

Original Paper

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Physicochemical Characterization of Pelletized Lime Kiln Dust as Potential Liming Material for Acidic Soils

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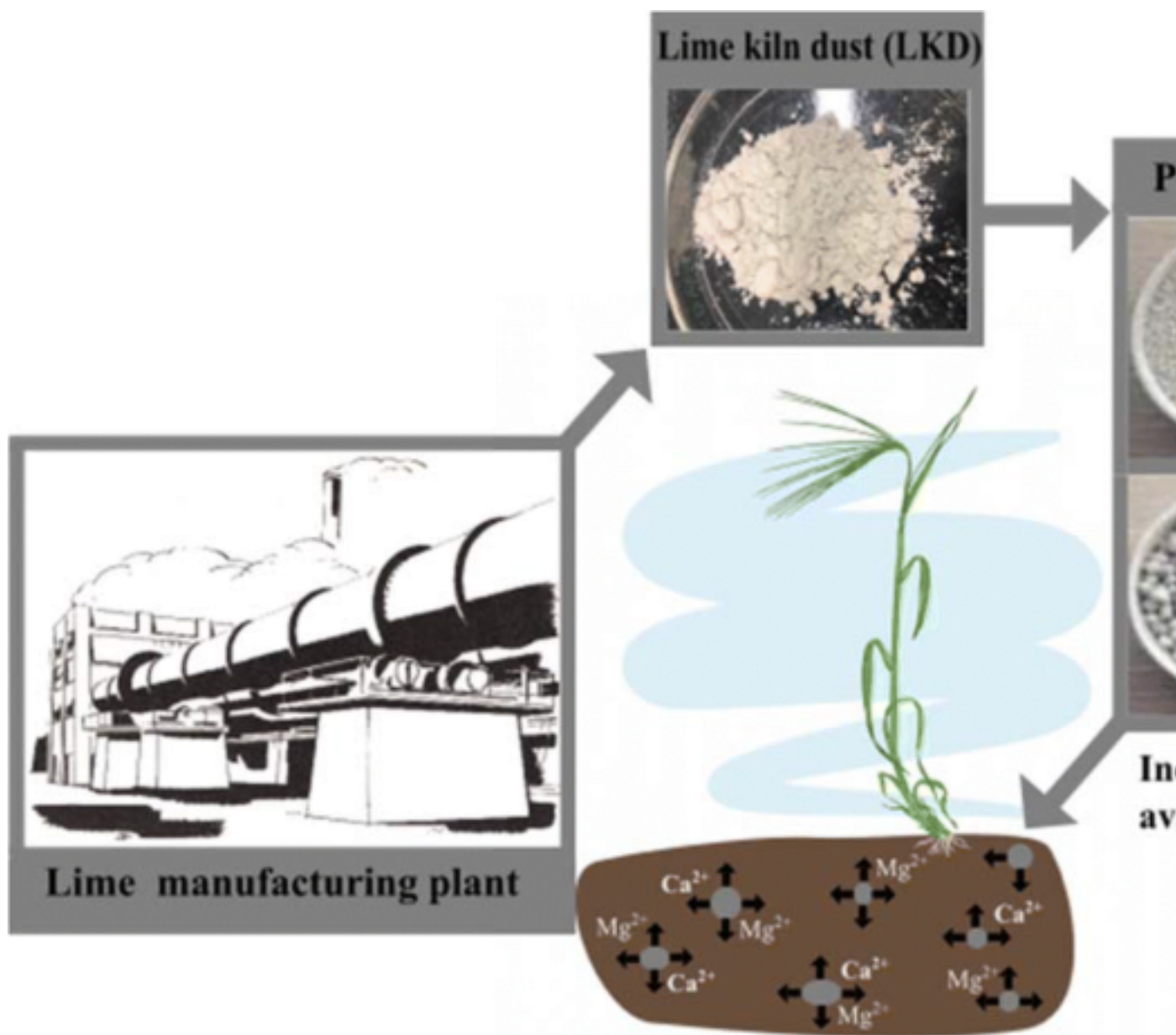
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#### Abstract

Lime kiln dust (LKD) is a fine particulate material by-product produced during the lime burning processes. Current reuse options are chiefly focused on reuse in the cement industry which are limited by the inherent porosity of this by-product. Due to the presence of calcium (Ca), magnesium (Mg) and other elements which can serve as micronutrients to the plants, LKD has the potential to be used as a replacement for conventional liming materials for both soil pH<sub>KCl</sub> increase and plant supplement with secondary major- (Ca and Mg) and micronutrients (Mn, Cu, Zn and Ni). The work described here outlines the investigation of physicochemical properties of pelletized LKD materials and their effect on soil pH<sub>KCl</sub>, available Ca and Mg content in the soil as well as straw and grain yields of spring barley. LKD were analyzed using X-ray diffraction, scanning electron microscopy with energy dispersive analysis, while detailed chemical analysis of both pelletized LKD and soil was performed using Atomic Absorption Spectroscopy. Pellet size and major element composition were used as chief indicators for the liming capacity of LKD. It was shown that low acidic soil (pH<sub>KCl</sub> 5.4) can be conditioned using fine (0.1–2 mm) pelletized LKD due to the high release rates while coarse pellets (5–8 mm) did not significantly increase available Ca and Mg content in soil and did not reach optimum pH<sub>KCl</sub> range even after 48 weeks. The highest application rate of LKD at 4 t/ha increased spring barley grain yield compared to control but the increase was not statistically significant. Thus, pelletized lime kiln dust could be a potential alternative to natural limestone or dolomite minerals as liming material for acid soils with the pellet size determining the liming kinetics.

Graphic Abstract



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