Climate change and cocoa flavour quality: analytical investigations to identify off-odor in cocoa products

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Introduction:

Climate change is heavily conditioning the agricultural productions. Cocoa growing in a rainfall area will also affect the choice of the methods of drying and may have some effect on storage, thereby strongly influencing the flavour quality of the finished product [1]. Chocolate manufacturer therefore need informative, practical and cost-effective methods to identify off-flavour to evaluate the quality of the in-coming raw material. Sensomics is the gold standard in the definition for the aroma blue print of a food as well as for off-flavours characterization [2,3], but it is too time consuming. Modern analytical techniques combined with chemometric methods enables to speed-up the chemical characterization and the definition of quality marker and are easy to transfer to routine analysis [4].

Methods:

The highly informative results obtained by HS-SPME-GCxGC-TOF MS have been the base to this work that deals with the develop a fully automatic method by HS-SPME-1D-GC-MS and HS-SPME-MS to be applied to routine control to explore their chemical information power to distinguish good from defective flavour qualities of cocoa in incoming cocoa raw material.

Results:

Twenty raw cocoa bean samples between good and defective beans were investigated. HS-SPME-GCxGC-TOF-MS analysis provided 2D fingerprints mined by pattern recognition tools (i.e. template matching fingerprinting and scripting) which resulted in highly informative chemical signatures for quality assessment. 231 target analytes were identified and matched through the sample set; Fisher ratio found that 20 of them had to be considered discriminative between defective and good quality cocoa beans. Analysis by HS-SPME-GC-MS showed that target compounds were present in very low amount in the chromatographic profile due to their chemical-physical characteristics, their high retention in the matrix because of both their relatively low volatility and the high percentage of fat in cocoa. A careful set-up of the analytical conditions and approaches were tested to improve the recovery of these compounds from the cocoa beans always taking into account the need of automation of the analytical process.

Conclusions:

The development of the analytical method was focused on sample preparation because it requires sensitivity and selectivity for the compounds responsible for the off-note. Different sampling methods have been tested, mainly involving HS-SPME-GC-MS because it is the most user-friendly, easy to automate and to combine on-line with GC-MS in view of a high throughput application. The method developed showed that the volatile fraction of cocoa beans is useful to discriminate between defective and good quality samples. Several compounds related to the off-odor were identified.

References

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