

Antioxidant properties of 21-day young shoots of white and red headed cabbage

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Background and objectives

Numerous epidemiological and pharmacological studies have revealed that a diet rich in *Brassica* vegetables may play an important role in protection against many chronic diseases, including cardiovascular disease, type II diabetes, dementia, age-related macular degeneration, immune dysfunction, obesity and some cancers. *Brassica* vegetables are classified as functional foods. Although horticultural *Brassica* plants are excellent sources of nutrients, such as vitamins, minerals and fibre, the majority of the research has concentrated on the content of secondary metabolites, e.g. glucosinolates, polyphenols and others.

Young shoots of vegetable are a completely new group of food products, which is currently developing intensively. This study were undertaken to broaden knowledge on health-promoting properties of raw 21-day young shoots of white and red headed cabbages, particularly in terms of the following indicators: dry matter, vitamin C, polyphenols, chlorophyll a and b, carotenoids, anthocyanins and antioxidant activity.

Table 1. Content of selected compounds and antioxidant activity in young shoots of white cabbage and young shoots of red cabbage.

Compounds	Young shoots of white cabbage	Young shoots of red cabbage
Dry mass [g/100 g]	8.01 ± 0.33 ^a	8.20 ± 0.75 ^a
Vitamin C [mg/100 g f.m.]	29.19 ± 0.04 ^a	83.60 ± 2.54 ^b
Total carotenoids [mg/100 g f.m.]	17.90 ± 1.55 ^a	19.83 ± 1.61 ^a
Chlorophyll a [mg/100 g f.m.]	132.33 ± 10.02 ^a	163.33 ± 11.02 ^b
Chlorophyll b [mg/100 g f.m.]	64.00 ± 5.20 ^a	82.53 ± 3.57 ^b
Total polyphenols [mg CGA/100 g f.m.]	84.97 ± 1.56 ^a	97.66 ± 0.78 ^b
Anthocyanins [mg/100 g f.m.]	n.d.	15,57 ± 1,25
Antioxidant activity [μmol Troloxu/1 g f.m.]	4.20 ± 0.01 ^a	11.56 ± 0.01 ^b

Values are presented as mean value ± SD (n = 3) and expressed in fresh matter. Means in rows with different superscript letters in common differ significantly (p ≤ 0.05).

Conclusions

Young shoots of red headed cabbage were generally characterized by a higher content of the discussed compounds, and thus - higher antioxidant activity, compared to young shoots of white cabbage.

Materials and methods

The experimental materials was ready to eat, 21-day white headed cabbage young shoots (*Brassica oleracea* L. var. *capitata* f. *alba*) of the cultivar *Gloria* and 21-day red headed cabbage young shoots (*Brassica oleracea* L. var. *capitata* f. *rubra*) of the cultivar *Haco*. The seeds were purchased from one of the leading company operating in the seed segment of the horticultural industry in Poland. The material was cultivated in greenhouse under strictly controlled temperature conditions. The daytime temperature was 21 °C and the nighttime temperature was 18 °C. The applied peat substrate TS2 was a mixture of specially prepared peat with the addition of PG Mix fertilizer and a surfactant, with pH = 6 and fertilization density of 2 g/l. The fertilizer used comprised of: nitrogen - 14% (including: 5.5% N-NO₃ and 8.5% N-NH₄); phosphorus - 16% P₂O₅; potassium - 18% K₂O; magnesium - 0.8% MgO; sulphur - 19% SO₃; boron - 0.03% B; copper - 0.12% Cu; iron - 0.09% Fe; manganese - 0,16% Mn; molybdenum - 0.20% Mo; and zinc - 0.04% Zn.

The material was collected and then homogenized in order to obtain a representative mean sample to determine dry mass, vitamin C, carotenoids and chlorophyll a and b. Simultaneously, methanol extracts were prepared and used to determine (spectrometrically) total polyphenols, antioxidant activity and anthocyanins.

All analyses were carried out in three parallel replications and mean ± SD were calculated for the values obtained. By the use of one-way analysis of variance (ANOVA), the significance of differences were checked between mean values of young shoots of white and red cabbage. The significance of differences was estimated with Duncan test at the critical significance level of p ≤ 0.05. The Statistica 10.1 (StatSoft, Inc., USA) program was applied.

Results

Young shoots of white headed cabbage were characterized by a significantly lower content of vitamin C, chlorophyll a and chlorophyll b, total polyphenols as well as antioxidant activity in comparison to young shoots of red headed cabbage.