Determination of organic matter in soils

GLOBE		*Related SDGs:*	*Type of activity*
Sphere	**Protocols**		
Pedosphere	Soil Characterization Soil pH	4 (Quality education) 12 (Responsible Consumption and Production)	Research

Overview

In the development of life cycles in ecosystems, a repetitive and vitally important process is oxidation, which is usually represented by a set of chemical reactions according to their specific occurrence. Additionally, an oxidative process can be an indicator of a certain condition-in this case, the presence of organic matter in soils treated with an oxidant (hydrogen peroxide), which will give us a qualitative indication of the presence of organic matter in that sample by means of an effervescence effect. Notwithstanding the above, it is interesting to know other daily applications of peroxide, such as the preservation against pathogens of rainwater used on crops, dental and wound sanitization, and fun science experiments.

Time
2 classes.

Prerequisites:
General knowledge of oxidative processes.

School level
Primary School.

Purpose

To acquire theoretical and practical knowledge of the application of hydrogen peroxide in the qualitative quantification of organic matter in soils, and their scope.

Student Outcomes

- To recognize the oxidation reaction of hydrogen peroxide and its visible effect.
- To optimize qualitative criteria to evaluate test results.
- To infer soil use possibilities from the measurements obtained.

LEARNING ACTIVITY

Introduction

Soil organic matter consists of plant and animal residues in different states of decomposition, tissues and cells of soil-dwelling organisms, as well as substances produced by soil organisms. The most stable part of this organic matter is called humus, which is obtained from the decomposition of most of the plant or animal substances added to the soil. The soil organic fraction acts as a regulator of the chemical processes occurring there, influences the physical characteristics and is the center of almost all soil biological activities, including microflora and fauna (Shuyana, 2018).

The chemical processes in which organic matter is basically involved are:

- The supply of nutrients by mineralization, particularly the release of nitrogen, phosphorus, sulfur and micronutrients available to plants.
- The stabilization of soil acidity due to its buffering power.
- The contribution to the soil cation exchange capacity, important for clay-textured soils of such exchange capacity and high cation retention.
- The regularization of availability levels of major nutrients and minor elements through the formation of organic substances that constitute soluble compounds.
- The absorption phenomena.

Guiding Research Questions

- What is the chemical reaction between soil and peroxide?
- What are the important effects that can be deduced from the presence of organic matter in soils?
- What could be the alternative uses of peroxide?

Scientific Concepts

- Hydrogen Peroxide (H_2O_2)
- Oxidation (chemical process)
- Humus

Materials and Tools

- 20-volume hydrogen peroxide, 250 mls
- A wash bottle
- 500 g. of burned soil with presence of ashes
- 500 g. of eroded surface soil
- 500 g. of sand
- 500 g. of soil with animal feces (cow, horse, etc.)
- 500 g. of worm humus

What to Do and How to Do It

- ***Beginning***
  - We must initially consider that peroxide is an oxidant and provides OH groups - and free radicals that can attack any oxidizable organic substance, in addition to a wide variety of organic compounds such as lipids and proteins... the bubbling is due to the release of oxygen (O_2). The test consists of placing quantities (200 g) of different soils in containers duly labeled with their characterization.

- ***Development***

  - Determine the pH of each sample, apply peroxide to each of the available samples and observe the appearance of effervescence, trying to establish an order from greater to lesser effect on the samples; take anecdotal and numerical records of your experiences.

- ***Closing***

  - Make a discussion of your results supported by the following table:

No.	Soil	Reaction	Grade	Appreciation
1	burned	No reaction	0	Absence of organic matter
2	eroded	No reaction	0	Poor in organic matter
3	sand	Mild effervescence	1	Low in organic matter
4	with feces	Moderate effervescence	2	Regular in organic matter
5	humus	Abundant effervescence	3	High in organic matter

  - Organize your data systematically using graphs and tables, record your inferences and conclusions, and set up an exhibition in your community.

Frequently Asked Questions

-Why is pH measurement recommended?

Because it is a measurement that provides a lot of information about the sample, and a correlation can be established with the amount of organic matter present.

-Are there special considerations to be taken into account when working on the experiences?

Not necessarily, but it is never a bad idea to wear goggles and safety gloves.

Suggested Resources

- GLOBE flooring materials (www.globe.gov)

Bibliography

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