

SUPPLEMENTARY MATERIAL

Table S1. Analysis of variance of the chemical composition of the bread with yeast extract model

Term			Sum of squares					
			df ¹	Protein	Starch	Fat	Total sugars	Cellulose
				content	content	content	content	content
Yeast	Linear	1	32.37521*	24.2081*	0.001213*	0.5233*	0.019515	
extract	Quadratic	1	0.94307	0.0166	0.000036	0.0082	0.000532	
Salt	Linear	1	1.95178	4.5631*	0.000511*	0.2633	0.005016	
	Quadratic	1	0.05726	0.3042	0.000010	0.1028	0.002576	
Sugar	Linear	1	10.20859*	71.0519*	0.004395*	177.2305*	0.091703*	
	Quadratic	1	0.03989	0.0086	0.000012	0.1186	0.000125	
Cross	Yeast extract x salt	1	0.28602	0.8075*	0.000013	0.2316	0.002519	
product	Yeast extract x sugar	1	0.11925	0.0006	0.000019	0.1837	0.000065	
	Salt x sugar	1	0.26276	1.1901*	0.000005	0.0066	0.001184	
Error	Residual variance	4	1.12679	0.2853	0.000166	0.1719	0.010624	
	Total sum of squares	13	45.06257	123.4954	0.008122	191.2990	0.164371	
R^2			0.975	0.998	0.979	0.999	0.935	

* Statistically significant at level of significance of $p < 0.05$

¹df - degrees of freedom

Table S2. Analysis of variance of the mineral content of the bread with yeast extract model

Term			Sum of squares					
			df ¹	Zn	Cu	Mg	Ca	Fe
				content	content	content	content	content
Yeast	Linear	1	25.76898*	0.063274*	22768.06*	3788.760*	2.51990*	
extract	Quadratic	1	0.02640	0.000193	1.18	18.061	0.16242	
Salt	Linear	1	0.87241*	0.044803*	124.65	11.102	1.00901	
	Quadratic	1	0.23647*	0.005363*	125.37	4.815	0.11274	
Sugar	Linear	1	10.63616*	0.644090*	3064.43*	187.282*	41.12755*	
	Quadratic	1	0.00569	0.006569*	1.49	0.032	0.35739	
Cross	Yeast extract x salt	1	0.01551	0.002991	40.79	1.084	0.07463	
product	Yeast extract x sugar	1	0.00740	0.000805	62.19	0.334	0.09288	
	Salt x sugar	1	0.01922	0.000158	6.48	0.072	0.11740	
Error	Residual variance	4	0.03630	0.002289	117.09	26.472	0.93355	
	Total sum of squares	13	36.09714	0.955000	26361.69	4109.303	47.89944	
R^2			0.999	0.998	0.996	0.994	0.981	

* Statistically significant at level of significance of $p < 0.05$

¹df - degrees of freedom

Table S3. Analysis of variance of the instrumental colour and texture characteristics of the bread with yeast extract model

Term			Sum of squares				
			df ¹	<i>L</i> *	<i>a</i> *	<i>b</i> *	<i>C</i> *
Yeast	Linear	1	21.84897*	6.959401*	17.71083*	7.015025*	0.18770
extract	Quadratic	1	0.11319	0.004746	0.00251	0.075138	0.12848
Salt	Linear	1	2.72577	0.000039	0.68268	0.438322	0.11738
	Quadratic	1	0.00128	0.036940	0.29949	0.124771	0.53206
Sugar	Linear	1	1.71788	0.005648	0.00260	0.003103	8.50540*
	Quadratic	1	2.09682	0.000201	0.00000	0.160561	0.85973
Cross	Yeast extract x salt	1	1.58984	0.000296	0.60620	0.141092	0.13764
product	Yeast extract x sugar	1	0.68667	0.001088	0.12094	0.091165	2.16433
	Salt x sugar	1	0.02587	0.001894	0.00473	0.005933	0.08232
Error	Residual variance	4	2.21420	0.158037	0.78272	0.268628	1.23756
	Total sum of squares	13	34.92969	7.532743	22.23944	8.859743	18.26804
<i>R</i> ²			0.937	0.979	0.965	0.969	0.932

