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Glutaraldehyde Crosslinked Zein Solutions Make Better Biodegradable Films

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ABSTRACT

The corn protein, zein, is a byproduct of the ethanol production industry. Recently, zein has been used in the production of films and food packaging due to its biodegradability, low production cost, and abundance of corn in the United States. To improve overall quality of zein films, the mechanical properties and surface properties should be enhanced. Therefore, in this study, our aim is to improve the properties of zein films with glutaraldehyde (GDA) as a crosslinker. Zein was solubilized and mixed with 70% ethanol and GDA, then sonicated. Solutions were poured onto different surface materials, including polydimethylsiloxane (PDMS), polystyrene (PS), and glass petri dishes to create films. Cast solutions were placed in the oven for different length of time (i.e. 0 hour, 1 day, 3 day, etc). Water contact angle and FTIR measurements were conducted to understand the crosslinking mechanism of zein films and surface properties of zein to understand how it will perform. Measurements from water contact angle and FTIR showed changes caused by heating, with 6% GDA films having less increase in hydrophobicity than films with 0% GDA and the changes in the ratio of α -helices and β -sheet structures of zein as the duration of heating was increased. Casting zein films on different surfaces affected the hydrophobicity of films that were not heated, but films that were heated for 3 days in the oven did not have any significant differences.

KEYWORDS

Zein, glutaraldehyde, time, films, biodegradable