

Comparison of Labelled and Analysed Composition of Effervescent Food Supplements: A Dataset on Selected Vitamins and Minerals

1. Overview

This dataset contains analytical and labelled data on the vitamin and mineral content of selected effervescent food supplements (FS) available on the Slovenian market. The dataset was used in the study “Quality Assessment of Selected Vitamins and Minerals in Effervescent Food Supplements” (Hribar et al. 2025) and supports the findings reported therein.

All effervescent tablets (ETs) available on the Slovenian market that contained at least one of the target micronutrients (vitamin B12, vitamin C, vitamin D, calcium, iron, magnesium, or zinc) were systematically collected and analysed. The dataset includes information on declared and analytically determined content of selected vitamins (D, B12, C) and minerals (zinc, calcium, magnesium, and iron).

In total, 71 ETs were analysed for the selected micronutrients. Across these products, 173 individual micronutrient quantifications were performed; in all cases, the measured concentrations were above the method detection and quantification limits. The number of declared active ingredients per product ranged from 1 to 22, indicating substantial variability in formulation complexity. Ten products (14%) contained only a single vitamin, and a further ten products (14%) contained only a single mineral. Two products (3%) included exclusively vitamins, and two products (3%) contained only minerals. The remaining 47 products (66%) were multi-ingredient formulations combining both vitamins and minerals.

The primary purpose of the dataset is to enable comparison between declared (labelled) nutrient values and analytically determined contents of vitamins and minerals in effervescent tablets, as well as to assess labelling compliance with relevant regulatory and reference standards.

1.1 Dataset content

The dataset includes information on:

- Effervescent food supplement products commercially available in Slovenia.
- Declared (labelled) amounts of selected vitamins and minerals.
- Analytically determined nutrient contents.

2. Samples and declared (labelled) composition

2.1. Underlying Database for Labelled Food Supplement Data

The present database builds upon the comprehensive CLAS database (Pravst et al., 2022), which provides detailed information on the labelling and composition of FS available in the Slovenian food supply. The CLAS database was set up as part of the Composition and Labelling Information System monitoring in 2015, and is updated every 3-4 years. While monitoring originally covered only traditional pre-packed foods, FS were added for the first time in 2023. The cross-sectional monitoring of FS was conducted in the two biggest general grocery stores; three pharmacies, one of which is also the biggest retailer of FS online; and two specialised retailers of FS. The monitoring was carried out by collecting photographs of the packaging using the CLAS mobile app, described elsewhere in detail (Pravst et al., 2022). The whole sample of FS included 2030 unique items.

2.2. Selection of Micronutrients and Food Supplement Samples

To identify the most relevant micronutrients, we examined the frequency of those declared on effervescent tablet labels and found that, among vitamins, the most commonly declared were C, B1, B6, B12, and D; while among minerals, the most frequently declared were magnesium, calcium, zinc, sodium, and selenium. For this study, we aimed to include the three vitamins and three minerals most commonly found in ETs. Based on this, we selected vitamins C, D, and B12, and magnesium, calcium, and zinc. Vitamin B12 was chosen as the most relevant of the B-group vitamins, given the notable prevalence of the deficiency in Slovenia (Ž. Lavriša et al., 2022). In addition to these six micronutrients in ETs, we additionally included iron, because of its public health relevance and previous national findings indicating suboptimal iron intake in specific population groups (Lavriša et al., 2022), despite its lower frequency in ETs. For samples where different flavours and/or packaging sizes of the same food supplement brand were available, we only selected one flavour in the smallest packaging size.

2.3. Description of the Final Sample and Market Sampling

Altogether, 71 samples were selected for further analysis. One product (one series/LOT) of each selected ET was purchased from the stores. International brands accounted for the vast majority of these samples (N=62; 87%), while only nine samples (13%) were national brands. The declared content of the selected vitamins and minerals per single tablet, the ingredient list, any nutritional and health claims, and the expiry date were extracted from the packaging.

