Novel edible nanocomposite film-based in pectin and poly(ε-caprolactone) nanoparticles

Marcos Vinicius Lorevice[1], Caio Gomide Otoni[2], Marcia Regina de Moura[3], Luiz Henrique Capparelli Mattoso[4]

[1]Federal University of São Carlos, [2]Universidade Federal de São Carlos, [3]Universidade Estadual Paulista Júlio de Mesquita Filho, [4]Embrapa Instrumentação Agropecuária - São Carlos

e-mail: marcos.lorevice@gmail.com

Biopolymers, such as polysaccharides, are obtained from renewable sources and can be biodegradable. These materials denote a means of producing novel packaging materials, encouraged by the limitations presented by petroleum-based packaging as to biodegradability. Biopolymer-based packaging, however, generally exhibit lower physical (mechanical, thermal, and barriers) properties than synthetic packaging, resulting in an obstacle to their use for packaging production. Nanoparticles have been used to improve the mechanical properties of biopolymers. In this context, the aim of this work was to produce nanocomposite films with poly(ε-caprolactone) nanoparticles (PCLNP) and high (HMD) and low (LMD) methoxyl degree (MD) pectins. PCLNP were synthesized by nanoprecipitation and further analyzed by zeta potential and dynamic light scattering. Films were obtained by casting and evaluated as to elongation at break (EB) and tensile strength (TS). PCLNP presented diameter and zeta potential values near to 130 nm and - 20 mV, respectively. The negative zeta potential is because the surfactant is spread over the entire PCLNP surface. PCLNP did not affect EB of pectin films. TS of HDM pectin films, however, increased from 30.79 ± 1.47 to 75.53 ± 17.81 MPa when PCLNP were added. TS of LMD pectin films also increased from 25.06 ± 3.78 to 87.81 ± 17.81 MPa. This suggests the formation of a good interactions between pectin network and PCLNP surface. This behavior can be related to the higher occurrence of hydrogen bonds, which in turn is a result of the higher number of free hydroxyls from carboxyl groups in LMD pectin. These results indicate a novel material with desirable physical-chemical properties for food packaging applications, making this product promising and competitive when compared to petroleum-based packaging.

The authors are thankful to PPGQ/UFSCar, Embrapa Instrumentation, and FAPESP (#2012/24362-6 and #2014/23098-9).