Global diagnosis of a parcel of vine

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Purpose of the case study

In a parcel, try to explain the differences in the behavior of the vine.

Two complementary approaches:

- field observations
- laboratory analysis

Summary and advice to the winemaker

Field observations

Soil observations

Tools and methods used :

- Observation of the environment
- Observation of soil profiles
- Floristic inventory: "plants bio-indicator ‘
- And other tests (structure with spade or “penetrometer”, earthworms, etc.)


400
600
200
800
0
1000
N

Observations of the vine

Tools and methods used to assess the development of the vine:

- Vine stock diameter
- Vine shoot length
- Number of grapes ; Their volume and weight (if possible)
- Color of the foliage, health status

Taking samples for analysis

Soil : in each horizon

Roots if necessary

Leaves /shoots / grapes

Synthesis of the case study

Synthesis of field observations

Interpretation of soil analysis

- Physical and chemical analysis
- Organic, microbial mass and biological activities

Interpretation of plant analysis

- Shoots
- Maybe grapes and wine analysis

Your conclusions and recommendations

For memory :letters/figures used for the samples

1 : lower part of the parcel

2 : upper part of the parcel, less vigor

R : under the row

I : between row

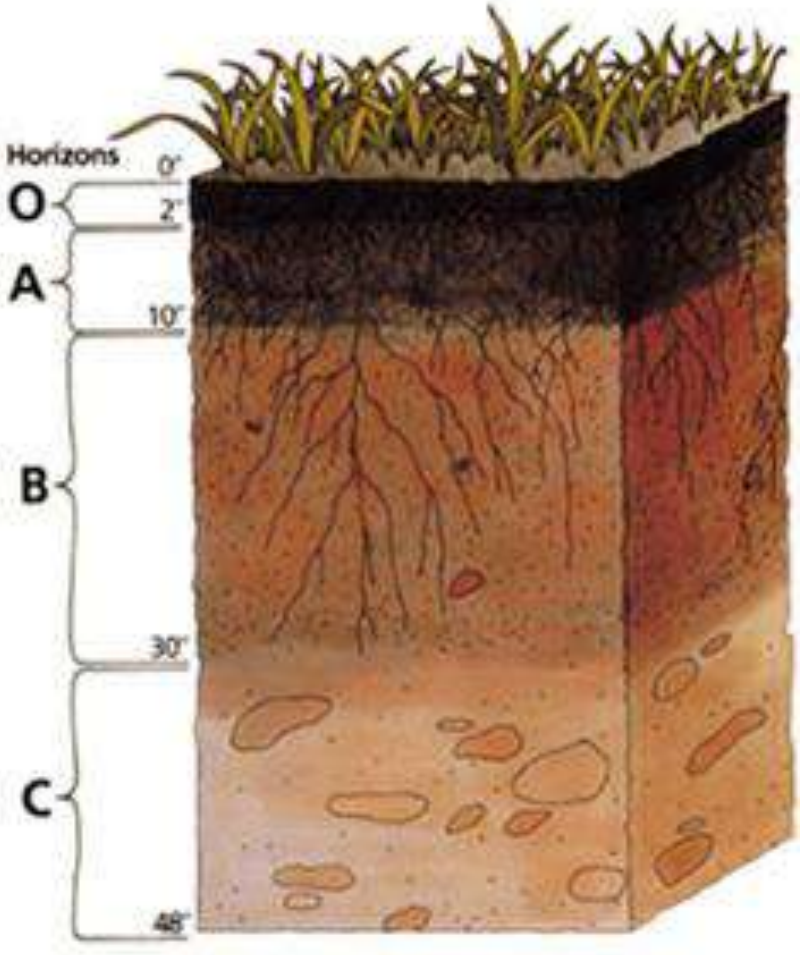
A : topic soil horizon 0 to 30 cm deep

B : second soil horizon 30 to 60 cm

Évolution du sol sur des millénaires : Présentation« simplifiée »

