

Formulation of a chocolate milk

INTRODUCTION

More and more consumers are looking for new dairy products with new tastes or added benefits for health. In this regard, new products have been developed recently for babies and young children with additional vitamins, iron, etc. However, as milk is an emulsion, and thus inherently unstable, the addition of various components will affect the stability of the colloidal system.



Nowadays, many supplemented drinking milks are produced. They contain various additives such as chocolate for the taste or additional calcium for bone health. However, the addition of these ingredients very often makes it difficult to stabilize the end product during storage.

The **Turbiscan Classic** is the ideal equipment for studying the effects of various ingredients and processes on the stability of dairy products.

SAMPLE PREPARATION AND EXPERIMENTAL PLAN

A chocolate milk was produced from partially skimmed, reconstituted milk.

Cocoa and stabilizers were added dry, and the chocolate milk homogenized, UHT heated and aseptically filled in Tetra bricks. Samples were withdrawn from the Tetra package directly after production.

The chocolate milk was aseptically filled in **Turbiscan Classic** vials and kept at room temperature during the measurement period (8 weeks).

Different milk compositions have been prepared using the same process. In a first set of experiments chocolate milks have been studied with different types of cocoa (I, II and III). Then a second set of experiments was done using various stabilisers (A, B, C and D).

RESULTS

When looking at the scans obtained over 55 days with chocolate milk, we get the following set of scans (*Figure 1*). The scans have been put in “Reference” mode for an easier view of the destabilisation phenomena.

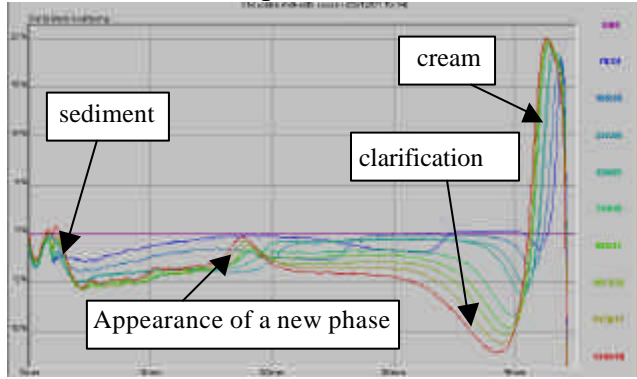


Figure 1. Scans of chocolate milk. Cocoa I

From this, we see that there is formation of a sediment at the bottom of the sample, leading to an increase in backscattering level at the bottom of the sample and a decrease at the top (clarification). This sediment is due to the migration of the cocoa particles.

We can also observe the formation of a layer of cream at the top of the sample because of the increase in backscattering level. Moreover, in some cases, the curves do not meet at a single point (“isobestic” point), which could be due either to coalescence of the fat droplets or to

Moreover, on several files one can see a peak in the middle of the sample (*Figure 1*) that is probably due to the appearance of a new phase due to the presence of two populations of cocoa particles. When looking at these samples we do see a subsidence of cocoa particles at the bottom of the cell.

If we want to compare the results obtained with various ingredients, we compute the kinetics of sedimentation (*Figure 2*) using the **Turbiscan Classic**.

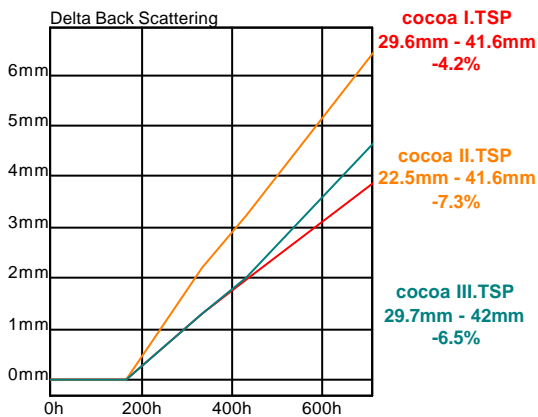


Figure 2. Kinetics of sedimentation

The kinetic curves show a much quicker sedimentation in the case of Ingredient II compared with the two others. Moreover, when looking at the raw scans (*Figure 1*), we see that in the case of cocoa I we have a phase separation (this is not observed with the other two cocoa types).

Therefore, cocoa III seems to be the most appropriate regarding stability. Note that all the samples cream to the same extent and the addition of the different cocoa types does not make any difference on the creaming.

In a second step, different stabilisers have been investigated (*Figure 3 and 4*).

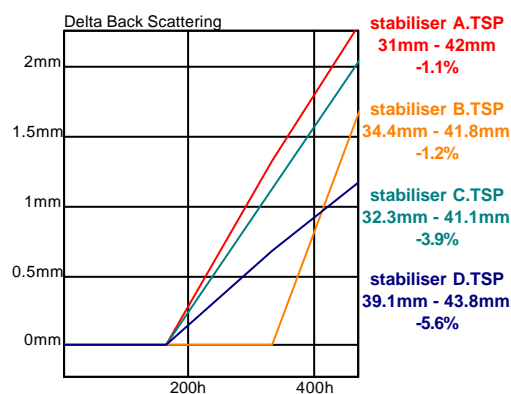


Figure 3. Kinetics of sedimentation

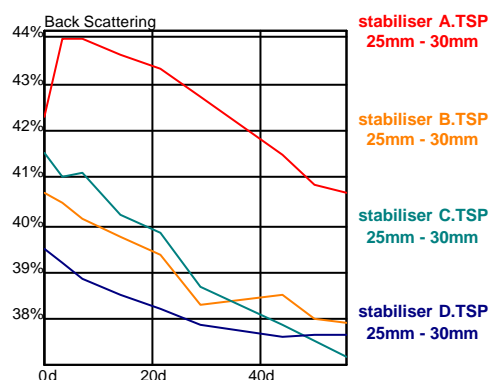


Figure 4. Kinetics of particle size variation

One can see in Figure 4 that the stabiliser A is not very efficient in preventing the system to coalesce or flocculate. On the other hand stabiliser B is delaying the sedimentation of the chocolate particles. Stabiliser D, finally, is good for delaying both sedimentation and particle size increase and it prevents creaming (data not shown). It would therefore be the recommended material to use.

CONCLUSION

The Turbiscan Classic detects destabilisation phenomena and allows a quantitative comparison of the results to be made. It is an ideal and objective tool for optimising a new formulation.