Mechanical properties of edibles films of cassava starch added of freeze dried Barbados cherry (*Malpighia* sp.) pulp

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Abstract: The environmental impact of continuing use of petroleum based material has led to a crescent number of researches aimed at development of biodegradable, edible films with functional properties in the coating fruits, avoiding quality loss and oxidation nutrients. The casting technique used to produce starch biodegradable films added of freeze dried Barbados cherry pulp (BC) and characterized by mechanical properties and thickness. Results show that addition of BC cause substantial impact on the evaluated properties. Addition of more than 80% of BC is not recommended to produce cassava starch film in the studied condition.

Due to the environmental impact generated by the continued use of non biodegradable petroleum based materials, there is a considerable increase of researches on the use of biopolymer sources that easily degrades in the environment. Packing films from biopolymers can have functional properties that not only physically protect the food but also can be safely consumed. Examples of functional properties: microorganisms inhibitors, anti oxidant attribute and other nutrients like vitamin C and β-carotene. The objective of this study was to evaluate the mechanical properties of cassava starch films plasticized with glycerol added of varied content of freeze dried Barbados cherry pulp (BC).

Filmogenic solution was prepared using a Viscoamylograph (Brabender, Duisburg) under controlled shear and temperature (up to 90°C) of cassava starch (4%), glycerol (30% starch base) and freezed Barbados cherry pulp (0, 70, 80, 86 and 94% starch base). 41.7 g of filmogenic solution were placed in disposable plexiglass ® plates and left in a controllable relative humidity chamber at 53% for 24 h at 30°C for drying. After this drying period, the partially dried film was manual gently removed from the plate and placed in a dissecator with saturated solution at 53% under vacuum for 6 days till equilibrium. The mechanical properties of the equilibrated films were investigated using a texture analyser TA-XT Plus (Stable Microsystem, Sussex, England) through tension strength (TS) and elongation at break (EL). The thickness of the films was measured using a digital micrometer IP54 (Fowler, USA).

Results observed at concentrations of 70%, 80%, 86% and 94% of the pulp indicated that the higher the concentration of pulp greater flexibility and less rigidity. It was observed an increase of BC addition till 80% in elongation at break. Overall, the addition of BC causes a considerable decrease of tensile strength, but when only the films with BC are considered, an extra drop in TS occurs when the addition exceeds 80% of BC. These findings indicate a limit of BC addition into the starch matrix that may create rupture points within which will affect the barrier and mechanical properties. Similar finding was also observed by Fakhouri [1] in biodegradable lipophilic starch films added of fatty acids.

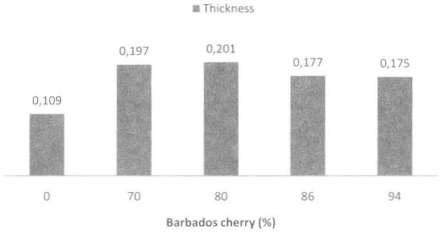

Figure 1: Thickness (mm) of cassava starch films added of freeze dried Barbados cherry.

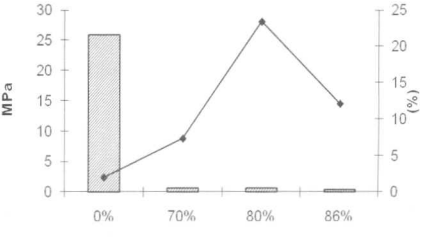

Figure 2: Mechanical properties: tensile strength (MPa) and elongation at break (%).

[1] Fakhouri, F. M. ; Fontes, L.C.B. ; Innocentini-Mei, L. H. ; Collares-Queiroz, F. P. Starch (Weinheim), v. 61, p. 528-536, 2009.