

# **BioBugs International Ltd**

## **\*What Makes Soil Tick\***

Understanding the nature of soil \*What Makes Soil Tick\*

In recent years the breakdown of the structure of the surface layers of soil under continuous cultivation in the paralleling decline in their productivity has been a matter of increasing concern.

This decline in production from soils which require constantly increasing expenditures for tillage and water represents even greater economic problems for the farmer and the nation. Increased usage of chemical fertilizers and inorganic soil conditioners, while serving other beneficial purposes, has not alleviated of deteriorating soil structures, loss of organic matter, and the wastage of water and fertilizers.

In many cases the chemicals used have aggravated the situation. A productive soil is characterized not necessarily by the mere presence of large quantities of plant nutrients, but by the rapidity with which the soil microbes make nutrients available to the higher plants. The processes that take place within the soil are, for the most part, dependent first upon the activities of living organisms; and hence, the existence of higher plants depends on the activities of the soil microbes.

Dr. S. A. Waksman stated in 1952, "The humus content, plus active microorganisms, is equivalent to a high degree of fertility." Another noted microbiologist, Dr. Stanley E. Wedberg, University of Connecticut, stated, "The fertility of the soil is in direct proportion to the number and activity of soil microorganisms."

There is a correlation between high humus content and high microbial activity in the soil; but, where does the humus come from? Organic matter is the source of energy and food supply for the soil organisms and microorganisms.

As organic matter returned to the soil is digested by microbes the resulting cellular material is mixed with the living and dead bodies of bacteria, fungi, actinomycetes and other microscopic forms of life, together with certain excretory materials produced during their life cycles to form a dynamic, ever changing, organic material called HUMUS.

Humus is the major storehouse of plant nutrients in the soil. It is literally the "fat of the land."

Soil microorganisms are involved in many beneficial activities within the soil. Those activities include:

- \* decomposition of crop residues

- \* mineralization of soil organic matter
- \* synthesis of soil organic matter
- \* nitrification
- \* fixation of nitrogen
- \* immobilization of mineral nutrients
- \* formation of organic substances which may be both stimulative and toxic to plant growth

Organic substances formed by microorganisms may influence soil structure stabilization, binding particles of soil together to permit better water penetration and reduce erosion.

Many cropping and tillage practices that farmers use are effective in crop production because of their influence on microbial activity. For example, when the soil is tilled, aeration is favorable for the growth of the nitrogen, sulphur and ironoxidizing organisms. When the soil lacks oxygen, it is unfavorable as an environment for many plants and organisms.

Every practice or management system influences microbial activity which in turn influences the decomposition of plant residues, the availability of nutrients and the soil structure. These all influence the crop growth, and the growth of crops determines the soil cover and the resulting organic matter. This influences the balance between the various types of microorganisms whose actions play a major role in the carbon, nitrogen and mineral cycles and thus governs to a great extent the fertility of the soil.

Each spoonful of mellow soil contains billions of living microscopic organisms. Multiply this by the number of spoonfuls of soil in an acre and you have figures that are astronomical. In fact, the living bacteria alone in an acre of soil of average fertility would weigh as much as a medium size cow. This seething mass of microorganisms constitutes a crop of three to five tons per acre foot of soil that the farmer sustains beneath the soil surface, in addition to the crop that he grows above ground. If the crop of microorganisms beneath the surface does not have adequate food, the crop above ground may suffer from competition for mineral nutrients and be more susceptible to disease.

"Microorganisms eat at the first table. They are in contact with almost every particle of soil, but plant roots are not. Without microorganic life, soil, the dynamic perpetual system that sustains terrestrial life, would become an inert mass incapable of providing food. Microorganisms decompose organic material and release elements and organic food for repeated use." states Dr. T. M. McCalla, research microbiologist, University of Nebraska.

Microorganisms need three things... air, water and an energy source starting with organic matter. John Box, Extension agronomist, Texas A. & M. <<http://www.tamu.edu/>>, has written, "the microbe is your best friend and may be the most important livestock you produce. Microbes live in the surface layers of the soil in fantastic numbers. Since we cannot see them, we often neglect them, Mike and his cousins can perform chemical miracles

that man has not yet learned to duplicate. Treat him well and give him the raw materials with which to work, and he will keep your soils in top production."

In addition to a food supply, you can help by preventing soil compaction. Compaction reduces air supplies, limiting the ability of microbes to perform. Compaction has an adverse effect on root development and the soil's ability to absorb and hold water. Without active soil microorganisms man would long ago have been covered up by his own waste. Fortunately, Biobugs can help the soil with this process.

\*How much life is in your soil?\*

A good microscope could easily show how much life is contained in any soil sample. Barring that, one could simply see how many earthworms are in a sample of soil. Earthworms are one of the best indicators of a well balanced soil. If your soil doesn't have them in great numbers, then you can be reasonably sure that your soil could use improvement. If they are very numerous you can know that in most years your soil will be most productive.

Jack Denton Scott, writing in the August-September 1968, National Wildlife <http://www.nwf.org/nationalwildlife/> says about the earthworm, "As a soil chemist he has few equals. The earthworm churns the earth into rich topsoil by blending in vegetable matter from the surface into the ground below, and by bringing mineral rich subsoil up where plants can use it. He drags leaves down into his burrow where bacteria can work on them. What he eats emerges in little clumps of dirt called castings. Passing through the worm's digestive tract, both alkalies and acids become more neutralized. Earth minerals and chemical are broken down, enriching the soil with particle nutrients that plants and seedlings can more easily assimilate.

Scientists comparing the top six-inch layer of the soil with the castings contained in a form that plants can use found there are five times as much nitrate, twice as much calcium, two and a half times as much magnesium, seven times as much phosphorus and 11 times more potassium. subsequently, scientists found that the soils content of actinomycetes organisms that play a significant role in decomposing all organic matter into humus multiply seven times as it passes through the earthworm. Our amazing friend is as energetic as he is talented. Each mature earthworm casts up about half a pound of humus a year.

Since a population of 50,000 earthworms in an are of normal ground is common (seven million have been found), one can figure conservatively that earthworms are producing 12 and a half tons of topsoil a year in each acre of good garden-type soil." As our knowledge of the soil microbes grows, we will continually learn ways of increasing those species which are needed to overcome problems which we have created by changing the natural environment, or problems which existed before, but which have grown out of hand, such as the various fungal diseases. Certainly the time is here for a deeper look into our soil and the problems that limit their production.

## Biobugs, Structured Performance

Extensive research since 1968 has resulted in a very high quality, yet moderately priced product: Biobugs.

### \*Biobugs Usage\*

Do you have problematic soil? Team Biobugs can help with your soil problems, including:

- \* hardpans
- \* compacted soils
- \* low water holding capacity
- \* excessive toxic salts
- \* poor water penetration
- \* low productivity from tied up plant food

A very economical way to apply Biobugs is to inject it daily into the waste water leading to the effluent pond or the waste tank then onto the land through a sprinkler irrigation system.

If good management is used in the application of Biobugs then you can expect good results.