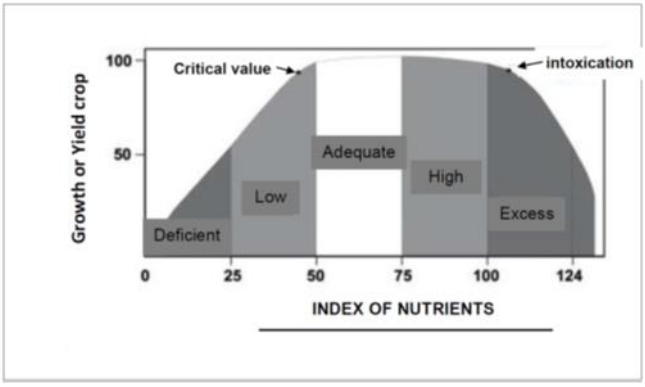
Eran Ben Yaakov

Agronomist, Gat Fertilizers

Analyzing plant matter in the orchard or field is familiar old tool in every farmer's and agronomist's tool kit. We would usually use this tool early in the season, when preparing a crop nutrition program, or in case we see unrecognized deficiency symptoms and want to react efficiently. In recent years additional, sometimes easier, methods of analysis have appeared, which replace plant analysis (such as multi-spectral photography that replaced petioles sap analysis in potato cultivation), but I still think that for the most part, plant analysis does not yet have an adequate substitute. In this article I will review reference points for performing plant analysis.

Why perform plant analysis?

Examination of plant material, leaves, sections of leaves or fruits offers one significant advantage: the analysis is being done on the plant itself, and so it shows the plant's condition. Any other analysis carried out in the field is a third-party analysis: soil, water quality, level of radiation, etc., which affect the plants in that plot, but for various reasons, the effect is not always according to plan, or is partial or not at all. For example, if we come to fertilize a field, it is possible that despite presumably proper fertilization with all nutrient elements, it will not result in the desired level of growth. It is possible that a hidden deficiency of one nutrient element constitutes a factor limiting plant development. This phenomenon generally occurs in "deceiving" crops such as cotton or pomegranate. The field looks good throughout the growing season, but the yield at the end of the season tells the truth.



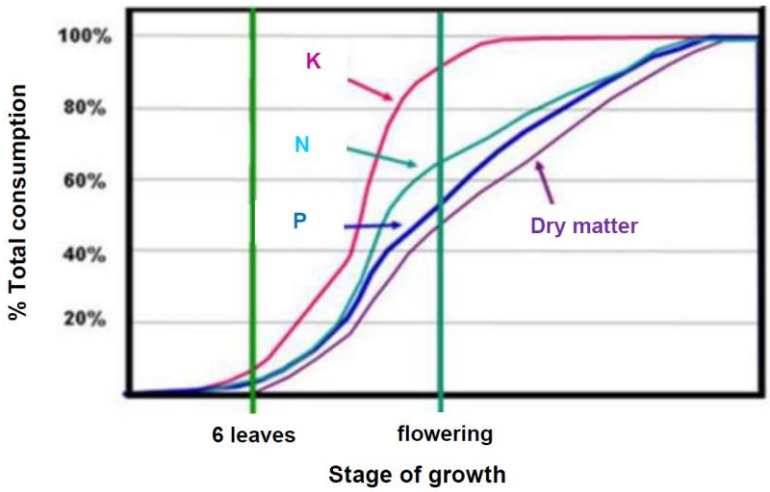
What do we analyze?

The part of the plant sampled is determined by the type of crop, its developmental stage, and the nature of the analysis. For example, with wheat, if we want to make sure that in terms of nitrogen level nutrition, the level required for differentiation of stalks is correct, we should sample whole plants at the developmental stage of 3-5 leaves. If we want to analyze our ability to influence the percentage of grains protein content, we should only sample the flag leaf and analyze the nitrogen level in that specific organ of the plant. In avocado, for the purpose of understanding the plant's nutritional needs, we should sample mature leaves from the spring growth flush, but to analyze the level of fruit ripeness, we should analyze the percentage of dry matter in the fruits flash. For crops such as cotton, where it is possible to react efficiently during the growing season, we should sample petioles to analyze the plant's nutritional condition. If we test leaf blades, we will see results for all nutrient elements, even those that constitute part of the different plant tissues.

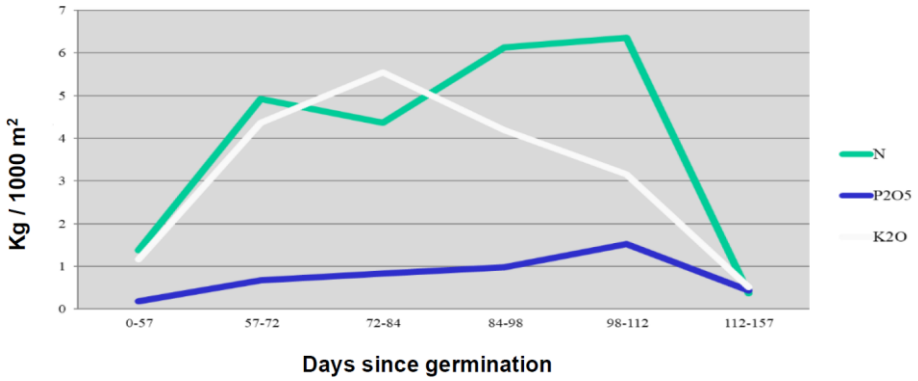
When to sample?

