Summary for the final report
Ensuring consistent sensory quality of milk chocolates by adapting process parameters and selecting raw materials (FreMiScho)

In the production of chocolates with a fresh-milky impression, an undesirable caramel aroma may occur. A possible reason is the crystallization of amorphous lactose, which is already present in the raw material milk powder in varying proportions. A complex interplay of temperature and moisture causes the strongly hygroscopic amorphous lactose to crystallize during chocolate production or during subsequent storage. During production, this can result in an undesirable caramel flavor as well as the formation of semolina inside the conche. During storage, milk-containing masses can thicken in the tank and generate faulty batches, which are linked to time-consuming cleaning of the storage tanks. Therefore, the influence of different raw materials, as well as different conching parameters and storage conditions on the physical and sensory properties as well as the profile of volatile flavor components of chocolate masses were investigated in this project.

Eight milk powders (spray-dried whole and skim milk powders, roller-dried whole milk powder) were characterized. Four powders were selected and used for the production of chocolate. During production, the following conching parameters were varied: Temperature, time, aeration, rotation speed and direction of rotation of the shearing elements. Fresh and stored chocolates were physically characterized (amorphous lactose, bound fat, water content and flow properties) and sensory evaluated. The profile of volatile aroma components was also investigated in fresh as well as stored chocolates. For the analyses, different samples and manufacturing parameters were covered as far as possible. To verify the data obtained on a laboratory scale, selected chocolates were manufactured on a scale-up to 200 kg.

The milk powders were found to significantly influence the quality of fresh chocolates. The milk powder used significantly determined the content of amorphous lactose and bound fat. The roller-dried milk powder and the fresh chocolates made from it had the lowest content of amorphous lactose. The amount of bound fat was also the lowest, which was due to the high amount of free fat in the milk powder and a low tendency of the powder to bind free cocoa butter. Chocolates with spray dried skimmed milk powder + butterfat appeared to become saturated with excess free fat during manufacture. An increased amount of bound fat increased the viscosity & yield point of the chocolates. Besides milk powder, flow properties were significantly affected by conching temperature - higher temperature reduced the viscosity. In combination with a prolonged conching time, this effect was intensified. In chocolates conched for a longer time, the water content was significantly lower.

It was possible to discriminate the fresh chocolates by gas chromatography-ion mobility spectrometry and sensory analysis. Sorted napping was performed for the sensory evaluation. Panelists perceived chocolates with skimmed milk powder as similar (sweet, caramel-like and creamy). In general, a decrease in the attribute caramel-like was accompanied by a stronger perception of the attribute milky.

Particularly the storage temperature showed a significant influence on water content, amorphous lactose content and viscosity of the stored chocolates. Chocolates with roller-dried milk powder tended to show the lowest contents of water, amorphous lactose or bound fat. Consequently, viscosity and yield point were lowest in chocolates with roller-dried milk powder. The influence of various parameters, such as conching temperature, aeration, speed or conching time on the physical properties, was reflected also after the storage of the masses.

IVLV members can download the complete final German project report from our homepage. All you need is to register in the section “My IVLV”. Non-members can request the final report from the IVLV office at office@ivlv.org .

Supported by:

Federal Ministry
for Economic Affairs
and Climate Action

on the basis of a decision
by the German Bundestag

Forschungsnetzwerk
Mittelstand

The IGF project no. 21455 N presented here by the Research Association of the Industrial Association for Food Technology and Packaging (IVLV e.V.) is funded by the Federal Ministry for Economic Affairs and Climate Action via the AiF as part of the program for the promotion of industrial community research (IGF) based on a decision of the German Bundestag.