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FOLIAR NUTRITION

Basic Information

From the scientific point of view foliar nutrition has long been recognized as a way of supplementing a plant's supply with nutrients. Absorbing nutrients through the leaves cannot replace uptake through the roots, only supplement it. This is why we also talk about "supplementary foliar feeding".

Supplementary foliar feeding means that fertilizer application via the leaves compensates an unbalanced nutrient ratio in the plant.

Supplementary foliar feeding is a way of supplementing the plant's supply with nutrients quickly and specifically.

In addition research has shown that foliar nutrition also promotes the absorption of nutrients via the roots.

Why foliar nutrition?

Even though fertilizer applied to the soil may be correctly calculated, in many instances the plant may still suffer a nutrient deficiency, although the symptoms may often be invisible: so called latent deficiency. This can cause a reduction in yield, which is often considerable. There are many different reasons for nutrient deficiency, such as:

* Unfavourable weather conditions such as drought, extreme variations in temperature and temperatures that are too high or too low. These inhibit the absorption, transport and processing of nutrients.
* Oxygen deficiency (when the soil is compacted, muddy and excessively wet or too cold soil, e.g. after rain) also reduces the uptake of nutrients and/or inhibits root growth and thus restricts the nutrient amounts that are available.
* Unsatisfactory soil pH values that persistently restrict the absorption of nutrients.
  If the pH is high, iron, manganese, boron, copper and zinc are fixed in the soil.
  If the pH value is low, the absorption of elements such as molybdenum is poor.
* An unbalanced supply of certain nutrients reduces the absorption of other elements. Too much phosphate in the soil will cause heavy metals such as iron and zinc to be fixed. Too much potassium will cause poor absorption of calcium and magnesium.
* Certain growth stages in the life of a cultivated plant require particularly high and often quite specific levels of nutrients. Furthermore, an adequate supply of nutrients obtained through the roots, is not guaranteed because of nutritional problems of a physiological nature.

In cases such as these is foliar nutrition an excellent method of ensuring that the plant receives a balanced supply of nutrients, because the leaves quickly absorb the nutrients that are then directly available to the plant.
This straightforward and safe absorption of nutrients also means that purposeful action can be taken at various stages of growth. Hence latent or ready acute deficiencies can be quickly remedied.

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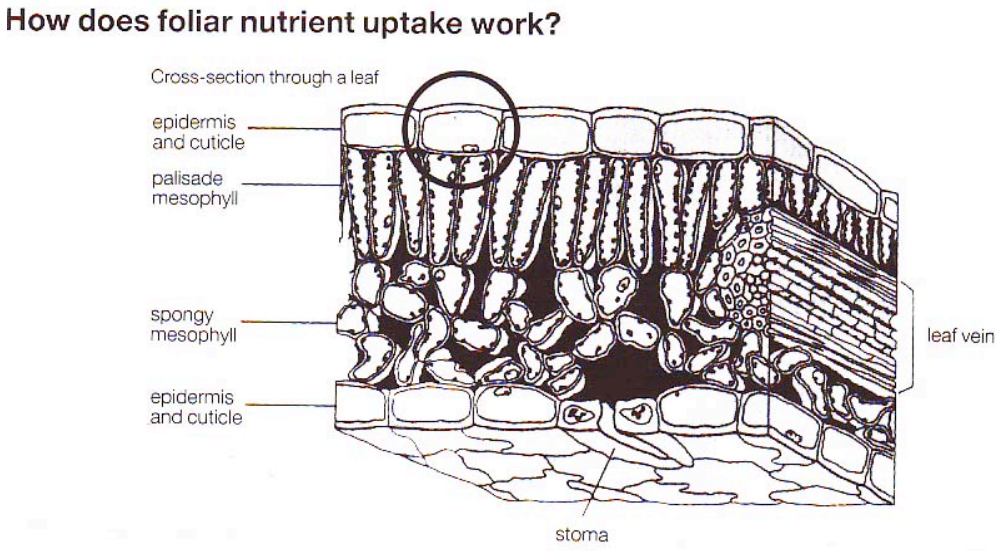
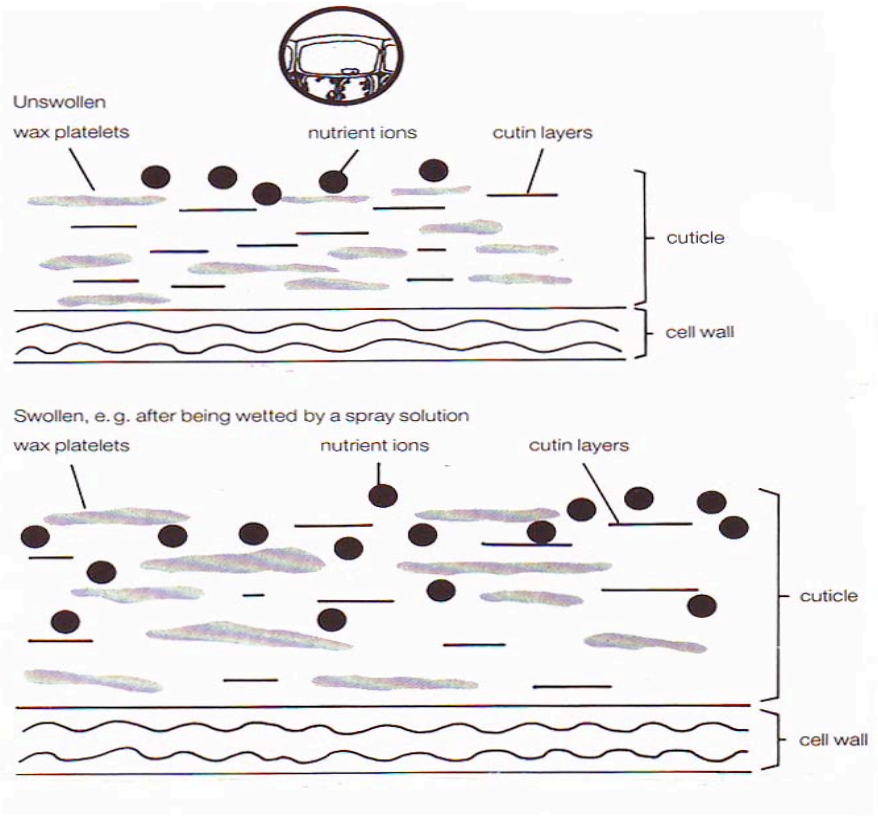
How does foliar nutrient uptake work ?