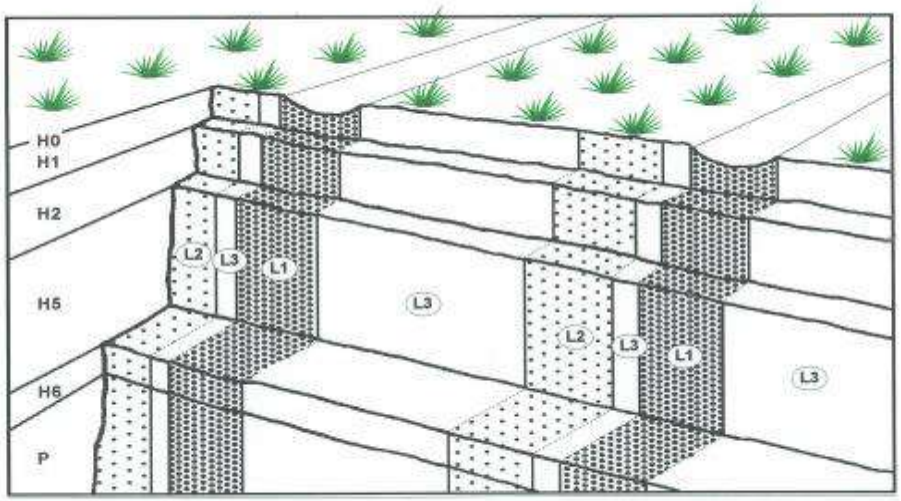
Humus
Encore riche en matière organique, horizon appauvri
Encore pauvre en matière organique, horizon d'accumulation

