

From Calcium to Protons : toward a new intelligence of liming for advising through new methods

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Development

- TS 16375 : a new method to assess limestone efficiency

- pH : a competition between proton production and released neutralising value

- IPA : a new approach for simple advising

- Bonus :
 - Expression of NV and nutrients
 - Assessment of NV for organic products
 - New citric reactivity
 - 7 th ATP



TS 16375 : a new method to assess limestone efficiency

Rectifications

■ Calcium ~~---~~→ pH

■ pH : many bias

- Mixing
- Grinding
- Water

→ Over optimistic indicator

■ CaCO₃

- Remaining (still there) → unefficient
- Dissolved → efficient

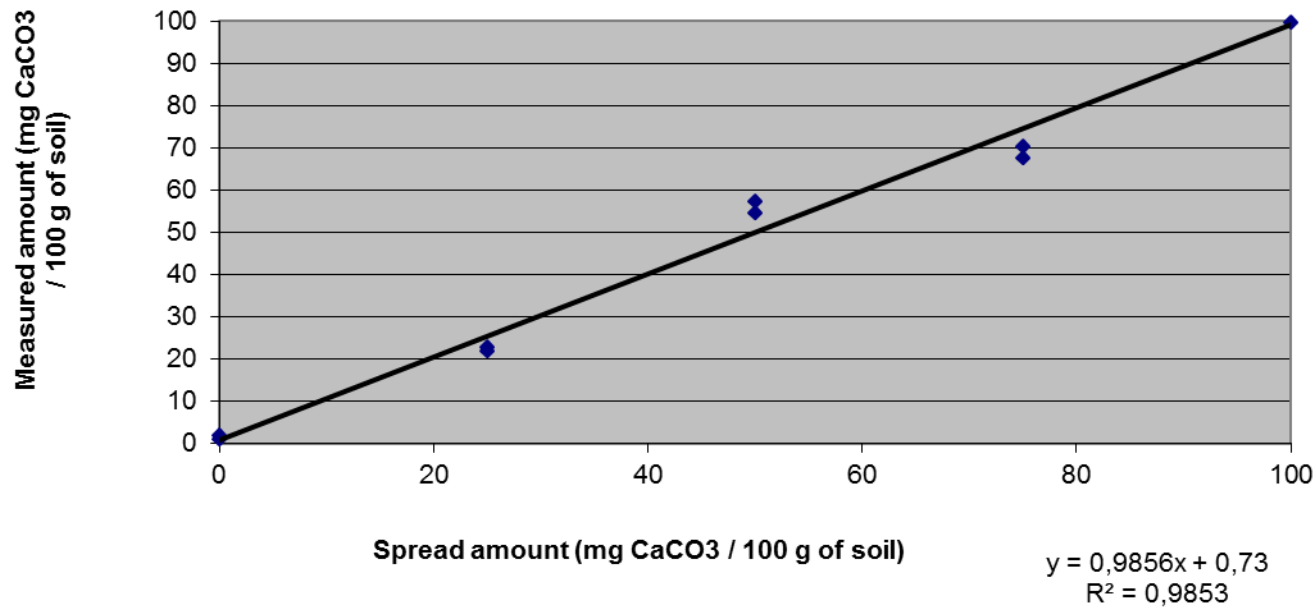
■ -> dissolution rate measurement

TS 16375 : a new method to assess limestone efficiency

- Measurement of remaining carbonate
- Inspired from CaCO_3 measurement in soils
- Hydrochloric attack in controlled conditions :
 - fine grinding
 - air pressure and tTemperature under control
 - thin glassware
 - Stopwatch
- Ring tested

