Soil Respiration 1-Day CO_2 Burst Information

Ward Laboratories, Inc.

Soil is a complex ecosystem that provides a habitat for an endless array of micro and some macro organisms. These include bacteria, fungi, protozoa, nematodes, earthworms, etc. These organisms are responsible for much of the nutrient cycling that takes place in the soil. They decompose crop residues, store plant nutrients, create stable organic matter in the form of humic acid, and help build soil structure. This leads to reduced soil compaction and erosion, while increasing water holding capacity and a deeper root zone. The relationship between different microorganisms and plants is dynamic. The predatory action of protozoa on bacteria helps release nitrogen into the soil and symbiotic bacteria and fungi aide the plant in acquiring more nutrients. Through better understanding of soil microbial communities we can begin to allow these organisms to work for us in our goal of high yielding, sustainable agriculture.

Many microorganisms give off carbon dioxide (CO2) as a result of aerobic respiration. The Soil Respiration 1-Day CO2 Burst test quantifies the amount of respired CO2 after rewetting a dry soil sample, employing an infrared gas analysis (IRGA) technique. The amount of CO2 measured over a 24 hour period represents "active carbon" or "respirable carbon" that was acted upon by the microbes and may also be used to estimate potential mineralizable nitrogen and phosphorus from the soil organic matter. Soil microbial biomass plays a critical role in controlling the supply of nitrogen and phosphorus to crops. The turnover and activity of soil biomass may account for more than 50% of the total crop nitrogen uptake. Therefore, the rate of soil biological activity should serve as a reliable index of the soil's capacity to supply nitrogen, and perhaps other nutrients such as phosphorus, to crops. Studies in the past 10 years have shown the flush of CO2 following drying and rewetting of soil mimics some natural processes and characteristics of long-term incubations and has been observed to correlate with nitrogen supply potential. The quality of soil carbon (C:N ratio) and supply of nutrients and moisture will have a significant effect on the exact ratio of biomass measured as evolved CO2 and nutrient release.

In general, soils that exhibit a higher CO2 flush are considered to contain greater microbial biomass due to a more favorable food supply, leading to an increased potential for activity and nutrient turnover/mineralization. Management practices employing no-till, manure, and cover crops help increase the amount of quality food available to microorganisms and the soil respiration test allows producers to track such changes over time in response to management. In addition, soil respiration has been incorporated into other testing procedures such as the Rick Haney's Test, which provides a more comprehensive measure of soil health using respiration as one of the test's foundations.

Additional information is available on the website at www.wardlab.com and new information may be added as it becomes available. Any questions regarding soil health testing may be directed to biotesting@wardlab.com.