enzyme*. Ammonium is then assimilated into organic molecules. Nitrogen has a positive influence on the **plant's growth**. The plant gets bigger leaves, more branches and the vegetative period is extended.

**About nitrogen in short...What is it and what does it do?** Nitrogen is a component of enzymes and is therefore involved in all enzyme reactions and plays an active role in the plant's metabolism.

**What do you see?...**Purple stalks, yellowing leaves and leaves falls of. **What can you do?...** Raise EC of the feeding or add extra nitrogen**.**

**Symptoms of a deficiency...**Stalks will turn purple and leaves will yellow and finally fall off.

## Development of a deficiency

- Quickly followed by larger leaves in the middle and top parts of the plant.
- The plant is a lighter colour as a whole.
- Larger leaves in the lower part of the plant turn light green. The leaf stalks of the smaller leaves now also turn purple. Typical vertical purple stripes appear in the stem.
- Leaves in the lower part of the plant turn more yellow and then become white. Finally, the leaves whither and fall off.
- The growth is visibly inhibited giving shorter plants, thinner stems, less leaf formation and smaller leaves.
- Further yellowing and whitening occurs in the top and middle parts of the plant.
- Leaves on growing points remain green longer but they are a lot less green than at normal nitrogen levels.
- Forced flowering starts and there is substantial leaf loss.

Substantial reduction in yield.

## Reasons for a deficiency

**Deficiency can be caused by incorrect feeding or giving feeding that contains insufficient nutrient elements**. Substrates that contain a lot of fresh organic material can cause nitrogen deficiency because micro-organisms bind the nitrogen. A lot of nitrogen can be bound, particularly in the first weeks; this is released later but it is generally too late.

## Solutions for a deficiency

- Raise the EC of the feeding and rinse the substrate well with it.
- Add nitrogen yourself to the feeding solution by using urea, blood meal, semi-liquid manure or by using a special 'mono-nutrient' product.
- Spray the underside of the leaves with a nitrogen solution. This can best be done at the end of the day, just before the lights are turned off. Be careful not to cause burning.

# Iron deficiency guide

Iron is a vital element for plant life. Iron has a number of important functions in the overall metabolism of the plant and is essential for the synthesis of chlorophyll. In general, iron is poorly absorbed by the plant. It can only be sufficiently taken up by the roots in certain forms and under proper conditions. Soil seldom contains too little iron, but it is possible that forms of iron that can be absorbed by the plant are lacking. The absorbency of iron is strongly dependent on the pH. Ordinarily, there is sufficient iron present in absorbable form in acidic soils.

## About iron in short

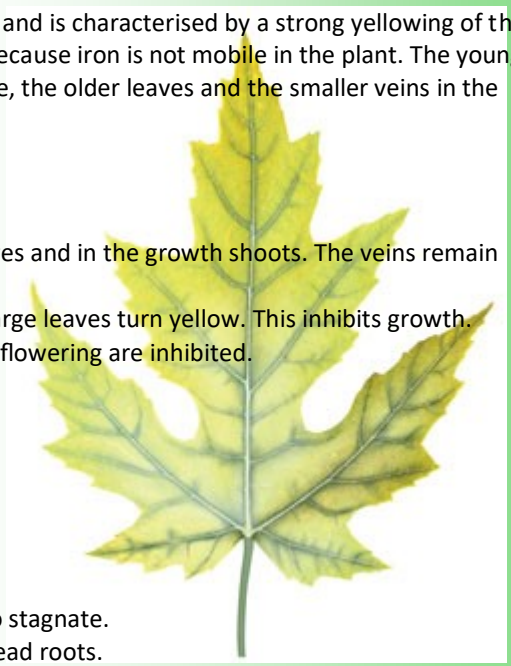
**What is it and what does it do?** Iron has a number of important functions in the plant's overall metabolism and is essential for the synthesis of chlorophyll.

**What do you see?** Strong yellowing of especially the young leaves and growth shoots between the veins.

**What can you do?** The best thing is to spray the plants with a watery solution of **EDDHA or EDTA chelates**.

### Symptoms of a deficiency

Iron deficiency can occur during periods of heavy growth or high plant stress and is characterised by a strong yellowing of the young leaves and the growth shoots between the veins. This occurs chiefly because iron is not mobile in the plant. The young leaves can't draw any iron from the older leaves. With a serious iron shortage, the older leaves and the smaller veins in the leaf can also turn yellow.

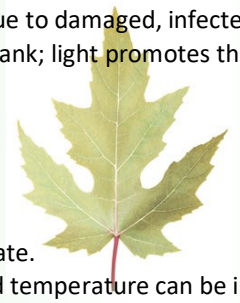


### Development of a deficiency

- Green/yellow *chlorosis*, from inside to the outside in the younger leaves and in the growth shoots. The veins remain mostly green.
- Continued yellowing of the leaves to sometimes almost white. Also, large leaves turn yellow. This inhibits growth.
- In serious cases the leaves show necrosis, and the plant's growth and flowering are inhibited.

### Reasons for a deficiency

- The pH in the root environment is too high (pH> 6,5).
- The root environment contains a lot of zinc and/or manganese.
- The concentration of iron is too low in the root environment.
- The root temperature is low.
- The root medium is too wet, causing the oxygen supply in the roots to stagnate.
- The root system functions inefficiently due to damaged, infected or dead roots.
- There is too much light on the nutrition tank; light promotes the growth of algae. Algae also use up the iron and break down iron chelates.



### Solutions for a deficiency

- Lower the pH.
- Iron chelates can be added to the substrate.
- Drainage can be improved, or the ground temperature can be increased.
- A leaf nutrient with iron chelates can possibly be applied. If a good fertiliser is used with hydroponic growing, an iron deficiency is almost out of the question.
- The best thing you can do is spray the plants with a watery solution of EDDHA - (max. 0.1 grams per litre) or EDTA chelates (max. 0.5 grams per litre).

