with higher skin/fruit flesh ratios had increased antioxidant capacity compared with larger fruits. It indicates that the antioxidant compounds predominantly accumulate in fruit skin. Considering that all samples were collected in orchards located in the same region, these differences are likely to be explained by the different genetic backgrounds of cultivars and cultivar candidates. Some cultivar candidates were characterized by higher antioxidant capacities and mineral element contents than the main commercial cultivars pointing to the possibility for increasing health-benefits of apple even under constant level of fruit consumption.

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Temporal changes of antioxidant parameters in *Acorus calamus* L.

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Sweet flag (*Acorus calamus* L., Araceae) is widely used medicinal plant as extracts or dried rhizome for several diseases, for external or internal use, as well. Numerous studies performed its antioxidant effects such as decrease of lipid peroxidation in noise-stressed rat brain after application of alcoholic extracts of Acorus. Since, sweet flag is under protection in Hungary and we have relatively little information about antioxidant properties of Hungarian population we decided to estimate some antioxidant parameters and temporal changes of these during vegetation period.

Plant material was collected twice in 2008 (June and October) and after washing with distilled water leaves (L), rhizome with (H) and without bark (HL) were used freshly (homogenate) or as alcoholic and watery extracts made of dried drugs. Parameters measured were FRAP (ferric reducing–antioxidant power), glutathione (GSH) level and free radical scavenging ability using DPPH. Statistical analysis was performed using STATISTICA 8.0 software (analysis of variance and correlation).

Our results showed that homogenate and alcoholic extract of leaves had significantly higher FRAP-values compared to those of watery extracts, in June. Antioxidant capacity in rhizome was usually lower than in leaves. In temporal aspect, a significant decrease (40%) of FRAP appeared in alcoholic samples of leaves, while there were no changes in rhizome. Glutathione (GSH) level was 4-6-fold higher in leaves than in both forms of rhizome and was in significantly positive correlation with FRAP. Fraction of residual DPPH radical (%) was the highest in rhizome with bark (H) which means that it had quite low reducing ability, nevertheless, free radical scavenging capacity of homogenates of leaves and rhizome with bark showed to be significantly higher in October compared to June. According to FRAP we can make a sequence qualifying the three types of samples: homogenate > alcoholic extract > watery extract.

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Table beet and red cabbage, as natural source of antioxidant compounds

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Free radicals derived from oxygen play an important part in the pathomechanism of different illnesses. Living organisms are supplies with an effective defence system against oxygen radicals. The first defence line is composed of antioxidant enzymes but different vitamins and low molecule compounds, such as phenols, thiols and flavonoids, are also effective against radicals. These compounds can be found in high quantities in vegetables. These compounds are mostly of polyphenol type and are able to bind free radicals and protect from the oxidation of biological molecules, membranes and tissues induced by active oxygen and free radicals. In evaluating bioactive content of vegetables an important role is provided to those compounds and are able to bind free radicals and protect from the oxidation of biological molecules, membranes and tissues induced by active oxygen and free radicals. Such are for example phenol type substances whose group includes pigment content as well. The colour materials of table beet and the red cabbage are suitable for natural pigment production and the same time they have favourable nutrition effect too.

During our experiment we measured FRAP and colour content in 4 red cabbage hybrids and 20 beet root varieties. In formation of bioactive substances of vegetables are very important the heritable quality parameters too. In this way we examined not only the different species, and the roil of varieties belong to them.

The red pigments were evaluated from diluted samples. A spectrophotometer was used to determine the absorbance of pigments: λ=538 nm for red pigments and λ=476 nm for yellow ones. For total phenol content the colour reaction to Folin-Denis reagents were evaluated at λ=760nm, by means of a katechin standard (mg katechin/100 ml). Total antioxidant content was expressed in the so-called FRAP values (ferric reducing ability of plasma) in μM/l. The method is based on the ability of antioxidants to reduce Fe(III) ions to Fe(II) ions in buffered sour medium (pH 3,6). The produced Fe (II) can be measured on photometers. Absorbance is proportional to the quantity of the produced Fe(II) ions and the antioxidants, respectively.

