



Antioxidant Activity of Fruits and Vegetables Pomace During 9 Months Storage Determined Upon In Vitro Digestion Using Three Antioxidant Methods

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INTRODUCTION An increased intake of antioxidants and anti-inflammatory nutrients such as polyphenols are related to prevention of obesity and diabetes type 2 and improvement of their management. Pomace from fruit and vegetable juice production is a by-product rich in dietary polyphenolics that can play an important role in prevention of mentioned diseases. Technological process developed at the Institute of General and Physical Chemistry (Belgrade, Serbia) was applied to transform various minimally processed fruits and vegetables pomace obtained from juice industry into stable flour, with low activity of water and high temperature of glass transition, determined by differential scanning calorimetry. Here, content of total polyphenolic along with anti-radical and ferric reducing activity was determined upon in vitro digestion in fresh and nine month stored pomace flour in order to get an insight into antioxidants retention.

METHODOLOGY Three methods were applied to determine the antioxidant activity of eight flours from fruits, vegetables or their mixtures (celery, apple and beetroot pomace or their mixtures with cucumber, kale, spinach, parsley, ginger and lettuce) subjected to in vitro digestion. In vitro digestion of analyzed samples was conducted using the Infogest consensus method that simulates the oral, gastric and intestinal phases of human digestion. A blank solution was prepared containing all reagents except the sample. The digested samples were analyzed for total phenolic content (TPC) determined by Folin-Ciocalteu (FC) and antioxidant (AO) activity using spectrophotometric DPPH and FRAP assay. Measurements were done in triplicate. Results were expressed in gallic acid equivalent (GAE) per g of sample ($\mu\text{g GAE/g}$) and μmol of Trolox equivalents per g of digested sample ($\mu\text{mol TE/g}$).

RESULTS High values of total phenolic content (FC GAE) (7.6 ± 0.3 - $13.4 \pm 1.1 \mu\text{g GAE/g}$) were found immediately after production of flour, as well as prominent antiradical activity (DPPH) (16.9 ± 0.9 - $55.5 \pm 4.5 \mu\text{mol TE/g}$) and ferric reducing power (FRAP) (98 ± 6 - $314 \pm 22 \mu\text{mol TE/g}$). Decrease of TPC was almost negligible during 9 months storage. Range of decrease of antiradical activity towards DPPH was 13.0 to 25.8 %. The highest decrease of reducing activity determined using FRAP was 14.3%. Relative Antioxidant Capacity Index (RACI), as indicator of AO activity, was calculated by assigning equal weight to Folin-Ciocalteu, DPPH and FRAP assays applied. For each assay, value obtained for particular sample was subtracted by mean value of all eight samples and that difference was divided by standard deviation. The presented RACI values are the averages of RACI values of all three AO methods used.

Table 1. AO activity of pomace flour from various fruits and vegetables or their mixtures determined upon in vitro digestion according to INFOGEST procedure

Sample number	Sample composition	Month	FC mg GAE/g	FRAP $\mu\text{mol TE/g}$	DPPH $\mu\text{mol TE/g}$
1	celery	0	10.67 ± 0.56	98 ± 6	16.9 ± 0.9
		9	10.47 ± 0.99	89 ± 3	14.7 ± 1.8
2	apple granny smith A	0	7.62 ± 0.32	119 ± 8	32.1 ± 3.0
		9	7.20 ± 0.54	108 ± 9	24.5 ± 1.4
3	apple, celery, fennel, arugula, ginger	0	9.22 ± 0.43	127 ± 12	29.3 ± 1.7
		9	9.61 ± 0.44	127 ± 4	24.8 ± 3.9
4	carrot, beetroot and apple	0	8.53 ± 0.87	145 ± 7	31.7 ± 0.4
		9	8.01 ± 0.34	149 ± 9	23.7 ± 1.9
5	apple granny smith B	0	8.22 ± 0.41	145 ± 14	38.0 ± 1.0
		9	8.15 ± 0.24	135 ± 15	31.5 ± 2.5
6	apple variety mix	0	8.82 ± 0.37	154 ± 10	37.6 ± 3.1
		9	8.40 ± 0.43	132 ± 2	27.9 ± 3.6
7	apple, lettuce, celery, parsley, cucumber, spinach, kale, ginger	0	11.44 ± 0.84	169 ± 10	33.6 ± 0.8
		9	11.60 ± 0.78	156 ± 7	26.3 ± 3.5
8	beetroot	0	13.45 ± 1.12	314 ± 22	55.5 ± 4.5
		9	13.22 ± 1.32	302 ± 23	44.5 ± 7.9

The results are presented as mean \pm SD;

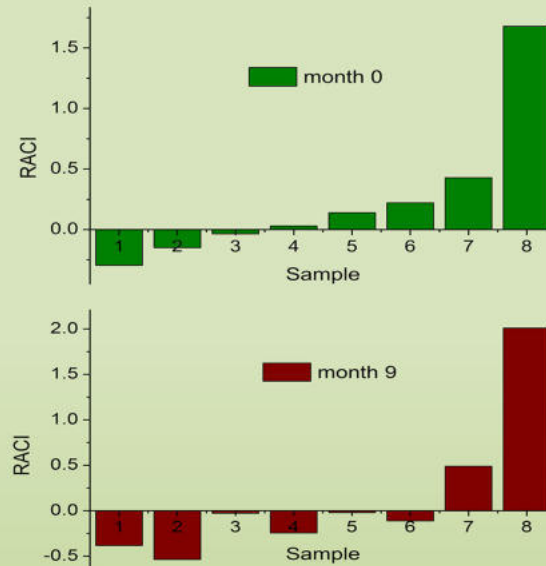


Fig 1. Rank of Relative Antioxidant Capacity Index (RACI) of pomace flour from various fruit and vegetables or their mixtures

CONCLUSION These results, which show a satisfactory preservation of the carriers of antioxidant activity, are in good agreement with the results of thermal analysis, as well as a very slow increase in water activity. In our future work, individual phenolic compounds will be identified and their contribution to the overall antioxidant activity will be evaluated.

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