

STANDARD OPERATING PROCEDURE  
***CALCULATING PESTICIDE CONCENTRATION IN DRY AND WET SOIL***

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**KEY WORDS**

Soil, pesticide concentration, wet-weight, dry-weight

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Environmental Monitoring Branch organization and personnel, such as management, senior scientist, quality assurance officer, project leader, etc., are defined and discussed in [SOP ADMN002.01](#).

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#### **1.0 INTRODUCTION**

Pesticide concentrations in soil can be expressed either on a dry or wet weight basis. The difference between these is that the moisture content of the matrix analyzed can be highly variable, such as soil, so specifying concentration on a wet weight basis is more variable than when expressed on a dry weight basis. When comparisons are made between treatments, reporting of concentration on dry weight basis is preferred. This is especially important in mass balance studies where the mass is summed over various sample components or matrices.

The current policy shared by the contract lab and by the Environmental Monitoring Branch is to report pesticide concentrations in soil as an “as received” basis, known as wet weight basis. During the analysis, two sample aliquots are removed from the sample, one for measuring pesticide concentration and the other for determining the moisture content of the sample. Both aliquots are weighed fresh out of the jar to obtain a wet weight. The pesticide aliquot is then extracted and analyzed to determine the pesticide concentration. The moisture aliquot is dried and weighed again to achieve both a wet and a dry weight. The chemistry laboratory reports pesticide concentrations in the sample on a wet weight basis and provides the wet and the dry weight of the second sample that was taken for moisture determination.

Usually it is the responsibility of the Project Leader to convert the reported pesticide concentrations from a wet to a dry weight basis. The Project Leader would then use the wet and dry mass of the moisture aliquot to adjust the pesticide wet weight concentration. Otherwise, the Project Leader could specify on the Chain of Custody and also the laboratory specification sheet that the laboratory provide results on a dry weight basis. Since the objective of most Branch studies requires reporting of pesticide concentration on a dry weight basis, this SOP provides guidance on the procedure for calculating the fraction moisture content of a sample and then for conversion of pesticide concentrations from a wet to dry weight basis.

Project leaders may also want to calculate the percent moisture of the samples for modeling or other purposes. To do so requires the wet and dry weight measures supplied by the laboratory for the moisture aliquot. An example of the calculation is provided in [SOP# METH 001.00](#).

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**1.1 Purpose**

This standard operating procedure provides instruction on how to convert pesticide concentrations reported from the laboratory on a wet weight basis to a dry weight basis.

**2.0 MATERIALS**

**2.1** Data Sheets from the Chemistry Laboratory

**2.2** Calculator

**3.0 PROCEDURES**

**3.1 Moisture content**

Moisture content of a sample is determined as a fraction of either the whole weight of the sample, which would be reported on a wet weight basis, or as a fraction of the dried sample where the water is removed, which is reported on a dry weight basis. Equation 1 provides the method to determine the fraction moisture content on a wet weight basis and Equation 2 on a dry weight basis. The data for wet and dry weight (wt) of a sample are reported by the laboratory:

Eq. 1. Moisture on a wet wt basis =  $(\text{Wet wt} - \text{Dry wt}) / (\text{Wet wt})$

Eq. 2. Moisture on a dry wt basis =  $(\text{Wet wt} - \text{Dry wt}) / (\text{Dry wt})$

**3.2 Conversion of pesticide concentration from wet to dry weight basis using fraction moisture on dry mass basis**

The relationship for converting concentration between wet and dry weight is:

Eq. 3. Concentration dry wt =  $(\text{Concentration wet wt}) \times (1 + \text{moisture Eq.2})$

The values reported by the laboratory are usually in ppm ( $\mu\text{g/g}$ ) or ppb ( $\text{ng/g}$ ) so these values are substituted into the corresponding concentration variable.

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#### **3.3 Conversion of pesticide concentration from wet to dry weight basis using data supplied on laboratory report sheets**

Chain of Custody or electronic data from the CDFA laboratory routinely contain pesticide concentration of a sample on a wet weight basis and the wet and dry weight of the moisture aliquot. Conversion of the pesticide concentration from wet to dry weight basis consists of two steps where first the data from the moisture aliquot is used to determine the fraction moisture content on a dry weight basis according to Eq. 2.. That result is then used in Eq. 3 to convert the pesticide wet concentration data to a dry weight basis. The following example provides guidance:

Example of data reported from the laboratory:

Pesticide concentration on a wet weight basis = 210 ppm (or 210 µg/g)

Wet weight of moisture aliquot = 50 g

Dry weight of moisture aliquot = 39.5 g

Step 1 – Determine fraction moisture on dry wt basis (Eq. 2)

$$\begin{aligned}\text{Moisture as a dry wt} &= (50-39.5) / (39.5) \\ &= 0.27\end{aligned}$$

Step 2 – Convert concentration in wet to dry wt basis (Eq. 3)

$$\begin{aligned}\text{ppm on dry wt basis} &= (210) \times (1 + 0.27) \\ &= 210 \times 1.27 \\ &= 266.7 \text{ ppm}\end{aligned}$$

#### **3.4 Reporting**

As illustrated in the example it is important to note the basis on which data are reported: The dry weight value is 27% greater than the wet weight value. It is advised that a statement should be included in the data analysis section of a report that specifies the basis of the units such: "Soil data are reported as ppb on a dry weight basis".