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Development and characterization of a modified biodegradable and edible soy protein film

A method for the preparation of an edible, biodegradable and microbe resistant film from Alkali Treated Isolated Soy Protein (ATISP) is presented here. Potassium sorbate (K-sorbate) and glycerol were used as plasticizers.

In order to prepare ATISP, soy protein was treated with a 10-fold amount (W/V) of 0.1 N NaOH. The sediment was freeze dried at –90 ^{o}C and grounded into a fine powder. Experiments were conducted in order to optimize the appropriate solvent, solvent volume, drying temperature and the drying time and to prepare a homogeneous film forming solution.

The solution for film formation was prepared by dissolving 3.0 g of ATISP in 30.0 cm3 of distilled water. Soy protein solution was heated for five minutes and 20.00 cm3 of 50% ethanol containing glycerol and 2.5% of K-sorbate was added to the hot solution. This hot viscous solution was filtered and sonicated and spread as a thin film on a clean dry glass pad. Finally the film was dried at 80 ± 5 ºC for 3 hrs. Once the film is cooled (after 24 h) it was pealed off. Each film was tested for physical properties such as glass transition temperature (Tg), tensile strength (TS), water vapor absorbance (WVA), water vapor permeability (WVP) and opacity. Then the best film forming solution was determined by varying the pH (in the range of 7-10) of the solution. The effect of H2O2 as a bleaching agent was also studied. The transparency and uniformity of soy protein film was investigated by electron micrographs.

The film was slightly yellowish in appearance, with the colour darkening as thickness increased. Transparency of the film is comparable with polyethylene. The thickness of the films was in the range of 0.05-0.10 mm. When the concentration of H2O2 is below 3%, the tensile strength of the film was increased and the properties such as elasticity, water vapor permeability and opacity were decreased. A similar behavior was observed when the pH of the film casting solution was at pH 10. Increase in the concentration of K-sorbate, increase the WVP and microbe resistivity.

In general the appearance of the film improved with 2.5% K-sorbate and at a pH of 10. This modified film has comparatively good film properties with respect to previously prepared soy films.