Development and characterization of chitosan-alginate edible films to improve passion fruits shelf-life

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Climacteric fruits, such as passion fruit, have a very short shelf life due to dehydration and intense physiological metabolism, limiting their storage, transport and commercialization. Therefore, this work aimed to produce and characterize chitosan and alginate films to be used as biopolymeric coatings in passion fruits in order to reduce their water loss during shelf-life. Films were produced by casting. The polymer concentration in the filmogenic solutions was 1.5% w/v in the following proportions of alginate:chitosan: 100:0; 25:75; 75:25 and 0:100. Chitosan solutions were prepared in 1%v/v aqueous acetic acid under magnetic stirring for 18h until complete dissolution. The alginate was dissolved in distilled water at 60°C under mechanical agitation at 6,500 rpm. After that, a pre-crosslinking was carried out by adding calcium chloride as a crosslinking agent at 0.5% w/w. In all polymeric solutions, glycerol was added as a plasticizing agent at a concentration of 30% w/w. The polymer solutions were poured in an acrylic plate and dried at 40°C for 16 h. After drying the alginate films were immersed in a crosslinking solution with 1.6 or 3.2 $mgCa^{2+}•cm^{-2}$ alginate film. The films were characterized regarding chemical, mechanical and barrier properties. All the evaluated formulations resulted in non-rigid and homogeneous films. Alginate and chitosan composite films were less transparent than the single films. The film thicknesses ranged from 82 ± 2 to 86 ± 3 ?m. Chitosan films were less water soluble than the alginate ones with values of 35.40%± 2.18 and 30.31%± 1.66 for the films with 75 and 100% chitosan, respectively. Films with 75 and 100% alginate were completely water-soluble. However, with the second cross-linking treatment, the alginate films solubility decreased to up to 27%. The sorption degree was in line with the solubility results, i.e., the higher the proportion of chitosan, the lower the sorption degree. Regarding water vapour permeability, chitosan films showed lower vapour permeability than alginate films. Overall, the films produced with higher chitosan concentration showed better potential barrier properties mainly low water solubility and swelling, being suitable for the use in formulations designed to produce edible films or coatings.