



TECHNICAL APPLICATION
INFORMATION



**Stabilisation of Whey and
Whey Mix Products
with Pectin**

STABILISATION OF WHEY *and Whey Mix Products*

The use of whey as remedy – whey cures for purification and weight reduction – has been described for generations.

With its nutritionally-physiologically seen especially valuable contents whey was re-discovered for all those consumers who show a clear alimentary conscious behaviour in choosing food. However in the meantime, broad consumer groups are addressed regarding whey more and more as a synonym for a healthy inbetween meal, a tasty thirst quencher and a natural fitness drink.

In the last two years whey drinks were the product group with the strongest growth within the “white line”.

Besides the classic whey drinks there are increasingly whey mix products with fruit and/or further milk resp. yoghurt components. The whey proportion of the drinks is usually between 60% and 90%. Sweet whey as well as sour whey are used. As fruit components you can find juice, juice concentrate, fruit pulp or fruit preparations.

The whey drinks have pH-values from 3.6 to 4.2 and are usually – to achieve a longer shelf life – heat treated.

Whey (milk serum) is a valuable by-product from rennet and cream cheese production milk is thickened with the addition of enzymes (rennet), acid or a combination of rennet and acid resp. by the activity of lactobacillus. The coagulated milk passes through a fortified syneresis of the protein gel in the further production process, in which whey is excreted.

While the milk components protein (casein) and fat mainly form the cheese in the firm phase, the nutritionally-physiologically valuable whey proteins, the lactose, the minerals, a small amount milk fat as well as vitamins and trace elements remain in the whey.

A distinction is made between sweet whey with a pH-value above 5.8 from rennet production and sour whey with a pH-value below 4.5 from sour-milk cheese production.



With modern technologies it is possible to concentrate resp. isolate the single components of the whey (mainly the proteins) and to make them available in suitable form for the industry for the production of whey drinks. Besides whey as liquid particularly spray-dried whey powders, whey protein concentrates (protein content above 35%) as well as whey protein isolates (protein content above 90%) are used for the production of whey drinks.

Their sensitivity towards heat is a critical property of whey proteins for the industrial whey processing and the production of whey drinks. Whey proteins are present in solved condition in sweet as well as in sour whey, however during heating they are denatured partially resp. completely – depending on the heating grade – and with that they become insoluble. This can lead to an undesired coagulation of the proteins and to sedimentation in the production of heat-treated whey drinks.



Pectin has a positive influence on the heat stability of whey proteins.

Therefore pectin can be used for stabilisation of whey drinks being heat-treated to achieve a longer shelf life.

Tests regarding stabilisation of whey drinks with pectin

Subject to varying heating conditions whey drinks with and without pectin were produced to investigate the influence of pectin on the protein stability.

Furthermore the influence of pH-value and ionic strength (addition of buffer substances) on the drink and the effect of a homogenisation step were analysed.

The drinks were produced with whey powder resp. whey protein concentrate. The protein content of the whey drinks was between 0.2 and 1.6% (the protein content of whey is about 0.8%). The heat treatment was done at 60° C, 70° C, 80° C and 90° C for 10 minutes. The drinks which were produced without pectin were already separated strongly at a heat treatment of 60° C / 10 minutes (separation into two phases). With the addition of pectin all drinks – also those being heated up to 90° C – were stable. In all drinks a light sediment could be found, probably resulting from an already present partial protein denaturation in the raw material (whey, whey powder etc.).

The influence of ionic strength on the heat stability of whey proteins under the addition of sodium citrate resp. a combination of pectin and sodium citrate was investigated. Sodium citrate solely had no influence on the whey proteins' stability – the drinks were instable. When increasing the ionic strength by addition of sodium citrate to drinks which were stabilised with pectin, a light amendment of the stability compared with the drinks being produced only with pectin, could be observed.

Further on a homogenisation step proved to be ameliorative regarding the stabilisation of the whey drinks.

The chart shows the influence of pectin, sodium citrate and homogenisation on the stability of heat-treated whey drinks. The stability was assessed by determining the sediment proportion after centrifugation.

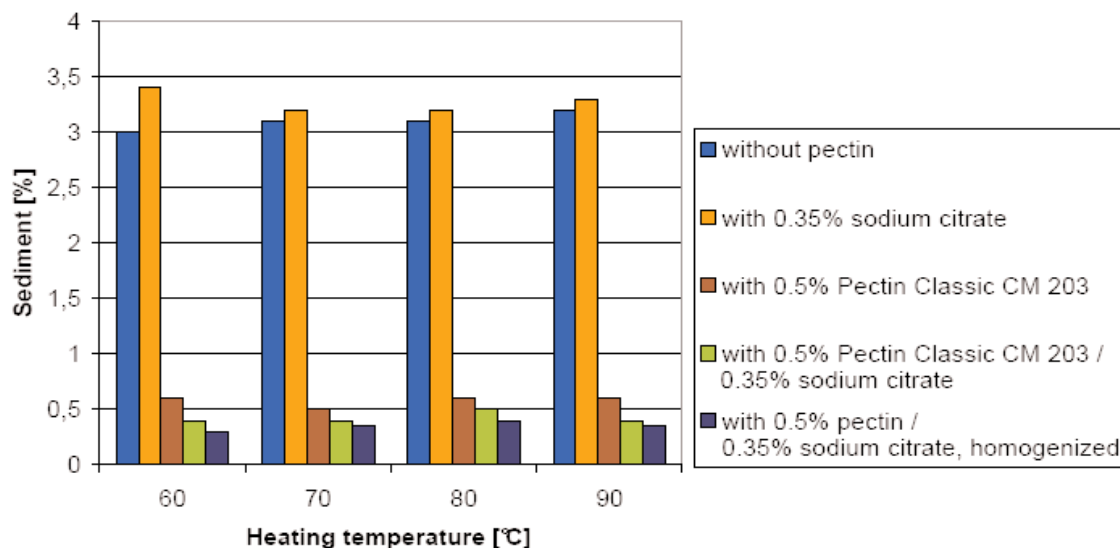


Fig. 1: Sedimentation whey drinks (0.8% protein content, pH 3.8) in dependence from heating temperature

