Model Equations in Terms of Coded Factors

All equations are expressed in terms of coded factors (*A*, *B*, *C*), where:

- *A* = PPSF proportion (%),
- *B* = sugar content (%), and
- *C* = baking time (min).

Coded levels: low (−1), centre (0), high (+1). Bold terms are statistically significant ($p < 0.05$).

Equation S1. Diameter (cm) of cookies (Quadratic model):

$$\hat{Y} = +5.470 + 1.602 \cdot A + 0.9758 \cdot B + 0.0575 \cdot C - 0.0751 \cdot AB + 0.0313 \cdot AC + 0.0384 \cdot BC + 0.7053 \cdot A^2 + 0.5667 \cdot B^2 + 0.4383 \cdot C^2, \quad \text{(S1)}$$

Equation S2. Thickness (cm) of cookies (Quadratic model):

$$\hat{Y} = +1.276 - 0.0751 \cdot A - 0.4044 \cdot B - 0.0036 \cdot C - 0.0275 \cdot AB - 0.0237 \cdot AC + 0.0497 \cdot BC + 0.0372 \cdot A^2 + 0.1090 \cdot B^2 - 0.1137 \cdot C^2, \quad \text{(S2)}$$

Equation S3. Overall acceptability of cookies (Linear model):

$$\hat{Y} = +5.882 - 0.8125 \cdot A + 1.688 \cdot B + 0.0000 \cdot C, \quad \text{(S3)}$$

Equation S4. Distance to break (mm) of cookies (Quadratic model):

$$\hat{Y} = +30.2506 + 6.04685 \cdot A + 8.16049 \cdot B + 16.4979 \cdot C, \quad \text{(S4)}$$

Table S1. Analysis of variance (ANOVA) for the quadratic model describing the effects of PPSF proportion, sugar content, and baking time on the diameter (cm) of cookies enriched with defatted pumpkin seed press cake flour (C-PPSF).

Source of variation	SS	df	MS	*F*	*p*	
Model	32.94	9	3.66	37.80	< 0.0001	significant
A–PPSF proportion (%)	20.53	1	20.53	212.04	< 0.0001	
B–Sugar content (%)	7.62	1	7.62	78.66	< 0.0001	
C–Baking time (min)	0.0265	1	0.0265	0.27	0.6171	
AB	0.0226	1	0.0226	0.23	0.6441	
AC	0.0039	1	0.0039	0.04	0.8464	
BC	0.0059	1	0.0059	0.06	0.8121	
A^2	2.09	1	2.09	21.63	0.0023	
B^2	1.35	1	1.35	13.96	0.0073	
C^2	0.8088	1	0.8088	8.35	0.0233	
Residual	0.6778	7	0.0968			
Lack of Fit	0.4768	3	0.1589	3.16	0.1476	
Pure Error	0.2010	4	0.0503			
Cor Total	33.62	16				

R^2 = 0.9798; Adjusted R^2 = 0.9539; Predicted R^2 = 0.7637; CV % = 4.96.

SS—sum of squares; df—degrees of freedom; MS—mean square; F—F-value; p—probability value; A—PPSF proportion (%); B—sugar content (%); C—baking time (min); AB, AC, BC—interaction terms; A^2, B^2, C^2—quadratic terms. Significance was evaluated at $p < 0.05$.

