SBEL 1532-
HORTICULTURE AND NURSERY

TOPIC 6:
PLANT AND ENVIRONMENT-
UNDERGROUND ENVIRONMENT

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For good and healthy growth of plants, environmental factor such the **temperature, water, light** and **nutrients** are essential.

For each factor, if becomes short in supply, it is called a **limiting** factor, since normal growth and development are limited by its scarcity.

Plants need the right amount of nutrients

Different plants have different needs

In the presence of light, carbon dioxide (CO_2) and oxygen (O_2) are exchanged

Animals use O_2 and give off CO_2

Plants use CO_2 and give Off O_2

Environmental Factors

These environmental factors can be divided into two parts:

- the **underground environment** – in which the roots live and grow, and

- the **above ground environment** – in which the visible part of the plant exists.

The Underground Environment

This environment normally refers to the medium in which the plant grows.

The medium, may it be **soil or soil substitute,** is important since plants through their roots anchors itself, takes in air, moisture and minerals - all which is vital to plant growth.

Most of the times, plant food is added to the medium to encourage better growth.

The Underground Environment

SOIL

Soil is made up of **sand, silt, clay, organic matter, living organisms**, and **pore spaces** which hold water and air.

Depending to the **percentage** of **sand, silt and clay,** soils are classified accordingly.

Soil composition vary greatly depending on their origin.

The Underground Environment

Generally soil found in the field consis **three (3) layers;**

a. **Topsoil-** represent the depth norn plowed or tilled, and contains the most org matter or decaying plant parts.

b. **Sub soil** - this is a well-defined layer below the topsoil. This the layer whereby roots penetrates.

c. **Soil bedrocks or lower subsoil** - This layer are only penetrated by deep-rooting plants. This layer sometimes are too hard t the roots and may prevent further growth.

Bedrock: more or less unweathered rock near the surfac

The Underground Environment

Three (3) most common types of soils closely related with plantings are;

a. Sandy soil or light soils

include soils in which silt and clay makes up less than 20 % of the materials by weight.

These soils drain well, but have little capacity to hold moisture and plant food.

b. <u>Clayey soil or heavy soil</u> contain at least 30 % clay. These soil relatively have poor drainage and aeration capabilities.

Therefore, they tend to hold more moisture than is good for the plant. However, they may be beneficial to plant growth since this type of soil also holds fertilizers and plant food.

c. <u>Loamy Soil</u> is the most desirable soil for general use.
Loam is a mixture of approximately equal parts of sand, silt and clay.

Soil Improvement:

Soil used in outdoor plant growth may be improved through
increased drainage,
irrigation methods,

and the **addition of organic matter** and plant food in the form of **fertilizers.**

The Underground Environment

Soil Improvement:

For Drainage:

To improve drainage is via the changing of soil structure.

The best way is through the adding of organic matter to encourage earthworms. The earthworms will encourage aggregation of the soil.

The use of Tile Drains will also help to improve drainage

- **Soil drainage is a very important ecological factor.**

- **Poorly drained soils can inhibit tree growth due to a lack of oxygen, which is necessary for basic root and microbial respiratory processes.**

- **Wet soils can also cause equipment limitations and in some climates, wet soils are colder than well-drained soils.**

- **Also note the indicators of poor drainage in the soil profile- the dull gray mottles in the B horizon.**

The Underground Environment

Soil Improvement:
Lime and Gypsum

will also help in soil aggregation and improve soil structure in some ways.

Lime "sweetens" your soil. In areas where soil is naturally "sour" (or acid), this is extremely important to growing healthy turf.

Lime helps improve lawn color and density, helps control thatch, and increases root development.

Lime application helps keep the chemistry of your soil in balance so that you can have, and enjoy, a thicker, greener, healthier lawn.

Soil Improvement:
Raising of Planting Beds & Placing Ditches between beds

These are also methods which are used to control moisture in soil.

Soil Improvement:
Mulching

- to retain soil moisture by reducing run-off and rate of evaporation.

- Of course, the most direct method of supplying adequate water is via irrigation.

Soil Improvement: Disease Control

The soil harbours certain disease such root rot and wilt.

Nematodes and insects may also damage roots.

Resistant varieties or natural controls such as crop rotation must be used to satisfactorily control these problems.

Soil Improvement: Disease Control

Chemical may also be used. Soil pasteurization (heat up to 180 F for 30 mins.) is necessary any time soil or sand is used in a planting media.

Soil Acidity (pH)

Most plants grow best in soil with a pH of from 5.6 to 7.0.

To change the soil acidity, liming can be done. Lime is added to acidic soil to increase its pH.

However, to lower the soil pH, materials containing sulphur are being used, e.g. iron sulphate, aluminum sulphates or gypsum.

Soil Acidity (pH)

Lime also affects the availability of other plant food elements to plants.

For example in a condition of low in the pH, phosphorus are not readily available to plants. Lowering the pH will release the phosphorus ions and makes it available to the plant.

Soil Acidity (pH)

On the other hand in some cases, in acidic condition, some iron and aluminum are made available, this may cause toxicity to some plants.

So the application of lime will make both iron and aluminum insoluble.

Liming will also activates soil organism and encourages the release of plant food. It will also improve the soil structure.

Plant Food & Nutrients:

Plant food is essential for its growth regardless of the type of medium it grows in.

The important thing is to ensure that they are available to the plants normally in a water soluble form.

Fertilizers are added to the medium of planting to supplement the deficiency of plant food.

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Plant Food & Nutrients:

Plant food are divided into two major groups which are Major Elements and Minor Elements.

Plant Food & Nutrients:

The element listed as major or minor are according to the **relative amounts of each element necessary** for plant growth.

Major Elements:

N (Total nitrogen)

P(Available phosphoric acid)

K (Soluble potash)

Minor Elements:

Calcium-Ca
Magnesium-Mg
Sulfur-S
Iron-Fe
Manganese-Mn
Boron-Bo
Copper-Cu
Zinc-Zn