# Magnesium deficiency guide

Magnesium is an indispensable element for a.o. plants. In plants, it represents a building block for chlorophyll (leaf green), and therefore, it is essential for photosynthesis. At the same time, magnesium plays an important role in the energy transfer. Together with calcium, it is also a component of tap water, influencing water hardness. Inorganic magnesium fertilisers are produced using the same bases that are used to produce potassium fertilisers.

## About magnesium in short

**What is it and what does it do?** Magnesium is indispensable to plants, epresents a building block for chlorophyll and is essential for photosynthesis. **What do you see?** Rusty brown spots, cloudy, vague yellow spots between the veins. **What can you do?** Spray with a 2% solution of Epsom salts every 4-5 days during about a week.

## Symptoms of a deficiency

When there is a shortage, the leaf green in the medium-old leaves under the flowering top will be broken up, and the magnesium will be transported into the young parts of the plant. This breakdown is visible as **rusty brown spots and/or vague, cloudy, yellow spots between the veins**. A slight shortage of magnesium hardly affects flowering, although the development of the flowers makes the deficiency symptoms worse.

## Development of a deficiency

- Signs of a deficiency first appear around the 4th-6th week. Small, rusty brown spots and/or cloudy yellow flecks appear in the middle-aged leaves (under the top of the plant). The colour of the young leaves and the fruit development are not affected.
- The size and number of rust-brown spots on the leaves increase.
- The symptoms spread out over the whole plant, which looks ill. When the shortage becomes acute, the younger leaves are also affected and flower production will be reduced.

## Reasons for a deficiency

The magnesium deficiency can occur because uptake is inhibited because of:

- A very wet, cold and/or acidic root environment.
- A high quantity of potassium, ammonia and/or calcium (for instance high concentrations of calcium carbonate in drinking water, or clay soils rich in calcium) in comparison with the quantity of magnesium.
- A limited root system and heavy plant demands.
- A high EC in the growing medium, which hinders evaporation.

## Solutions to resolve a deficiency

- When a shortage is diagnosed, the best thing to do is spray with a 2% solution of Epsom salts.
- Fertilisation via the roots → Inorganic: Epsom salts on hydroponics or kieserite (magnesium sulphate monohydrate). Organic: composted turkey or cow manure.

## Recovery

Rectify the possible causes: in soil, when the pH is too low (less than 5), use magnesium containing calcium fertilisers. On hydro, temporarily apply a nutrient solution with a higher pH (6.5). When the EC is too high, rinse and/or temporarily feed with drinking water only. When growing indoors, keep the root temperature between 20 - 25 degrees Celsius.

## For your information

A little extra magnesium is not particularly harmful. When growing in soil, excessive quantities of magnesium do not appear quickly. **Too much magnesium inhibits the uptake of calcium**, and the plant displays general symptoms of an excess of salts; stunted growth, and dark-coloured vegetation.

# Calcium deficiency guide

Since calcium can be transported almost exclusively via the xylem vessels, it is an element that deposes of little mobility within the plant. It is, therefore, important that a sufficient amount of calcium is always available in the root environment, so that it will be continuously available for absorption by the plant.

## About calcium in short...what is it and what does it do?

Is important to the growth process….Has a regulating effect in the cells and contributes to the stability of the plant.

**What do you see?...** Yellow/brown spots, surrounded by a sharp brown outlined edge.

**What can you do?...** Add calcium by applying a liquid lime fertiliser such as a calcium nitrate solution.

Calcium occurs throughout the entire plant. It is used for many processes in the plant, however, calcium is most important for the **growth process**. It has a regulating effect in the cells and contributes to the stability of the plant. Plants have two transportation systems at their disposal: the xylem vessels and the sieve vessels. Most nutrients can be transported via both systems, however, for calcium this is not possible.

## Symptoms of a deficiency

The older, larger leaves just above the bottommost ones will show the first symptoms. Yellow/brown spots occur, which are often surrounded by a sharp brown outlined edge. In addition, the growth is curbed and in serious cases the tops are smaller than normal and do not close.

## Development of a deficiency

- The symptoms often appear quickly; within one or two weeks of the first spots being visible on the older leaves. The spots usually start as small, light brown specks that increase in size over time.
- After two weeks, the older leaves show ever increasing spots and the spots also often appear at the edge of the leaves, as with a potassium deficiency or with *scorch symptoms*. The spots have a sharp outline and do not originate exclusively at the edge of the leaves. A lag in development is often already noticeable within a week.
- Sometimes the growing points will wrinkle up and around the fruits you will find thin, small leaves that are not spotted.
- The older leaves die off slowly and yellowish cloudy spots may appear around the necrotic spots. The older the leaf is, the more serious the symptoms are.
- The flowering is also hindered and slowed down. Fruits stay small.

## Reasons for a deficiency

- Culture on calcium fixing soil.
- An excessive amount of ammonium, potassium, magnesium and/or sodium in the root environment. The absorption is curbed mostly by ammonium and least by sodium.
- Problems with the evaporation caused by an excessively high EC value or by excessively high or low relative humidity.

## Solutions to a deficiency

- If the EC value of the substrate or the soil is too high, it can be easily rinsed out with pure and if necessary acidified water.
- Additional calcium can be applied through the nutrient solution by means of liquid lime fertilisers such as a calcium nitrate solution. With an excessively acidic soil, lime milk can be used to increase the pH.
- Use the appropriate soil that is not too acidic. Acid soil often contains insufficient amounts of lime. Good potting soil and Coco substrates are already limed.