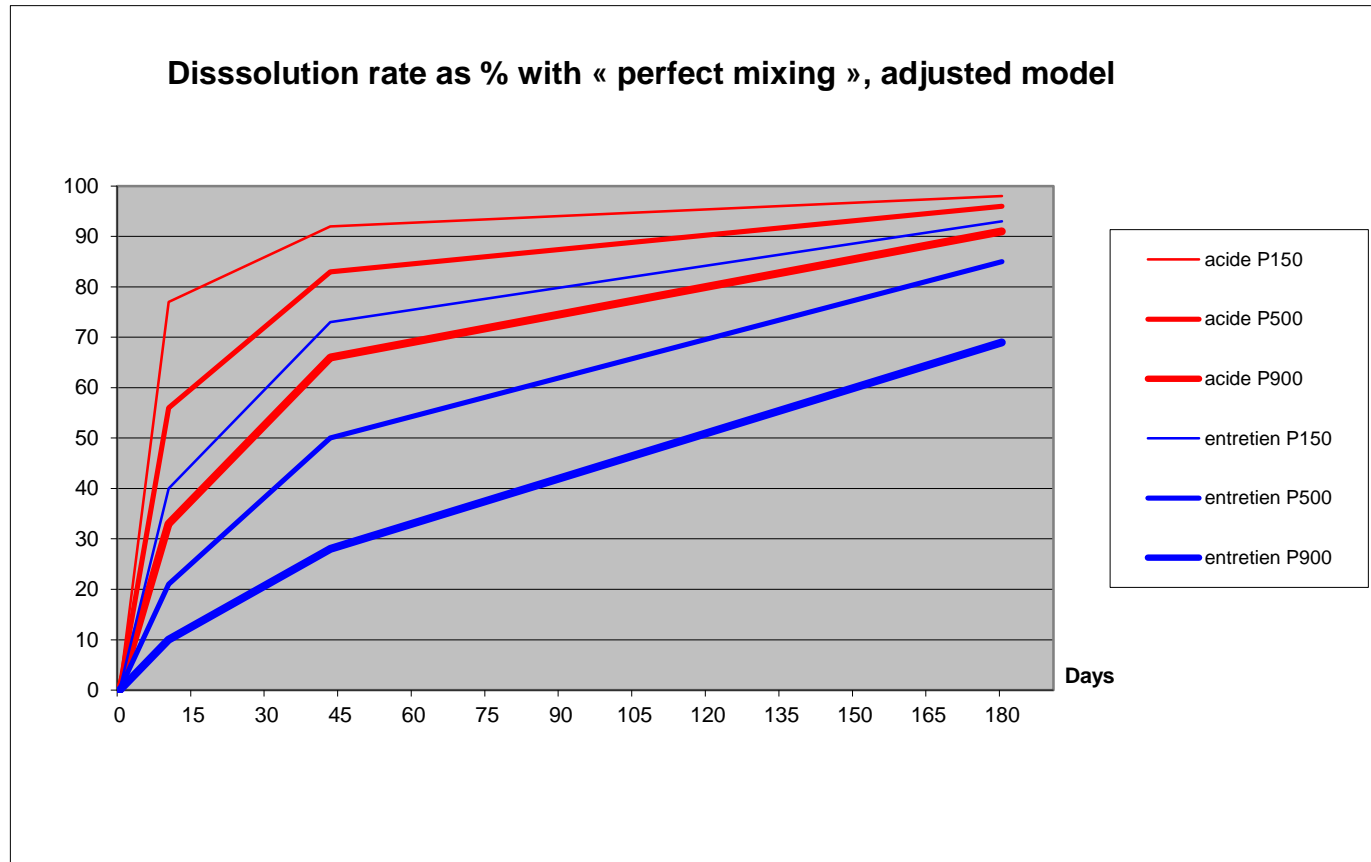
The method is relevant

Relation between spread amount and measured amount , 0/160 μ carbonate, soil sample mass : 20 g



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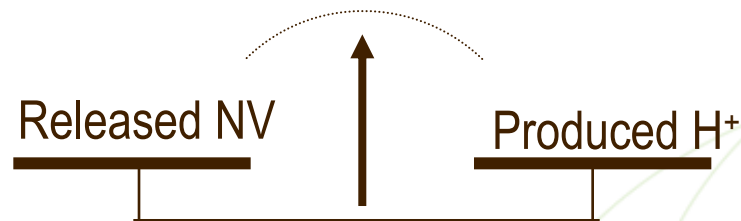
Results from field experiment (LDAR)



pH : a competition between H^+ production and released NV

To keep a correct acido-basic status :

The liming material shall release (dissolve) per year at least as much neutralising value than produced protons (H^+) from the cropping system.



