INFLUENCE OF ENCAPSULATION MATERIALS ON THE PHYSICOCHEMICAL PROPERTIES OF BLACKBERRY POWDER PRODUCED BY SPRAY DRYING

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INTRODUCTION

Blackberries contain a great variety of phenolic compounds, especially anthocyanins, which are considered bioactive compounds with functional benefits. Encapsulation is using for protection from environmental conditions, avoiding oxidation and increasing the shelf life of bioactive compounds. Different encapsulation conditions and agents influence the encapsulation efficiency, yield, and antioxidant activity. The aim of this work was to study the effect of different carrier agents (maltodextrin, acacia gum) on the physicochemical properties of blackberry powder produced by spray drying.

MATERIALS AND METHODS

Research was carried out at VMU Agriculture Academy, Institute of Agricultural and Food Sciences in 2020. Orkana variety blackberries juice with maltodextrin and acacia gum was spray dried. Spectrophotometric methods were used to analyze total phenols, total anthocyanins and antioxidant activity of spray dried blackberries powder. Color of powder was detected by spectrophotometer ColorFlex assessing the values of coordinates L*, a*, b*. Statistical analysis was performed using one-way analysis of variance (ANOVA) (Statistica 12, StatSoft, USA). Fisher (LSD) test was applied to assess significant differences between the samples at $p<0.05$.

RESULTS

Table. 1. Total content of phenolic compounds in blackberry powder, mg g^{-1}

Blackberry powder	Total phenolic content
MDX 10%	12.72 ± 0.66 d
MDX 15%	7.78± 0.91 c
MDX 20%	3.38 ± 0.74 a
MDX 5% AG 5%	12.79 ± 1.66 d
MDX 7.5% AG 7.5%	873 ± 2.12 c
MDX 10% AG 10%	5.64 ± 2.61 b

Encapsulation agents: MDX- maltodextrin, AG- acacia gum
Note: Means marked by the same letter in the same column have no significant differences at P≤0.05

Table. 2. Total content of anthocyanins compounds in blackberry powder, mg g^{-1}

Blackberry powder	Total anthocyanins content
MDX 10%	3.32 ± 0.25 d
MDX 15%	2.03 ± 0.16 b
MDX 20%	1.35 ± 0.08 a
MDX 5% AG 5%	3.31 ± 0.12 d
MDX 7.5% AG 7.5%	2.55 ± 0.18 c
MDX 10% AG 10%	2.01 ±0.05 b

Encapsulation agents: MDX- maltodextrin, AG- acacia gum
Note: Means marked by the same letter in the same column have no significant differences at P≤0.05

Table. 3. DPPH free radical scavenging activity of antioxidants in blackberry powder, %

Blackberry powder	DPPH free radical scavenging activity
MDX 10%	88.82 ± 0.94 a
MDX 15%	89.82 ± 0.66 c
MDX 20%	89.57 ± 0.37 bc
MDX 5% AG 5%	89.06 ± 0.87 ab
MDX 7.5% AG 7.5%	91.21 ± 0.42 d
MDX 10% AG 10%	92.16 ± 0.04 e

Encapsulation agents: MDX- maltodextrin, AG- acacia gum
Note: Means marked by the same letter in the same column have no significant differences at P≤0.05

Table. 3. Color of blackberry powder, NBS units

Blackberry powder	L*	a*	b*
MDX 10%	38.31 f	46.76 kl	11.58 e
MDX 15%	43.01 h	47.05 l	8.75 c
MDX 20%	46.59 kl	47.01 l	6.63 b
MDX 5% AG 5%	40.48 g	46.16 jk	10.04 d
MDX 7.5% AG 7.5%	44.53 i	45.49 j	6.90 b
MDX 10% AG 10%	47.95 m	44.71 i	4.93 a

Encapsulation agents: MDX- maltodextrin, AG- acacia gum
Note: The L (lightness) value ranges from 0 = black to 100 = white, the a* (redness) ranges from green (negative) to red (positive), and b* (yellowness) values are blue (negative) to yellow (positive).*

CONCLUSIONS

As the concentration of maltodextrin increased from 10% to 20%, the total content of phenolic compounds in the obtained blackberries powder decreased from 12.72 mg g^{-1} to 3.38 mg g^{-1}, the concentration of anthocyanins from 3.31 mg g^{-1} to 1.35 mg g^{-1}. Replacement of 50 % maltodextrin with acacia gum was found to increase the total amount of phenolic compounds, concentration of anthocyanins and DPPH radicals scavanging activity. The use of encapsulation agents such as maltodextrin and acacia gum mixture is more efficient than individual components.

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