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Effect of glycerol and corn oil on wettability of polysaccharide coatings

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Edible coatings can be used to improve shelf-life and food quality by providing effective and selective barriers to moisture transfer, oxygen uptake and reduction of microbiological contamination. Wettability defines the ability of a coating to adhere and spread onto a food's surface and is determined through the values of the spreading coefficient. The effectiveness of edible coatings thus depends on the control of the wettability of the coating in order to ensure a uniformly coated surface.

The aim of this study was to evaluate the influence of glycerol and corn oil on galactomannan and chitosan coatings' wettability. The liquid-vapour interfacial tension (γLV) and the wettabillity of the coatings were evaluated (OCA20, Dataphysics, Germany) for different glycerol and oil concentrations on three model surfaces (glass, poly(methyl methacrylate-PMMA and stainless steel 316-SS316) in order to evaluate how the wettability could be influenced by surfaces with different properties. Results show that when glycerol is added, γLV values decrease for both coating solutions. The increase of glycerol concentration also leads to a decrease of the spreading coefficient (Ws), however when oil is added this behaviour was not observed: for galactomannan coatings Ws increased for all surfaces when oil is added, while for chitosan coatings the values of Ws decreased for all surfaces. This distinct behaviour between chitosan and galactomannan coatings can be related with the different oil emulsification patterns exhibited by chitosan and galactomannan solutions as shown through optical microscopy images. Moreover, oil-free chitosan coatings show more affinity to the surface with the highest polar component (PMMA). The same happens for galactomannan coatings without oil. For galactomannan coatings containing oil the surfaces with the lowest polar component (SS316 and glass) are the ones showing the lowest Ws values. This work provides insight on how plasticizers and lipids could affect their behavior when coating different types of food surfaces.