The potential use of cashew apple lignin as photoprotector ingredient for cosmetics

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Abstract

Prolonged exposure to ultraviolet (UV) radiation causes damage to the skin and immune system. Therefore, enormous efforts have been made to develop biodegradable and sustainable UV protective materials with the increasing awareness of health and disease control. The high presence of phenolic groups makes lignin a promising candidate for natural UV protective material. Then, this study aimed to use lignin from cashew apple bagasse (CAB) to produce hybrid nanocomposites with zinc and titanium oxides and to evaluate their antioxidant and UVA/UVB properties. The yields of lignin-based nanocomposites were similar, 37.2 ± 1.3% for LigZnO and 34.3 ± 2.2% for LigTiO_2. The size of the particles were at nanoscale, 789 ± 12 nm and 864 ± 17 nm for LigTiO_2 and LigZnO, respectively; also being stable according to zeta potential (|−32 mV| to |−48 mV|). FTIR analyzes show the presence of interactions between lignin and zinc or titanium oxides, being both nanocomposites. Lignin showed a high antioxidant (94.5 ± 0.9%) potential while LigZnO showed a scavenging effect of 31.8% similar to the obtained by the LigTiO_2 (28.9%). Lignin present superior photoprotective characteristics in the UVA compared to UVB region, with UVA/UVB ratio of 1.8. Consequently, lignin-based nanocomposites present better photoprotection in the UVA region (UVA/UVB ratio of 2.4), and higher than lignin due the properties of UVA absorption from ZnO and TiO_2 oxides. Then, the results suggest the production of lignin-hybrid nanocomposites with antioxidant and photoprotective properties for future application as UV absorber in cosmetics products. Additionally, the low-cost and sustainable synthesis of lignin nanocomposites not only contributes to value-added nanomaterials production, but also helps to mitigate the agro-waste disposal problems.

Keywords: Lignin; Cashew apple bagasse; Sustainability; Nanocomposites; UV-blockers.