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Rheology of Tamarind Gum Solutions

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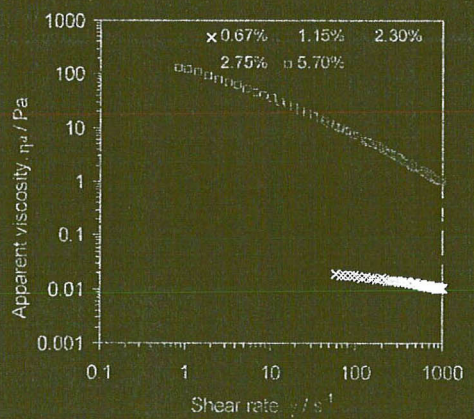
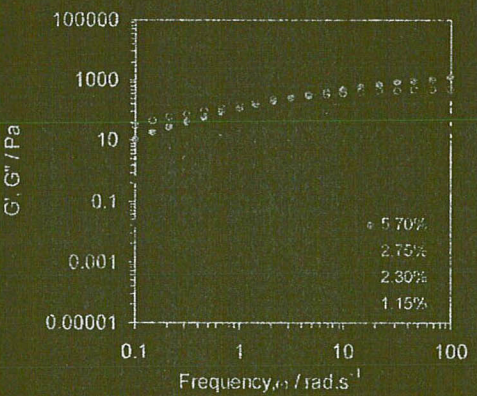
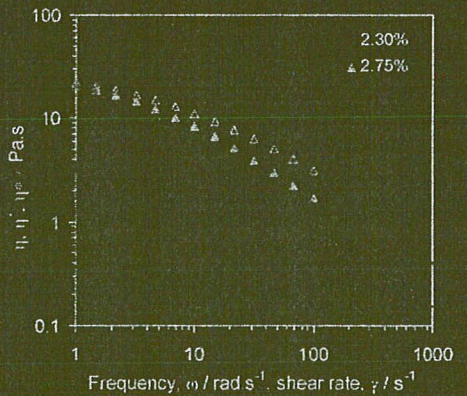
1. Introduction

In Thailand , the tamarind tree (*Tamarindus indica* L.) is the commercially important plant and widely grown in many regions of the country. Tamarind gum is obtained from the endosperm of the seed of the tamarind fruit (**Figure 1**). Tamarind gum is polysaccharide with high molecular weight which forms viscous solutions when dissolved in water [1]. Thus, it is attensively applied in many industries as a thickening, sterbilizing, and gelling agent [2]. In present work, crude tamarind gum provided from Thai tamarind was characterized for physicochemical properties. Also the rheological behaviour of crude tamarind gum solutions was investigated at 20°C.







$$\eta_a = \eta_\infty + \frac{(\eta_o - \eta_\infty)}{\left[1 + (\tau\dot{\gamma})^m\right]}$$

Abstract

Tamarind seed gum as seed polysaccharide from *Tamarindus indica* L. has been characterized for physicochemical and rheological properties in the present work. The structural analysis determined the presence of glucose:xylose:galactose in a molar ratio of 2.61:1.43:1.The Huggins and Kraemer plots obtained by capillary viscometry gave an intrinsic viscosity of 4.7 dl/g and the viscosity average molecular mass was calculated to be 9.18×10^5 g.mol^{-1} using the Mark-Houwink relationship. The steady shear and dynamic viscoelasticity properties of tamarind seed gum in aqueous solutions at different concentrations were investigated at 20°C using a Haake Rheometer RS75. The tamarind seed gum solutions clearly exhibited shear-thinning flow behaviour at high shear rate and Newtonian region occurred at low shear rate range, however, at higher concentrations, pronounced shear thinning was observed. The value of zero shear viscosity (η_0) was estimated by fitting Cross and Carreau models. The specific viscosity at zero shear rate (η_{sp0}) was plotted against the coil overlap parameter ($C[\eta]$) and the slopes of the lines in the dilute and semi-dilute regions were found to be ~ 2.2 and 4.3 respectively. The value of the critical concentration (C^*) was about $4.23/[\eta]$. While, the mechanical spectra in the linear viscoelastic region of tamarind seed gum solutions showed the typical shape for macromolecular solutions. Plots of η versus $\dot{\gamma}$ and η^* versus ω were superimposible and hence obey the Cox-Merz rule.

Keywords: Tamarind seed gum; Seed gum; Rheological behaivour; Intrinsic viscosity; Critical concentration

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Rheological behaviour of tamarind seed gum in aqueous solutions

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Graphical abstract