The EPM Project 23RPT03 GrainMetfor the development of CRMs characterised for water content constituted of plant-origin bulk materials

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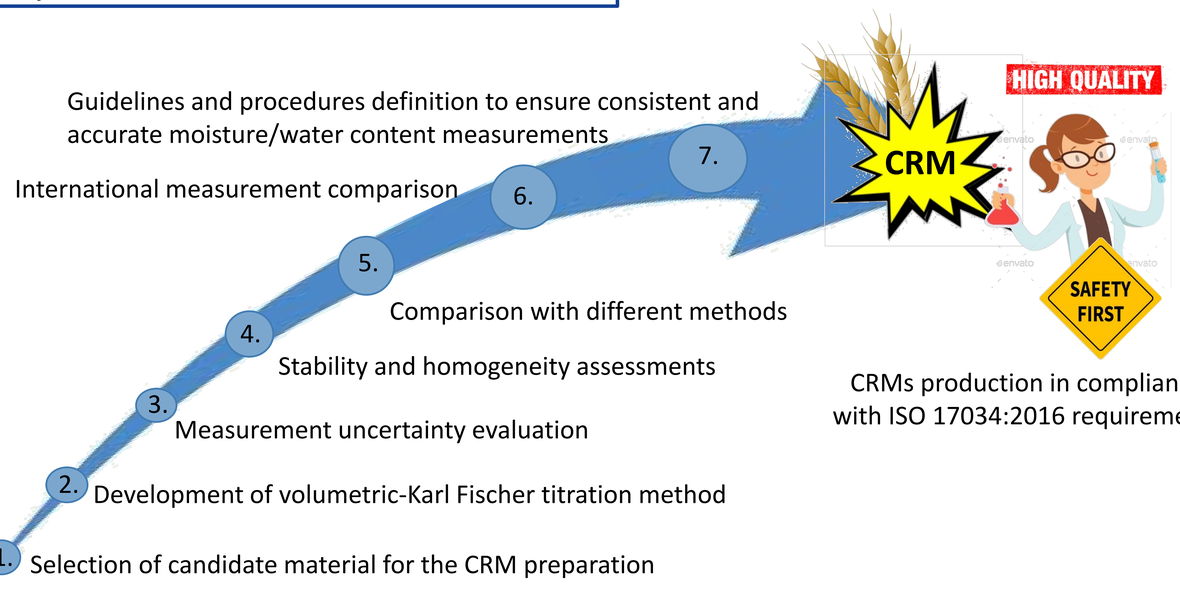
F. Durbiano, F. Rolle, S. Pavarelli, M. Sega, A. Işleyen, H. Nasibli, E. A. Klahn, I. Leito, B. Tallawi, O. Melnykov, S. Kulyk, A. Petrenko, L. Ovchar, O. Shcherbakova, A. Popov, A. Rusu, A. Curdov, T. Kolesnikova, L. Moritz, L. Prochaska, Z. Pálková

Title

Metrology for standardised moisture content measurement in plant-origin bulk materials in support of International and European food safety and trade - **GrainMet**

Project start date: 01 June 2024, Duration: 36 months



CRMs production in compliance with ISO 17034:2016 requirements

Overview

Water content determination in plant-origin bulk materials is necessary to support quality and fair trade in the food sector. Regarding human health, water presence leads to microbial growth and chemical deterioration reactions, as well as changing the flavour, texture, and appearance of the food products. With accurate data, quality, storage conditions, pricing, and the safety of these materials can be evaluated.

Moisture is a generic term which involves both water and all the volatile substances that evaporate during the drying process

It does not identify a specific measurand

Industrial laboratories mostly use methods based on the *Loss-on-Drying* (*LoD*) approach

The *LoD* approach prescribes that the sample is weighed before and after the drying process. The difference in the two masses is the moisture content in the sample.
- ISO 712:2009 Cereals and cereal products, determination of moisture content – Reference method.
- ISO 6540:2021 Maize, determination of moisture content

The completeness and selectivity of water removal are not guaranteed.

GRAINMET

Water content

Volumetric – Karl Fischer titration

It can become a primary method

Karl Fischer titration

Karl Fischer Titration is a common analytical method used for the determination of water content in a variety of substances: food, beverage, cosmetics, pharmaceuticals.

Water and iodine are consumed in a 1:1 ratio in the reaction. Once all of the water is consumed, the excess iodine is detected voltametrically by the titrator's indicator electrode. That signals the end-point of the titration.

In v-Karl Fischer, iodine is added mechanically. In c-Karl Fischer, iodine is generated electrochemically.

The selectivity to water allows high repeatability of the measurement.

$$\underset{\text{[alcohol]}}{ROH} + SO_2 + \underset{\text{[base]}}{R'N} \rightarrow \underset{\text{[alkylsulfite salt]}}{[R'NH]SO_3R} + \underset{\text{[water]}}{H_2O} + \underset{\text{[iodine]}}{I_2} + 2R'N \rightarrow \underset{\text{[hydroiodic acid salt]}}{2[R'NH]I} + \underset{\text{[alkylsulfate salt]}}{[R'NH]SO_4R}$$

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