- If the release of NV is higher than H^+ production, pH increases.
- On the contrary, soil acidifies, H^+ replace useful cations, pH and saturation rate drop.

IPA : a new approach for simple advising

- Targets
- Principles
- Use
- Evidences
- Advising
- Questions



IPA Indice de Positionnement Agronomique

■ Targets :

- ✓ To simplify advising about product choice
- ✓ To put all liming materials on a technical capacity scale

• Reference guide :

- ✓ Same IPA calculation rules for all interested stakeholders (locked software)
- ✓ External and annual certification by Qualité France SAS

Fundamentals about **IPA** from **COMIFER** experience

- ✓ *Neutralising value is more effective when soil is acidic.*
- ✓ *The finer or softer the material is, the faster the speed dissolution is (for carbonates).*
- ✓ *For equal spreaded mass, number and particule distribution will improve efficiency*



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IPA calculation principles

IPA calculation depends on the following characteristics :

- ✓ Product type (chalk, carbonate with or without magnesium ; burnt lime ; mixt (burnt +unburnt) products ; liming materials from steel industry)
- ✓ Presentation (dry, wet, liquid)
- ✓ Fineness (for carbonates)
- ✓ Reactivity (as solubilité carbonique) for carbonates
- ✓ Components and percentages for mixtures

- ✓ Indexes are calculated to the next integer value, then rounded to the nearest 5 points.
- ✓ **Practically, attributed IPA values, from 40 to 150, correspond to the target saturation rate.**

Calcul de l'Indice de Positionnement Agronomique CELAC (IPA)

Référence du produit

En savoir plus ...

Sauvegarder en .txt

Imprimer le résultat

Copie d'écran ...

Cochez les cases, cliquez sur les boutons ou déplacez le curseur avec la souris pour saisir les caractéristiques du produit dans la zone centrale.

Quand toutes les informations nécessaires sont saisies, cliquez sur le bouton "Lancer le calcul" pour faire apparaître l'IPA sur la zone en bas à droite de l'écran.

Quand le pointeur passe sur une zone de texte en noir, vous obtenez des explications complémentaires.

Petits déplacements : cliquer sur les flèches des extrémités.
Déplacements proportionnels : faire glisser le curseur.
Grands déplacements : cliquer sur les zones intermédiaires.

Il est possible d'ouvrir simultanément plusieurs fenêtres. Réduire la première. Elle est alors disponible sur la barre des tâches du bas de l'écran. Une seconde fenêtre peut alors être lancée.

Le logiciel se ferme en cochant toutes les croix blanches sur fond rouge en haut à droite des écrans.

Composant(s)