3. Laboratory analysis

Laboratory analysis encompassed the quantification of the selected micronutrients. All the purchased samples were weighed, and the average number of single ETs in the packaging was calculated to enable comparison with the labelled composition. The analyses were conducted by an independent external laboratory (Mérieux NutriSciences, Via Fratta 25, Resana, Italy), using standards applicable for food control authorities. For all the investigated samples, we used laboratory methods accredited for use with the appropriate matrix (food supplements). Vitamin D was quantified using liquid chromatography coupled with tandem mass spectrometry (AOAC International, 2012) [accreditation reference MP 1570 revision 3/2021], which can distinguish between cholecalciferol (vitamin D3) and ergocalciferol (vitamin D2). Vitamin B12 was quantified using liquid chromatography and UV detection (AOAC International, 2018, 2019b) [accreditation reference MP 2347 revision 3/2022], which enables the detection of cyanocobalamin. Ascorbic acid was determined using an adapted method (Fontannaz, Kiliç, & Heudi, 2006), with liquid chromatography and UV detection [accreditation reference MP 2174 revision 3/2019]. Calcium and magnesium were quantified using inductively coupled plasma atomic emission spectroscopy (ICP-AES) (AOAC International, 2019a) [accreditation reference MP 1289 revision 18/2023], while iron and zinc were determined using inductively coupled plasma mass spectrometry (ICP-MS) (European Committee for Standardisation, 2014) [accreditation reference MP 1288 revision 23/2024]. The following data for the coefficient of variation (CV) as a precision measure of the laboratory methods are provided in the accreditation documentation for the methods used: vitamin D (CV 7.2%); vitamin B12 (CV 3.9%); vitamin C (CV 7.7%); calcium and magnesium (CV 3.8%); iron and zinc (CV 3.7-7.4%).

4. Bibliography

AOAC International. (2012). Simultaneous Determination of Vitamins D-2 and D-3 by LC-MS/MS in Infant Formula and Adult Nutritionals: First Action 2011.13. *Journal of AOAC International*, 95, 583-587. doi:10.5740/jaoacint.CS2011_13

AOAC International. (2018). Vitamin B 12 (cyanocobalamin) in Infant Formula Adult/Pediatric Nutritional Formula by Liquid Chromatography with Ultraviolet Detection: Collaborative Study, Final Action 2014.02. *Journal of AOAC International*, 101. doi:10.5740/jaoacint.17-0452

AOAC International. (2019a). AOAC SMPR 2014.004: Minerals and Trace Elements in Infant Formula and Adult/Pediatric Nutritional Formula. *Journal of AOAC International*, 98(4), 1042-1043. doi:10.5740/jaoac.int.SMPR2014.004

AOAC International. (2019b). Standard Method Performance Requirements (SMPRs) and Corresponding AOAC First and Final Action Official Methods. *Journal of AOAC International*, 101(1), 299-334. doi:10.1093/jaoac/101.1.299

Fontannaz, P., Kiliç, T., & Heudi, O. (2006). HPLC-UV determination of total vitamin C in a wide range of fortified food products. *Food Chemistry*, 94(4), 626-631. doi:https://doi.org/10.1016/j.foodchem.2005.02.012

Hribar, M., Goljuf, Š., Pravst, I. Quality assessment of selected vitamins and minerals in effervescent Food supplements. *Journal of Food Composition and Analysis* (accepted manuscript; 2025 - in press). URL <https://doi.org/10.1016/j.jfca.2025.108803>

Lavriša, Ž., Hristov, H., Hribar, M., Žmitek, K., Kušar, A., Koroušić Seljak, B., . . . Pravst, I. (2022). Dietary Intake and Status of Vitamin B12 in Slovenian Population. *Nutrients*, 14(2). doi:10.3390/nu14020334

Pravst, I., Hribar, M., Žmitek, K., Blažica, B., Koroušić Seljak, B., & Kušar, A. (2022). Branded Foods Databases as a Tool to Support Nutrition Research and Monitoring of the Food Supply: Insights From the Slovenian Composition and Labeling Information System. *Frontiers in Nutrition*, 8. doi:10.3389/fnut.2021.798576