Unit 3

Soil chemistry and plant nutrients

According to their chemical reactions, soils are characterized as acid, neutral or alkaline. The acidity of the soil can be measured with the use of the pH meter although this is not the only method of testing soil reaction. High pH readings, above 7.3 indicate plenty of lime and soil is classed as alkaline. Readings from 6.6 to 7.3 indicate that the soil is neutral and low pH, 6.5 or less, shows an acid soil.

Some plants grow well in soils that are highly acid while others can grow in soils with pH readings above 7.3. Such plants, called 'plant indicators', show with their presence the relative acid content of the soil.

Plants need about sixteen different chemical elements for a healthy growth and can get most of them from the soil. The elements that are found in the largest quantities in plants ae called 'macronutrients' and are nitrogen, phosphorus, potassium, sulfur, calcium and magnesium. Those elements found in lesser quantities are called 'micronutrients or trace elements'. Nitrogen is necessary for cell division, growth and respiration.

Photosynthesis, the process by which the plants make sugar from air and water in the presence of light and chlorophyll, takes place only when nitrogen is present. Too little nitrogen causes stunted and weak plants with yellow looking leaves; too much nitrogen causes tall and weak plants.

Phosphorus is important for the root system of a plant. It is found in the growing parts of the plant, the flower and the seed.

Potassium is found in the soil and enables the plant to produce good fruit because it helps the plant to form sugar and starches. It also makes it possible for these nutrients to move from one part of the plant to another.

Apart from the three main plant foods mentioned above, calcium is very important too because it holds plant cells together and enables the plant to take the other foods from the soil.

humus in soil:

Humus is the organic matter in the soil; it is made of dead parts of plants and animals. Humus takes in water and has plenty of nutrients; nitrogen is the most important. Plants put roots into the soil to get the water and nutrients. Humus is good for plants, it makes soil more fertile and helps prevents disease in plants and food crops. It is like a sponge; air and water move easily through the loose soil and oxygen can reach the roots of plants. The dark color of humus (usually black or dark brown) helps to warm up cold soil in the spring.

- **Special terms: Guess the word in question from the definitions provided:**

  Choose among: respiration – cell – sugar – alkaline – acid – calcium – potential hydrogen (PH) – nitrogen - stunted

  1 _____ = any sour tasting substance that typically is water soluble and reacts with bases to form salts

  2 _____ = any substance having a base pH higher than 7 and having a relatively low concentration of hydrogen ions

  3 _____ = in chemistry it is a numeric scale used to specify the acidity or basicity of an aqueous solution

  4 _____ = inhalation and exhalation of air; breathing. In biology, the sum total of the physical and chemical processes in an organism by which oxygen in conveyed to tissues and cells and the oxidation products, carbon dioxide and water are given off.

  5 _____ = (chemistry) a member of the same class of carbohydrates, as lactose, glucose or fructose

  6 _____ = chemical element with symbol N and atomic number

  7 _____ = reduced growth in development; a plant disease that causes dwarfing

  8 _____ = chemical element with symbol Ca and atomic number 20

  9 _____ = the building blocks of all living organisms; they are molecules in food that all organisms need to make energy, grow, develop and reproduce

- **Comprehension questions; scan the text and try to answer the following questions:**

  (Tip of advice: read 'the reading techniques' on the Appendix section)

  1. What does the pH meter measure?
  2. How is a soil characterized according to their chemical reactions?
  3. Which readings indicate acidity in soil?
  4. Which plants are called plant indicators and what do they show with their presence?
  5. Where do plants find the elements for their growth?
  6. How many of them are needed for a healthy growth?
  7. Differentiate between 'macronutrients' vs 'micronutrients'.
  8. What is the role of nitrogen in plants?
  9. What process takes place only in the existence of nitrogen?
  10. Which element facilitates the movement of nutrients in plants?
  11. What does the excess of nitrogen cause?
  12. How is the root system better developed?
  13. The cell are held together with the presence of which element?

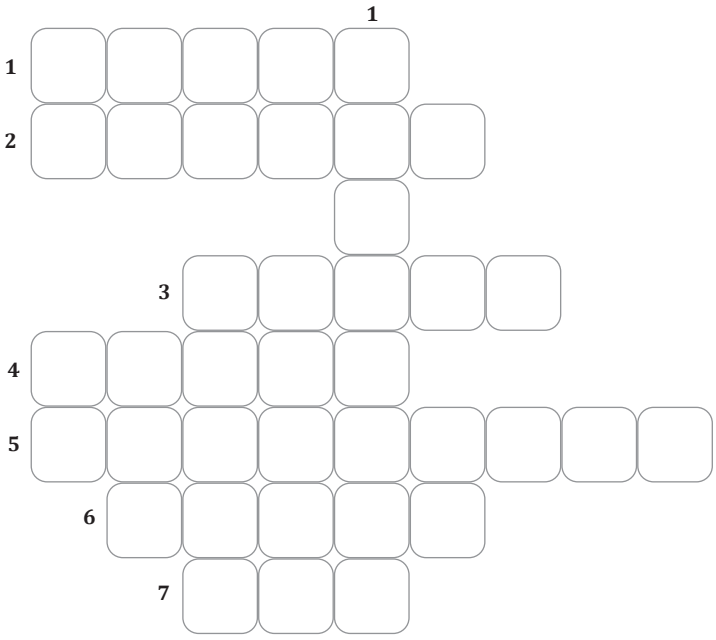
- **CLOZE TEST:**

  ON PHOTOSYNTHESIS

  A plant is like a factory. It will take several things, put them together with the help of _____ and end up with something new. The conversion of light energy into chemical energy in green plants is called _____ . This word can be broken into two words: _____ meaning 'light' and _____ meaning 'put together'. Only _____ plants can take water from _____, carbon dioxide from the _____ and, with the help of light, make _____. Since plants do not use all of the _____ for food-making, it is given off. Animals need plants for _____ and oxygen.

  (a. soil, b. sugar, c. food, d. synthesis, e. light, f. photo, g. oxygen, h. photosynthesis, i. air, j. green)

- **CROSSWORD**



ACROSS:

1. natural radiation that makes things visible
2. non-metallic element that is present in all living matter and occurs in its pure form as diamond and graphite
3. of the color between blue and yellow in the spectrum; of the color of growing grass and the leaves of most plants and trees
4. living organism that is not an animal which grows in the earth and usu. has a stem, leaves and roots
5. the combining of separate things, ideas, etc., into a complete whole
6. liquid without color, smell or taste that falls as rain, is in lakes, rivers and seas and is used for drinking, washing etc.
7. mixture of gases surrounding the earth and breathed by all land animals and plants

DOWN:

1. in or into company; with or towards each other