18 November 2020 (11am - 2 pm CET) & 19 November 2020 (4pm - 7pm CET)

Effect of addition of cocoa bean shell in hazelnut spread

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Introduction

There is growing demand in food industry to use by-products created during food production. Cocoa shell is a waste produced by chocolate industry, which is rich in dietary fibers and bioactive compounds. It presents a great material for production of nutritionally richer products. Hazelnut spread is one of the most favorite products to many people although it has high contents of sugar and fat. Addition of dietary fiber source into its composition would be nutritionally desirable but this could also change stability and texture of the spread. The aim of this study was to determine colloidal stability, texture (firmness and spreadability) and color of hazelnut spreads enriched with different amounts of cocoa shell.

Materials and methods

Hazelnut spreads were produced in laboratory ball mill at 50 °C with speed of mixing 60 rpm and mixing time 3 h (spread without cocoa shell) and 3.5 h (spreads with cocoa shell). Nine spreads were produced and in those recepies, cocoa shell replaced cocoa powder or sugar. Control sample (S0) was produced with 52% sugar, 17% hazelnut paste, 10% palm and 10% coconut oil, 4.1% milk powder, 6.3% cocoa powder, 0.4% lecithin, 0.1% salt and 0.1% vanillin. In samples SC6 and SC4, whole cocoa powder and 4.2% cocoa powder were replaced with cocoa shell, respectively. In samples SC5, SC10 and SC15, 5, 10 and 15% of sugar were replaced with cocoa shell, respectively. Samples SC10-0.5, SC10-0.6 and SC10-PGPR+LEC were produced with 10% of cocoa shell, with 0.5% lecithin, 0.6% lecithin and 0.3% lecithin + 0.2% polygycerol polyricinoleate, respectively.

Emulsifiers were added one hour before the end of mixing and vanillin half an hour before the end of mixing.

Color

Color of samples was measured with chromameter Konica Minolta CR-400. The measurement was carried out in the LCh and CIEL*a*b* system. Colour was measured after cooling of samples. L* shows lightness, a* red or green colour and b* yellow or blue, L_0*, a_0* and b_0 * are values for control sample (S0). Total colour change (ΔE) (1) was calculated according to:

$$\Delta E = \sqrt{(L - L_0)^2 + (b - b_0)^2 + (a - a_0)^2} \qquad (1)$$

Colloidal satability

To determine colloidal stability, 15 grams of sample was weighed into plastic tubes and heated at 80 °C in a Julabo, SW22 water bath for 30 minutes. The samples were then cooled at room temperature for 15 minutes. After cooling, the samples were centrifuged in a thermostated centrifuge IEC Centra-MP4R, USA at 2900 g at 20 °C for 20 minutes. The height of the separated oil and the total height after centrifugation were measured and colloidal satability was calculated and presented in %.

Texture

Texture Analyser TA.XT (Stable Micro systems, Great Britain) with maximal force 50 kg was used for measurements. Spreadability and firmness of samples were measured using a spreadability Rig (HDP/SR) attachment. Samples were filled into a female cone (90° angle) and penetrated using the corresponding male cone. Results were processed with Texture Exponent 32 software.

Results

Table 1. Color of hazelnut spreads with added cocoa shell

Sample	L*	a*	b*	C	h°	ΔE
S0	16.39 ± 0.06	4.10 ± 0.12	7.30 ± 0.13	8.37 ± 0.07	60.68 ± 1.09	
SC6	15.74 ± 0.04	2.73 ± 0.16	6.13 ± 0.10	6.71 ± 0.07	65.99 ± 1.50	1.92 ± 0.09
SC4	15.95 ± 0.11	2.99 ± 0.19	6.26 ± 0.07	6.94 ± 0.09	64.44 ± 1.50	1.59 ± 0.10
SC5	14.12 ± 0.15	3.23 ± 0.12	5.27 ± 0.09	6.18 ± 0.05	59.06± 0.97	3.17 ± 0.08
SC10	13.21 ± 0.12	2.42 ± 0.21	4.46 ± 0.12	5.08 ± 0.11	61.50 ± 2.41	4.58 ± 0.04
SC15	11.15 ± 0.12	2.27 ± 0.18	3.55 ± 0.20	4.22 ± 0.15	58.22 ± 1.62	6.70 ± 0.09
SC10-0.5 LEC	12.67 ± 0.14	2.86 ± 0.10	4.53 ± 0.16	5.36 ± 0.14	57.72 ± 1.31	4.80 ± 0.07
SC10-0.6 LEC	13.09 ± 0.04	2.73 ± 0.09	4.44 ± 0.05	5.21 ± 0.05	58.37 ± 0.98	4.57 ± 0.03
SC10-PGPR+LEC	12.53 ± 0.08	2.87 ± 0.35	4.39 ± 0.13	5.25 ± 0.14	56.95 ± 3.78	4.99 ± 0.07

