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BOOK of ABSTRACTS

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C and H stable isotope ratio analysis using GC-IRMS for vanillin authentication

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Introduction:
Vanilla extracts are widely used as flavouring ingredients in foods and beverages and as aromatic compounds in perfumes and pharmaceuticals. Due to the high production cost of high-quality natural extracts from Vanilla planifolia, synthetic or natural identical biosynthetic vanillin (which derives from natural precursors such as guaiacol, ferulic acid, eugenol and lignin) are often used as a substitute for authentic natural vanillin [1].

Methods:
We combined analysis of 13C/12C (expressed as δ13C) values and2H/1H (expressed as δ2H) ones using gas chromatography coupled to isotope ratio mass spectrometry(GC-IRMS) [2]. 16 authentic samples of Vanilla planifolia, 16 natural identical, 5 synthetic vanillin and 20 commercial extracts were considered.

Results:
The carbon isotope ratio values allow discriminating between natural and natural identical or synthetic vanillin (averagely -19‰ vs -30‰). Authentic natural vanillin from Vanilla planifolia and natural identical vanillin are characterised byδ2H values much lower than synthetic vanillinones (averagely-50‰ vs +73‰). The isotopic values of all the commercial extracts declared to be from Vanilla planifolia (N=20), had δ13C values within the typical range of natural vanillin, but δ2H values outside the range and more similar to that of synthetic vanillin. Our results show howthe stable isotope ratio analysis (SIRA) of 13C/12C is no longer sufficient to discover vanillin adulteration, due to the practice of adding 13C to the methyl site of synthetic vanillin [3], and the new analysis of δ2H is mandatory.

Conclusions:
The combination of δ13C with δ2H GC-IRMS analysis of vanillin can therefore be proposed as a suitable tool to improve the detection of vanilla extract adulteration.

Novel Aspect:
Stable isotope analysis of 2H/1H can be a rapid and effective method to identify the natural or synthetic origin of vanillin.

References

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