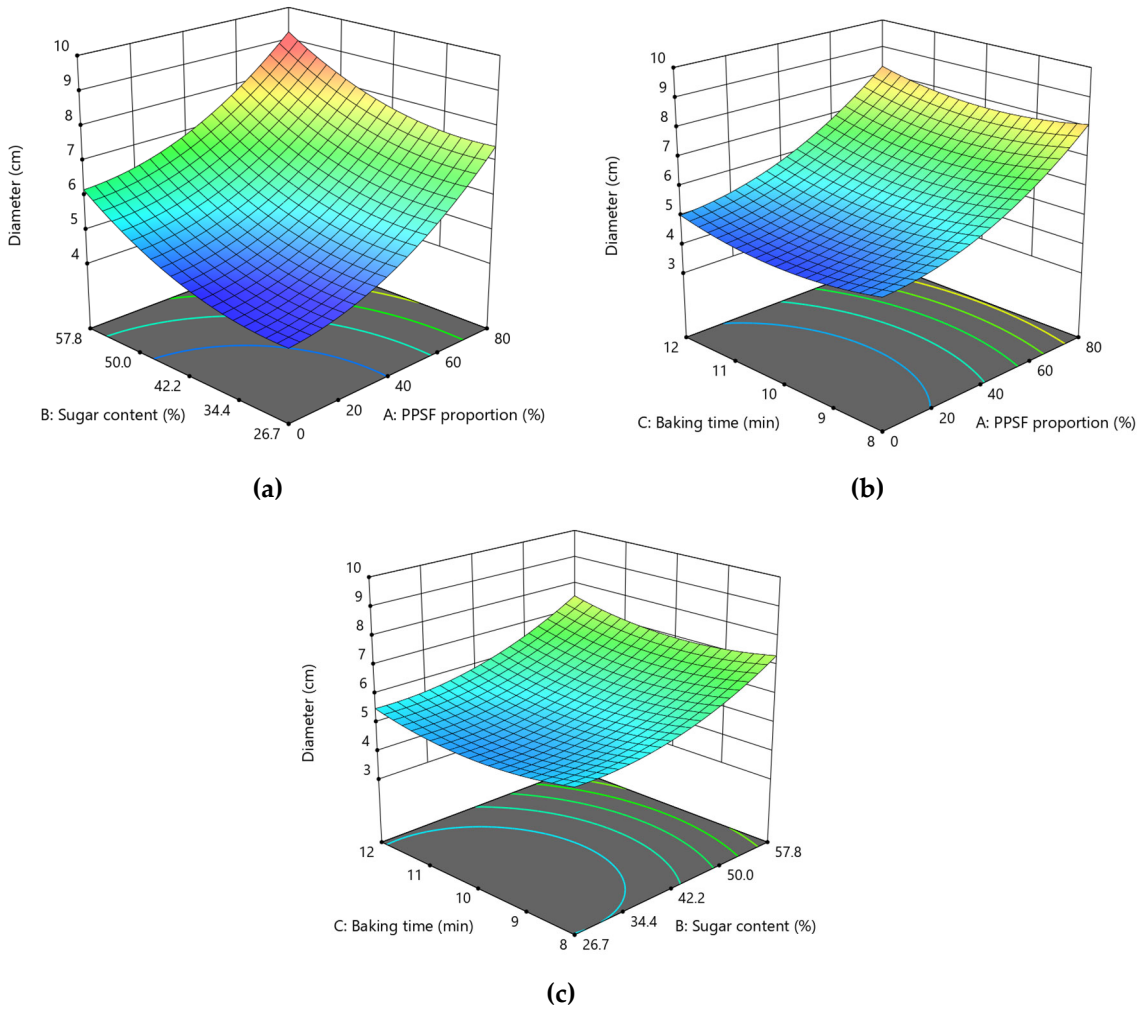


Figure S1. Three-dimensional response surface plots showing the effects of PPSF proportion (A), sugar content (B), and baking time (C) on the diameter of cookies enriched with defatted pumpkin seed press cake flour (C-PPSF): (a) interaction between A and B at the centre level of C; (b) interaction between A and C at the centre level of B; (c) interaction between B and C at the centre level of A.

Table S2. Analysis of variance (ANOVA) for the quadratic model describing the effects of PPSF proportion, sugar content, and baking time on the thickness (cm) of cookies enriched with defatted pumpkin seed press cake flour (C-PPSF).