Calcaire

70 %

Craie

Dolomie

30 %

Cuit

ABS

100 %

Présentation

Sec
 Humide
 Liquides

Sec
 Humide

Finesse

80 % passant à 100 µ

80 % passant à 100 µ

Solubilité Carbonique

60

25

IPA

90

75

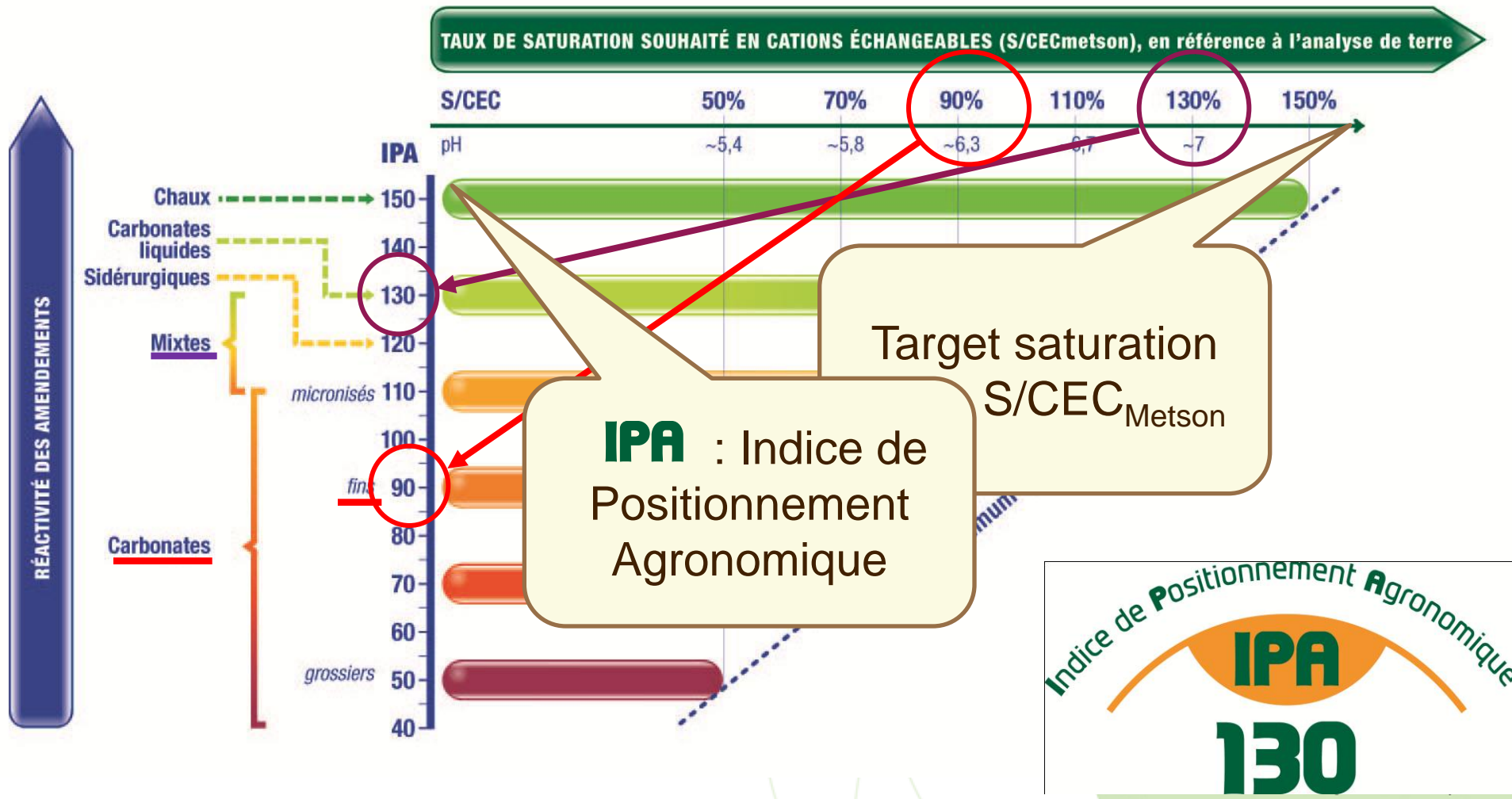