The outer layer of the leaf expands when it gets in contact with humidity e.g. after wetting by a spray solution. The nutrient ions can then penetrate the cuticle between the cutin layers and wax platelets, to reach the place where photosynthesis takes place via a process equivalent to nutrient uptake through the roots.



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Different methods of foliar nutrition

There are various methods of foliar nutrition in practice. This section will describe in greater detail the three most important methods, each with different aims:

1. General Foliar Nutrition - for supplementary feeding and stimulation of plant metabolism

This type generally involves foliar fertilizers with a balanced content of macro- and micronutrients in a nutrient ratio that is suitable for virtually all plants. The applications are to control stress caused by weather conditions when there is a general nutrient deficiency, and as a supplementary foliar feed when soil fertilization is insufficient.

2. Crop-Specific Foliar Nutrition - for satisfying specific nutrient requirements of different crops

Crop specific foliar nutrition covers both physiological nutritional problems and the specific nutrient requirements of a particular crop under certain conditions.

Two examples will illustrate this:

* Foliar nutrition to take account of the physiological nutritional problems.
  Bitter pit in apples is caused by a localized calcium deficiency in the fruit. Calcium applied to the soil will not cure this, as the calcium is not transported into the fruit in sufficient quantities. Calcium applied via the fruit and leaves is the only way of preventing this deficiency. Similar symptoms of calcium deficiency also occur, for example, in vegetable growing: Blossom-end rot of tomatoes.

* Foliar nutrition to take account of the specific nutritional requirements of the particular crop under certain conditions.

Foliar nutrition in maize will serve to illustrate this. Maize has a very low capacity of P-uptake because of poor root formation during the juvenile phase. At the same time, maize has a high demand for phosphate during the first weeks of growth.

As in addition to this phosphate is very immobile in the soil, cool springs in particular will entail the acute danger of phosphate deficiency manifested by a blue violet discoloration of the leaves. Under such conditions, an adequate nutrient supply of maize can be assured by foliar nutrition only, promoting a smooth development during the early stages of growth, thus forming the basis of a steady and fruitful growth.

3. Soil-Specific Foliar Nutrition - for solving soil-specific nutritional problems

The fixation of certain nutrients in the soil is the reason for applying foliar fertilizers. Two examples:

* Micronutrients - particularly iron, manganese and zinc - are fixated in soils with a high pH to such an extent that they will be insufficiently available to the growing plant, or even not at all. This problem applies to all crops grown on alkaline soils.

* However, fixation in the soil can also involve macronutrients, for example potassium. In soils rich in clay but with a low potassium content, a great part of the potassium supplied by soil fertilizers is fixated to the clay minerals and cannot be absorbed by the plant.
  In this case, but also when micronutrients are fixated in alkaline soils, only foliar nutrition will remedy safe and promptly the insufficient nutrient supply of the plants and help to assure quality and yield.

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Foliar nutrition increases the utilization of soil nutrients

The nutrients absorbed by the leaves stimulate the metabolic processes in the plant, positively influencing the nutrient uptake via the roots.

Foliar-fed plants thus always absorb more nutrients from the soil than those that have not received a foliar feed, so that the increased yields achieved with foliar nutrition are not exclusively attributable to the quantities of nutrients supplied by foliar application: they are really a consequence of the increased uptake of soil nutrients caused about by foliar feeding.

This is the reason why increased yields can be achieved through foliar nutrition on both poor and good soils.

Foliar nutrition as a contribution to environmental protection

Large quantities of soil fertilizer applied to permeable soils with poor absorption can cause considerable problems because nutrients leach out into the ground-water.

Foliar feeding can also help to solve this problem. The basic dressing is reduced; the emphasis is on nutrient supply via the leaves. These nutrients are utilized to a much greater extent than those applied to the soil.

Only a brief overview

This brief overview of foliar nutrition techniques can only touch on some of the opportunities in this interesting branch of plant nutrition. Many developments are currently taking place which will open up new chances for foliar nutrition.

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