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Development of an edible coating for preservation of Serra da Estrela cheese: surface characterization and coating formulation

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Abstract

Serra da Estrela cheese is the most prestigious traditional Portuguese cheese, being recognized worldwide. In order to prolong the shelf life of this product, which occurs mostly by external spoilage and growth of fungi and moulds on its surface, the application of an edible coating has been considered. For this purpose, the external surface characterization was performed and the type of surface determined. For this, the sessile drop method was applied, i.e. the contact angle between the surface and the droplet of three pure liquids - bromonaphthalene, formamide and water - was calculated and the surface energy was determined. Polar and apolar components obtained were 7.09 mN/m and 35.53 mN/m, being the cheese surface tension 42.62 mN/m, which means that the cheese has a low surface energy (i.e. <100 mN/m). This value allows using Zisman's method and calculating the critical surface tension (32.68 mN/m). In order to determine the coating formulation with the best composition for application on cheese, the wettability of 27 formulations (three different polymers were used - alginate, guar gum and chitosan - with different concentrations of glycerol and Tween 20, totaling 9 formulations for each polymer) was evaluated. Formulations with 1% (w/v) alginate with 0.1% (w/v) of glycerol and 0.15% (w/v) of Tween 20; 1% (w/v) guar gum with 0.3% (w/v) of glycerol and 0.15% (w/v) of Tween 20; 1% (w/v) chitosan with 0.3% (w/v) of glycerol and 0.15% (w/v) of Tween 20, were the solutions with better wetting capacity on cheese surface. The spreading coefficients were -15.20 mN/m, -21.83 mN/m and -15.07 mN/m for alginate, guar gum and chitosan solutions, respectively. Pareto charts analysis allowed concluding that for alginate-based coatings, the variation of the polymer formulation, together with glycerol and Tween 20 concentrations have significant influence on the values obtained. The same happened in guar gum films. Regarding the coatings containing chitosan, it is only the biopolymer concentration that has significant influence on the values of wettability. These

three alternative compositions for edible coatings can now be tested aiming at valorizing this traditional cheese by improving its shelf-life and marketing potential.

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