

The effect of limonene on the crystallization of cocoa butter

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The formulation of reduced fat chocolate has been of interest to the confectionery industry for a considerable time. It presents a challenge, as fat reduction strategies are often accompanied by poor quality of the formulated product due to an increased viscosity of the molten chocolate. This causes difficulties during processing and poor sensory properties of the final product. The addition of limonene to chocolates leads to fat reduced chocolates that are less hard and have a lower melt viscosity.

This study was undertaken to shed light on the changes produced by the addition of limonene on the crystallization and microstructure of cocoa butter. Based on evidence obtained by X-ray diffraction, differential scanning calorimetry and polarized light microscopy, it is proposed that the presence of limonene enhances the production of lower polymorphic forms on cooling but accelerates the transformation to more stable polymorphic forms. This is demonstrated in the transformation of the α and β'_{IV} forms in cocoa butter to form β_V at early storage times ($t = 0-1$ week), and the transformation to form β_{VI} at times $>2-3$ weeks at 20 °C. There is a complex but marked effect on crystal size, mainly at early storage times.