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Characterization of polyvinyl alcohol films reinforced with crystalline microcellulose obtained from mango seed for use in controlled drug release

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Cellulose is one of the most abundant biopolymers on Earth. It is renewable and biodegradable, and it has a crystalline microstructure that can be extracted from the cell walls of plants. This characteristic has generated significant interest as a source of reinforcing fillers, resulting in composite materials with good mechanical properties suitable for a wide range of applications. Mango fruit is a fleshy drupe formed by a skin and an edible pulp surrounding a hard and firm stone containing a single seed. This seed represents 35-55% of mango fruit weight and comprises two parts, the tegument and the kernel. The tegument contains large amounts of cellulose, hemicellulose, and lignin. The kernel contains starch, cellulose, hemicellulose, lignin, and fatty acids such as oleic, stearic, palmitic, and linoleic. In this way, mango seed constitutes a suitable source for the extraction of microcellulose. Poly(vinyl-alcohol) (PVA) is a water-soluble, biodegradable polymer and an interesting material for high-tech applications. The mechanical properties of PVA can be substantially improved using microcellulose reinforcement. The design and application of PVA as drug carriers to regulate and dose their release in specific applications is a prospect that has become of great interest. This work aimed to prepare and characterize PVA films reinforced with crystalline microcellulose obtained from mango seeds for use in biomedical applications. Mango seeds were chemically pretreated (MSP), hydrolyzed (MSH), and bleached (MSB). These samples were characterized by FTIR, SEM, and XRD. Subsequently, PVA films reinforced with these mango seed samples were prepared and compared with a PVA film without reinforcement. The physicochemical (FTIR, SEM, swelling) and mechanical (tensile test) characteristics of the types of films were evaluated. The results indicated that the different treatments performed on mango seeds allowed the isolation of microcellulose. While the reinforced films show the potential for use as an agent in the controlled release of drugs.