Supplementary Materials

The Effect of Hemp Cake (*Cannabis sativa* L.) on the Charac-teristics of Meatballs Stored in Refrigerated Conditions

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Table S1

pH and colour values of raw meatballs measured on 0 days of storage; mean ± SD.

Parameter	Meatballs				
	M0	M1	M2	M3	M4
pH	6.13 ± 0.12	6.14 ± 0.10	6.19 ± 0.05	6.14 ± 0.06	6.19 ± 0.06
L	45.96 ± 2.29	46.88 ± 2.15	45.91 ± 1.76	45.53 ± 2.75	43.83 ± 2.15
a*	3.24 ± 1.06	3.15 ± 0.66	3.95 ± 1.34	3.30 ± 1.27	2.68 ± 0.46
b*	11.31 ± 0.90[b]	12.20 ± 1.46[ab]	13.55 ± 1.30[a]	13.56 ± 1.43[a]	13.29 ± 1.21[a]

[a,b,c] – Means with different letters in a row indicate a significant effect of hemp cake addition ($P < 0.05$).
M0 = control; M1, M2, M3, M4 = meatballs with increasing content of hemp cake, i.e., 0.9%, 2.6%, 4.2% and 7.4%, respectively.

Table S2

Changes in hydrophobicity of raw and cooked, vacuum-packed meatballs with different hemp cake content; mean ± SD.

Hydrophobicity	Meatballs				
	M0	M1	M2	M3	M4
Raw samples	154.81 ± 9.8[abcx]	132.64 ± 4.89[cx]	160.61 ± 12.56[abx]	164.40 ± 11.8[ax]	139.30 ± 10.92[bcx]
Cooked samples					
1 day	48.12 ± 4.65[abz]	51.15 ± 0.89[abyz]	53.93 ± 2.32[ay]	44.28 ± 2.77[bz]	44.01 ± 4.90[bz]
6 days	65.01 ± 1.89[aby]	60.34 ± 2.70[by]	62.71 ± 3.3[aby]	67.50 ± 4.42[ay]	64.79 ± 1.53[aby]
12 days	43.67 ± 1.47[z]	45.14 ± 6.75[z]	49.27 ± 5.55[y]	51.87 ± 6.20[z]	47.17 ± 6.04[z]

[a,b,c] – Means with different letters in a row indicate a significant effect of hemp cake addition ($P < 0.05$);
[x,y,z] – means with different letters in a column indicate a significant effect of storage time ($P < 0.05$).

Table S3

Protein and lipid oxidation values of cooked and vacuum-packed meatballs during storage; mean ± SD.

Parameter	Day	Meatballs				
		M0	M1	M2	M3	M4
Protein oxidation	1	1.32 ± 0.33[ay]	1.16 ± 0.14[bz]	1.15 ± 0.07[bz]	1.14 ± 0.14[bz]	1.12 ± 0.07[bz]
	10	2.24 ± 0.17[ax]	2.10 ± 0.21[bx]	2.02 ± 0.13[cx]	2.02 ± 0.16[cx]	1.99 ± 0.20[cx]
	17	2.16 ± 0.32[ax]	1.76 ± 0.25[aby]	1.64 ± 0.24[by]	1.59 ± 0.22[by]	1.53 ± 0.18[by]
Lipid oxidation	1	0.93 ± 0.06[ay]	0.70 ± 0.23[aby]	0.53 ± 0.33[aby]	0.41 ± 0.14[by]	0.35 ± 0.08[by]
	10	1.48 ± 0.03[ax]	1.33 ± 0.01[bx]	1.23 ± 0.08[cx]	1.01 ± 0.05[dx]	0.94 ± 0.03[dx]

[a,b,c] – Means with different letters in a row indicate a significant effect of hemp cake addition ($P < 0.05$);
[x,y,z] – means with different letters for particular parameter in a column indicate a significant effect of storage time ($P < 0.05$).

Table S4
Influence of hemp cake addition on the sensory properties of cooked and vacuum-packed meatballs during storage; mean ± SD.

