Rheological characterization of xanthan/galactomannans and kappa-carrageenan/galactomannans interactions: Comparison of galactomannans from nontraditional sources with conventional galactomannans

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Led by consumers' demands, food industry shows a growing interest in the formulation of mixed polysaccharide systems, leading to final products having specific properties and possibly cost advantages. In many systems, the combination of two polysaccharides gives rise to strong synergistic effects. Gels formed by galactomannans (mainly guar gum (GG) and locust bean gum (LBG)) and xanthan or kappa-carrageenan already find extensive applications.

In the present work the synergistic interactions of two non-conventional galactomannans (extracted from Gleditsia triacanthos and Sophora japonica seeds) with xanthan and kappa-carrageenan were studied and compared with those obtained with traditional galactomannans (GG and LBG), in order to investigate their ability to provide novel properties to food products and to evaluate their effectiveness as alternative galactomannan sources. This was done by determining the rheological behavior (through dynamic oscillatory measurements) of xanthan/galactomannans and kappa-carrageenan/galactomannans mixtures and evaluating the effects of polymers concentration and temperature in the interaction strength, measured in terms of elastic module.

For xanthan/galactomannans systems the maximum synergies were obtained for ratios of 20/80 xanthan/Gleditsia triacanthos galactomannan, 20/80 xanthan/Sophora japonica galactomannan, 40/60 xanthan/GG and 50/50 xanthan/LBG. For kappa-carrageenan/galactomannans mixtures the maximum synergies were obtained for 60/40 kappa-carrageenan/Gleditsia triacanthos galactomannan, 40/60 kappa-carrageenan/Sophora japonica galactomannan, 80/20 kappa-carrageenan/GG and 60/40 kappa-carrageenan/LBG.

The higher degrees of synergism were obtained for Sophora japonica galactomannan and LBG followed by Gleditsia triacanthos galactomannan and GG (mannose/galactose ratios of 5/1, 4/1, 3/1 and 2/1, respectively). The differences observed in the gels rheological behavior suggest a dependence upon the fine structure of the galactomannan chain. A decrease of gelling and fusion temperatures was observed for increasing galactomannans concentrations and for decreasing galactomannans mannose/galactose ratio.

The results point at a very interesting synergies between the non-conventional galactomannans and xanthan or kappa-carrageenan which can presumably be used in the development of food products with novel properties.