

LEAF OR SAP ANALYSIS?

A comparison of strong and weak points

Ingermar Mansson,
LMI AB. Sweden

Abstract

Leaf analysis is compared with Sap analysis on general principals. The second half of the article is a subjective evaluation of strong and weak points based on 55 years of experience.

Background

In all plants nutrients are present in 2 forms. Partly as dissolved inorganic salts, these are raw material necessary for further growth. Partly as organic products such as proteins, chlorophyll and enzymes. The conventional leaf-analysis measures everything in the sample, both raw material and finished products. Results are given / kg dry matter.

Sap analysis measures only the raw material and results are given as mg/l.

% or mg/l, does it matter?

Plant material contains varying amounts of sugar, starch and cellulose. These carbohydrates do not contain plant nutrients, but they affect the weight of the dry sample.

The practical effect of this is that leaf analysis will show lower nutrient levels as carbohydrates increase. Normally carbohydrate content increases with age, why optimum levels of nutrients will change drastically during the year. This effect is so strong that it is necessary to strictly regulate what parts are to be sampled, also the development stage has to be included in order to evaluate the result. To get reliable references involves a lot of analysis and work. Specific references for different varieties might be necessary.

Sap analysis is not affected by above variations. Differences in reference values between varieties are rare.

Total content of raw material?

Leaf analysis shows all nutrients accumulated during the lifetime of the leaves. In order to minimise 'history' and show the present nutrient situation, the 5 leaf from the top is often chosen as base for the analysis. If a deficiency limits growth it takes time for the leaf analysis to indicate the reason. Either the leaf has to increase weight, or the limiting nutrient has to be translocated to other parts of the plant. Both processes are slow. Excess is shown faster as no growth is necessary.

Sap analysis measures only inorganic nutrients. Both deficiencies and excesses are shown by the analysis within days after some change in uptake. The changes can be big as levels can vary between 0 and decades above optimum level. For correct evaluation of a sample, greater attention must be directed to the relation between elements.

The methods are completely different. Experiences from one method cannot be applied to the other without caution.

Matchstart

To answer the question in the headline a comparison will be made on some important points.

Sampling

Both methods have demands on what parts has to be sampled. This is more critical for leaf analysis, where also development stage has to be identified.

Sap samples should be taken at full turgor and without dew or rain on the leaves. This limits sampling to suitable weather. After sampling Sap-samples must be protected against evaporation and arrive at the lab within days.

It is easier to take and transport a leaf-sample why leaf analysis wins, 1-0.

Time of analysis

Sap analysis takes less work in the lab and thus is normally faster.

Sap analysis wins, 1-1

References

Worldwide most references are for leaf analysis. On this point there is no contest. *(Some of the references are quite old and may not relate to the current yield levels, they may also not be applicable to specific climatic areas.)*

Leaf analysis wins, 2-1 *(unless reference data is available in specific locations or crops).*

Interpretation

In spite of the advantage in available references for leaf analysis the interpretation of sap analysis is less likely to be wrong.

The sap method is 'error' tolerant as variations for many elements is big, a small analytical error does not affect the interpretation.

For a disturbed culture that does not follow 'normal' development, references for leaf analysis can be directly misleading.

For iron most scientists agree that leaf-analysis often show an invers correlation to a visible deficiency, whereas sap has a positive correlation.

Sap wins 2-2

Harvest

As sap shows a more current nutrient status the odds increases that a treatment has positive effect on the harvest. For a practical grower this is the most important point.

Sap wins 2-3

Analysis price

As Sap takes less work in the lab the price may be lower.

Sap wins 2-4

Conclusion

For scientists wanting to calculate total nutrient uptake only the leaf analysis can give the answer.

If the object of research is root-uptake, root breathing, ion antagonism a.s.o. the sap method gives a more direct result.

For long cultures with little maintenance, such as forestry, short time variations are of less interest and leaf analysis is the best choice.

For practical growers and advisors working with intensely maintained crops the Sap analysis is the best tool.