Our measurements showed more than threefold differences in total antioxidant activity among varieties, the lowest value being 171.13 μM/l and highest 702.57 μM/l. The corresponding betanin (17.18 and 57.80 mg/100 ml) and total polyphenol (37.5 and 85.5 mg/100 ml respectively) contents show similar differences. The highest FRAP values was measured in the *Bonel, Pablo* and *Pronto* varieties (506.97; 571.43; 702.57 μM/l). Based on our results it can be stated that varieties of higher betanin and poliphenol contents have higher antioxidant values as well. With the further measurements we concluded that red cabbage varieties greatly vary in pigment. There is a correlation between the pigment and dry matter content and FRAP. According to our data the highest FRAP parameters were measured in *Sandoro* F_1 whose colour intensity also proved to be excellent. Lower parameters were shown by *Rendero* F_1 which also lagged behind regarding dry matter content and pigment content.

Our measurements showed the varieties with higher pigment and poliphenol content have high antioxidant values too. There is a close correlation between red pigments (betanin), total polyphenol contents and FRAP values. The correlation between the quantity of these compounds and the FRAP values ($r = 0.7799$ and $r = 0.7435$, respectively).

Accordingly, the two compounds must have a role in the evolution of antioxidant effects.

Biological evaluation of volatile oils and aromatic agents by FRAP method

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Biological (antioxidant) values of volatile oils used in medication and basic components used in flavouring and parfumery have not been known so far. For that reason the authors examined the applicability of a chemical method (FRAP) adapted for plant materials. The aim of the work was to study that the volatile oils and essence of parfume of positive effect to biochemical (allergic) processes in the human body may posses any antioxidant properties.

Volatile oils, fragrance compositions (know and unknown combinations, but known tendency) were studied. The measurements were made in 1% solutions. The components of volatile oils and fragrance compositions were identified by GC-MS and FRAP method was used for measurement of antioxidant property.

The identified and frequently occuring basic-, aromatic- and perfumed compounds may be characterized by the following FRAP values: methyl salicylate 303±1 μmol/L, α-amyl acetate 144±2 μmol/L, borneol 284±1 μmol/L, camphor 286±1 μmol/L, carvon 164±2 μmol/L, menthol 1.86±0.23 μmol/L, menthon 1.88±1.10 μmol/L, thymol 284±1 μmol/L, linalol 299±1 μmol/L, linalyl acetate 221±4 μmol/L, limonene 445±3 μmol/L, terpineol 142±1 μmol/L, cinnamic aldehyde 303±1 μmol/L, anethol 509±2 μmol/L, while the FRAP values of volatile oils were the followings: lemon oil 198±1 μmol/L, geranium oil 152±2 μmol/l, sage oil 313±3 μmol/L, pine oil 255±1 μmol/L, muscate sage oil 484±2 μmol/L, patchuli oil 178±2 μmol/L, petitgrain oil 174±3 μmol/L, dill seed oil 323±1 μmol/L, eukalyptus oil 14±2 μmol/L, clove oil 197±1 μmol/L, peppermint oil 167±1μmol/L, rosemary oil 35 ±1 μmol/L. The FRAP values of essence-compositions varied between 250-1000 μmol/L (female 251±8 μmol/L, male 409±13 μmol/L, kid 1093±7 μmol/L). At the T1-T15 style tendency with unknown compositions the values were between 3000-9000 μmol/L in 10% solutions, while smaller values characterize the american unisex essences (P-18, P-19, P-20): 243±2 μmol/L, 252±4 μmol/L and 520±1 μmol/L, respectively.

It has been stated that the FRAP method is suitable for measurement of in vitro antioxidant property of complex compositions.