

PHYSICOCHEMICAL AND MICROBIOLOGICAL PROPERTIES OF THE ZERO-WASTE VEGETABLE SPREADS

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Abstract

Due to avoidance of microbial contamination, external layer and leaves of root vegetables are discarded during food preparation process and these parts may contain many beneficial components. The aim of this study was to use of parts of the vegetables that are normally eliminated by the cleaning process (leaves, peels) for preparation of the vegetable spread and evaluate its microbiological safety, sensorial analysis parameters and physicochemical properties.

An entire vegetable (beetroot, parsnip, carrot) with leaves and peels was used to prepare zero-waste vegetable spreads while cleaned vegetables was used the preparation of the traditional kind. The results of the sensory analysis (using a 5-point hedonic scale) and the chemical (energy content was measured using a bomb calorimeter; water activity was performed using a water activity analyser; in addition, moisture content, carbohydrate content, fat content, protein content and ash content were evaluated using AOAC established procedures) and microbiological assays (the determination of the total number of microorganisms, coliform bacteria, *Salmonella* spp., and *Klebsiella* spp. was performed using ISO methodologies) of the zero-waste vegetable spread and the traditional kind were compared to evaluate the impact of the usually eliminated parts of the vegetables on the organoleptic properties, shelf life and nutritional value of the product. The accuracy was measured by calculating the average value of 3 - 5 measurements. The data was analysed by using Microsoft Excel 2021 and the data analysis software RStudio. The Student's t-test was applied to indicate a significant difference at a 95% confidence level.

The results showed that the content of minerals, moisture and calories were higher in the zero-waste products ($p < 0.05$), instead there was no significant difference in water activity, protein, fat content and carbohydrate content ($p \geq 0.05$). The microbiological assays showed that the carrot spreads with the zero-waste and traditional preparation methods had a shelf life of 3 and 4 days, respectively; shelf life of the beetroot spreads was 3 days and that of the parsnip spreads was 5 days. The zero-waste cooking method can change the sensory aspect of a product. The carrot spread without waste had a green appearance instead of the orange colour. The zero-waste beetroot spread was more red and sweeter than traditionally prepared beetroot spread. The sour taste of the parsnip spread was less intense by the zero-waste cooking method than the traditional kind.

In conclusion, the use of external layer and leaves of root vegetables increased the content of minerals, moisture and calories of vegetable spreads and it is microbiologically safe. Furthermore, it appeals to consumers' senses.

Key words: Zero-waste, Beetroot, Carrot, Parsnip, Vegetable spread.