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Charcoal kiln relicts – a favorable site for tree growth?

Allan Buras (1), Florian Hirsch (2), Ernst van der Maaten (1), Melanie Takla (3), Christin Räbiger (1), Roberto Cruz Garcia (1), Anna Schneider (2), Alexandra Raab (3), Thomas Raab (2), and Martin Wilmking (1)

(1) Institute of Botany and Landscape Ecology, University of Greifswald, Soldmannstrasse 15, 17487 Greifswald, Germany (allan@buras.eu), (2) Chair of Geopedology and Landscape Development, Brandenburg University of Technology Cottbus-Senftenberg, Konrad-Wachsmann-Allee 6, 03046 Cottbus, Germany, (3) Research Centre Landscape Development and Mining Landscapes (FZLB), Brandenburg University of Technology Cottbus-Senftenberg, Konrad-Wachsmann-Allee 6, 03046 Cottbus, Germany

Soils with incompletely combusted organic material (aka 'black carbon') are considered fertile for plant growth. Considerable enrichment of soils with black carbon is known from Chernozems, from anthropogenic induced altering of soils like the 'Terra Preta' in South America (e.g. Glaser, 2001), and from charcoal kiln relicts. Recent studies have reported a high spatial frequency of charcoal kiln relicts in the Northeastern German lowlands (Raab et al., 2015), which today are often overgrown by forest plantations. In this context the question arises whether these sites are favorable for tree growth.

Here we compare the performance of 22 Pinus sylvestris individuals – a commonly used tree species in forestry – growing on charcoal kiln relicts with 22 control trees. Growth performance (height growth and diameter growth) of the trees was determined using dendrochronological techniques, i.e. standard ring–width measurements were undertaken on each two cores per tree and tree height was measured in the field. Several other wood properties such as annual wood density, average resin content, as well as wood chemistry were analyzed.

Our results indicate that trees growing on charcoal kiln relicts grow significantly less and have a significantly lower wood density in comparison with control trees. Specific chemical components such as Manganese as well as resin contents were significantly higher in kiln trees.

These results highlight that tree growth on charcoal kiln relicts is actually hampered instead of enhanced. Possibly this is a combined effect of differing physical soil properties which alter soil water accessibility for plants and differing chemical soil properties which may negatively affect tree growth either if toxic limits are surpassed or if soil nutrient availability is decreased. Additional soil analyses with respect to soil texture and soil chemistry shall reveal further insight into this hypothesis. Given the frequent distribution of charcoal kiln relicts in the German lowlands (e.g. Raab et al., 2015) and their potentially adverse effects on tree growth, these findings elucidate a yet unknown impact of past human activities on recent biological processes.

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