Parameter	Day	Meatballs				
		M0	M1	M2	M3	M4
Color intensity	1	$4.03^c \pm 1.32$	$4.72^c \pm 1.16$	$5.91^b \pm 1.12$	$6.92^{ab} \pm 0.96$	$7.72^a \pm 0.71$
	6	$4.37^d \pm 1.82$	$5.03^{cd} \pm 1.62$	$6.07^{bc} \pm 1.55$	$7.26^{ab} \pm 1.28$	$8.26^a \pm 1.01$
	12	$4.29^d \pm 1.57$	$4.84^{cd} \pm 1.20$	$5.79^{bc} \pm 1.19$	$6.76^{ab} \pm 1.06$	$7.78^a \pm 1.26$
Color uniformity	1	$8.34^a \pm 1.09$	$7.57^{ab} \pm 1.04$	$6.84^b \pm 1.25$	$6.16^{bc} \pm 1.49$	$5.19^c \pm 1.78$
	6	7.66 ± 1.66	7.36 ± 1.36	6.84 ± 1.54	6.53 ± 1.85	6.13 ± 1.99
	12	$7.16^a \pm 2.11$	$6.81^{ab} \pm 1.78$	$5.74^{abc} \pm 1.43$	$5.25^{bc} \pm 1.36$	$4.93^c \pm 1.28$
Hardness	1	3.78 ± 1.06	4.33 ± 0.89	4.51 ± 0.99	4.76 ± 1.15	4.61 ± 1.38
	6	4.44 ± 1.10	4.48 ± 1.06	4.81 ± 1.33	4.76 ± 1.64	4.95 ± 1.89
	12	4.76 ± 0.97	4.38 ± 1.20	4.88 ± 1.19	5.08 ± 1.80	5.10 ± 1.87
Juiciness	1	$6.13^a \pm 2.09$	$6.03^a \pm 1.58$	$5.69^{ab} \pm 1.13$	$5.10^{ab} \pm 0.92$	$4.39^b \pm 1.32$
	6	$6.09^a \pm 1.54$	$6.03^a \pm 1.36$	$5.69^a \pm 1.33$	$5.10^{ab} \pm 1.03$	$4.15^b \pm 1.26$
	12	$6.01^a \pm 1.26$	$6.10^a \pm 1.14$	$5.47^{ab} \pm 1.13$	$5.01^{ab} \pm 1.17$	$4.32^b \pm 1.40$
Graininess	1	$2.67^d \pm 1.62$	$3.25^{cd} \pm 1.53$	$4.56^{cb} \pm 1.47$	$5.51^{ab} \pm 1.60$	$6.76^a \pm 2.05$
	6	$2.14^d \pm 0.82$	$2.56^{cd} \pm 0.87$	$4.14^{bc} \pm 1.36$	$5.21^{ab} \pm 2.00$	$6.54^a \pm 2.17$
	12	$2.55^c \pm 1.71$	$2.48^c \pm 1.27$	$3.78^{bc} \pm 1.84$	$5.01^{ab} \pm 1.68$	$6.23^a \pm 2.09$
Binding	1	5.85 ± 1.90	6.62 ± 1.50	6.66 ± 1.63	6.77 ± 1.72	6.21 ± 1.76
	6	6.22 ± 1.80	6.36 ± 1.47	6.57 ± 1.68	6.29 ± 1.72	6.33 ± 1.92
	12	6.44 ± 1.54	6.08 ± 0.94	6.35 ± 1.22	5.98 ± 1.22	5.45 ± 1.83
Fatty-oil odour	1	2.81 ± 1.41	2.75 ± 1.55	2.84 ± 1.60	2.99 ± 1.96	3.08 ± 2.20
	6	4.22 ± 2.38	4.13 ± 2.41	3.81 ± 2.48	3.57 ± 2.46	3.43 ± 2.86
	12	4.32 ± 2.53	4.00 ± 2.33	3.53 ± 2.15	3.07 ± 2.16	2.80 ± 2.01
Meaty odour	1	$6.58^a \pm 2.24$	$6.13^{ab} \pm 2.22$	$5.56^{ab} \pm 2.20$	$5.05^{ab} \pm 2.01$	$4.15^b \pm 1.96$
	6	6.09 ± 1.75	5.76 ± 1.84	5.53 ± 2.10	4.83 ± 1.98	4.05 ± 1.99
	12	6.21 ± 2.00	5.88 ± 1.81	5.18 ± 1.81	4.41 ± 2.12	4.12 ± 2.03
Spicy odour	1	3.02 ± 1.60	3.26 ± 1.73	3.89 ± 2.01	4.02 ± 2.17	4.24 ± 2.25
	6	3.11 ± 2.02	3.12 ± 2.04	3.56 ± 1.86	3.60 ± 1.97	3.64 ± 2.59
	12	2.56 ± 0.98	2.73 ± 0.82	3.27 ± 1.13	3.07 ± 1.85	2.97 ± 2.16
Meaty taste	1	$7.86^a \pm 1.25$	$7.31^a \pm 1.43$	$6.81^{ab} \pm 0.98$	$5.64^{bc} \pm 1.69$	$5.09^c \pm 2.18$
	6	$7.16^a \pm 1.36$	$6.81^a \pm 1.32$	$6.06^{ab} \pm 1.29$	$5.24^{bc} \pm 1.01$	$4.01^c \pm 1.10$
	12	$7.00^a \pm 1.33$	$6.91^a \pm 1.15$	$6.33^{ab} \pm 1.44$	$5.37^{ab} \pm 1.78$	$4.64^b \pm 1.97$
Salty taste	1	4.69 ± 1.54	4.69 ± 1.49	4.77 ± 1.26	4.70 ± 1.23	4.44 ± 1.32
	6	4.80 ± 1.67	4.76 ± 1.55	4.59 ± 1.58	4.56 ± 1.68	4.52 ± 1.95
	12	4.80 ± 1.90	4.71 ± 1.79	4.59 ± 1.58	4.32 ± 1.50	4.16 ± 1.52
Fatty-oil taste	1	3.76 ± 2.23	3.76 ± 2.22	3.76 ± 2.21	3.71 ± 2.30	3.72 ± 2.42
	6	3.75 ± 2.05	3.32 ± 1.69	3.39 ± 2.08	3.34 ± 2.29	3.36 ± 2.67
	12	3.69 ± 1.91	3.66 ± 1.84	3.26 ± 1.71	3.48 ± 1.99	3.58 ± 2.18
Bitter taste	1	1.31 ± 0.52	1.42 ± 0.54	1.96 ± 1.41	2.15 ± 1.71	2.46 ± 2.25
	6	1.46 ± 0.73	1.61 ± 0.96	1.92 ± 1.47	2.04 ± 1.56	2.43 ± 2.25
	12	1.28 ± 0.36	1.52 ± 0.85	1.68 ± 0.71	1.68 ± 0.69	2.07 ± 1.40
Spicy/ herbal taste	1	3.94 ± 2.09	4.11 ± 1.82	4.75 ± 1.66	4.97 ± 1.50	4.94 ± 2.23
	6	4.20 ± 2.03	4.39 ± 1.93	4.89 ± 1.62	5.06 ± 1.85	5.47 ± 2.23
	12	3.70 ± 1.93	3.96 ± 1.62	4.54 ± 2.04	4.13 ± 2.19	3.88 ± 2.11
Overall score	1	$7.17^{ab} \pm 1.74$	$8.11^a \pm 1.23$	$7.44^{ab} \pm 1.46$	$5.93^{bc} \pm 1.61$	$4.86^c \pm 2.23$
	6	$7.14^{ab} \pm 1.17$	$7.94^a \pm 1.35$	$7.49^a \pm 1.40$	$5.89^b \pm 0.79$	$3.88^c \pm 1.29$
	12	$6.55^{ab} \pm 1.48$	$7.48^a \pm 1.77$	$6.97^{ab} \pm 1.74$	$5.26^{bc} \pm 1.74$	$3.52^c \pm 1.42$

