Method development of an isotopic traceability tool for determination of the geographical origin of roses by Isotope Ratio Mass Spectrometry (IRMS)
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Abstract

The growing number of government rules regarding agricultural products such as flowers and plants lead to growers having to meet strict regulations regarding safety, environment, sustainability and traceability. Therefore, this study aims to develop isotope analysis technology for provenance determination of roses. The focus will be on development of methods using isotope ratio mass spectrometry (IRMS) for geographical origin traceability. The emphasis of this work was on discriminating Dutch, Ecuadorian and Kenyan roses. The approach consisted of the analysis of $\delta^{2}H$ and $\delta^{18}O$ for the source and rose stem water, $\delta^{13}C$ and $\delta^{15}N$, total C and N for the rose stem and alkane concentrations for the rose leaf wax.

Isotope ratio mass spectrometry (IRMS) is known as one of the most advanced techniques for isotope analysis nowadays. In this work, it was used for the determination the geographical origin of roses by measuring the relative abundance of element isotopes in the sample. The isotope ratio of these elements reflects the unique and representative fingerprints of the particular environment, which is related to the biological, chemical and physical processes in the plants. Therefore, it offers the possibility to discriminate roses of different origins.

The results provide proof that the IRMS method based on $\delta^{2}H$, $\delta^{18}O$, $\delta^{13}C$ and $\delta^{15}N$ values, total C and N of stems and water, as well as alkane concentrations in the leaves, offers a potential technique for the geographical origin determination of roses from Ecuador (EC), Kenya (KN) and the Netherlands (NL). The best separation of the groups was obtained from the water analysis using the combination of rose water and source water samples. However, the results of rose solid material analysis can also be used to distinguish roses from different origins, especially Dutch roses which were separated very nicely from Ecuadorian and Kenyan roses.