Source of variation	SS	df	MS	*F*	*p*	
Model	1.47	9	0.1638	63.73	< 0.0001	significant
A–PPSF proportion (%)	0.0451	1	0.0451	17.54	0.0041	
B–Sugar content (%)	1.31	1	1.31	509.19	< 0.0001	
C–Baking time (min)	0.0001	1	0.0001	0.04	0.8476	
AB	0.0030	1	0.0030	1.18	0.3132	
AC	0.0022	1	0.0022	0.87	0.3818	
BC	0.0099	1	0.0099	3.84	0.0907	
A^2	0.0058	1	0.0058	2.27	0.1757	
B^2	0.0501	1	0.0501	19.48	0.0031	
C^2	0.0544	1	0.0544	21.19	0.0025	
Residual	0.0180	7	0.0026			
Lack of Fit	0.0171	3	0.0057	24.74	0.48	
Pure Error	0.0009	4	0.0002			
Cor Total	1.49	16				

R^2 = 0.9879; Adjusted R^2 = 0.9724; Predicted R^2 = 0.8160; CV % = 3.93.

SS—sum of squares; df—degrees of freedom; MS—mean square; F—F-value; p—probability value; A—PPSF proportion (%); B—sugar content (%); C—baking time (min); AB, AC, BC—interaction terms; A^2, B^2, C^2—quadratic terms. Significance was evaluated at $p < 0.05$.