a,b,c – Means with different letters in a row for particular parameters indicate a significant effect of hemp cake addition (one-way ANOVA and *post hoc* Tukey test) ($P < 0.05$);

ns = non-significant; * = P < 0.05, ** = P < 0.01.

Table S5

Influence of the storage time (T), hemp cake addition (H), and their interaction on the sensory analysis of meatballs.

Parameter	Time (days) T			p	Hemp cake addition H p	Interaction T x H p
	1	**6**	**12**	**p**	**p**	**p**
Colour intensity	5.86 ± 1.72	6.20 ± 2.04	5.89 ± 1.77	ns	***	ns
Colour uniformity	6.82 ± 1.72^a	6.91 ± 1.74^a	5.98 ± 1.80^b	**	***	ns
Hardness	4.40 ± 1.12	4.69 ± 1.41	4.84 ± 1.43	ns	ns	ns
Juiciness	5.47 ± 1.57	5.41 ± 1.47	5.36 ± 1.37	ns	***	ns
Graininess	4.55 ± 2.20	4.12 ± 2.23	4.01 ± 2.22	ns	***	ns
Binding	6.42 ± 1.69	6.35 ± 1.68	6.06 ± 1.43	ns	ns	ns
Fatty-oil odour	2.89 ± 1.72^b	3.83 ± 2.47^a	3.54 ± 2.24^{ab}	*	ns	ns
Meaty odour	5.49 ± 2.23	5.25 ± 2.02	5.16 ± 2.06	ns	***	ns
Spicy odour	3.69 ± 1.97	3.47 ± 2.08	2.92 ± 1.45	ns	ns	ns
Meaty taste	6.54 ± 1.84^a	5.86 ± 1.65^b	6.05 ± 1.77^{ab}	*	ns	ns
Salty taste	4.66 ± 1.34	4.65 ± 1.65	4.52 ± 1.63	ns	ns	ns
Fatty-oil taste	3.74 ± 2.21	3.43 ± 2.12	3.53 ± 1.87	ns	ns	ns
Bitter taste	1.86 ± 1.48	1.89 ± 1.49	1.65 ± 0.88	ns	*	ns
Spicy/herbal taste	4.54 ± 1.88	4.80 ± 1.94	4.04 ± 1.94	ns	ns	ns
Overal score	6.70 ± 2.01^a	6.47 ± 1.89^{ab}	5.96 ± 2.14^b	*	ns	ns

[a,b,c] – means with different letters for particular parameters in a row indicate a significant effect of time (two-way ANOVA and *post hoc* Tukey test) ($P < 0.05$);
* = $p \le 0.05$, ** = $p \le 0.01$, *** = $p \le 0.001$; ns = non-significant.