MICROSTRUCTURAL DESIGN OF FRUIT FILLED PRALINES FOR THE TROPICS

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Introduction

Different microstructural strategies are developed to increase the thermal stability of chocolate and fruit fillings.

In this study, the heat resistance of dark chocolate was tuned by optimisation of the particle size distribution (PSD) and fat content (32% *versus* 34%). Next, the incorporation of mango fats, more particularly Vietnamese mango fat (VMF) and the stearin fraction of Indian mango fat (IMF), was applied.

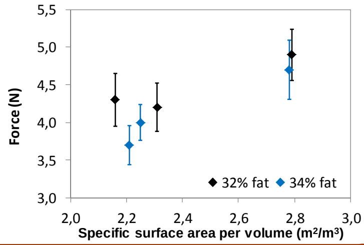
The heat resistance of the gelled fruit filling was tackled by increasing the gelatin concentration.

The final aim was to apply a combination strategy for the development of fruit filled pralines withstanding tropical condition.

1. Impact of PSD/fat content on chocolate hardness at 30°C

Figure 1: Chocolate hardness as affected by PSD and fat content

Harness of dark chocolate bars was measured by penetration using a needle. It was observed that adjusting the refiner settings can increase chocolate hardness, in contrast to a decrease in fat content from 34% to 32%.



2. Incorporation of mango fats to increase heat resistance of chocolate

Figure 2: Triglyceride profile of CB, VMF and IMF stearin

The triglyceride analysis using HPLC-ELSD revealed that VMF and IMF stearin exhibit a higher SOS content at the expense of POS and POP compared to CB.

Following the isosolid diagrams, CB/CB IMF stearin and CB/VMF mixtures are highly compatible.

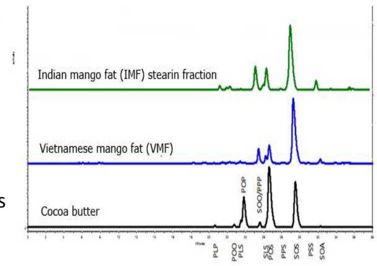


Figure 3: Isosolid diagram of CB/IMF stearin and CB/VMF

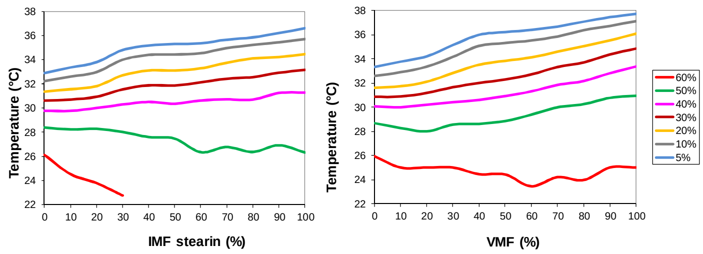
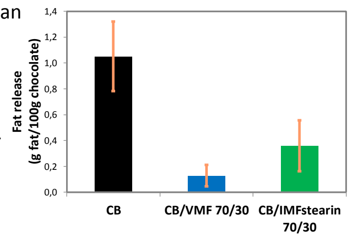


Figure 4: Heat resistance test of dark chocolate as affected by fat composition

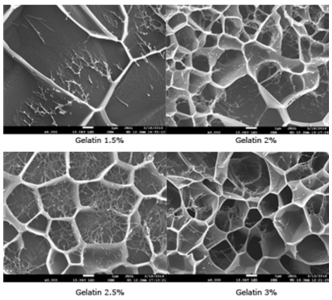
Fat release at high temperature can result in quality loss due to the adhesion of the chocolate to the packaging.

The incorporation of 30% VMF or IMF stearin clearly had a positive effect on the fat release at high temperature (34°C for 24 h).



3. Tuning the heat resistance of gelled orange fruit filling @ 30°C

Figure 5: Microstructure of gelatin gels using cryo-SEM



The gelatin gel was vitrified in liquid nitrogen, etched to reveal the detailed microstructure and visualized using SEM.

Increasing the gelatin concentration (1,5-2,0-2,5-3,0%) resulted in a more condensed network structure, which has implication for the gel strength of the fruit filling.

Figure 6: Gelling curves of fruit fillings following cooling from 80°C to 11°C at a rate of 2°C/min

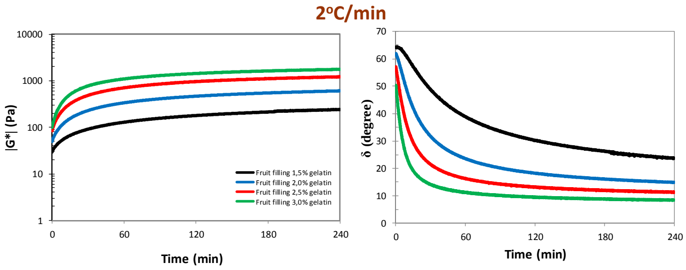
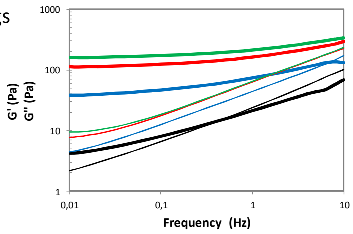


Figure 7: Frequency dependent behavior (G': thick; G'': thin) of fruit fillings at 30°C

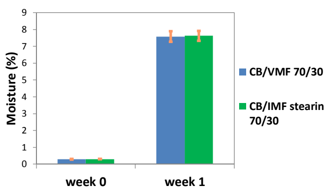
The gel point (δ = 45°) of the fruit fillings decreased as the gelatin concentration increased. The complex modulus |G*| was positively correlated to concentration.

Gelled orange fruit filling with gelatin concentrations of 2,5% and 3% showed a relative high stability at 30°C, and are applicable in fruit filled pralines for the tropics.



4. Moisture migration test @ 30°C

Figure 8: Moisture migration from fruit filling to chocolate at 30°C



During storage at 30°C, moisture migration from orange fruit filling to chocolate resulted in an even higher heat resistance of chocolate due to formation of a secondary sugar network.

Conclusions

VMF can be used as a CBI without preceding fractionation, in contrast to IMF.

It was shown that the heat resistance of chocolate for praline applications can be tuned by the particle size distribution, fat content and the incorporation of SOS-rich fats. The gelatin concentration can be steered for the development of gelled fruit fillings for the tropics. Moreover, moisture migration from the filling to the chocolate will results in an even higher thermal stability of the pralines.

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