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Enthalpic Relaxation in fish (Salmon salar) gelatin films

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Edible film is a common technology used to preserve a variety of fresh foods. One of the phenomena that can alter the film structure stability is the enthalpic relaxation. This is a spontaneous phenomenon that occurs in amorphous polymers in the glassy state that is manifested by a densification, resulting in cracking of the polymeric matrix on storage. The present work looked at the enthalpic relaxation in films constructed from salmon (*Salmon salar*) and commercial bovine gelatins. The protein molecular weight (MW) was determined by electrophoresis and the aminoacid content was quantified by HPLC. Thermal transitions were assessed by differential scanning calorimetry (DSC). Films were prepared by pouring a 7% (w/v) gelatin dispersion at 60°C onto tefloned containers and then stored at 5°C for 4 days. After conditioning over P_2O_5, the 250 µm thickness films were equilibrated over saturated 11, 44 and 68% RH giving moisture contents (MC) of ~8, ~11 and ~16% (wet basis, w.b.) respectively. The films were annealed in the glassy state for 24, 48 and 72 hours at 20°C. Electrophoresis showed for both gelatins clear bands associated to α1, α2 (Mw ~ 100kDa) and β (Mw ~ 200 kDa) chains indicating type I collagen. Interestingly, the Mw for salmon gelatin was lower than bovine gelatin. The biochemical composition showed 12.2 mg/100g of proline (*pro*) and 10.7 mg/100g of hydroliprone (*hpro*) for bovine gelatin, 8.0 mg/100g of *pro* and 4.1 mg/100g of *hpro* for salmon gelatin respectively. DSC on fresh films (0h) showed endothermic peaks associated to the melting of triple helices formed during film preparation. The melting temperature (Tm) decreased from 122°C to 80°C for bovine gelatin and from 111°C to 73°C for salmon gelatin when MC decreased from ~16 to ~8% respectively. The glass transition temperature (Tg) decreased from 89.2°C to 31.4°C for bovine gelatin and 78°C to 28°C for salmon gelatin for the same MC range. An excess of enthalpy (ΔH) was detected in the annealed films. ΔH increase with ageing time up to 72h, ~ 0.8 J/g to ~ 2.0 J/g and 1.7 J/g to 3.0 J/g for 8% and 11% MC films respectively. For the samples equilibrated to 16% MC, no change in ΔH was detected. This was explained by the sample's Tg and Tm approaching the annealing temperature. The kinetic and extent of the relaxation was higher for fish gelatin films. This data could be explained by the smaller Mw of the constituents in salmon gelatin the higher concentration of *pro* and *hpro* in bovine gelatin that could have a stabilization of the polymer chains restricting its relaxation towards equilibrium.

Keywords: Fish Gelatin Film, Enthalpic Relaxation, Glass Transition Temperature, Glassy State

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Effect of the concentration by reverse osmosis of grape juice on its aroma profile

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Reverse osmosis (RO) is a membrane process applied for fruit juices concentration as it is carried out under mild temperature, preserving the natural aroma profile of these beverages. In Brazil, grape juice is usually concentrated during the crop season that can results in methyl anthranilate loss, the main substance of grape juice characteristic aroma. The aim of this work was to evaluate the effect of the RO temperature for the concentration of grape juice and its influence on the aroma profile. The single strength red grape juice (SGJ) produced with *Vitis labrusca* grapes (Concord, Isabella, BRS Rubea and BRS Violet cv.) was concentrated at 50°C, 30°C and 20°C, and 60 bar transmembrane pressure. The RO processes were carried out in a plate and frame unit with composite membranes presenting 98% rejection to NaCl. Volatile compounds characterization was accomplished by SPME extraction with PDMS/DVB fibers and the aroma profile was determined by gas chromatography using flame ionization detector and mass spectrometer. For the Quantitative Descriptive Sensory analysis, ten panelists evaluated

eight samples of the reconstituted grape juices (12,7°Brix), including the SGJ, the three concentrated juices and four commercial products (E, F, G, H) in a nine point hedonic scale, where 1 was absence or weak and 9 represented strong characteristic aroma. Permeation of volatile compounds was observed in all RO processes at all evaluated temperatures. The relative peak area for methyl anthranilate was 0,9% for SGJ; 0,6%, 0,9% and 1,0% for the juices processed by RO at 50°C, 30°C and 20°C, respectively; and 9,9% for product E. Sensory tests confirmed that product E presented the highest (6,88) and the juice processed at 50°C the lowest mean score (4,34). But the juice processed by RO at 30°C and 20°C were the most favorable for the preservation of grape juice aroma.

Keywords: Grape juice, Reverse osmosis, Concentration, Aroma

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Keywords: Gelatin films, Enthalpic relaxation, Glass transition temperature, Glassy state