ABSTRACT:

This study revolves around the practical implementation of green chemistry principles, yielding valuable outcomes. Biochar, synthesized via pyrolysis within a kiln operating at temperatures ranging from 600°C to 700°C, was derived from two distinct sources: citrus fruit peels and walnut shells, both locally procured. The biomass was meticulously washed, sun-dried, and subjected to pyrolysis, resulting in finely ground biochar with uniform porosity. To assess the impact of nutrient enrichment on biochar, separate treatments involving zinc and iron were applied, rendering the biochar "loaded." Various proportions of biochar were incorporated into soil in the form of groups for a comprehensive comparative analysis of qualitative and quantitative attributes. Cucumber plants were cultivated both with and without the inclusion of biochar, following identical procedures for zinc-treated citrus peel and walnut shell biochar, as well as iron-treated counterparts, providing a foundation for quality and yield comparisons. Our comprehensive analyses unveiled remarkable results, including soil amendment, augmented leaf and fruit dimensions, and increased crop yield. The quantification of metal content was conducted using Flame Atomic Emission Spectroscopy, while Fourier-Transform Infrared Spectroscopy (FTIR) analyses were employed to corroborate and support our findings