EFFECT OF STRUCTURAL CHARACTERISTICS OF MODIFIED WAXY CORN STARCHES ON RHEOLOGICAL PROPERTIES, FILM-FORMING SOLUTIONS, AND ON WATER VAPOR PERMEABILITY, SOLUBILITY, AND OPACITY OF FILMS.

ABSTRACT

Waxy corn starch (amylopectin) and three of its chemical derivatives: acetylated cross-linked (ACLS), oxidized (OS), and octenyl-succinylated (OSA), were used together with additives such as Tween 80, sorbitol, and beeswax suspension or safflower oil to test their effect on film-forming solutions (FFS) and films. The objectives of this study were the starch structure characterization, and its correlation with rheological properties of FFS and solubility, opacity, and water vapor permeability (WVP) of the produced films. Analysis of starch structure, rheological characterization, and films micrographs revealed that the starches contained predominantly low MW amylopectin molecules and film properties depended on their ability to reorganize. Additionally, the interaction among groups introduced in modified starches or with additive molecules can hinder or promote starch reorganization, resulting in films with increased or reduced WVP, solubility and transparency properties. Films were obtained by casting and showed a thickness less than 41 μm. Films prepared with OS and beeswax exhibited the best reorganizing capacity of FFS, resulting in less soluble ($30.0 \pm 1.6\%$), highly transparent ($23.2 \pm 3.3\ UA \times nm$) and less permeable films ($0.485 \pm 0.016\ g \cdot mm \cdot m^{-2} \cdot h^{-1} \cdot kPa^{-1}$). On the other hand, ACLS showed an opposite trend which was attributed to a more open film structure. These results contribute to understand the molecular interactions of waxy starch molecules in FFS which may be useful to design tailored coatings.

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Autores: Alfonso Pérez-Gallardo, Luis A. Bello-Pérez, Blanca García-Almendárez, Gerardo Montejano-Gaitán, Gustavo Barbosa-Cánovas, Carlos Regalado*

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