



Application of N-modified lignite and activated biochar to increase growth of summer wheat on nutrient-poor sandy soil

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Land degradation is recognized as the main environmental problem that adversely depletes soil organic carbon (SOC) and nitrogen (SON) stocks, which in turn directly affects the fertility and productivity of soils. Degraded soils and marginal lands are characterized by low fertility, poor physicochemical and biological properties and are almost free of soil organic matter (SOM), limiting their functional properties and, hence, their productivity. To enhance or restore the fertility of these soils, natural soil amendments such as biochar, lignite or humic acids can be added. A greenhouse experiment was carried out to investigate the effect of different application rates (5, 7.5, 11, 15, 28 t ha⁻¹) of N-modified lignite (NL) incorporated in a nutrient-poor sandy soil from a recultivation site on plant growth, water use and nitrogen use efficiency of summer wheat. Additionally activated biochar (BC) was tested to see whether any differences exist between N-modified lignite and activated biochar at the same C-application rates. All variants with soil amendments displayed a much higher grain and straw yield and water use efficiency compared to the control sample. The differences were significant for the 28 t ha⁻¹ variant followed by the variant with 5 t ha⁻¹ NL. With the 7.5 t ha⁻¹ NL higher biomasses, water and nitrogen use efficiency could be achieved compared to the variant treated with BC at the same C-content. This study shows that even small amounts of N-modified lignite can increase growth, water and nitrogen use efficiency of summer wheat on marginal lands.