Soil climate explained

Soil is the natural body in which terrestrial plants grow. Many characteristics affect the soil's ability to support plant life, including soil moisture and soil temperature. These climatic features of soil vary widely among soil types due to differences in texture, color, structure, organic matter content and topography.

The typical mineral soil is composed of about half soil particles and half pore space, on a volumetric basis. The pore space contains water and air in various proportions. When the pore space is filled with water, the soil is said to be "saturated." When water drains from the larger pores due to gravitational forces, and an equilibrium condition is obtained, the soil is at "field capacity." After the soil moisture is depleted by crop growth to the point where no more water is available for plants to use, the soil is at the "permanent wilting point."

Under saturated conditions, aeration is a problem. Restricted movement of oxygen to roots can impede root growth, limit absorption of nutrients and water, allow the formation of toxic substances in the soil solution, and reduces the activity of aerobic micro-organisms.

Micro-organisms which oxidize nitrogen and sulfur in the soil are ineffective in poorly aerated soils. Plants may appear deficient in these elements even where adequate amounts of the nutrients are present in the soil. Denitrification may also occur in excessively wet soils. This reduces the supply of available N to plants.

At "field capacity," moisture conditions are ideal for plant growth. Moisture is readily available and free interchange of oxygen and carbon dioxide between the soil and the air can occur. Soil micro-organisms can function at optimum rates. This enhances the release of nutrients from soil organic matter, aand the decomposition of plant residues in the soil.

Oxygen must be present in the root zone in order for root cells to generate energy required in growth processes. For example, the uptake of plant nutrients occurs through the expenditure of energy.

Plant growth is affected both directly and indirectly by soil temperature. When soil temperature is below about 40 degree F, root growth is very slow. The volume of soil being explored by roots for nutrients and water is small. As the temperature increases above 50 degree F, root growth proceeds more rapidly. Extremely high soil temperatures (above 95 degrees F) may be detrimental to root growth.

Availability of plant nutrients may also be affected by soil temperature. The solubility of compounds containing plant nutrients generally increases with an increase in temperature. A good example of this is the solubility of phosphate compounds. Cool season crops often benefit from the application of a high phosphorus starter fertilizer in soils where warm season crops may show no response.

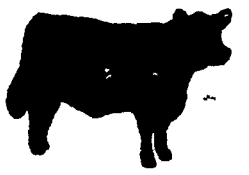
Optimum temperatures for seed germination and plant growth vary widely according to the crop. Some grasses grow best when soil temperatures are relatively cool, while corn and grain sorghum prefer temperatures in a higher range. It is recommended that soil temperature reach 50 degrees F for corn and 60 degrees F for sorghum before planting the crop.

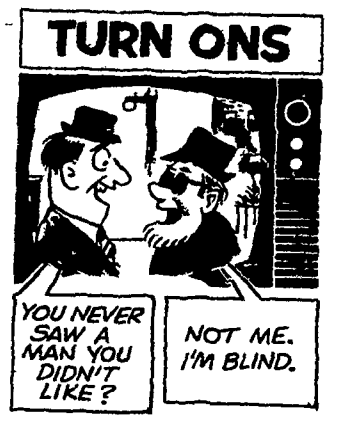
Several factors affect soil temperature: the net amount of heat absorbed, the specific heat of the various constituents of soil, and energy required for changes in the soil such as evaporation. Net absorption of heat from the sun is also dependent on various factors. Dark colored soils absorb more heat than light colored soils. Soils which slope toward the sun absorb more heat than level areas or areas with a north slope. Soils with a vegetative cover or mulch are insulated from the sun's rays compared to bare soil.

Freezing and thawing aid physical weathering. Clumps and aggregates are subjected to pressure which alter the physical makeup of the soil. This action is beneficial to the soil in alleviating compaction from equipment used in crop production. Swelling and shrinking of some clays from alternate wetting and drying may also alleviate compaction problems in soils.

Soil climate frequently dictates which species of crops can be grown on any particular land area. It should be considered when deciding the fertility program that will be used on adapted crops. The decision to use a starter fertilizer with high phosphorus many times is dictated by cool temperatures.

The most efficient form and rate of nitrogen for a crop may be determined by soil temperature and moisture conditions, since nitrification is very temperature-dependent. And finally, the effect of soil climate on breakdown of soil organic matter may also dictate the amount of fertilizer required for a specific crop, since organic matter contains many of the required plant nutrients.





Insects Normal

Insects and diseases that attack trees are normal in a forest, according to the U S. Department of Agriculture It is only when their appetite for cellulose gets out hand that epidemic destruction of timber stands take place.

Indian Fires

To increase wildlife populations, early American Indians in the East used to set fire to vast areas of forest land to create clearings where wildlife foods could grow