CITRUS FIBER/GUAR AND CHOKEBERRY POLYPHENOLS POWDERS AS POSSIBLE FOOD ADDITIVES

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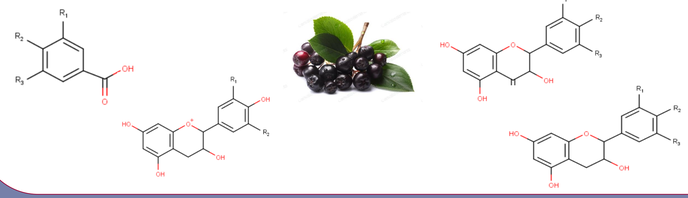
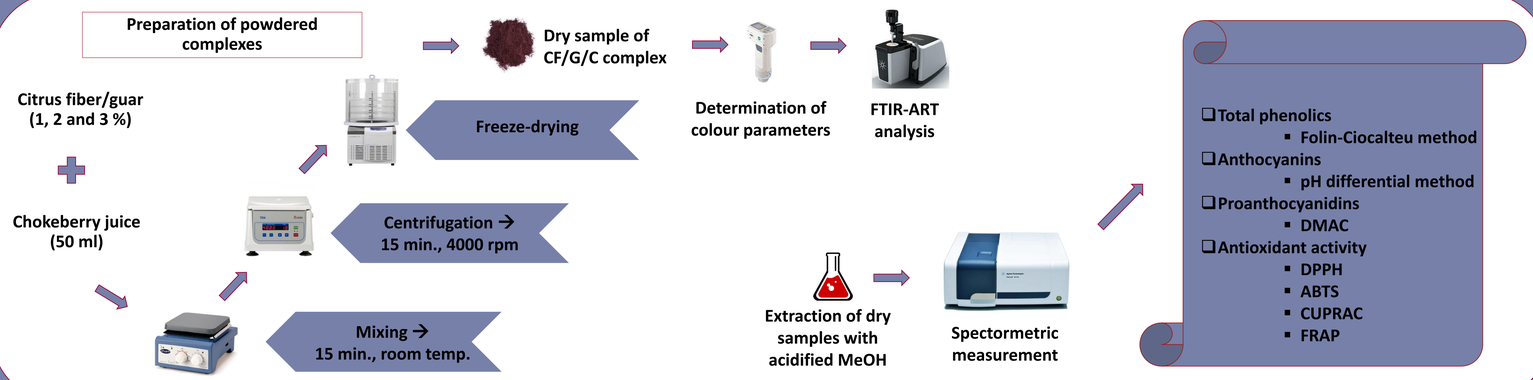
INTRODUCTION

Chokeberry, known as a treasure trove of antioxidants, is used in the food industry in a variety of products. Its high-value ingredients need to be preserved so that they can ultimately have a positive effect on human health. Due to their properties, dietary fibers were reported as possible carrier of bioactive ingredients. In this study, the possibility of using citrus fiber/guar as a carrier of polyphenols from chokeberry juice was investigated.



MATERIALS AND METHODS



RESULTS

Table 1 Total phenolic content, proanthocyanidins and anthocyanins on citrus fiber/guar/chokeberry phenolics complexes

Samples	TPC (mg/g)	PC (mg/g)	AC (mg/g)
	After preparation		
CF/G_1%/C	51.53 ± 0.05^{c}	25.69 ± 0.07^{c}	3.85 ± 0.02^{c}
CF/G_2%/C	29.80 ± 0.02^{b}	12.94 ± 0.04^{b}	2.32 ± 0.05^{b}
CF/G_3%/C	21.55 ± 0.05^{a}	5.32 ± 0.04^{a}	2.08 ± 0.03^{a}
	After storage		
CF/G_1%/C	45.53 ± 0.22^{c}	9.12 ± 0.00^{c}	3.30 ± 0.03^{c}
CF/G_2%/C	19.98 ± 0.02^{b}	4.35 ± 0.01^{b}	2.21 ± 0.03^{b}
CF/G_3%/C	18.39 ± 0.13^{a}	3.36 ± 0.01^{a}	1.88 ± 0.02^{a}

CF-citrus fiber; G-guar; C-chokeberry
Within the column (separately for fresh and stored samples), means followed by superscript different letters are significantly different at $p \leq 0.05$ (ANOVA, Fisher's LSD).

