ENRICHMENT OF PECTIN-BASED BLACKBERRY HYDROGELS WITH APPLE FIBER

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Introduction

Modern consumers search for food with health-promoting properties as the awareness of the link between diet and health is on the rise. Great deal of attention is being paid to polyphenols and their various sources in plant-based foods due to their antioxidant properties as free radical scavengers and other beneficial effects. The addition of apple fiber in the manufacturing of novel food products increases its dietary value and at the same time does not cause changes in general costs. Since bioactive compounds such as phenolics are unstable, hydrogels may be used as their delivery systems whose release may then be controlled.

Aim

- To investigate the possibility of using pectin-based (low-methoxyl pectin or high-methoxyl pectin) hydrogels prepared from blackberry juice with the addition of Ca^{2+} for delivery of blackberry phenolics.
- To examine whether enrichment with apple fiber (10%) causes increase in antioxidant activity, total phenolics and proanthocyanidins.
- To determine which formulation makes the product the richest in polyphenols.

Preparation and evaluation

Blackberry juice + Pectin + (Apple fiber) = (Enriched) hydrogel

spectrophotometric analysis

extraction with acidified methanol

color measurement

Results

Table 1 Color parameters of prepared hydrogels

SAMPLE	L*	a*	b*	ΔE	°h	C*
BLACKBERRY, 3% LMP, 10% $CaCl_2$	23.65 ± 0.01^c	7.96 ± 0.02^c	3.31 ± 0,02^c	4.48	22.56 ± 0.18^a	8.61 ± 0.01^c
BLACKBERRY, 3% LMP, 10% $CaCl_2$, 10 % AF	29.49 ± 0.01^e	12.56 ± 0.01^e	9.91 ± 0.02^e	13.87	38.29 ± 0.06^d	15.99 ± 0.02^e
BLACKBERRY, 3% HMP, 10% $CaCl_2$	21.82 ± 0.01^b	4.87 ± 0.02^b	2.52 ± 0.01^b	0.83	27.37 ± 0.15^b	5.48 ± 0.02^b
BLACKBERRY, 3% HMP, 10% $CaCl_2$, 10% AF	29.04 ± 0.01^d	12.17 ± 0.01^d	9.45 ± 0.02^d	13.11	37.84 ± 0.08^d	15.40 ± 0.00^d
BLACKBERRY JUICE	21.24 ± 0.01^a	4.28 ± 0.01^a	2.45 ± 0.01^a		29.82 ± 0.21^c	4.94 ± 0.01^a

LMP: low-methoxyl pectin; HMP: high-methoxyl pectin; AF: apple fiber; $CaCl_2$ solution concentration: 100 mM. Within the column, means followed by superscript different letters are significantly different at $p \leq 0.05$ (ANOVA, Fisher's LD). L*-lightness of sample (L* = 0 dark, L* = 100 light); a* > 0 red, a* < 0 green; b* > 0 yellow, b* < 0 blue; °h-hue; C*-saturation; ΔE-color change of the hydrogels compared to blackberry juice.

Table 2 Antioxidant activity, total phenolics and proanthocyanidins

SAMPLE	FRAP (μmol/100 g)	CUPRAC (μmol/100 g)	DPPH (μmol/100 g)	ABTS (μmol/100 g)	TOTAL PHENOLICS (g/kg)	PROANTHOCYANIDINS (μg/g)
BLACKBERRY, 3% LMP, 10% $CaCl_2$	0.33 ± 0.01^a	18.97 ± 0.88^a	3.88 ± 0.01^b	1.39 ± 0.07^a	0.42 ± 0.01^a	13.20 ± 0.66^b
BLACKBERRY, 3% LMP, 10% $CaCl_2$, 10 % AF	0.75 ± 0.01^b	46.71 ± 0.31^c	4.47 ± 0.08^c	3.80 ± 0.02^b	1.13 ± 0.02^c	297.10 ± 0.09^d
BLACKBERRY, 3% HMP, 10% $CaCl_2$	0.35 ± 0.01^a	18.56 ± 0.56^a	3.48 ± 0.33^{a,b}	1.34 ± 0.01^a	0.41 ± 0.01^a	11.57 ± 0.42^a
BLACKBERRY, 3% HMP, 10% $CaCl_2$, 10% AF	0.77 ± 0.06^b	47.98 ± 0.22^c	4.86 ± 0.09^c	4.03 ± 0.07^c	1.19 ± 0.00^d	309.00 ± 0.24^e
BLACKBERRY JUICE	0.42 ± 0.01^a	23.36 ± 0.43^b	3.11 ± 0.02^a	4.47 ± 0.02^d	0.47 ± 0.01^b	32.97 ± 0.29^c

LMP: low-methoxyl pectin; HMP: high-methoxyl pectin; AF: apple fiber; $CaCl_2$ solution concentration: 100 mM. Within the column, means followed by superscript different letters are significantly different at $p \leq 0.05$ (ANOVA, Fisher's LD).

Discussion and Conclusion

In samples with added apple fiber an increase in antioxidant activity as well as total phenolics, proanthocyanidins and color change was observed. Results obtained in this research showed that pectin-based hydrogels could be used for the efficient delivery of blackberry phenolics and apple fiber could serve as an ingredient with the potential to enhance the nutritive value of novel food products.

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