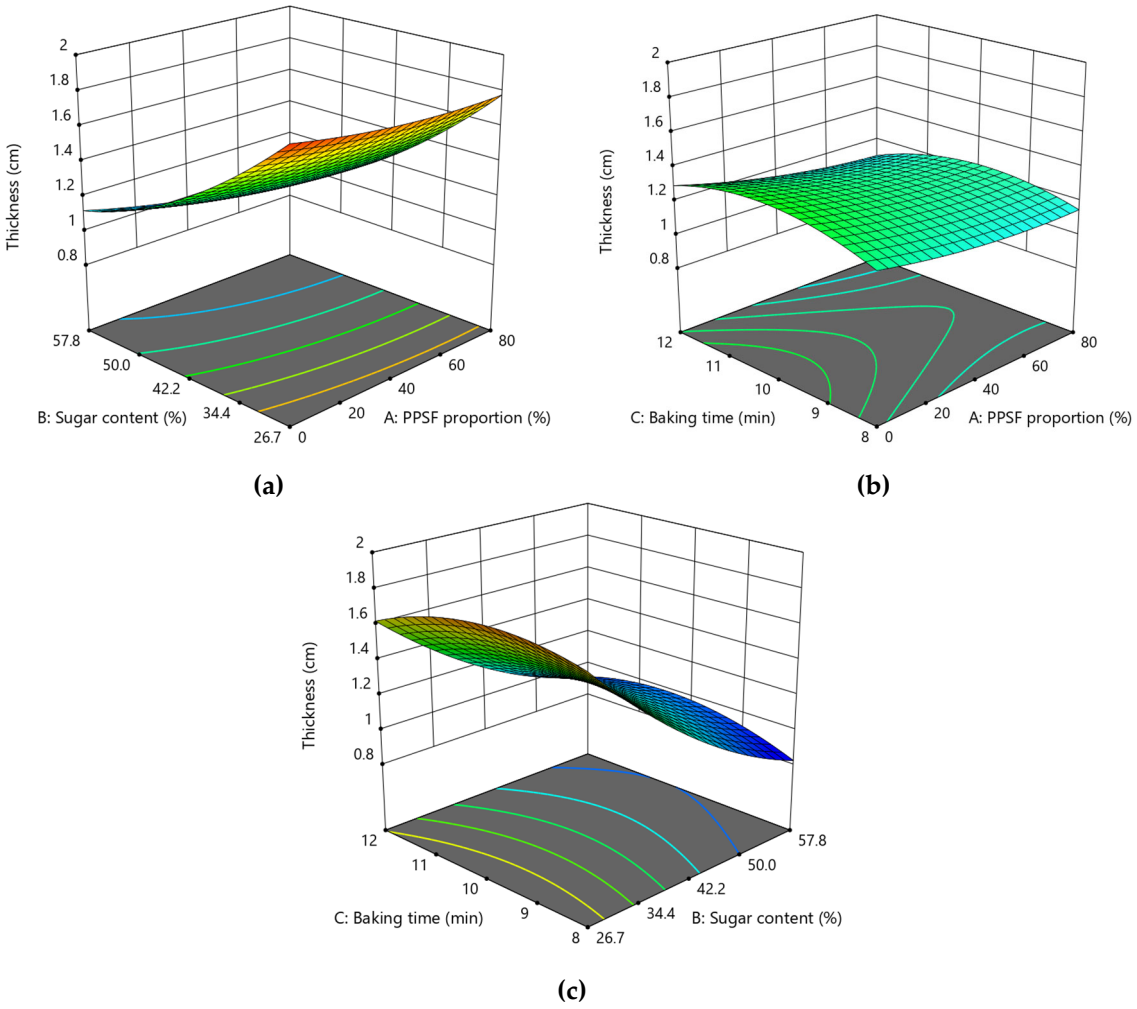


Figure S2. Three-dimensional response surface plots showing the effects of PPSF proportion (A), sugar content (B), and baking time (C) on the thickness of cookies enriched with defatted pumpkin seed press cake flour (C-PPSF): (a) interaction between A and B at the centre level of C; (b) interaction between A and C at the centre level of B; (c) interaction between B and C at the centre level of A.

Table S3. Analysis of variance (ANOVA) for the linear model describing the effects of PPSF proportion, sugar content, and baking time on the overall acceptability of cookies enriched with defatted pumpkin seed press cake flour (C-PPSF).

Source of variation	SS	df	MS	*F*	*p*	
Model	28.06	3	9.35	25.32	< 0.0001	significant
A–PPSF proportion (%)	5.28	1	5.28	14.30	0.0023	
B–Sugar content (%)	22.78	1	22.78	61.67	< 0.0001	
C–Baking time (min)	0.0000	1	0.0000	0.00	1.0000	
Residual	4.80	13	0.3694			
Lack of Fit	3.28	9	0.3647	0.96	0.5626	
Pure Error	1.52	4	0.3800			
Cor Total	32.86	16				

R^2 = 0.8539; Adjusted R^2 = 0.8202; Predicted R^2 = 0.7397; CV % = 1.03.

SS—sum of squares; df—degrees of freedom; MS—mean square; F—F-value; p—probability value; A—PPSF proportion (%); B—sugar content (%); C—baking time (min); AB, AC, BC—interaction terms; A^2, B^2, C^2—quadratic terms. Significance was evaluated at $p < 0.05$.

