



Combination of stable isotopes analyses and hydrogeological information as an authentication tool for bottled waters

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Bottled water is a food product that considerably depends on the environment from which it originates, not only at the place where it is produced, but predominantly on the conditions in the recharge area of the wells captured for bottling. According to their source and the bottling process, bottled waters can be divided into natural and artificially sparkling waters, still and flavored waters. These waters originate from various parts of the hydrological cycle and their natural origin is reflected in their hydrogen, oxygen and carbon stable isotopic compositions ($\delta^2\text{H}$ and $\delta^{18}\text{O}$, $\delta^{13}\text{C}_{\text{DIC}}$). A total of 58 domestic and foreign brands and 16 replicates of bottled waters, randomly collected on the Slovene market in September 2004, were analyzed for $\delta^2\text{H}$, $\delta^{18}\text{O}$ and $\delta^{13}\text{C}_{\text{DIC}}$. The isotopic composition varied between -83‰, and -46‰, with an average of -66‰, for hydrogen, and between -11.9‰, and -7.5‰, with an average of -9.6‰, for oxygen. The $\delta^{13}\text{C}_{\text{DIC}}$ values varied between -63.1‰, and +1.0‰, with an average of -12.3‰. Average $\delta^{13}\text{C}_{\text{DIC}}$ values for naturally sparkling, artificially sparkling, still and flavored waters were -3.3‰, -36.5‰, -10.0‰, and -11.0‰, respectively. This investigation helped (1) to determine and test the classification of bottled waters, (2) to determine the natural origin of bottled water, and (3) to indicate differences between the natural and production processes.