Horizon d'altération de la roche



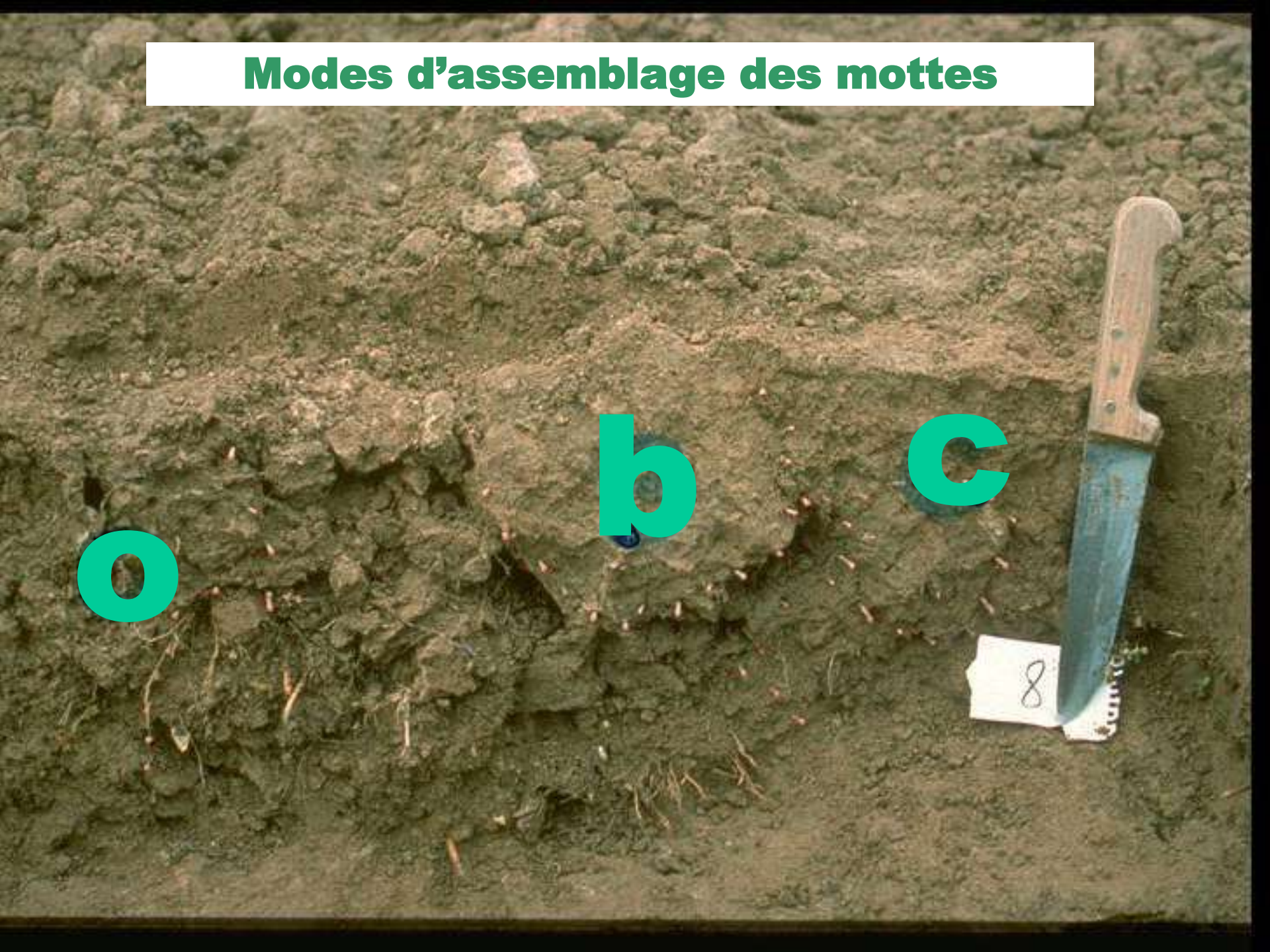
E des sols, Barot

The cultivated soil profile



VERTICAL AND LATERAL PARTITIONS OF "PROFIL CULTURAL"

Modes d’assemblage des mottes



Etat interne des mottes

(Manichon 1982, Gautronneau 2000)

Γ (gamma)

Φ (phi)

Δ_0 (delta zéro)

Δ (delta)

Observations of soil profile

- horizons, depth, stone content, geological subsoil.

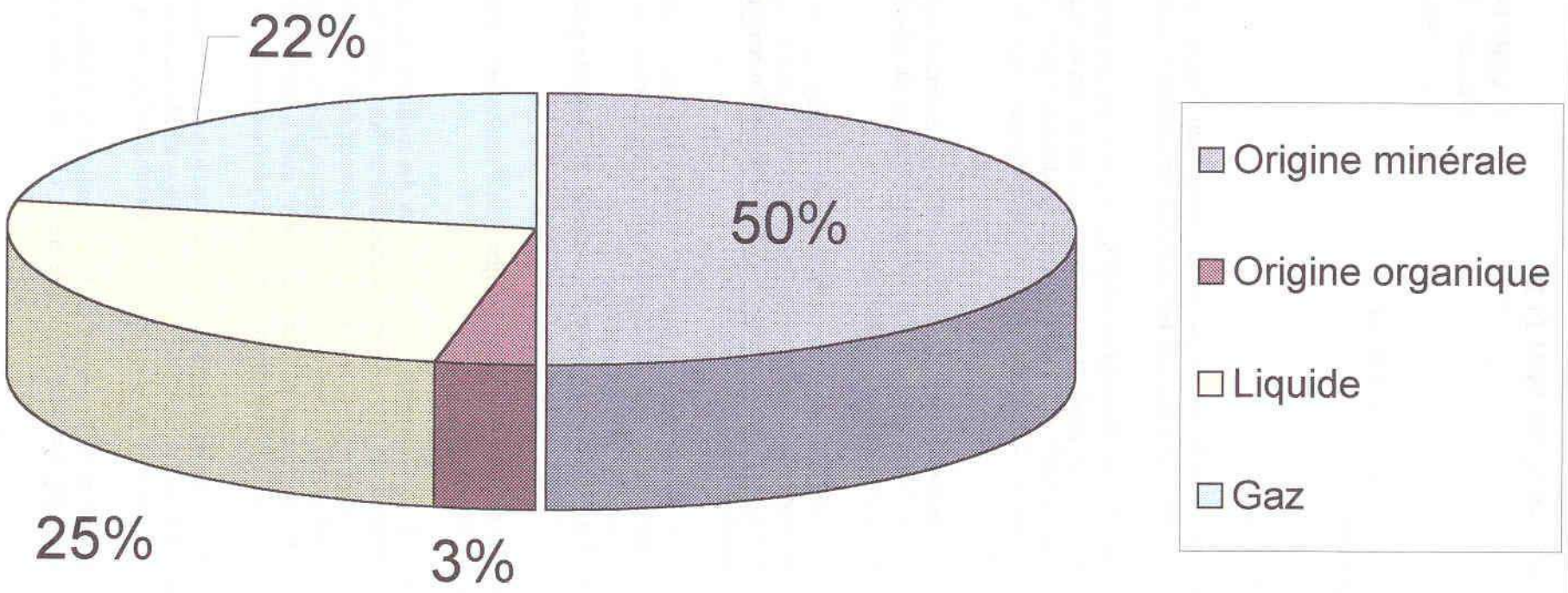
- soil structure, pedological phenomenon going on
- rooting of crop and cover crop : density, depth, state
- biological activity (earthworms, ants…)
- presence of raw crop residues

General comments on soil and limiting factors

Structure et aération

Les quatre fractions du sol : exemple d'un limon moyen

d'après Mériaux (techniques agricoles)



Soil analyses

Indispensable complement to field diagnosis

Samples are taken by type of soil in the different profile parts. Interpretation is made part by part and by comparing data from one part to the other and between different points of field. Example: field top and bottom in case of slope.

