

Researchers check quality of chocolate with ultrasound

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Chocolate. Credit: Wikimedia Commons

Belgian chocolate is a world-famous delight. But producing a divinely delicious bar of chocolate that has a beautiful gloss, makes that wonderful sound when you break it, melts in your mouth, and maintains all these qualities throughout its entire shelf life, is not easy. The crystallisation of the cocoa butter—the fat in the chocolate—plays an important role in that process.

Professor Imogen Foubert from the KU Leuven Department of Microbial and Molecular Systems explains: "Cocoa butter crystallises as the liquid [chocolate](#) hardens. Five types of crystals can be formed during this process, but only one of these has the qualities we want. The number, size, shape, and the way in which the crystals stick together play an important role as well." It is therefore crucial to monitor the

crystallisation of the cocoa butter closely during the chocolate production process, because we don't want inferior chocolate ending up on shop shelves.

"We've discovered that we can detect differences in the crystallisation of cocoa butter with ultrasonic waves," adds Professor Koen Van Den Abeele from the KU Leuven Department of Physics and Astronomy. The new technique involves sending transversal ultrasonic waves through the cocoa butter. The researchers then measure the reflection of these waves for information about the structure of the butter. The technique is similar to the ultrasound echography used to monitor the health and growth of foetuses in the womb. "When the cocoa butter is liquid, the ultrasonic wave is reflected in its entirety. As soon as the butter crystallises, part of the sound wave penetrates the cocoa butter, so the amount of reflection we measure changes. This enables us to see how the different crystals stick together, which is important for the ultimate properties of the chocolate."

Chocolate manufacturers currently check the quality of their chocolate 'offline'. A sample is taken from the production line to be analysed in a lab. This method is very time-consuming, making it impossible to intervene quickly when something is wrong. As a result, a large amount of chocolate is destroyed or re-processed - a costly affair. The novel technique can be used 'online' to check the chocolate while it's still on the production line.

The researchers designed a lab prototype, which now needs to be turned into a prototype for use in real chocolate production lines. The current results were obtained with cocoa butter and need to be confirmed for actual chocolate.

The findings are the result of Annelien Rigolle's interdisciplinary doctoral research, supervised by Professor Imogen Foubert , who

specialises in fat crystallisation, and Professor Koen Van Den Abeele, who's an expert in the use of ultrasound for non-destructive testing of materials such as composites, metals, and concrete.

Provided by KU Leuven

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