



Statistical evaluation and comparison of the chemical quality of bottled water and flemish tap water

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ABSTRACT

In this study the physico-chemical composition reported on the label of 49 bottled still waters, 22 bottled sparkling waters and 13 tap waters were used to carry out a characterization study by means of multivariate pattern recognition methods such as principal components analysis (PCA) and discriminant analysis. Also, analysis of variance was used to detect statistical differences between the water types and different brands. The collected data consisted of nine major ions (calcium, magnesium, potassium, sodium, sulfate, bicarbonate, chloride, fluoride and nitrate) and pH. The different water types were represented graphically in a Piper diagram. In this Piper diagram, most of the waters were situated on the left side of the diamond. For the anions, this means that large amounts of HCO_3^- and small amounts of Cl^- , F^- and SO_4^{2-} are present. The main cations are Ca^{2+} and Mg^{2+} , rather than Na^+ or K^+ . Further, it was noted that tap water had a higher chloride content, originating from chlorine dosing for disinfection. A one-way analysis of variance (ANOVA) test (with known standard deviation) confirmed the difference among different water types and water brands. Principal components analysis revealed that the differences between water types are best characterized by components that indicate saltiness, hardness and pH. The component pH allowed discriminating between sparkling water and non-sparkling water. It was not possible to divide the different water types based on saltiness or hardness, but it could be demonstrated that different types of water exist (low-mineral, oligomineral and mineral).

Keywords: Water analysis; Statistical evaluation; Chemical water quality; Principal components analysis; Linear discriminant analysis; Analysis of variance

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