Major criteria used:

Soil fixation capacity, measured from the quantity and quality of ultra-fine particles (“real” clay and fine silt).

This parameter determines level of inputs not to be exceeded and necessity or not to fraction them. CEC Cobaltihéxamine or CEC Metson

Links of organo-mineral complex, measurement of :

Exchangeable calcium and magnesium
Iron Mehra-Jackson
total and active limestone and index of chlorosis capacity (In French IPC).
Water pH and KCl pH.
“Exchangeable” aluminium with KCl.

These parameters determine the decision to bring calcareous amendments or not (nature, quantity, fractioning), give an evaluation of blockage risk, and correction needed.

Organic matter: Measurement of total carbon and total nitrogen ;
C/N.

This is not enough in order to characterize the organic soil functioning.

Then we measure two fractions of organic matter :

- **stable humus, complex polymers linked to ultra-fine particles,**

- **free organic matters, easily accessible to microbial biomass; they are measured on the coarse part of fine earth.**
  The level and balance between those two fractions determine the type of product to bring to the soil.

The quantity of inputs depends on crop, soil fixation capacity and on biological activity.

- Matière organique libre/rapide : facilement accessibles à la biomasse du sol (rôle nourricier), rôle fertilisant pour les plantes. Dégradation rapide (< 12 ans).

- Matière organique liée/très lente : constitue l'humus stable du sol, dégradation très lente (>50 ans),

La vie du sol peut représenter

Dans 20 cm de terre agricole et par ha :

- 500 kg à 5 T de vers de terre, 10 à 1000 individus /m2
- 5 à 50 T de matières vivantes microbiennes
- 3.10^{18} de bactéries
- 150 millions de km d'hyphes fongiques, dont les mycorhizes

Microbial Mass and mineralization activities

An important part of soil fertility is linked to its biological components. Microbial Mass constitutes the most active fraction of this component.

The analysis is made on surface earth (5 to 30cm).

The chosen parameters are :

Microbial biomass : expressed in milligrams carbon per kilo of earth : this is the quantity of microscopic organisms in soil (mainly fungi and bacteria

Example :

Biomass mg C/kg of soil	Interpretation
100-150	**LOW**
200-300	**Correct**
300-400	**High**

Éléments minéraux stockés dans la BM (calculés)