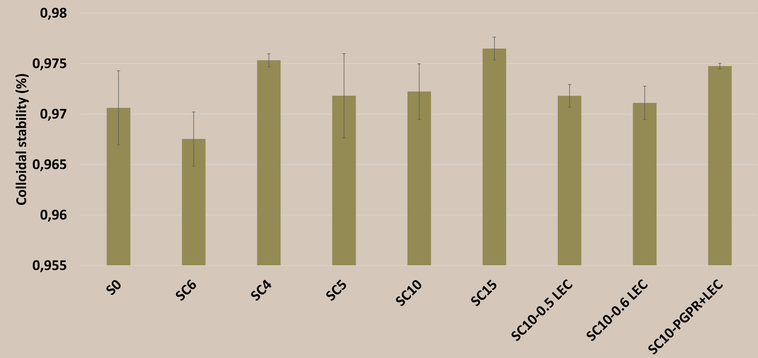

Figure 1. Colloidal satability of hazelnut spreads with added cocoa shell

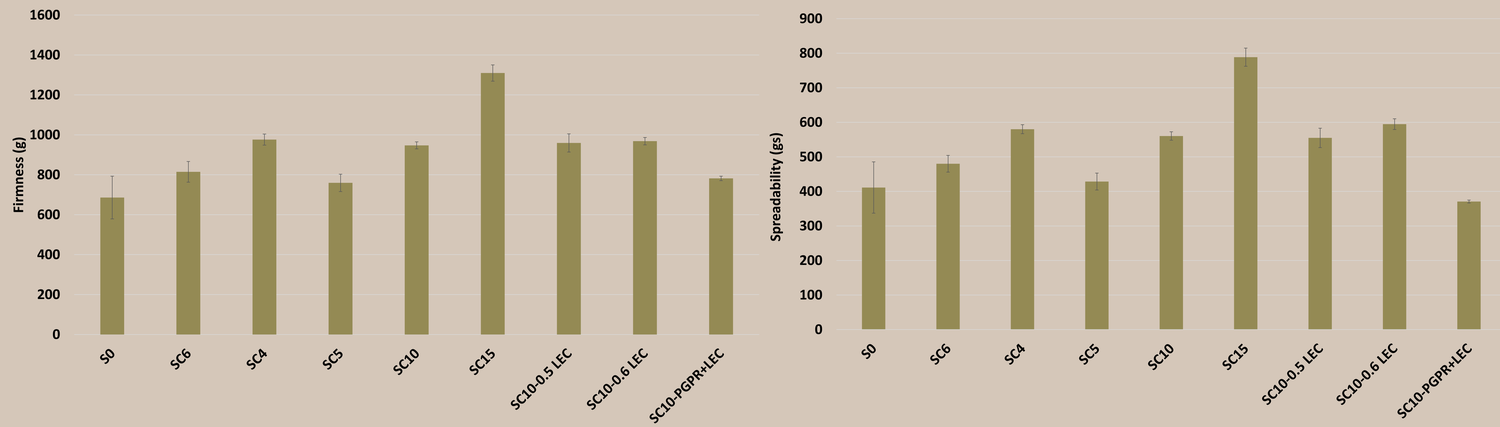

Figure 2. Firmness and spreadability of hazelnut spreads with added cocoa shell

Conclusions

- Results showed that colloidal stability was higher for spreads with added cocoa shell. The sample where cocoa shell replaced 15% of sugar had the best colloidal stability (Figure 1).
- Texture properties showed the same trend (Figure 2). Firmness and spreadability increased as cocoa shell content increased. When cocoa shell replaced part of cocoa powder, firmness and spreadability were higher than for samples where cocoa shell replaced part of sugar.
- Also, total color change of samples changed as cocoa shell content increased (Table 1). Cocoa shell gives a more intense brown color to the products to which it is added, so that could attract consumers.
- Overall, cocoa shell could be used in production of hazelnut spreads and thereby reduce environmental pollution and enrich nutritionally poor products.

Acknowledgment

This work has been supported by Croatian Science Foundation under the project „Application of cocoa husk in production of chocolate and chocolate-like products” (UIP-2017-05-8709)