EFFECT OF THE PLASTICIZERS GLYCEROL AND SORBITOL ON THE VISCOELASTIC PROFILES OF NATIVE AND MODIFIED STARCH FILM FORMING SOLUTIONS

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The objective of this work was to determine effect of the plasticizers glycerol and sorbitol, on the rheological profile of film forming solutions of native and oxidized banana starch. Samples of starch solutions with 4 % (w/w) total solids, composed of native or modified (by oxidation at two levels of sodium hypochlorite; 2 and 3 % w/w) banana starch (2 % (w/w) solids and glycerol or sorbitol either alone (2% (w/w solids), or combined (1% (w/w each), making four treatments per starch sample (starch 100, starch:glycerol 50:50, starch:sorbitol 50:50 and starch:glycerol:sorbitol 50:25:25), and overall a total of twelve, were prepared. Amplitude and frequency sweeps were carried out using a stress controlled Rheometer TA Instruments (strain mode), model AR1000, with a cone and plate system, 60 mm of diameter and angle of 2°. Samples were heated up at 10°C/min starting at room temperature, running tests at 90°C and then, after cooling down at the same mentioned rate, tests were done at 25°C. The results showed that all starch solutions at both 90°and 25°C, behaved as weak viscoelastic gels [1], and except for samples composed by starch-glycerol-sorbitol; usually the storage modulus (G') > the viscous modulus (G") over the amplitude and frequency ranges. Overall, native starch solutions with no plasticizers produced gels with the highest moduli (G', G") values when compared with those with the plasticizers either alone or combined and also with those of oxidized starch. It was seen that the higher the level of oxidation, the lower the moduli. Results suggested that glycerol addition strengthened sample structures [2] of native and 2% oxidized starch, while sorbitol reinforced in a higher extent those of 3% oxidized samples. The effect of cooling down the film forming solutions, was an increase in moduli.

[1] J. D. Ferry, Viscoleastic properties of polymers (3rd ed). New York, NY: Wiley, 1980.

[2] J. F. Steffe, Rheological Methods in Food Process Engineering, East Lansing, MI: East Freeman Press, 1992.