

Chemical soil properties – Exercise C05

SOIL NUTRIENTS AVAILABILITY

Reference posters n. 11a, 11b, 12a

RELEVANCE

Soil nutrients are essential for plant growth and ensure crop production in many agricultural environments. Soil properties such as increased infiltration and water retention capacity, improved soil structure, and biological properties, an adequate soil organic matter (SOM) content can lead to a higher supply of nutrients, while an adequate soil pH is critical in regulating nutrients availability. The integrated management of these elements can favor not only agricultural production but also reduce fertilization doses by understanding the natural potential of soils to supply nutrients to plants. This exercise aims to evaluate the impact of soil physical, chemical and biological parameters on nutrients availability as well as their interactions, which can be useful for a more sustainable management of fertilizers.

MATERIALS



Soil laboratory data: SOM, texture, pH, nutrients content



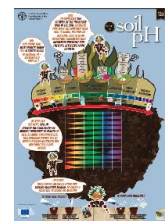
Poster on soil pH (12a)

PROCEDURE

1) Look at your soil analysis and identify the pH value. Alternatively, you can perform one of the proposed exercises to determine your soil's pH (C01 or C01b)

Fecha de muestreo	pH (H2O) (1)	Conductividad eléctrica (SECE)	Textura	Materia orgánica (MOC) (2)	% NMO	Nitrogeno total (N)	PH	Relación C/N	Nitrogeno disponible	Fosforo Olsen (P)	Potasio intercambiable (K)	Calcio intercambiable (Ca)	Magnesio intercambiable (Mg)	Sales intercambiables (S)
18/11/2023	8,28	62,60	Fl, 26,65	3,885	2,49	0,249	6,54	59,1	4,88	0,29	5,45	1,40	0,06	

2) Determine the influence of pH on nutrients availability using posters 12a as a reference



3) Look at your soil analysis and find out the nutrients content (N, P, K, Ca, Mg, Na) in comparison to the reference values provided

Fecha de muestreo	pH (H2O) (1)	Conductividad eléctrica (SECE)	Textura	Materia orgánica (MOC) (2)	% NMO	Nitrogeno total (N)	PH	Relación C/N	Nitrogeno disponible	Fosforo Olsen (P)	Potasio intercambiable (K)	Calcio intercambiable (Ca)	Magnesio intercambiable (Mg)	Sales intercambiables (S)
18/11/2023	8,28	62,60	Fl, 26,65	3,885	2,49	0,249	6,54	59,1	4,88	0,29	5,45	1,40	0,06	

PROCEDURE

4) Find out the texture of your soil as per your soil analysis. Alternatively, soil texture can be determined through the exercise P01

Fecha de muestreo		pH (H2O)	Conductividad eléctrica (CEC)	Tiempo de infiltración (min)	MO (%)	Nitrogeno total (N)	Nitrogeno total (N)	NH4	NO3	Relacion C/N	Nitrogeno disponible (mg/kg)	Fosforo (ppm)	Potasio intercambiable (N)	Calcio intercambiable (N)	Magnesio intercambiable (N)	Relacion micro/nutriente
Uso del suelo	Uso del suelo	cm/s	µmhos/cm	cm	%	g/kg	g/kg	g/kg	g/kg	-	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
16/11/2023	3,24	62,60	FL	2,65	3,685	2,49	0,249	6,54	58,1	3,84	0,29	5,45	1,40	0,06		

5) Find out the soil organic matter as per your soil analysis. Alternatively, soil organic matter can be estimated through the exercises P02, C02

Fecha de muestreo		pH (H2O)	Conductividad eléctrica (CEC)	Tiempo de infiltración (min)	MO (%)	Nitrogeno total (N)	Nitrogeno total (N)	NH4	NO3	Relacion C/N	Nitrogeno disponible (mg/kg)	Fosforo (ppm)	Potasio intercambiable (N)	Calcio intercambiable (N)	Magnesio intercambiable (N)	Relacion micro/nutriente
Uso del suelo	Uso del suelo	cm/s	µmhos/cm	cm	%	g/kg	g/kg	g/kg	g/kg	-	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
16/11/2023	3,24	62,60	FL	2,65	3,685	2,49	0,249	6,54	58,1	3,84	0,29	5,45	1,40	0,06		

6) Visually evaluate the soil structure and the level of soil compaction (you can refer to exercises P03 and P07).
 Example of poor soil structure and compaction: Soil is dominated by coarse clods or appears with powder consistency. Very few or no pores are present which reduce the aeration and gaseous exchange rates. Little space is present for air, water or roots.



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7) From the observation at larger scales, do you think there are visible signs of soil degradation such as low productivity (often related to nutrient deficiency), bare soil, presence of gullies, presence of salinity, erosion (inducing factors for erosion can be: steep slope, poor soil cover, frequent heavy rains)?



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8) After considering the previous factors, answer the questions in the section below

ADVANTAGES OF THE METHOD

The method provides an overview of factors affecting nutrients availability in a simple and comprehensive way

LIMITATION OF THE METHOD

Specific information about the soil and environmental conditions are necessary. Background knowledge on soil components and their interacting effect on nutrients availability might be needed. For a more effective evaluation is advisable to compare different soils

QUESTIONS TO BE ADDRESSED

What do you think a low content on SOM can imply for nutrients availability? What are the nutrients with smaller pH ranges? What happens to nutrients if your soil is compacted? What happens if you have visible signs of erosion? How do you think soil texture can affect nutrients availability? Are your nutrients in soil within the recommended ranges? if not, what does it imply? According to these observations, how can you improve soil nutrients availability?

EVALUATION EXAMPLES

POOR

Extreme pH values, low SOM, low nutrient content, degraded soil (visible signs of nutrient deficiencies, erosion, compaction, salinization etc.).

MODERATE

Not optimal pH value for the type of crop, low SOM, observation of few signs of compaction or other types of soil degradation (erosion, salinization etc.)

GOOD

pH value suitable for the specific crop, high SOM, high nutrients in soil. No visible sign of compaction or other types of soil degradation (erosion, salinization etc.)