pH-value and protein content of the whey drink are important influencing parameters for the pectin dosage required for stabilisation.

The lower the pH-value (the test drinks had pH-values between pH 3.8 and 4.5), the higher is the necessary pectin dosage. For stabilisation of a whey drink with a protein content of 0.8% and a pH-value of 3.8, a dosage of 0.4 – 0.5%

Pectin Classic CM 203 is required (see chart). With increasing protein contents also higher pectin dosages have to be applied whereas drinks with very high whey protein contents cannot be stabilised at higher temperatures.

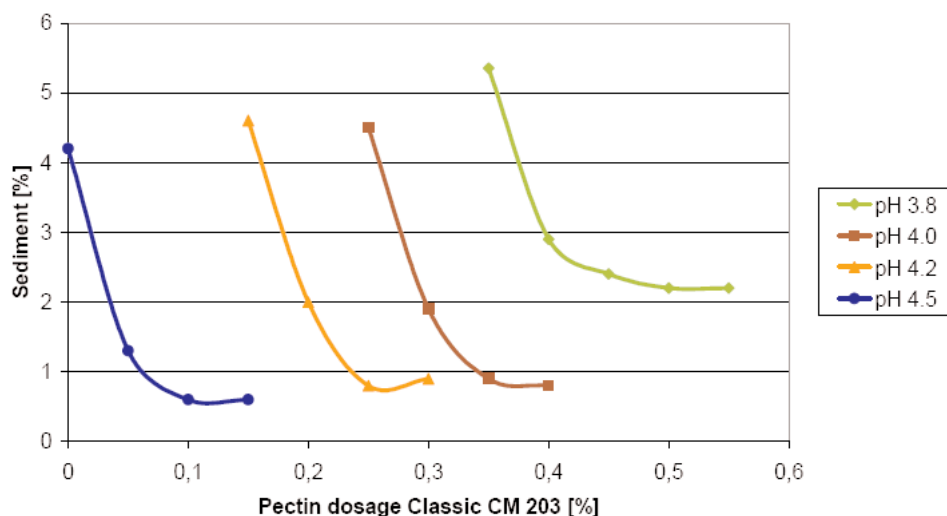


Fig. 2: Stabilisation of whey drinks in dependence from pectin dosage

The tests could prove the positive influence of pectin on the heat stability of whey products.

For an economic and efficient stabilisation of whey drinks, also with a longer shelf life, all influencing factors mentioned have to be considered.

In order to assess the behaviour of whey proteins also under industrial heating conditions, whey mix drinks (protein content 0.8%, pH-value approx. 3.8, pectin dosage 0.25 resp. 0.5% Classic CM 203) were produced in technical scale and heated in a plate heat exchanger at 75° C, 90° C and 105° C for 20s.

Under these conditions which are more gentle for whey proteins also a partial denaturation – depending on the heating grade – takes place. This effect can be largely avoided or obviously minimised by the addition of pectin.

In the whey drinks which were produced with pectin under industrial conditions no flocculating of the whey proteins could be observed. With sufficient pectin dosage stable products could be obtained up to a heating temperature of 105° C for 20s.

Besides the stabilizing effect pectin can also be used to increase viscosity in whey drinks, i.e. for reaching a desired mouthfeel. By increasing the viscosity further on the sediment proportion related to the raw material which is usually observed in these drinks, can be decreased.

The tests could prove the positive influence of pectin on the heat stability of whey protein under industrial heating conditions whereas the production of stable whey drinks depends on the particular technology (heating process, homogenisation) and the recipe parameters such as pH-value, protein content and ionic strength which influence the optimal pectin dosage.

In consideration of all these parameters it is possible to produce pleasing heat-treated whey resp. whey mix products with pectin having a longer shelf life due to the heat treatment. This meets the requirements of all those consumers having chosen this product line for themselves as healthy, tasty drinks.

Whey Fruit Drink
Product Pectin Classic CM 203

<p>120g Pectin solution 2.5% (= 0.3%) 30g Sweet whey powder 70g Orange juice concentrate 50g Sucrose 1.25g Citric Acid 730g Water Citric Acid solution (50%) to adjust pH-value</p> <p>Input: approx. 1000g pH-value: approx. 3.8 - 4.0</p>	<ul style="list-style-type: none"> • Dissolve whey powder in 470g water and leave to swell for 30 minutes. • Dissolve orange juice concentrate, sugar and citric acid in the remaining water. • Make pectin solution 2.5% (see Technical Application Information). • Stir pectin solution into the whey (Ultra Turrax). • Adjust pH-value to 3.8 - 4.0 if necessary. • Homogenise at 150 bar. • Pasteurise 70°C, 10min.
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