Sensory shelf-life of a selenium-bioenriched fermented beverage and microbial survival under storage and gastro-intestinal digestion conditions

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Selenium (Se) is an essential micronutrient whose deficiency in the human body negatively affects the cardiovascular system, increases the risk of cancer and viral infections, male infertility, neurodegenerative diseases and decreases immune and thyroid function. In Argentina, Se ingestion is usually below the recommended dietary intake; thus, Se-enrichment of foods is an attractive strategy to increase its ingestion. During storage, food products change as a result of biological, enzymatic, and physicochemical reactions. These transformations can affect the nutritional, microbiological, and sensory quality of the food product limiting its shelf-life for consumption. In this work, we aimed to evaluate the sensory shelf-life of a fruit juice-milk beverage (FJMB) fermented with Se-enriched lactic acid bacteria (LAB), and the microbial survival during the shelf-life and *in vitro* gastro-intestinal (GI) digestion. Fruit-origin strains *Levilactobacillus brevis* CRL 2051 and *Fructobacillus tropaeoli* CRL 2034 were grown in the presence of 5 mg/L of Se (at 30 °C 24 h) prior to co-inoculation (1%, v/v, of each strain) in the FJMB. Beverages were incubated at 30 °C 14 h followed by storage at 6 °C until sensory analyses. Selenized fermented beverages were prepared weekly for microbial and sensory assessment following a reversed design (up to 52 days). The total cell count in the beverage decreased from 9.0 to 8.6 U log CFU/mL at day 14 while from day 21 on values remained constant (8.0 U log CFU/mL). *F. tropaeoli* CRL 2034 was more sensitive to storage conditions decreasing 1.6 U log CFU/mL at the end of the studied period, while the cell count of *L. brevis* remained around 8 U log/mL until the end of storage. A gradual decrease in pH values was observed throughout the shelf-life, until reaching a value of pH= 4.1 at the end of the storage period. *L. brevis* survived the harsh *in vitro* GI conditions while a decrease of 1.00 U log CFU/mL for *F. tropaeoli* CRL 2034 was observed. Sensory shelf-life was estimated through two methodologies based on hedonic test. Consumers (n= 105) evaluated a set of samples with different storage times and scored their overall liking using a 9-point hedonic scale (acceptability limit), and stated their acceptance/rejection of the beverages (survival analysis). Acceptability values decreased from 6.74 (like moderately) to 4.68 (neither like nor dislike) over the storage period, and sensory shelf-life was estimated using an acceptability limit method as 21 days for a value of 6 (like moderately) and 44 days for a value 5 (neither like nor dislike). The rejection of the product increased over time from 18 to 70%. Data of the survival analysis followed a Weibull distribution, and a shelf-life of 42 days (50% rejection) was estimated. Our results suggest that selenized cells of *F. tropaeoli* CRL 2034 and *L. brevis* CRL 2051 could be used for formulating functional Se-enriched beverages with acceptable sensory properties and shelf-life.

Keywords: Selenium, gastrointestinal system, Acceptability limit, Survival analysis