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Effect of the PVA type on the physical properties of biodegradable films based on blends of gelatin and PVA

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Modern consumer demands healthy foods and with low environmental impact. Consequently, research on edible and/or biodegradable films increased in the last decade. Current biopolymers based films are usually sensitive to environmental conditions, and have low mechanical resistance. The use of blends of biopolymers with biodegradable synthetic polymers, such as the poli(vinil alcohol) could be an alternative to improve films characteristics. Thus, the objective of this work was to study the effect of the PVA type (different hydrolysis degree) on the mechanical properties, color, opacity and water solubility of biodegradable films based on blends of PVA with gelatin. Films were produced from a film forming solution (FFS) containing 2g of macromolecules/100g of FFS, with 30% of PVA in relation to gelatin, and 0 and 25g glycerol/100g of macromolecules. The PVA tested were from a Celanese Celvol® series named 504, 418, 425, 350 and 125. The FFS was dried at 30°C, in an oven with circulation and renewal of air, for 24-28 h. Once obtained, films were conditioned at 58% of relative humidity at 22°C for 7 days. Then, tensile and puncture tests, color, opacity and water solubility were determined on the films. Overall, for films without plasticizer, the PVA type did not affect the puncture force ($\tilde{3}$0N), nor the puncture deformation ($\tilde{3}$%); being an exception the films with Celvol®504, in which the average puncture deformation value was higher (3.9%). In films with glycerol, those with Celvol®504 had lower resistance (5.1N) to puncture and films produced with Celvol®125 and 350 were the most resistant (7.6N). The puncture deformation of films with plasticizers varied between 6.3 and 8.2%. According to the tensile tests on films without glycerol, the Celvol®418, produced the most resistant (83MPa) and the most rigid (28MPa) films, followed closer by Celvol®350 (80MPa). No effect of the PVA type was observed on all films elasticity. Besides, the presence of glycerol in films, masked the effect of the PVA type on the mechanical properties. Although small variations in color parameters and the opacity of films were observed, it could be considered that all films produced in this work were colorless (DE*=$\tilde{3}$) and scarcely opaque (Y=1-2). The PVA reduced the water solubility of films respect to those based on pure gelatins. In conclusion, the PVA improved the properties measured on gelatin based films without a defined trend for the PVA type. Acknowledgments: to FAPESP and CNPq in Brazil, and Ceprobi-IPN in Mexico.