* Statistically significant at level of significance of $p < 0.05$

¹df - degrees of freedom

Table S4. Analysis of variance of the sensory characteristics of the bread with yeast extract model

Term			Sum of squares							
			Appearance					Taste		
			df ¹	Characteri stic	Crust colour intensity	Crumb colour intensity	Colour uniformi ty	Characteri stic	Sweet	Sour
Yeast	Linear	1	6.689*	47.89*	28.66*	0.25*	18.43*	107.73*	75.85*	10.66*
extract	Quadratic	1	0.01	0.15	1.39	0.08	1.23	6.99*	1.62	0.01
Salt	Linear	1	2.24*	4.56	3.11	0.08	0.85	0.78	1.54	20.55*
	Quadratic	1	0.50	2.01	0.26	0.00	0.00	1.33*	0.39	0.37
Sugar	Linear	1	1.83	7.18	1.49	0.03	6.34*	0.15	0.04	0.58
	Quadratic	1	0.05	0.00	0.03	0.02	0.45	0.77	0.50	0.00
Cross	Yeast		0.06	2.51	0.24	0.18	2.57	0.01	0.00	0.40
product	extract x salt	1								

Error	Yeast extract x sugar	1	0.03	0.07	0.16	0.03	7.62*	0.83	0.00	2.83*
	Salt x sugar	1	0.24	0.33	0.49	0.02	0.12	0.45	0.32	0.02
	Residual variance	4	0.96	6.13	4.03	0.10	2.85	0.57	2.97	1.25
	Total sum of squares	13	15.10	83.54	45.98	0.84	59.56	131.99	89.65	39.29
	R^2		0.936	0.926	0.912	0.875	0.952	0.996	0.967	0.968
			Aroma					Texture		
Term		df ¹	Characteristic	Sour	Yeast	Pungent	Firmness	Elasticity	Wall thickness	Pores uniformity
Yeast extract	Linear	1	16.55*	78.33*	53.14*	45.65*	0.00	1.79	0.00	0.84
	Quadratic	1	1.60	2.54	1.93*	0.11	1.94	2.62	0.20	0.27
Salt	Linear	1	0.44	1.19	2.44*	1.84*	0.04	0.10	0.36	0.44
	Quadratic	1	0.02	0.38	0.04	0.79	0.05	11.82*	0.54	1.79
Sugar	Linear	1	6.67*	0.00	1.35*	0.98	24.75*	9.08*	19.08*	30.06*
	Quadratic	1	0.26	0.49	0.02	0.43	0.29	13.51*	0.25	3.43
Cross product	Yeast extract x salt	1	2.70	0.02	0.02	0.05	6.06	0.10	5.01	0.78
	Yeast extract x sugar	1	9.39*	0.00	0.05	0.09	16.53*	10.01*	14.16*	5.92
	Salt x sugar	1	0.17	0.13	0.39*	1.96*	0.92	0.70	1.28	0.24
Error	Residual variance	4	2.56	2.83	0.14	0.58	7.56	4.4	5.32	3.57
	Total sum of squares	3	59.59	92.97	68.75	54.47	63.29	54.89	52.95	61.02
R^2			0.957	0.970	0.998	0.989	0.881	0.920	0.900	0.942

* Statistically significant at level of significance of $p < 0.05$

¹df - degrees of freedom

Table S5. Regression coefficients of SOP of the bread with yeast extract model for chemical composition