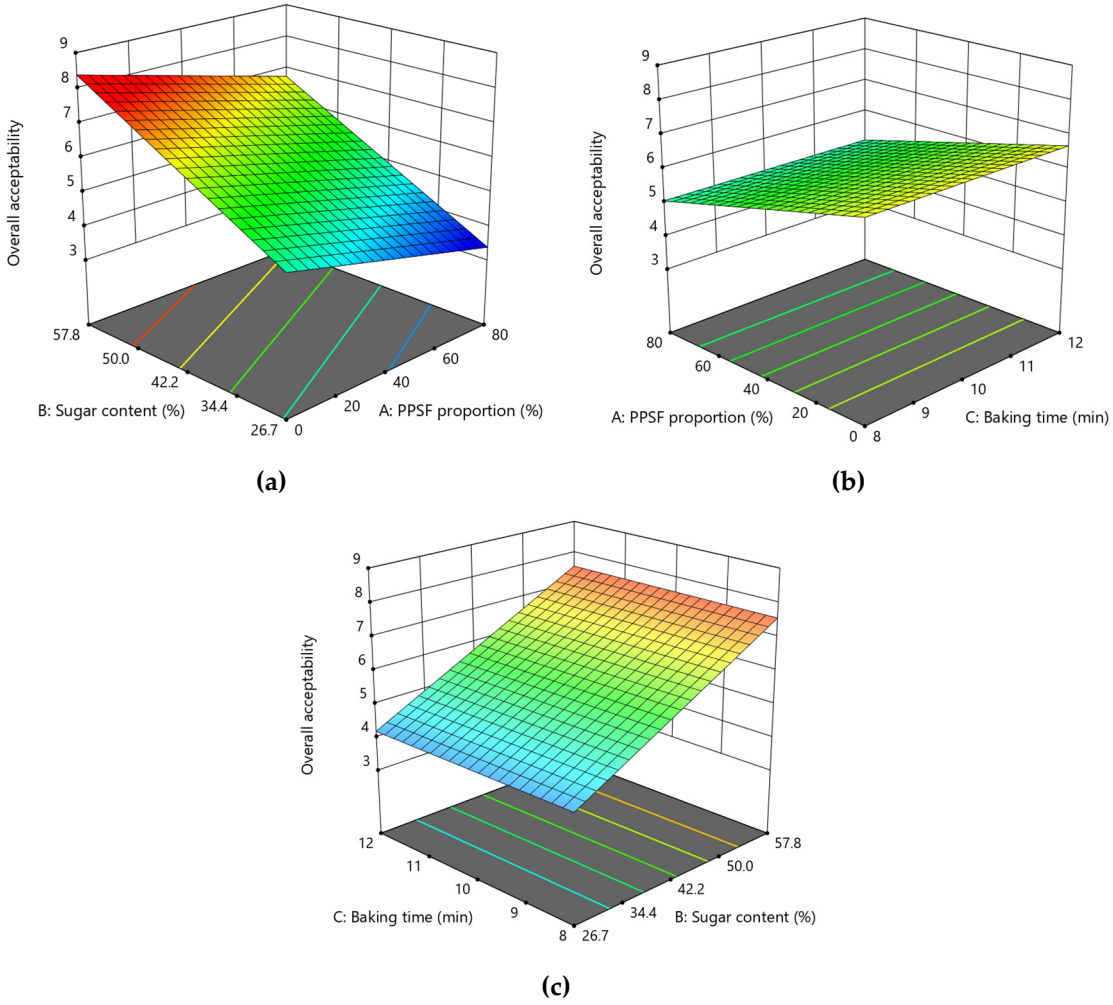


Figure S3. Three-dimensional response surface plots showing the effects of PPSF proportion (A), sugar content (B), and baking time (C) on the overall acceptability of cookies enriched with defatted pumpkin seed press cake flour (C-PPSF): (a) interaction between A and B at the centre level of C; (b) interaction between A and C at the centre level of B; (c) interaction between B and C at the centre level of A.

Table S4. Analysis of variance (ANOVA) for the linear model describing the effects of PPSF proportion, sugar content, and baking time on the bending stiffness (N/mm) of cookies enriched with defatted pumpkin seed press cake flour (C-PPSF).

Source of variation	SS	df	MS	*F*	*p*	
Model	4172.01	3	1390.67	7.78	0.0032	significant
A–PPSF proportion (%)	406.35	1	406.35	2.27	0.1557	
B–Sugar content (%)	740.11	1	740.11	4.14	0.0628	
C–Baking time (min)	3025.55	1	3025.55	16.92	0.0012	
Residual	2324.42	13	178.80			
Lack of Fit	2308.40	9	256.49	63.96	0.103	
Pure Error	16.02	4	4.01			
Cor Total	6496.43	16				

R^2 = 0.6422; Adjusted R^2 = 0.5596; Predicted R^2 = 0.4315; CV % = 44.20.

SS—sum of squares; df—degrees of freedom; MS—mean square; F—F-value; p—probability value; A—PPSF proportion (%); B—sugar content (%); C—baking time (min). Significance was evaluated at $p < 0.05$.