The sampling season depends on the type of plant and the purpose of the analysis. In a crop for which we can react efficiently to the lab analysis results during the growing season, such as cotton, several analyses can be run throughout the growing season to adjust fertilizer accordingly. For crops such as corn, where the effective time frame for reaction is very brief, it is acceptable to sample the whole plant at 30 days of age, and until the results arrive, we will already be close to the effective time limit for adjusting the course of fertilization.

Rate of nutrient absorption in Maize (corn):



Absorption of nutrients in Acala 4-42 Cotton



Absorption graphs Comparison for corn and cotton.

The rate of nutrient absorption in corn vs. cotton. In corn, once it is tasseling (about 80 days after sprouting) there is nearly no possibility of adjusting plant nutrition, as compared to cotton, where until 112 days after sprouting it is possible to influence absorption of nutrient elements.

For perennials, we carry out plant analysis during the period that the nutrient values in the part examined are at a stable level. For this reason, if we delayed in sampling the leaves during the season, there is no point in doing it later.

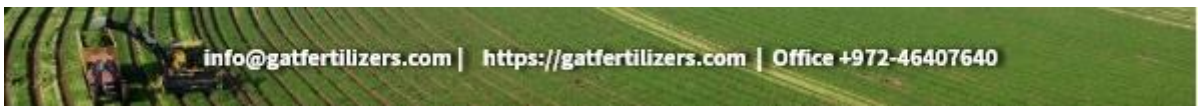
In that sense, there is a single exception. If there are signs of deficiency, or to rule out the possibility of unidentified visual signs, it is possible to carry out a comparative analysis between leaves without visual signs and leaves with signs of deficiency, and by that to investigate whether one or another nutrient element is deficient. **It is important to sample leaves carefully at the same phenological stage.**

How to relate to the analysis results?

analysis results should be considered in the context of the overall growth area and its performance in the previous season. For example, for Haas Avocado, after a very abundant season, we will see a decline in the potassium level. We need to understand what the source of decline is and to correct the nutritional program accordingly. Some of the analysis results serve as a criterion for the accuracy of sampling. For citrus fruit, there is an explicit guideline: the calcium value must be between 4-6%. Since calcium constitutes a component of the plant cell's wall, a lower value will indicate the sampling of immature leaves, while a higher value will indicate the sampling of over-mature leaves. In any case, we need to relate to results from such sampling as of doubtful reliability, that does not reflect accurately the orchard's condition.

When sending several samples for analysis, it is very desirable to examine whether the distribution of results is normal. If all analysis results have higher values than recommended for all parameters, this should raise a serious question about the quality of sampling and/or the analysis in the lab.

In plant analysis, to ensure precision in lab results, it is extremely important to prepare samples with great care. For example, in leaf analysis, thorough cleaning is required and a preparation process that includes drying samples, grinding into power, and preparation of the extracts for instruments analysis. For analyzing macro elements, we are aided by special equipment that analysis nitrates, phosphorus, and potassium. For micro analysis, where concentration of leaves is relatively low, we are aided by an ICP device, the most advanced of its type, with which we can analyze over 30 elements, including metals.



The customer receives results in a relatively short time, e.g., for analyzing petioles the time involved does not exceed 48 hours. When testing leaves, a longer period time is required. Analysis results from previous seasons are saved in the lab, so that it is possible to compare and examine the trend over the years.

Around the world, plant analysis is very customary for a variety of crops. Following are several examples:

Strawberries– petioles throughout the growing season.

Squash (melon, zucchini, pumpkin)– the youngest full-sized leaf, 5 or 6 from the vertex.

Beans– the youngest full-sized leaf.

Tomatoes and peppers– leaf 4 or 5 from the vertex.

Corn– in season – testing whole plants or a leaf near the ear. At the end of the season, prior to harvest, test the lowest 20 cm of the stalk, to check whether fertilization was proper during the season.

Clover– the top 15 cm of the plant.

Petiole testing– cotton and potatoes.

Testing leaves in the orchard– avocado and citrus (during October).

Generally, the common denominator of all the plants and parts examined during the ongoing growing season is that all have intensive nutrient circulation while growing, and they present a true picture of the plant’s nutrient condition. In analysis carried out in orchards once a year, for the most part we sample mature leaves from the past Spring’s flush.

Today, we at Deshen-Gat offer a full array of plant analysis for orchards, field crops, petiole and leaf analysis. analysis is done in field service laboratories and at the Deshen-Gat laboratory at our southern plant in Kiryat-Gat. Some analysis is even possible to carry out in the field.

A side from plant analysis, fertilizers analysis is executed in the laboratory, including macro and micro elements and additional fertilizer characteristics (for raw material and complex fertilizer solutions and solid soluble).

You can contact the Deshen-Gat agronomist in your area, to collect plant samples to the lab for analysis and consultation to help in making decisions regarding your plot fertilization.

*Participating in preparing this article: Yifat Torga Mazor, laboratory director at Deshen-Gat.