

**Variability of saccharides in onions
in the growth phase and during processing**

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Abstract

Onion is a rich source of bioactive compounds with a beneficial effect on human health. The content of these compounds varies depending on the morphological part of the plant - the differences are even in individual layers of the onion. A group of bioactive compounds remaining in the onion, even after removing its outer layers during peeling and processing, are fructooligosaccharides, which can constitute over 60% of the dry weight of the onion. Many pro-health effects of FOS on the human body have been proven. As a component of the soluble fraction of dietary fiber, they have a prebiotic effect, and the bifidogenic effect occurs while inhibiting the development of pathogenic microorganisms. They are also characterized by cardioprotective properties by affecting the lipid profile of the blood, and also contribute to increasing the absorption of minerals in the large intestine. Onion varieties differ in many parameters. The saccharide profile is usually not analyzed during the commodity evaluation. The compounds are not only responsible for the taste of onion, because fructooligosaccharides act as reserve substances in the plant, which significantly affects storage stability. Changes in the content of saccharides are observed both during the growth of the plant and during its processing. The aim of the work was to characterize common onion and to study the content of saccharides and the variability of their profile during vegetation and processing. The research material consisted of onions of 5 varieties: Alonso F1, Hysky F1, Red Lady F1, Hystore F1 and Robusta. The bulbs of the tested cultivars were grown in the experimental field of the Institute of Horticulture in Skierniewice. The research was carried out during the vegetation period from the beginning of bulb formation until harvest. The commodity evaluation of the collected plants was carried out by determining their weight and size, including bulbs, leaves and roots. The layered structure of the bulb produced by *Allium cepa* makes it possible to examine individual layers, therefore, in the sections of the bulbs of the tested cultivars, the gradient of non-structural saccharides content was determined. The variability of the saccharide profile depending on the cultivar and vegetation time, when fructooligosaccharides were gradually accumulated, was also characterized. Correlation between FOS content and individual quality parameters, e.g. onion weight and dry matter content was also determined. The degree of accumulation of non-structural saccharides can be an important parameter in processing, where both the dry onion skin and the outer layers of fleshy scales are removed during peeling.

Two low-energy preservation methods were selected: osmoconcentration and lactic fermentation, and then the impact of these processes on saccharide retention was investigated. Most of the previous studies on osmoconcentration focused on the kinetics of the process and the degree of water removal from the product. Therefore, one of the assumptions of the work, in addition to characterizing the above determinants of the process, was to supplement the knowledge about saccharide retention during osmotic dehydration. This type of treatment not only partially removes water, but also allows for a controlled modification of the composition. Solutions of sucrose, sodium chloride and fructooligosaccharides were used as osmotic agents in various combinations and

concentrations. The results of the research confirmed that osmoconcentration allows to modify the profile of saccharides and to design low-processed products. In addition, fructooligosaccharides can be an alternative to sucrose as an osmotic agent, showing not only prebiotic properties, but also allowing to reduce the caloric value of the dehydrated product. Optimization of osmoconcentration consisting in the appropriate selection of a hypertonic solution and process time can lead to obtaining a product with the expected properties. It has been shown that osmoconcentration can be used as a method of supplementation with fructooligosaccharides of long-stored bulbs with reduced FOS content. An important element of the research was to determine the effect of lactic fermentation on the retention of saccharides in onions. Osmotic dehydration is usually used as a preliminary process before traditional drying, in order to reduce the energy cost of the process and improve the sensory characteristics of the product. An important cognitive aspect was the combination of both processing techniques - osmoconcentration and fermentation, and then the evaluation of the modification of the saccharide profile in the obtained products. Three strains belonging to the genus *Levilactobacillus brevis* isolated from spontaneous plant silages were used for the fermentation process of raw onion and onion with a saccharide profile modified in the osmotic dehydration process. The influence of individual strains on the change of saccharide profile and fermentation efficiency was examined. Due to the variety of varieties, as well as the diversification of the saccharide profile in the individual layers of the scales, onion is a valuable raw material for obtaining a product with the expected properties, and the obtained research results can contribute to the development of methods to design prebiotics with an optimal composition.