IPA brut : 85

Nouveau calcul / Annuler le calcul en cours

IPA final : 85

Using IPA

Choisir un amendement minéral basique avec l'IPA

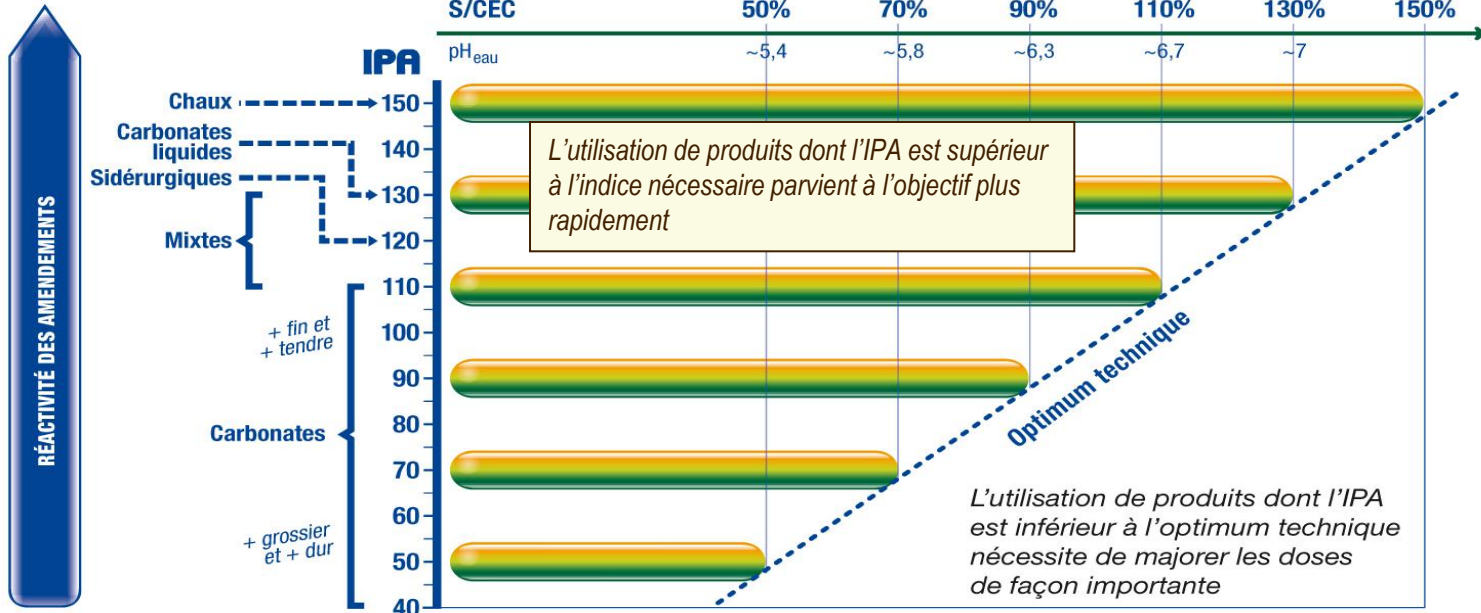


Using IPA

Choisir un amendement minéral basique avec l'

