

## Leaf analysis, or nutritional diagnosis P-K

Foliar or leaf analysis (also called nutritional pasture diagnosis) enables to measure a posteriori the availability of phosphorous (P) and potassium (K) in the soil, and the capacity of the grass cover in the pasture to absorb these mineral elements from the soil. Leaf analysis conducted one year, is used to determine the fertilisation needs for the following years providing the farming conditions remain the same. The foliar values measured in Spring, are representative of the P and K nutritional values of the plot for the year.

by **Pauline DOLIGEZ** | 14.04.2017 |

Technical level 



Collecting fresh grass for a foliar diagnosis © P. Doligez

### What is the difference between foliar analysis, and soil analysis ?

A soil analysis measures the content of fertilising elements present in the soil. However, on natural pasture land established for over two years, organic matter and fertilising elements (N, P and K) are concentrated within the top few

centimetres of soil, near the roots of the grass cover. When a soil analysis is carried out, the soil samples are collected (without surface litter) from below the roots of the grass cover, which is below the area where the fertilising elements are concentrated.

The link between the availability of fertilising elements in the soil, and the capacity of the plant to absorb them is not always well known. Thus, analysing these fertilising elements (present in the soil, or provided through fertilizers) in the leaf, gives a better idea as to whether they have been absorbed by the plant.

## Why analyse P and K content on the grazing land ?

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**Phosphorous** (P) and **potassium** (K) are mineral elements which the plant needs to grow and develop. P and K nutrition helps to enhance the nitrogen and water available in the soil.

- When there is a lack, production and nutritional value of fodder will be lower (lower protein content)
- In excess, potassium(K) can be washed out (when spreading too much liquid bovine manure for example).

Reasoning phospho-potassic fertilisation is a part of good pasture management. Most of P and K content is provided through restitution. (Animal droppings in the pasture). This means that very little fertilizer needs to be bought, as animals reject 3/4 of the phosphorous and potassium ingested. Phosphorous and potassium, unlike nitrogen, do not evaporate as gases. Plots which have been grazed on should not have a lack of phosphorous or potassium.

On the other hand, plots which are harvested for hay, where there is no or little grazing, will show a more marked lack of these elements. They can therefore benefit from additional organic fertilizers (manure, compost) or minerals.

## What criteria are analysed ?

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The laboratory analyses Nitrogen (N), Phosphorous (P) and Potassium (K) content in the leaf as a % of dry matter. P and K content depend on N content, as while the plant is growing, plant tissue shows a balance between the elements N,P, and K. Nutritional indices, P Index (phosphorous index) and K Index (potassium index) are then calculated.

A soil sample, used to measure the acidity in the soil (pH), can also be carried out with the foliar analysis. If the soil is too acidic, or too basic this can cause poor nutrition in P and K of the grass.

## Interpreting nutritional P and K indices

Nutritional index	Level	Advice
Index > 120	Surplus	Suppression of fertilizers the following year is possible, but the content may decrease, even with an identical yield.
$100 < i < 120$	Very satisfactory	Additional supplements do not increase yield, just a gain in content.
$80 < i < 100$	satisfactory	Fertility will be maintained with a supplement of 100 units of $K_2O$ and 30 units of $P_2O_5$ per hectare per year.
$60 < i < 80$	Insufficient	A drop in the yield may be noticed with regard to climate conditions, and expected production.
$i < 60$	Very insufficient	A very insufficient index induces a depressed state for both the animals, and for the upkeep of good quality plants. This state will inhibit the development of leguminous species, and allow poor quality plants to develop.

## Example of the results of a P-K nutritional analysis on a field

INTERPRETATION AND COMMENTS / DNP	
<b>ADVICE ON PHOSPHOROUS FERTILISING</b>	
<b>P Index = 109</b>  <b>Very satisfactory</b>	<b>Nutritional quality very satisfactory</b>  Suppressing phosphorous fertilisation will not induce a decrease in production. Phosphorous fertilisation can be given a miss for one or two years. Then carry out a new analysis or contact your technician
<b>ADVICE FOR POTASSIC FERTILISING</b>	
<b>K index = 70</b>  <b>insufficient</b>	<b>Insufficient nutritional value</b>  Depressed effect on production depends on climatic conditions and expected production. Increase usual potassic fertiliser by 40 to 60 units of K <sub>2</sub> O/Ha/year (with a maximum of 150 units total over the period). Carry out a new diagnosis in 3 or 4 years time.



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## When should a foliar analysis take place ?

On a plot, a foliar diagnosis can be carried out every 3 to 5 years. Every 3 years if, after an analysis, changes were made to fertilising practices, otherwise every 5 years.

## How to collect grass samples ?

1. Carry out the analysis in **the Spring**, when growth is not impeded by unfavourable climatic conditions (dry or cold).
2. Take the samples from a plot which has not yet been grazed on, during spring growth, with grass at a height of 15cm (mid-calf).

3. Five to twenty handfuls should be collected with shears, 4 to 5 cms from the ground. Samples are collected from a representative plot following a diagonal line, or a « W » (samples collected every 5-10 paces). On fields where horses graze, the samples collected should come from areas where horses generally graze (avoid the rough areas that horses generally don't eat).
4. Remove any leguminous plants from the sample, otherwise the analysis would be distorted (especially regarding K content).
5. A sample of around 500g of green matter containing a mixture of the grass collected, so as to be representative of the cover of the field, should be sent to the laboratory either chilled or frozen beforehand. Fill in the accompanying form for the laboratory and include :
  - Name of the plot
  - Type of pasture
  - Farming method
  - Previous fertilizers used (dates and quantities)

Some laboratories will offer a double analysis (PH analysis of the soil, and leaf analysis of fresh grass)

### How much does foliar analysis cost ?

The price of a P-K nutritional diagnosis costs between **€22 -€30 ex VAT** per analysis.

### Where can a foliar analysis be conducted ?

Some agronomic laboratories will offer a foliar diagnosis. The Chambre d'Agriculture Départementale (local Chamber of Agriculture) will either offer the service themselves, or direct you to a nearby laboratory.

### What are the benefits ?

The financial investment of carrying out a foliar analysis on permanent pastures is beneficial. Management of adapted fertilisation can then be implemented, and is economically profitable. E.g : reducing or amending quantities of fertiliser when unnecessary. Or, on the contrary, a gain in the yield of forage crop production, by recycling manure or compost produced on the farm.

## Bibliography

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