



Insight into nutrient uptake

Dry matter and plant sap analysis

Adequate nutrient uptake, from the soil or applied nutrients, is vital to crop production. A correct supply of nutrients is therefore needed. But do you know how much of the various nutrients the crop has absorbed and how much follow up fertilization is required? An analysis of the crop will shed light on this, enabling you to adjust your fertilization to the crop's needs.

A plant consists of 99% carbon, oxygen and water. Major and trace elements make up the rest. Although the nutrients only form a very small part of the plant material, a deficiency in one or more elements can often have serious consequences for the growth and development of the crop.

Nutrient uptake

A plant absorbs the major and trace elements from the soil or substrate in which it is growing. The availability of these nutrients not only depends on the fertilizers provided, but also on the type of soil or substrate and the pH level. However, just because a nutrient is present, this is no guarantee that the uptake by the plant will be enough. This depends on the conditions. Besides pH and EC, climate is also an important factor, since temperature, light and relative

humidity determine the rate of evaporation and therefore the uptake and transport of nutrients. The mutual relationship between the various nutrients present also plays a role. Too high a concentration of one element can inhibit the uptake of another. Lastly, the availability and uptake of nutrients are also influenced by microorganisms.

Two types of analysis

There are two methods of obtaining an insight into the nutrient uptake and nutrient levels of the crop:

- **The dry matter analysis (CropCheck):** analysis of the nutrients bound in the plant material (leaves and stems).
- **The plant sap analysis (PlantsapCheck):** analysis of the nutrients in the cytoplasm and vascular bundles.

CropCheck

In oven-dried plant material, the dry matter analysis determines both the bound and dissolved nutrients. It therefore gives you information on all the nutrients present in the plant. The results are presented in g/kg, µg/kg, %/kg or mmol/kg dry matter. Eurofins Agro has an extensive database of target values for a wide range of crops, allowing you to check whether the values presented in the analysis of your plant material match the guideline values for your crop.

PlantsapCheck

The plant sap analysis determines the nutrient composition of pressed plant material that has been frozen and thawed. This analysis determines all the nutrients in the sap and the cytoplasm and provides a picture of the uptake of nutrients by the plant. The plant sap analysis is a snapshot, so the results can be influenced by a range of factors. It is therefore important to always take samples at the same time of day. The results are presented in mg/l or mmol/l.

Interpretation

The life cycle of the plant consists of various stages (such as the vegetative stage, the generative stage and the reproductive stage). The chemical composition of the sampled material can vary depending on the stage of the plant. When interpreting the results of the two methods it is, therefore, important to take the plant's development stage into account.

Which plant part?

Leaf samples for CropCheck and PlantsapCheck should be taken from new, fully developed dry leaves. It is also possible to sample other parts of the plant (such as older leaves and fruits) to obtain a better picture of the composition of these plant parts (e.g. the calcium content of fruits or flowers). If the plant is displaying deficiency or toxicity symptoms, it is useful to have the analysis performed on a sample from healthy plants as well as one from plants with stunted growth. This enables a better comparison of the differences.

When submitting a sample for the PlantsapCheck, it is important to take the sample from dry plants at maximum cell turgor (i.e. preferably in the morning). The samples have to be shipped in a sealed plastic bag to prevent evaporation.



The difference

It should be noted that the ease with which nutrients are transported through the plant differs. Readily soluble elements such as potassium, sodium, chlorine and nitrate are mainly present in the sap and the cytoplasm, whereas calcium, magnesium and phosphorus are largely bound in the plant cell structures.

Consequently, the results from a dry matter analysis and a plant sap analysis will differ. Therefore, there is no linear correlation between the calcium content in plant sap and in dry matter (figure 1) in the same sample, whereas there is a linear correlation between the K content in both methods (figure 2).

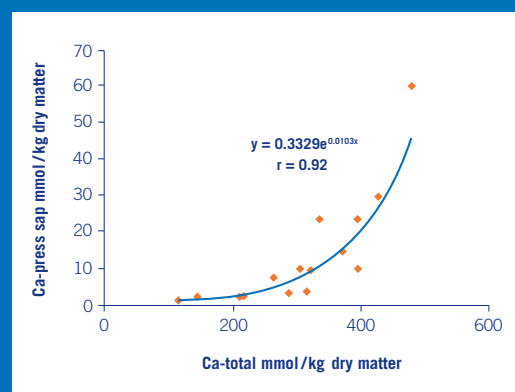


Figure 1: Correlation between Ca content in a carnation leaf determined by dry matter analysis and plant sap analysis. (Source: Cees Sonneveld and Wim Voogt 2009)

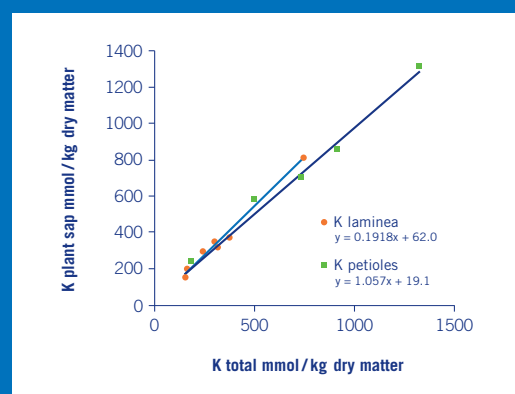


Figure 2: Correlation between K content in a tomato leaf determined by dry matter analysis and plant sap analysis. (Source: Cees Sonneveld and Wim Voogt 2009)