

Standardized Product Definition and Product Testing Guidelines for Biochar That Is Used in Soil (aka IBI Biochar Standards)

Technical Program Revisions (arranged by *IBI Biochar Standards* Section)

April 2013

Section 4 Biochar Material Test Categories and Characteristics

Sub-section 4.1 Test Category A – Basic Utility Properties

1. Change in Organic Carbon Test Method

CONTEXT: The molar ratio of hydrogen to organic carbon (H:C_{org}) is used to determine the carbon stability of biochar materials. Lower values of this ratio are correlated with greater carbon stability (see appendix 5 of the *IBI Biochar Standards*). On page 12 Table 1 of Version 1.0 of the *Standardized Product Definition and Product Testing Guidelines for Biochar That Is Used in Soil* (hereinafter referred to as the *IBI Biochar Standards*) users are directed to determine the organic carbon content of biochar by dry combustion (Dumas method) before (total carbon) and after (organic carbon) treatment with hydrochloric acid (HCl).

After further review by the Expert Panel that provided input in the development of the *IBI Biochar Standards*, IBI is changing the test method utilized to determine organic carbon. In Version 1.1 (V1.1) of the *IBI Biochar Standards*, users are directed to use the “pressure calcimeter method” to determine CO₂-C (inorganic carbon) via addition of 1N HCl, as per ASTM D4373-02 (2007). IBI made this decision for the following reason:

1. *Laboratory Preference.* The pressure calcimeter method is preferred by the majority of professional soil testing laboratories and is a lower cost method.

REVISION: The Test Method for Organic Carbon in Table 1 Test Category A: Basic Utility Properties shall read:

“Total C and H analysis by dry combustion-IR detection. Inorganic C analysis by determination of CO₂-C content with 1N HCl, as outlined in ASTM D4373-02. Organic C calculated as Total C – Inorganic C. See Appendix 5 for H:C_{org} discussion.”

Sub-section 4.2 Test Category B – Toxicant Reporting

1. Removal of Earthworm Avoidance Test from Test Category B – Toxicant Reporting Requirements

CONTEXT: Ascertaining the safety of biochar for application to soils is paramount to a successful biochar industry. One important purpose of the *IBI Biochar Standards* is to provide assurance to biochar users and national and international regulatory bodies that a particular biochar is safe for use as a soil amendment.

Toxicants potentially present in biochar products can be divided into two categories – those that may be present in the feedstocks used (metals and polychlorinated biphenyls (PCBs))

and those that may be produced by the thermochemical process used to make biochar (polycyclic aromatic hydrocarbons (PAHs) and dioxins). To this end, Test Category B – Toxicant Reporting outlined on pages 13-14 of the *IBI Biochar Standards* V1.1 contains a suite of testing requirements to ascertain levels of known potential toxicants and gives Maximum Allowed Thresholds (MAT) by jurisdiction (see Appendix 3 pages 28-29 of the *IBI Biochar Standards* V1.1 for information on development of the MAT).

Because earthworms (*Eisenia foetida*) are highly mobile and sensitive to environmental contamination, it has been suggested that they can be used to infer soil health by observing preference for amended soils versus non-amended control soils (de Bruyn 1997; Paoletti et al. 1998). To this end, Version 1.0 of the *IBI Biochar Standards* required an Earthworm Avoidance Test as a component of Test Category B.

After further review by the Expert Panel that provided input during development of the *IBI Biochar Standards*, IBI has removed the Earthworm Avoidance Test from the Test Category B – Toxicant Reporting requirements for the following reasons:

1. *Redundancy*. The mandatory testing of and MAT for dioxins, PAHs, PCBs and metals as outlined in Test Category B will identify the presence and levels of specific toxicants that earthworms may have reacted to. In cases where the MAT is surpassed for a certain toxicant, IBI will consider the biochar material unacceptable. Furthermore, IBI is retaining the Germination Inhibition Assay (OECD 1984) as a Test Category B requirement. Similar to the Earthworm Avoidance Test, the Germination Inhibition Assay provides an indication of the presence of potential toxicants in biochar (Van Zwieten et al 2010). The removal of the Earthworm Avoidance Test will reduce the costs of laboratory analysis while retaining important safeguards relative to biochar safety, making the *IBI Biochar Standards* more accessible to the global biochar community
2. *Lack of testing availability*. Although the Earthworm Avoidance Test is an established method, IBI has polled numerous soil testing laboratories in the US and Canada and determined that there is a dearth of accredited labs that conduct the Earthworm Avoidance Test.

REVISION: The Earthworm Avoidance Test shall be removed from Test Category B – Toxicant Reporting requirements.

REFERENCES

- ASTM International (2007) *ASTM D4373-02 (2007) Standard Test Method for Rapid Determination of Carbonate Content of Soils* <http://www.astm.org/Standards/D4373.htm> (accessed March 2013).
- de Bruyn LAR (1997) The status of soil macrofauna as indicators of soil health to monitor the sustainability of Australian agricultural soils. *Ecological Economics*. 23:167–178
- OECD Organisation for Economic Co-operation and Development (1984b) Terrestrial Plants, Growth Test no. 208. In *Guideline for Testing of Chemicals*. <http://www.oecd.org/dataoecd/18/0/1948285.pdf>. (Accessed January 2012).
- Paoletti MG, Sommaggio D, Favretto MR, Petruzzelli G, Pezzarossa B, Barbafieri M (1998) Earthworms as useful bioindicators of agroecosystem sustainability in orchards and vineyards with different inputs. *Applied Soil Ecology*. 10:137–150

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