Impact of dehydration on the bioactive compounds of 'Redfield' apples

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Introduction

Snack foods make up an important part of consumer's diet in Canada. Recently, with the increasing awareness about bioactive compounds, there is a growing demand for snacks which not only provide convenience and taste but also nutritional and health benefits[1]. Apples are highly suitable for processing into healthy snack foods as apples are rich source of bioactive phenolics, especially flavonoids, which play an important role in the prevention of chronic diseases such as heart diseases, diabetes, and cancer [2]. Red-fleshed apples have potential for use in value-added snack product manufacturing because of the presence of higher content of anthocyanins in the flesh which provides additional nutraceutical value in addition to natural red color.

Objective

The objective of this research was to study the effect of dehydration of apple slices made from red-fleshed apple cv. "Redfield" on the bioactive polyphenolics, vitamin C, and total antioxidant capacity.

Materials & Methods

Slicing : Mature 'Redfield' apples were washed and cut into 2.0-mm-thick slices perpendicular to the core using an apple slicer.

Drying: Apple slices were dried using two methods: (i) hot forced-air drying (47°C at 0.7 m s^{-1} for 7 hr) and (ii) convection oven drying (70°C for 10 hr).

Quantification: The dehydrated apple slices were analyzed for phenolic profiles, vitamin C content, total phenolic (Folin Ciocalteu) content, and total antioxidant capacity (FRAP, Ferric reducing ability of plasma and ORAC, Oxygen radical absorption capacity).

Statistical analysis
Data were analyzed using one way ANOVA methods with SAS and Minitab software's. All model assumptions were verified. Differences among means were tested by the Tukey's Studentized Range test at $\alpha = 0.05$.

Literature cited (1.) Zandstra, E. H. et al. *Food Quality and Preference* **2001**, 12, 75–82.
(2.) Boyer, J. and Liu, R. H. *Nutrition Journal* **2004**, 3–5.

Results & Discussion

Both air drying and oven drying method influenced various bioactive compounds and ORAC value of dehydrated red-fleshed apple when compared to fresh red-fleshed apple.

Table 1. Phenolic profiles of dehydrated apple slices.

	Phenolic profiles (mg per 100 g DM)				
	Catechins	Phenolic acids	Anthocyanins	Phloridzin	Quercetins
Fresh	135.6 a	89.53	29.2 a	22.4 a	15.2 a
Air-dried	102.7 b	86.27	13.6 b	19.7 a	12.4 ab
Oven-dried	107.2 b	73.35	10.1 b	14.0 b	9.5 b

Table 2. Vitamin C, total phenolic content, and total antioxidant capacity of dehydrated apple slices.

	Vitamin C (mg /100 g DM)	Total phenolic content (mmol GAE /100 g DM)	ORAC (mmol TE /100 g DM)	FRAP (mmol TE /100 g DM)
Fresh	112.390 a	0.065	84.763 b	8.290
Air-dried	55.529 b	0.069	116.632 a	7.990
Oven-dried	78.142 ab	0.071	26.658 c	8.800

GAE: Gallic acid equivalent ; TE: Trolox equivalent

Phenolic acids were well retained during both air and oven drying; however, drying significantly reduced the concentration of catechins and anthocyanins.

Oven drying resulted in loss of phloridzin and quercetins in apple slices.

Concentration of vitamin C was significantly reduced as a result of air drying.

Interestingly, ORAC values were significantly influenced by drying and oven drying reduced the ORAC value greater than that of air drying.

There was no effect of drying on the total phenolic (Folin Ciocalteu) content and FRAP values.

Conclusion

- Dehydration significantly reduced the concentration of many polyphenolics compounds present in 'Redfield' apples.
- Vitamin C concentration of air-dried apple slices was lower than that of oven-dried apple slices.
- Investigation of dehydration processes to minimize the impact on bioactive compounds and vitamin C are in progress.