Exemple : 395 mg de C microbien

N 178 U - kg /ha

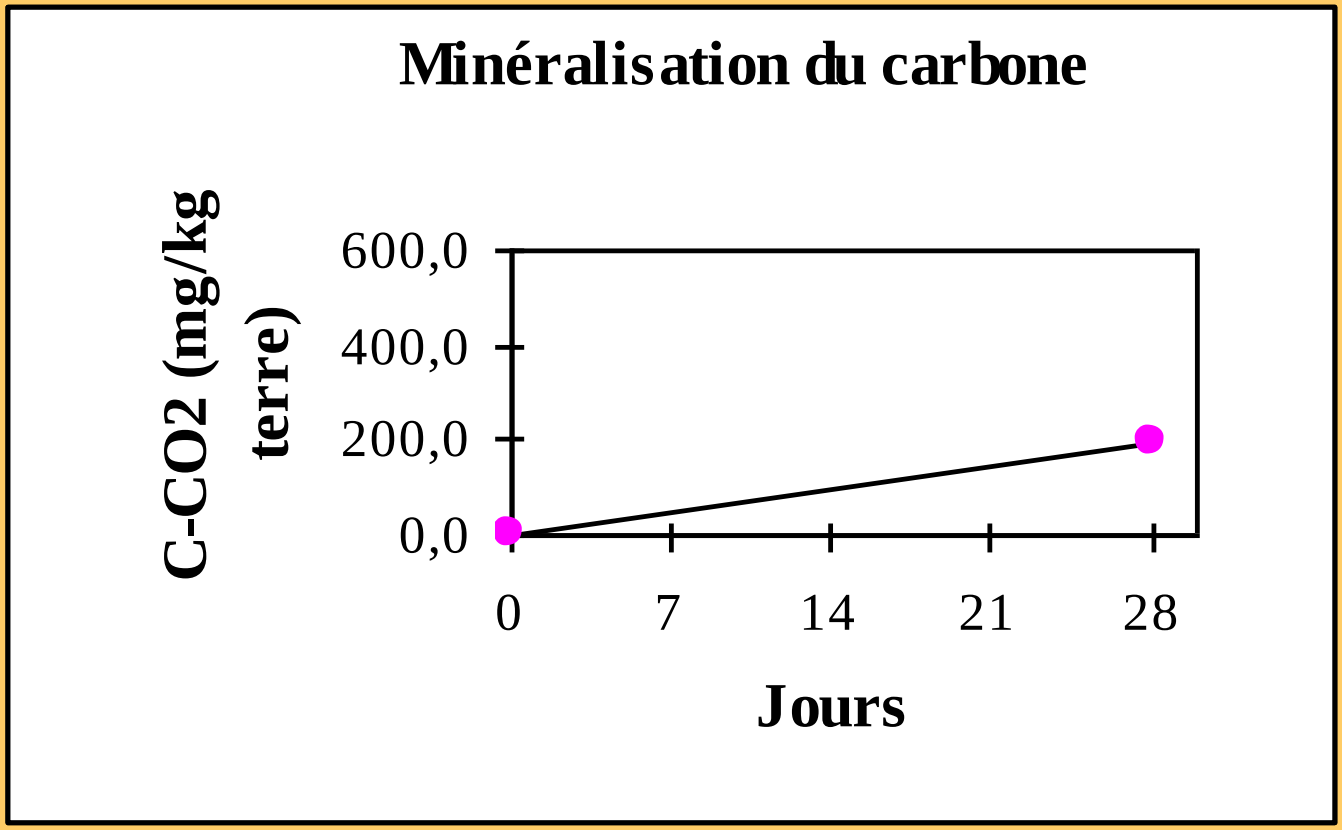
P 137 U – kg /ha

K 116 U - kg /ha

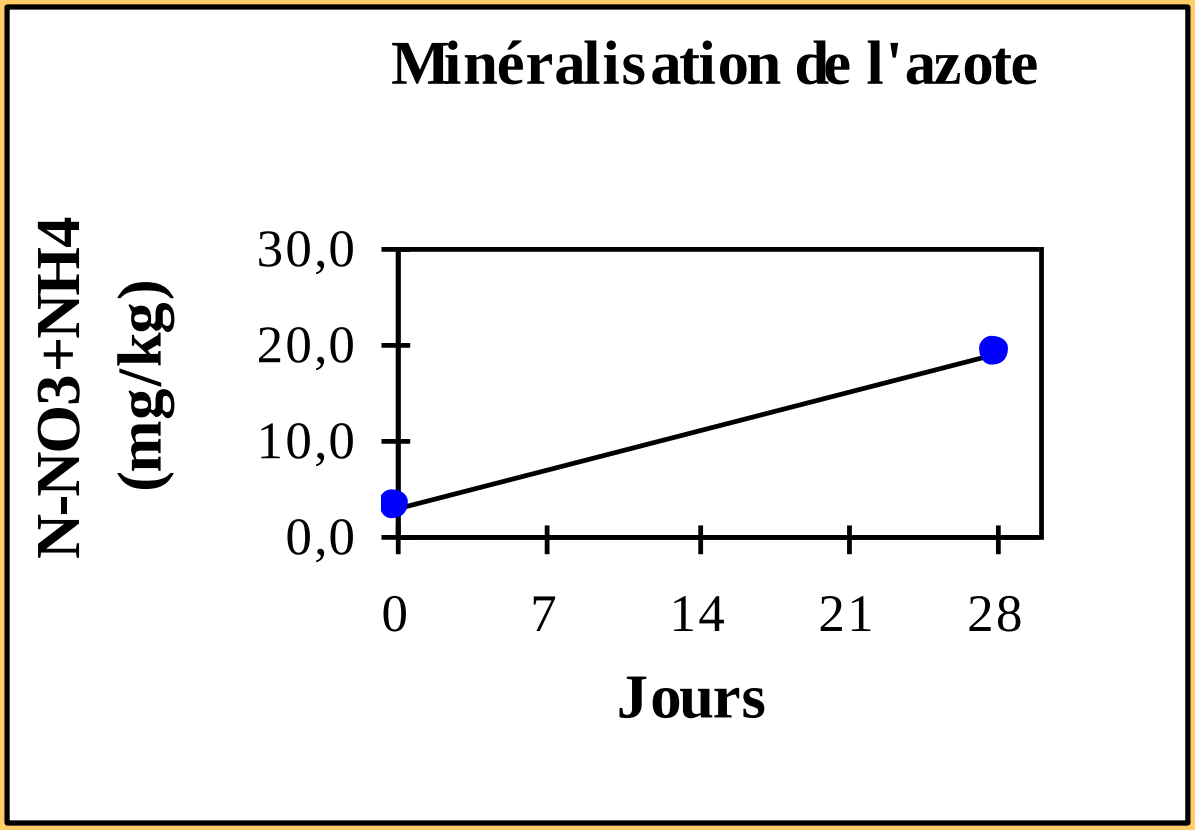
Ca 17 U – Kg /ha

Mg 17 U – kg/ha

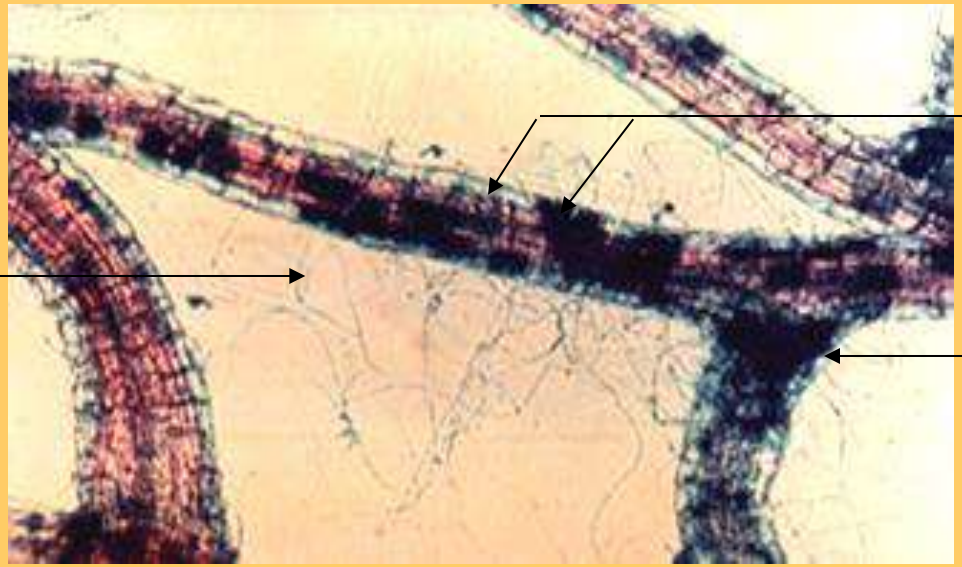
Carbon Mineralization Activity expressed in mg C-CO2/kg/28 days. Calculation of carbon mineralization index.



Nitrogen Mineralization Activity: expressed in mg N-mineral (NO_3^- et NH_4^+)/kg/28 days.
Calculation of nitrogen mineralization index



Analysis of roots mycorrhization rate : qualitative indicator of soil and plant functioning



(Photo INRA)

Mineral content : easily exchangeable elements and trace elements.

Total elements measured on the mineral substratum : P, K, Ca, Mg. *Determines inputs balance and eventual corrections*

Soil Evolution : *balance between free iron and total iron. Balance between free aluminium and total aluminium.*

Soil Hydromorphy : *manganese easily “reduced” /total manganese*

Plantes bio-indicatrices

=> toutes les plantes sont bio indicatrices des ***« contraintes de milieux »***.

Ceci nécessité de connaître leur BIOTOPE PRIMAIRE **= son « VRAI »** milieu naturel

Inventaire floristique et plantes bio-indicatrices

- Une espèce est déterminante et indicatrice pour la sphère immédiate où elle vie : dans un rayon de 50 cm maximum.
- Une espèce sera déterminante et indicatrice pour une parcelle, si elle est présente et répartie sur l'ensemble de la parcelle avec une densité de plusieurs individus à plusieurs dizaines d'individus au mètre carré