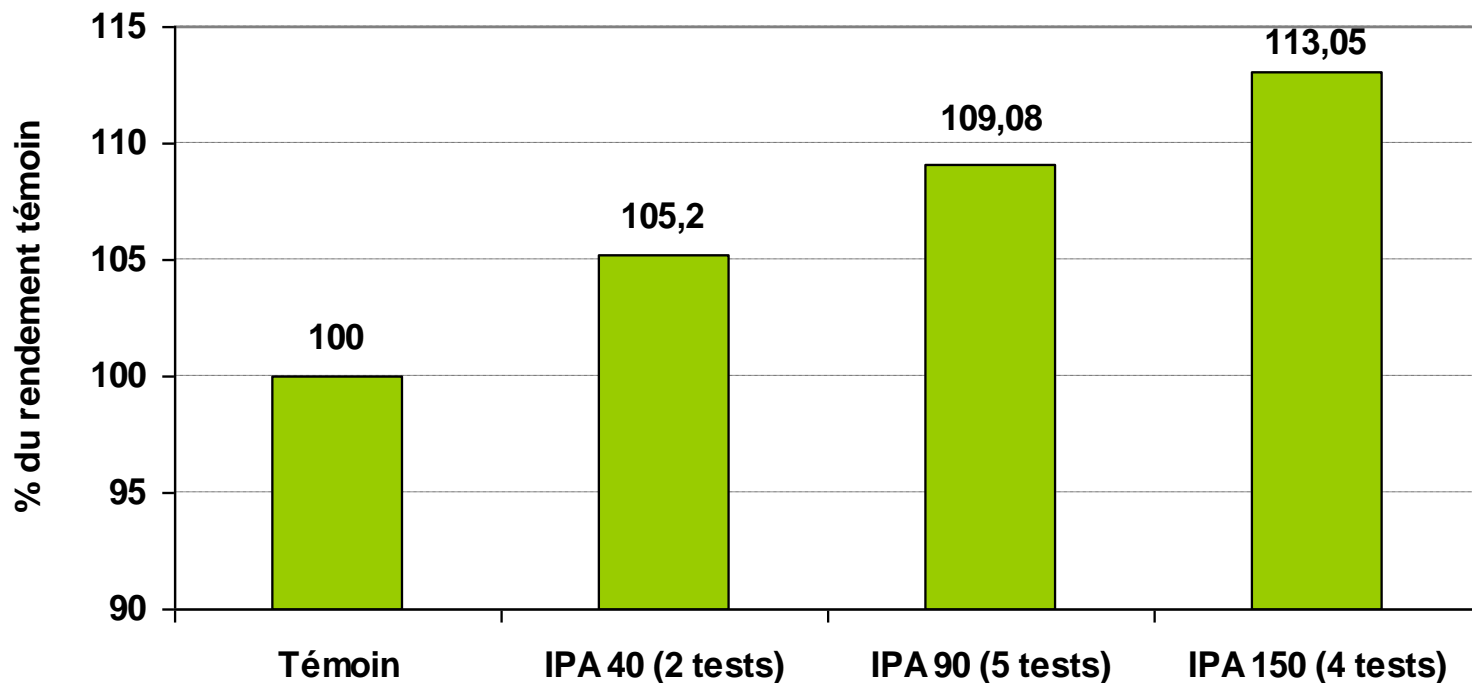
Indice de Positionnement Agronomique
IPA

TAUX DE SATURATION SOUHAITÉ EN CATIONS ÉCHANGEABLES (S/CECmetson), en référence à l'analyse de terre



IN VIVO experiments

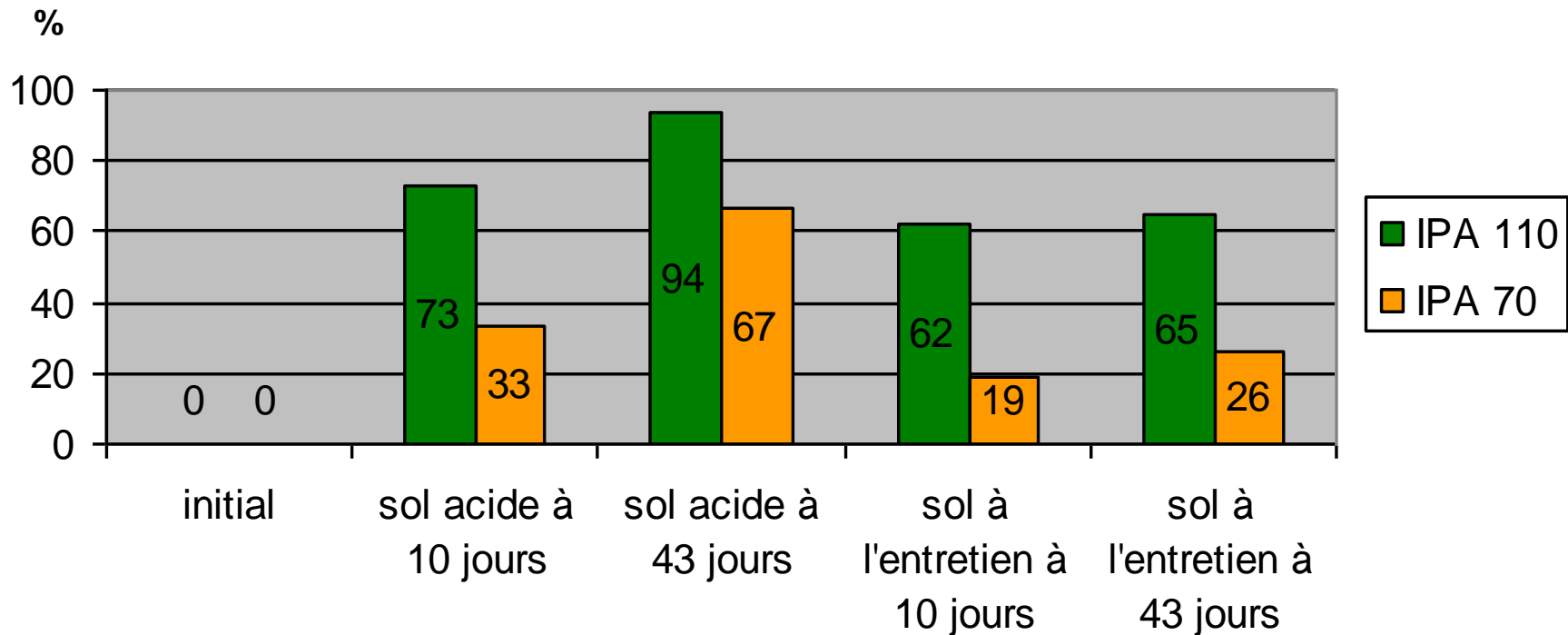
Rendements moyens par type de produit pour un apport équivalent à 1000 VN/ha et à pH supérieur à 6
(4 essais Pool Fertil)



