

GUIDELINES FOR SOIL DILUTION



UPDATED TECH MEMO 0317-2/3

SOLVITA CO₂-BURST : ORIGINAL RANGE VS HIGH RESPIRING SOILS

Solvita CO₂ is a test protocol based on an expected “normal” amount of soil CO₂ respiration. Many people are curious about how the range was established and what to do in high OM soils which generate sufficient CO₂ 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.

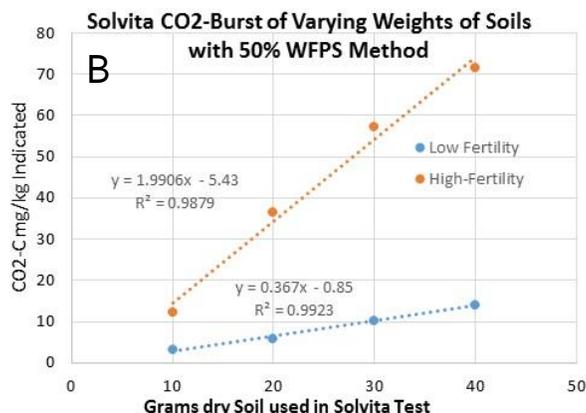
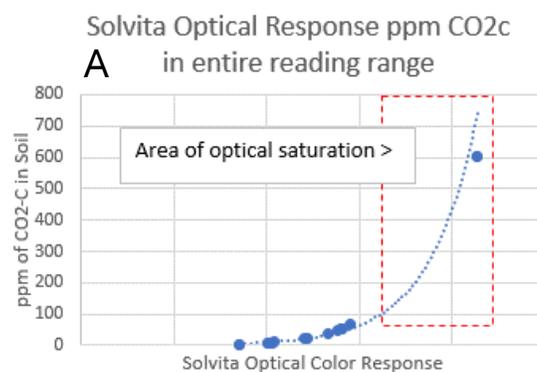
Solvita was originally calibrated for 0 – 95 mg/kg daily CO₂-C output. The numeric range is found in Brinton’s work in Sweden from a 17-yr field study¹ which identified values over this range for depleted and enriched soils under traditional farming. Doran’s work in Nebraska was also accessed for CO₂ rates on tilled, prairie soils which were observed from 4 to 96 μg CO₂-C / g soil/day². 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 CO₂ 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 30 cc appears to be the most ideal amount (approximately 25 - 30 g). It may also be sufficient to bring high respiring soils into an acceptable Solvita detection range. It is also recommended to use as standard jar size 1-pint (475 cc) instead of the 8-oz (265 cc) jars. Since Solvita employs the Ideal Gas Law the volume of the airspace also determines absolute CO₂ when calculated to soil quantity.

Recommendation: For Solvita Color over 4.5 (104 ppm) use 30 cc soil (25 – 30 g). No correction is necessary as this soil : volume relationship is ideal for Solvita and corrects for excessive saturation.

Recommendation 2: (Using larger Jars): Use 1-USA-pint jar (475cc) and 40 g soil without any correction. For very high respiration use 1 USA-Qt (946cc) and 40g soil correct by 2.0 factor.

Note: This method has been validated for 50% WFPS method. Labs using mini-canning jars (240 cc) should discontinue that method as it concentrates CO₂ too much/



¹ 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.

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