

# GUIDELINES FOR SOIL DILUTION



TECH MEMO 0317-2

## SOLVITA CO<sub>2</sub>-BURST : ORIGINAL RANGE VS HIGH RESPIRING SOILS

Solvita CO<sub>2</sub> is a test protocol based on an expected “normal” amount of soil CO<sub>2</sub> respiration. Many people are curious about how the range was established and what to do in high OM soils which generate sufficient CO<sub>2</sub> to saturate the optical scale. Normally, it is not considered good lab practice to read any results in the steep part of an optical curve (see **A**). This can cause unreliable data since the slightest difference is magnified. This memo shows a method to dilute soil to make high Solvita readings appear more normal.

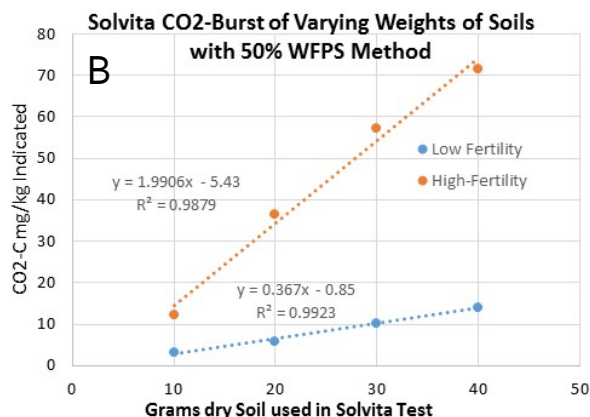
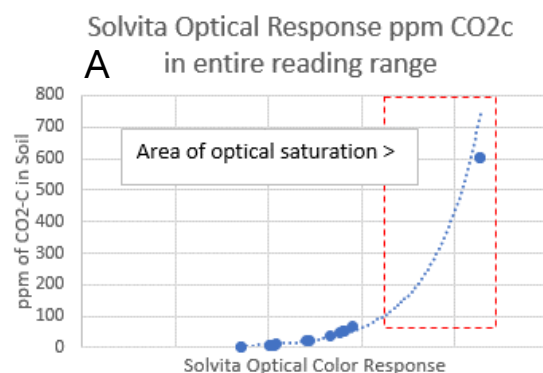
Solvita was originally calibrated for 0 – 95 mg/kg daily CO<sub>2</sub>-C output. The numeric range is found in Brinton’s work in Sweden from a 17-yr field study<sup>1</sup> which identified values over this range for depleted and enriched soils under traditional farming. Doran’s work in Nebraska was also accessed for CO<sub>2</sub> rates on tilled, prairie soils which were observed from 4 to 96 μg CO<sub>2</sub>-C / g soil/day<sup>2</sup>. Thus, a range of 0 – 100 seemed appropriate for most farm soils.

When soil is particularly active due to high OM or from heavy manuring, respiration can be quite high, and it is advisable to use less soil. Generally, Solvita colors over 4.5 indicate a highly active soil where the Solvita optic curve becomes too steep. Diluting works best at this point. Graph (**B**) show the excellent linearity of Solvita CO<sub>2</sub> when diluting 40 g soil down to 10 g. *It is not advised to use as little as 10 g as it is difficult to adjust moisture properly.* Using 20-30 g may be sufficient to bring high respiring soils into an acceptable Solvita detection range. If CO<sub>2</sub> is still high after this, using a larger jar size is the best approach instead of further reducing soil. This is because Solvita employs the Ideal Gas Law so volume of the airspace determines CO<sub>2</sub> concentration to which the probe reacts. Changing the jar size has a similar effect as altering weight.

**Recommendation 1:** (Using less Soil)- For Solvita Color over 4.5 (104 ppm) use **25 g** soil and correct the result by **1.64** (  $40 \div 25 * 1.02$  abs vol correction).

**Recommendation 2:** (Using larger Jars): Use 1-USA-pint canning jar (475cc) and 40g soil correct by **1.84** For very high respiration use 1 USA-QT (946cc) and 40g soil correct by **3.75** factor.

**Note:** This method has been validated for 50% WFPS method. Labs using mini-canning jars (240 cc) for Solvita are concentrating CO<sub>2</sub> by a factor of 11% and the correction should be **0.89**.



<sup>1</sup> Petterson, Brinton & v, Wistinghausen, E.v. 1979. Effects of organic and inorganic fertilizers on soils and crops. Results of a long term field experiment in Sweden. Nordisk Forskningsring, Meddelande Nr. 30. Järna.

<sup>2</sup> Doran J, T Kettler, M Tsivou. 2009. Field and Laboratory Solvita Soil Test Evaluation. USDA-ARS, University of Nebraska, Lincoln