

Transnational Access Report

1. General Information

Project Acronym (ID):	BIOADD-mad-it-eat
Project Title	B iochar a ddition and c omparative a nalysis of high-yield <u>i</u> ng I talian durum w heat varieties
Name of Group Leader	Arianna Latini
Name of organization	ENEA (Italian National Agency for New Technologies, Energy and Sustainable Economic Development)

2. Project summary (max. 250 words)

The experimental activity lead at the SCREEN House installation (FZJ) aimed at studying the influence of biochar on the development and growing performances of some Italian wheat varieties. Biochar is a charcoal obtained through a pyrolysis process mainly used for agricultural purposes. Among its several benefits, it may increase crop yields, help to prevent fertilizer runoff and leaching, retain moisture, and above all it may replenish exhausted and marginal soils with organic carbon. Durum wheat (*Triticum durum*) has been chosen for its valuable importance for Italy, given the special characteristics of its final products (pasta in particular) and also with a regard to well known “Made in Italy” brands. Furthermore, the rise of Italian durum wheat production, which nowadays is not able to entirely supply the National demand, has become crucial: yields are quite low, land available for cultivation is in decrease and feedstock quality should be further improved.

In summary, for comparative analyses, five Italian high-yielding and good-quality durum wheat varieties with a clear commercial impact have been selected and grown under controlled conditions in biochar-amended pots in the SCREEN House. Two different biochar stocks have been used, one proceeding from a woody feedstock and another from wheat straw. Each biochar was administered in two different ways: directly added to soil (NON activated biochar) and after activation with a digestate solution (biochar “charged” with water and nutrients). In comparison to controls, significant shoot biomass differences, which need a more in depth analysis, amongst wheat genotypes and soil treatments emerged.

4. Main achievements (max. 250 words)

The SCREEN House phenotyping experiment, with a sample size of 150 plants, aimed at a comparative analysis of the effects of different biochar-amended soils on plant above-ground biomass development. The current experiment resulted technically perfect thanks to the fundamental help and hard work of the FZJ colleagues.

In this study two different kinds of biochar (two very dissimilar feedstocks, wood chips for B1 and wheat straw for B2), in both conditions of activated or NON-activated, and some elite durum wheat genotypes have been evaluated. Moreover, the choice of using a digestate for charging the biochar was driven by the interest in the application of digestate into soil to contribute to the nutrients’ recycling.

General trends were evident for each treatment: with respect to controls, on average, B1 had a slightly positive effect on shoot biomass production, while B2 had a very negative influence on plant growth. In most cases, as expected, the digestate-treated biochar performed better: in fact, NON-activated biochar should inhibit plant growth because it absorbs all water and nutrients from soil and plant feels like starvation. We are now waiting from the results of soil chemical and physical analyses to better rationalize on the major differences between B1 and B2. In addition, the response of each durum wheat variety to the soil-biochar composition showed a strong genotype-dependence.

Further in progress integrated analyses, such as agronomic evaluations and expression profiles of genes for plant adaptation to biochar-amended soil, will help to get more insights into the plant genotype-specific response.