

VOLUME-SCOOP METHOD FOR CO₂-BURST



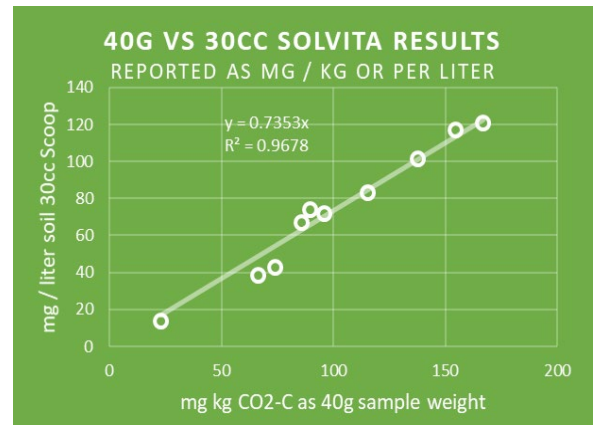
TECH MEMO 0018-#11

SOLVITA

Solvita CO₂ is a protocol enabling simple and accurate measurement of soil CO₂-respiration in a 24-hr time (or optionally longer)¹. The original lab method² used 40g soil prior to adding an excess of water for wetting. Results were reported as mg/kg (ppm) dry soil weight. Recently, labs have found that volumetric scooping instead of weighing is a suitable method for Solvita. This memo explores weight vs volume tests and concludes that volume scooping is acceptable if not an improvement.

Any change to Solvita test parameters will affect results in two ways. The first and obvious is that the DCR is preprogrammed to assume 40g soil. Correcting the weight difference is easy but does not fix the result entirely. Solvita reacts like seawater-buffer to actual CO₂ concentration in the free airspace, by the Ideal Gas Law. Reducing sample weight therefore increases the amount of total air space available for CO₂.

The advantage changing Solvita to a volume method is not only that it eliminates the very time-consuming steps of weighing. With the new approach, it also eliminates correcting weight and volume to arrive at 50% WFPS, the new method of wetting. Moreover, 40g soil is really an excessive sample size, particularly since eliminating the capillary-wetting method which saturated most soils and caused unusually low respiration. Soil samples possess microbiology capable of order-of-magnitude differences between samples, and the Solvita gel detector is capable of a broad range of response (2 – to 200 ppm). Reducing sample size will still provide great capacity to distinguish low – medium and high microbiology samples. Another advantage switching to a volume-scoop of 30cc is that it helps to buffer-out occasional very high CO₂ results caused by high OM soils which at 40g hardly even fit in the container. Such soils can saturate the CO₂-gel response. Finally, reducing sample size has already shown to provide a fairly a linear relation to dilution³.



Trials at Woods End show that the 30cc scoop (now available from Solvita) correlates closely to the 40g weight approach (see Figure). It turns out, running the math, a correction of Solvita results from the original method is unnecessary as the difference going from 40 g to 30 cc soil given the change in jar volume and STP gas constraints plus the reduced weight, virtually cancel each other out with an uncorrected r² of 0.9997. Therefore, using 30cc gives acceptable results which now should be reported as mg/liter (mg/1000cc) instead of mg/kg. Further correction does not serve any real purpose and it can be argued that a volume basis is more accurate in terms of soil surface area (1 hectare soil = 1-million liters). Therefore mg /liter soil = kg/hectare CO₂-C (assuming 15cm depth).

SUMMARY New method with 30-cc Scoop: Perform the test as is using 9-10 cc water as the standard wetting method for all 30cc samples. Report results directly on the DCR lo-CO₂ channel as mg CO₂-C per liter soil (mg/l) instead of mg/kg of soil.

¹ TechMemo #5 What Is CO₂-Burst vs 3 Or 7-Day Respiration. solvita.com/technical-notes/

² Brinton et al. 2005. ISSPA Journal

³ Tech Memo #2 Guidelines for Soil Dilution. solvita.com/technical-notes/