

ABSTRACT

ABSTRACT

Cancer prevention is based on the use of foods containing bioactive substances of plant origin, including cruciferous plants (*Cruciferae*). Red cabbage (*Brassica oleracea* var. *capitata* f. *rubra*) is a vegetable belonging to the cabbage family and is a valuable source of bioactive compounds in a daily diet. Most of the scientific works on the vegetable concern mainly on the sprouts and mature vegetative form, while there is no comprehensive research related to its early development - young shoots, which are particularly important in terms of their health - promoting properties.

The aim of this dissertation was to compare the content of nutrients and bioactive compounds in young shoots of red cabbage with reference to the mature vegetable. The second equally important aim of this work was to compare the effectiveness of the previously unknown, potentially anti-cancer effect of young shoots with reference to the mature cabbage, on human prostate cancer cell lines DU145 (not detectably hormone sensitive) and LNCaP (androgen receptor-positive), as well as normal PNT-2 line.

In the first stage of research, the basic chemical composition, the content of vitamin C, sum of carotenoids, minerals, glucosinolates, total polyphenols (also anthocyanins) and antioxidant activity were determined. In the second stage of study, analysis of signaling pathways, definition of genes and protein involved in the regulation of proliferation and apoptosis of prostate cancer cell lines treated with fresh and *in vitro* digested and absorbed juice of young shoots and of its mature vegetable were carried out.

The results of the first stage indicated that the chemical composition differed in the analyzed material. Young shoots were richer source of protein, crude fat, selected minerals, and other ingredients with proven chemopreventive properties, i.e. glucosinolates, vitamin C and carotenoids, were also characterized by higher antioxidant activity, compared to the mature red cabbage. On the other hand the red headed cabbage was a better source of digestible carbohydrates and sum of anthocyanins. There were no differences in the content of dietary fiber and total polyphenols in tested vegetables.

The results of the second stage showed that the juice of young shoots both in the fresh and digested form, caused a significantly greater reduction of the proliferation of both analyzed prostate cancer cells DU145 and LNCaP lines, compared to the fresh and digested juice of the red cabbage, respectively. All analyzed types of the cabbage juice, in particular the digested and absorbed juice of young shoots and the mature vegetable, resulted in an apoptotic effect on the cells of both studied cancer lines.

Induction of the apoptosis process of prostate cancer cells in both studied lines was associated with increased expression of the p53 protein, activation of proteins the mitochondrial apoptotic pathway, i.e. pro-apoptotic proteins from the Bcl-2 family, release of cytochrome c, Smac/Diablo and HtrA2/Omi, increased expression of the Apaf-1 protein, as well as activation of the caspase cascades. In addition, the up-regulation of, involved in the receptor pathway of apoptosis, genes *FAS* and *FADD* and also their protein products in the DU145 cell line was observed. Inhibition of TNFR1, RIP, NF- κ B and Akt1 activity may induce apoptotic signals in both cell lines. The regulation of activity of protein kinases, the interaction of which with the above-mentioned proteins causes cell death, was also determined.

Ando Dardasle