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LDAR experiment

% du calcaire s'étant dissous (efficacité)



Attention : Essai en pots conduit au champ en conditions parfaites d'incorporation

Advising

- 1 Soil analysis (pH, S/CEC)
- 2 Set the target saturation rate depending on cropping system
- 3 **Choose a product with suitable IPA (= target S/CEC)**
- 4 Calculate lime requirement as necessary NV/ha
- 5 Calculate the amount of product depending on its NV
- 6 Spread and till to disperse particles

To know more ...

■ On the internet web site:

www.ipa-chaulage.info or « ipa » + « chaulage »

- Possible downloads :
 - 3 pages brochure
 - News about IPA
- Lime requirement calculation
- Frequently asked questions (FAQ)
- Product list and producers

Bonus :

- Expression of neutralising value and nutrients
- New citric reactivity
- NV for organic products
- 7th ATP



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Expression of Neutralising Value and Nutrients

- $\text{pH} \sim \text{Log}(1/[\text{H}^+])$
 - acidity is related to H^+ in soils :
 - H^+ in excess -> acid soil
 - lack of H^+ -> alkaline soil
 - in some countries : NV expressed as CaO equivalent
 - in some others : NV expressed as CaCO_3 equivalent
 - both are confusing and refer to calcium :
 - Ca measurement -> CaO -> NV : **wrong**
 - NV is to be measured, not calculated from Ca (or Mg) content

We should come to indicators related to real properties :

- H^+ (protons) for Neutralising Value : potential capacity to neutralise H^+
- Similar for P_2O_5 , K_2O , CaO , MgO , SO_3 , Na_2O :
-> P, K, Ca, Mg, S, Na, as for N and micro nutrients

EN 14984 : assessment of NV for organic products

- EN 12945 is not relevant (HCl reacts with O.M.)
- Calcium content converted to CaO then NV is not relevant
- Use EN 14984 : incubation method
 - Soil alone
 - Soil + reference liming material
 - Soil + tested product (same dry matter amount)

 - compared pH evolution
- Expression of results to be modified as NV equivalent



EN 16357 : new citric reactivity

- Automatic titration (+ sample changer)
- 15 minutes only
- Citric acid at pH 4,5 (closer to soil conditions)
- Test sample : 5 g (better representativeness)
- Ring test : 18 laboratories, good r and R
- Included in 7 th ATP

7th ATP to EC 2003 / 2003

- last stage : November 19 th (final decision)
- including :
 - G1 carbonates / dolomites
 - G2 oxide / hydroxide
 - G3 sugar factory lime
 - G4 mixed lime (G1 + G2)
 - G5 mixtures with EC fertilisers (except μ nutrients)
- application : 12 months after publication