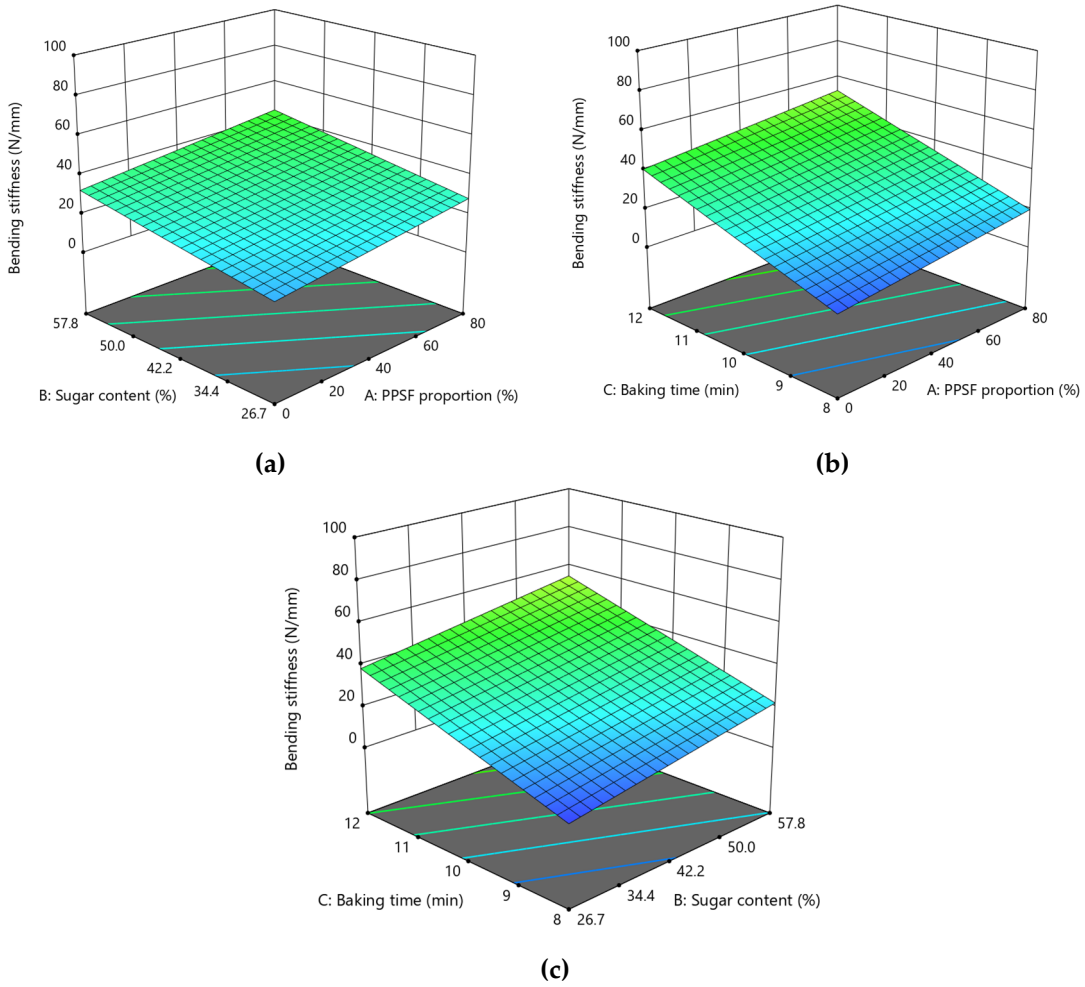


Figure S4. Three-dimensional response surface plots showing the effects of PPSF proportion (A), sugar content (B), and baking time (C) on the bending stiffness of cookies enriched with defatted pumpkin seed press cake flour (C-PPSF): (a) interaction between A and B at the centre level of C; (b) interaction between A and C at the centre level of B; (c) interaction between B and C at the centre level of A.