

# Using in-situ Respiration to Measure the Performance of Microbial Products

Conventional fertilizers supply sufficient nutrients for plant growth, but over the long term, they adversely affect the health of the soil by depleting it of valuable humus, and by reducing the overall biological activity. Depletion of microbial activity leads to less resistant soils, which gives rise to plant stresses, and a greater susceptibility to diseases. To address this issue, a host of products are available which claim to re-establish beneficial microbial populations within the soil. To evaluate these products, a respirometer was used to measure the respiration and hence, the *effect* of a given material directly within the soil. Respiration is an indicator of overall biological activity, which also closely correlates to the nutrient mineralization necessary for plant growth.

## WHAT IS RESPIRATION?

Respiration is the process whereby living cells oxidize nutrients, like glucose, into CO<sub>2</sub> and H<sub>2</sub>O creating the necessary energy for cell division, growth and other cellular functions. This reaction can be precisely measured using a respirometer. The respirometer used in these tests is a specially adapted instrument which measures the in-situ respiration rates of the microflora within a given volume of soil.

Figure 1 is a photograph of a 4-channel respirometry unit and sample chamber. The soil sample is first placed into the bottom of the glass chamber and is sealed to prevent the influx of outside air. Each chamber is connected to a very sensitive pressure transducer, which allows measured quantities of oxygen to enter the chamber as the soil organisms respire. To prevent the accumulation of CO<sub>2</sub> within the chamber, a trap (usually filled with KOH) is inserted in the neck of the vessel. As respiration continues, the resulting oxygen utilization creates a slight vacuum within the sealed chamber. This activates a pressure transducer, which then opens a metering valve to allow a

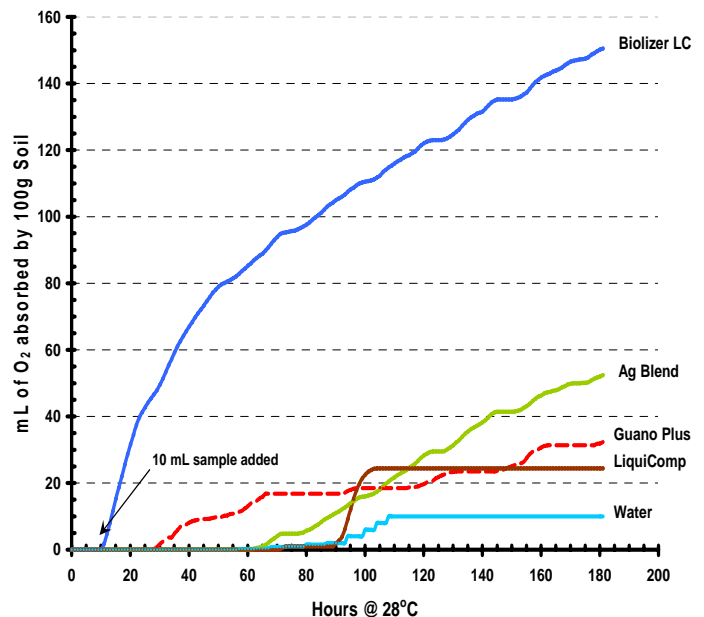


Figure 1: Sample chamber & Respirometer

measured quantity of pure oxygen to enter the system (thus replenishing the absorbed oxygen). The total amount of oxygen utilized is monitored and controlled by computer, making it possible to compare respiration rates between the various chambers. All tests were run in duplicate to ensure statistical significance.

## DATA ANALYSIS

To provide a comparative baseline of the natural microflora, a 100g control sample of soil was added to a chamber along with 10 ml of distilled water (see Figure 2). Subsequent analyses were conducted to compare the four products (*Biolizer*<sup>®</sup>LC<sup>1</sup>, Ag Blend<sup>2</sup>, Guano Plus<sup>3</sup> and LiquiComp<sup>4</sup>). Measured 10 ml quantities of each product were added to separate chambers containing 100g of soil each. The control sample (water + soil) shows only a slight increase in



respiration, indicating the effects of poor soil quality and the resultant low microbial activity. When the data was compiled the results indicate that LiquiComp and Guano Plus were only slightly better than the water+soil control sample. Although the Ag Blend sample performed better than both LiquiComp and Guano Plus, it was substantially less than the *Biolizer*<sup>®</sup>LC sample. Also of significance is that *Biolizer*<sup>®</sup>LC responded after only 10 hours from application, followed by Guano Plus at 30 hours, Ag Blend at 60 hours and LiquiComp at 90 hours (similar to the water sample). After 7 days (168 hours) the total respiration of Ag Blend, Guano Plus and LiquiComp was less than 50 ml of O<sub>2</sub>. By comparison, *Biolizer*<sup>®</sup>LC utilized more than 150 ml of O<sub>2</sub>, equivalent to a 300% increase over the other products (see Figure 2).

## CONCLUSION

*Biolizer*<sup>®</sup>LC is a scientifically formulated, organic liquid product that delivers a very effective microbial and nutrient package. Immediately after application, it begins to re-establish the beneficial soil microbes in biologically impoverished agricultural soils. When compared with other commercial products that claim microbial activity, *Biolizer*<sup>®</sup>LC shows significantly better results.

<sup>1</sup>*Biolizer*<sup>®</sup> LC is a registered trademark and manufactured by Converted Organics of California, LLC; <sup>2</sup>Ag Blend is manufactured by Advanced Microbial Solutions, LLC; <sup>3</sup>Guano Plus is manufactured by BioScientific, Inc.; <sup>4</sup>LiquiComp is manufactured by Biological Integrated Organics, Inc