

ABSTRACT

Garlic cloves (*Allium sativum* L.) are widely used all over the world as a spice and vegetable recommended in the prevention of chronic non-communicable diseases and infections caused by various microorganisms. The content of bioactive compounds in garlic cloves and its products is very well described in the available literature. However, there is a lack of research on the health-promoting properties of young garlic plants obtained from sowing air bulbs and planting cloves. These plants can be a very good source of the same bioactive ingredients that are determined in garlic cloves at the stage of harvest maturity.

The aim of this study was to compare the chemical composition and content of bioactive ingredients as well as the antioxidant activity of young Polish plants, winter garlic varieties Harnaś and Ornak grown from air bulbils or cloves. A second equivalent objective was to evaluate the effect of *in vitro* digestion on the bioavailability of polyphenolic compounds identified in plant material using the Caco-2 cell line model.

In the first stage of research, the basic chemical composition, content of selected minerals and vitamin C, antioxidant activity and content of selected polyphenolic compounds (flavonoids and phenolic acids). In the next stage of the research, the influence of the *in vitro* digestion and absorption process on the bioavailability of polyphenolic compounds was assessed. In the last stage of the research, the influence of extracts from young garlic plants on the expression of genes of selected pro- and anti-inflammatory cytokines in Caco-2 cell lines was determined.

Based on the results of the first stage of the research, it was found that young garlic plants of Harnaś and Ornak cultivars obtained from cloves harvested in May contained significantly more protein, dietary fiber, selected minerals, vitamin C and polyphenols compared to plants obtained from air bulbs. It was also shown that plants of the cultivar Harnaś grown from cloves contained more of the above-mentioned ingredients compared to the Ornak variety.

In the second stage of the research, it was found that young garlic plants of the Harnaś and Ornak cultivars, subjected to *in vitro* digestion, were characterized by a lower content of polyphenolic compounds compared to the undigested material. It was also shown that, as a result of the absorption process using the Caco-2 cell model, the concentration of selected polyphenolic compounds decreased after the tested extracts had passed through

the Caco-2 cell monolayer. Harnaś cultivar extracts from young garlic plants reduced the expression of the pro-inflammatory cytokine genes of tumor necrosis factor- α ($TNF-\alpha$) and interleukin-1 β ($IL1\beta$).

Based on the obtained results, it can be concluded that young garlic plants harvested in May are a rich source of health-promoting ingredients. A valuable complement to these studies would be an in-depth analysis of the bioavailability of polyphenolic compounds and other components in *in vivo* studies.

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