Chlorides in soils

GLOBE		*Related SDGs:*	*Type of activity*
Sphere	**Protocols**		
Pedosphere	Soil pH Soil characterization: texture	4 (Quality education) 12 (Responsible production and consumption)	Research

Overview:

Among the most abundant salts in saline soils appear halite or sodium chloride (NaCl) and magnesium chloride (MgCl2), which can limit the growth of many crops. It is therefore of particular interest to determine their presence in soils, in the context of the chemical interaction of their components.

Time:

2 classes

Prerequisites

- Chemical reactions.
- Solubility

School Level
High School (K-10 to K-12).

Purpose

Establish the presence of chlorides (mainly sodium and magnesium) in the studied soil, their characteristics, and their effects on its functionality.

Student Outcomes:

- Understanding the influence of chloride presence on soil pH,
- Recognizing chemical precipitation and solubility reactions.
- Familiarizing with characteristics and effects of chloride application in soils.

LEARNING ACTIVITY

Introduction

Chloride is an anion that carries a negative electrical charge, so it does not adsorb with soil particles and can move very easily with water in the soil. Because of this, irrigation water quality and irrigation management are the main factors affecting chloride concentration in the soil. However, chloride is necessary in small amounts because it contributes to plant metabolism, photosynthesis, osmosis (movement of water in and out of plant cells), and ionic balance inside plant cells.

Guiding Research Questions:

- What does soil salinity dynamics entail?
- What are the characteristics of chlorides in soil?

Materials and Tools:

- Test tubes
- Distilled or demineralized water.
- Funnel and filter paper.
- Silver sulfate solution, Ag_2SO_4, 4 (grams per liter).

Scientific Concepts:

- Acid-base chemical reactions
- Concept of pH
- Chlorides
- Anionic and cationic exchanges
- Soluble chlorides
- NaCl
- Precipitates

What and how to do it:

– ***Beginning***

When selecting sampling sites, it should be taken into account that the distribution of salts in a soil profile may not be very regular, both in land area and depth and in seasonal periods of the year. In rainy or low irrigation periods, it is possible that a superficial horizon may give a negative response to the presence of chlorides, but that these are easily detectable in deeper horizons.

Take at least three samples from different locations (or horizons from the same sample), proceed to take some soil from each one and place it in test tubes (one for each one); add distilled or demineralized water and shake. Once shaken conveniently, the content of the tube is filtered by means of a funnel and filter paper. The resulting filtrate is called "filtrate".

- ***Development:***

To check whether the soils under consideration contain chlorides, a few drops of silver sulfate are added to the filtrate, and a white precipitate (silver chloride) will form, easily observed by the increase in turbidity. Care must be taken in the addition of the silver sulfate, as the precipitate that will form may dissolve and pass into the filtrate again if there is an excess of chloride.

- ***Closing:***

Using the corresponding GLOBE protocols, establish the texture and pH of each sample and infer the relationships that exist between the deduced characteristics. Prepare a report of the experience and deduce the equations of the chemical processes that occurred in the tests.

Frequently Asked Questions

How to systematize the concepts and applications developed?

Conduct a literature search to deduce the eventual contribution of soluble chlorides in the soil, the potential benefits for its substrate function, the relationship of this function with pH and its texture. Arrange your above findings in a display format to communicate them in your immediate community.

Resources:

GLOBE program soil research and work materials (www.globe.gov).

Bibliography

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