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# Exploring the Potential of Electric-Arc-Furnace Slag in Sustainable Crop Production

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Circularity necessitates efficient utilization of by-products from diverse industries. Steel slag, one of the by-products generated through steel manufacturing, has the potential to be used in different areas, including but not limited to agriculture. In our study, the impact of electric-arc-furnace (EAF) slag on growth and mineral composition of model crops has been investigated in alkaline and acidic soil types under greenhouse conditions. Mineral composition and physicochemical properties of EAF slag were determined prior to pot experiments. Steel slag amendment remarkably improved the growth of wheat by up to 78% over control in acidic soil. It ensured significant enhancement in shoot P, K, Zn, and B levels, particularly in acidic soil. Moreover, the yield and nutritional quality of the grain positively responded to slag amendment as well. The lettuce growth, on the other hand, was improved by 400% compared to control in response to steel slag application in acidic soil. Mineral composition of lettuce was also improved by slag amendment in terms of K, Ca, and Zn concentrations. There was no significant increase in the concentration of potential toxic metals like Cd, Cr, V, or Pb observed in any of the model crops as a result of slag application. Furthermore, 31% and 60% decreases over control in the shoot Cd level were achieved by steel slag treatment in alkaline and acidic soil types, respectively. Obtained results demonstrated that steel slag could enhance the yield and nutritional quality of the grain and the harvestable biomass of lettuce through improvements in soil properties. EAF slag proved to be a potential alternative to chemical fertilizers, which cause significant amount of CO2 emission during their production. The long-term effect of steel slag on soil and different plant species should be tested to determine the safety of the material, especially under field conditions.

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