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Intercalation technique can turn pomegranate industrial waste into a valuable by-product

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Abstract

The development of nanotechnology has led to the production of new valuable by-products in the food industry. In this way, we synthesized a new green fungicide using the impure montmorillonite (Mt) and extract of pomegranate fruit waste. In addition, we compared the Mt/pomegranate fruit peel extract (Mt/PFPE) with the Mt/clove leaf extract (Mt/CLE) and Mt/Gallic acid (Mt/GA) composites. The mentioned composites were prepared through the simple and low-cost intercalation technique. The antifungal activity of these composites on postharvest gray mold (*Botrytis cinerea)* in apple fruit were tested in vitro and in vivo. XRD pattern confirmed the highly intercalation of plant extracts between interlayers of Mt nanoparticles. HPLC analysis and FTIR spectra showed that Mt nanoparticles absorbed the phenolic compounds from extract selectively. TGA analysis indicated high loading yield up to 70%. The Mt/PFPE, Mt/CLE and Mt/GA nanocomposites had 102%, 84% and 75% higher antifungal activity than single Mt nanoparticles. These findings suggest the Mt/PFPE nanocomposite as a low-cost but valuable by-product in the pomegranate juice industry.

Keywords: By-product, Pomegranate peel extract, Montmorillonite, Green fungicide, Intercalation.