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The effect of environmental factors on stable isotopic composition of n-alkanes in Mediterranean olive oils

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Traceability of the geographic origin of olive oils is an important issue from both commercial and health perspectives. This study evaluates the impact of environmental factors on stable C and H isotope compositions of n-alkanes in extra virgin olive oils from Croatia, France, Greece, Italy, Morocco, Portugal, Slovenia, and Spain. The data are used to investigate the applicability of stable isotope methodology for olive oil regional classification in the Mediterranean region.

Analysis of stable C isotope composition of n-C29 alkane showed that extra virgin olive oils from Portugal and Spain have the most positive n-C29 alkane delta13C values. Conversely, olive oils from Slovenia, northern and central Italy are characterized by the most negative values. Overall, the n-C29 alkane delta13C values show a positive correlation with the mean air temperature during August-December and a negative correlation with the mean relative humidity during these months.

Analysis of stable H isotope composition of n-C29 alkane revealed that the deltaD values are the most positive in olive oils from Greece and Morocco and the most negative in oils from northern Italy. The deltaD values of oils show significant correlation with all the analyses geographical parameters: the mean air temperature and relative humidity during August-December, the total amount of rainfall (the same months) and the annual deltaD values of precipitation. As predictor variables in the Categorical Data Analysis, the n-C29 alkane deltaD values show the most significant discriminative power, followed by the n-C29 alkane delta13C values. Overall, 93.4% of olive oil samples have been classified correctly into one of the production regions.

Our findings suggest that an integrated analysis of C and H isotope compositions of n-alkanes extracted from extra virgin olive oil could become a useful tool for geographical provenancing of this highly popular food commodity.