Table 2 Antioxidant activity of citrus fiber/guar/chokeberry phenolics complexes

Samples	DPPH (µmol/g)	ABTS (µmol/g)	FRAP (µmol/g)	CUPRAC (µmol/g)
		After preparation		
CF/G_1%/C	2.86 ± 0.01^{c}	3.50 ± 0.01^{c}	0.33 ± 0.01^{c}	28.58 ± 0.05^{c}
CF/G_2%/C	2.16 ± 0.01^{b}	2.27 ± 0.04^{b}	0.25 ± 0.00^{b}	18.61 ± 0.06^{b}
CF/G_3%/C	1.80 ± 0.01^{a}	1.38 ± 0.01^{a}	0.19 ± 0.00^{a}	13.93 ± 0.05^{a}
		After storage		
CF/G_1%/C	1.93 ± 0.01^{c}	3.06 ± 0.02^{c}	0.35 ± 0.00^{c}	23.30 ± 0.11^{c}
CF/G_2%/C	1.23 ± 0.01^{b}	1.84 ± 0.03^{b}	0.20 ± 0.00^{b}	13.37 ± 0.06^{b}
CF/G_3%/C	1.14 ± 0.02^{a}	1.52 ± 0.01^{a}	0.18 ± 0.00^{a}	11.35 ± 0.03^{a}

Table 3 Colour parameters of citrus fiber/guar/chokeberry phenolics complexes

Samples	L*	a*	b*	ΔE	°h	C*
			After preparation			
CF/G_1%/C	39.93 ± 0.03^{a}	20.67 ± 0.06^{a}	3.27 ± 0.02^{c}		8.98 ± 0.08^{c}	20.93 ± 0.06^{a}
CF/G_2%/C	41.90 ± 0.02^{b}	22.23 ± 0.05^{b}	3.26 ± 0.02^{b}		8.34 ± 0.07^{b}	22.47 ± 0.05^{b}
CF/G_3%/C	45.31 ± 0.13^{c}	23.09 ± 0.11^{c}	2.90 ± 0.01^{a}		7.15 ± 0.02^{a}	23.27 ± 0.11^{c}
			After storage			
CF/G_1%/C	40.78 ± 0.02^{a}	21.90 ± 0.02^{a}	3.89 ± 0.02^{c}	1.62	10.06 ± 0.06^{c}	22.24 ± 0.02^{a}
CF/G_2%/C	42.97 ± 0.01^{b}	23.01 ± 0.03^{b}	3.74 ± 0.02^{b}	1.41	9.24 ± 0.06^{b}	23.31 ± 0.03^{b}
CF/G_3%/C	46.07 ± 0.08^{c}	23.50 ± 0.03^{c}	3.39 ± 0.04^{a}	0.99	8.20 ± 0.09^{a}	23.74 ± 0.03^{c}

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 – colour change of stored samples compared to fresh samples

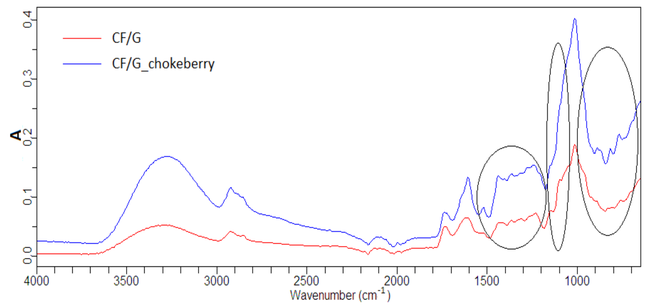


Figure 1 IR spectra of citrus fiber/guar and citrus fiber/guar/chokeberry complexes

DISCUSION

It has been observed that increasing the amount of fiber reduced the absorption of phenolics, anthocyanins and proanthocyanidins of chokeberry onto citrus fiber/guar. In stored samples (8 months), smaller amounts of phenolic compounds were measured, following the same declining trend with a higher amount of fiber. Results of antioxidant activity followed the same tendency obtained for phenolic compounds. Futher, amount of used fiber had an effect on colour parameters (L*, a*, b*, °h and C*) of citrus fiber/guar/chokeberry complexes. The samples with a higher amount of fiber were brighter, and after storage, the largest colour change was observed in the sample with 1% added fiber. IR spectra obtained by FTIR-ART analysis of powder complexes, indicate that the binding of components from chokeberry juice to the fiber occurred, due to changes in the structure of the complexes compared to pure fiber. Differences were found in three regions as indicated in Figure 1 and suggest changes in C=O, C-C and C-H bonds.

CONCLUSION

The obtained and analyzed bioactive powder complexes could be applied in the enrichment of various products in the food industry and contribute to the bioactive properties of the final product.

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