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Coffee seeds isotopic composition as a potential proxy to evaluate Minas Gerais, Brazil seasonal variations during seed maturation

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Plant seeds incorporate the prevailing climate conditions and the physiological response to those conditions (Rodrigues et al., 2009; Rodrigues et al., submitted). During coffee seed maturation the biochemical compounds may either result from accumulated material in other organs such as leafs and/or from new synthesis. Accordingly, plant seeds develop in different stages along a particular part of the year, integrating the plant physiology and seasonal climatic conditions. Coffee bean is an extremely complex matrix, rich in many products derived from both primary and secondary metabolism during bean maturation. Other studies (De Castro and Marraccini, 2006) have revealed the importance of different coffee plant organs during coffee bean development as transfer tissues able to provide compounds (i.e. sugars, organic acids, etc) to the endosperm where several enzymatic activities and expressed genes have been reported. Moreover, it has been proved earlier on that green coffee bean is a particularly suitable case-study (Rodrigues et al., 2009; Rodrigues et al., submitted), not only due to the large southern hemispheric distribution but also because of this product high economic interest. The aim of our work was to evaluate the potential use of green coffee seeds as a proxy to seasonal climatic conditions during coffee bean maturation, through an array of isotopic composition determinations. We have determined carbon, nitrogen, oxygen and sulfur isotopic composition (by IRMS - Isotope Ratio Mass Spectrometry) as well as strontium isotope abundance (by MC-ICP-MS; Multicollector Inductively Coupled Plasma Mass Spectrometry), of green coffee beans harvested at different times at Minas Gerais, Brazil. The isotopic composition data were combined with air temperature and relative humidity data registered during the coffee bean developmental period, and with the parent rock strontium isotopic composition. Results indicate that coffee seeds indeed integrate the interactions between plant physiology and local climate variations as well as the particularly soil geology.

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