	Protein content	Starch content	Fat content	Total sugars content	Cellulose content
β_0	19.48823*	60.25488*	0.561246*	0.112927	2.527256*
β_1	0.66427	-0.22688	-0.006601	0.210073	-0.037756
β_{11}	0.09820	0.01303	0.000603	0.009180	-0.002332
β_2	-2.75701	2.52659	-0.038902	2.611951	0.255671

β_{22}	0.60488	-1.39415	0.008176	-0.810488	-0.128293
β_3	-0.38412	-0.86644*	-0.006511*	1.069037*	-0.028628
β_{33}	0.00505	-0.00234	0.000087	-0.008705	-0.000283
β_{12}	-0.20322	-0.34146*	-0.001364	-0.182878	0.019073
β_{13}	-0.01312	-0.00095	0.000166	-0.016288	0.000307
β_{23}	0.09739	0.20727*	0.000438	-0.015439	0.006537

* Statistically significant at $p < 0.05$ level

Table S6. Regression coefficients of SOP of the bread with yeast extract model for mineral composition

	Zn content	Cu content	Mg content	Ca content	Fe content
β_0	21.05561*	5.905732*	238.2642*	95.7865*	43.74018*
β_1	0.56339*	-0.064232*	26.4998*	11.3420*	0.63632
β_{11}	0.01643	-0.001405	-0.1098	-0.4297	-0.04075
β_2	3.05707*	0.345488	80.8633	-18.2048	1.78762
β_{22}	-1.22927*	-0.185122*	-28.3049	5.5468	-0.84878
β_3	-0.19630*	-0.082116*	-4.1025	-0.9203	-0.66209*
β_{33}	0.00191	0.002049*	0.0308	-0.0045	0.01511
β_{12}	0.04732	0.020780	-2.4269	-0.3957	-0.10380
β_{13}	-0.00327	0.001078	-0.2997	-0.0220	-0.01158
β_{23}	-0.02634	0.002390	0.4837	0.0511	0.06510

* Statistically significant at $p < 0.05$ level

Table S7. Regression coefficients of SOP of the bread with yeast extract model for instrumental colour and texture characteristics

	L^*	a^*	b^*	C^*	Bread crumb quality
β_0	64.22543*	4.427622*	19.18201*	16.53756*	-2.29909
β_1	0.25357	-0.382622	0.98349*	0.23244	-0.05341

β_{11}	-0.03402	0.006966	-0.00506	-0.02772	0.03624
β_2	0.05945	1.510915	-2.90616	2.85171	5.68811
β_{22}	-0.09049	-0.485854	1.38341	-0.89293	-1.84390
β_3	0.30854	0.013939	-0.05651	0.09072	0.65704*
β_{33}	-0.03660	-0.000359	0.00003	-0.01013	-0.02344
β_{12}	0.47912	-0.006537	-0.29585	0.14273	0.14098
β_{13}	-0.03149	-0.001254	0.01321	0.01147	-0.05590
β_{23}	0.03056	-0.008268	0.01307	-0.01463	-0.05451

32 * Statistically significant at $p < 0.05$ level

33 Table S8. Regression coefficients of SOP of the bread with yeast extract model for sensory characteristics

		β_0	β_1	β_{11}	β_2	β_{22}	β_3	β_{33}	β_{12}	β_{13}	β_{23}
Appearance	Characteristic	7.33780*	0.21220	0.00741	-4.09146	1.78537	0.19110	0.00585	0.09366	-0.00663	-0.09317
	Crust colour intensity	-5.59817	0.29817	-0.03951	11.27622	-3.58780	0.36159	0.00112	0.60195	-0.00980	-0.10902
	Crumb colour intensity	0.41220	1.13280	-0.11941	3.94146	-1.28537	-0.11860	0.00415	0.18634	-0.01537	0.13317
	Colour uniformity	8.079878*	0.350122*	-0.029366	-0.138415	0.065854	-0.077439	0.003659	-0.161463	-0.006146	0.029268
Taste	Characteristic	10.99573	-2.59073*	0.11220	-2.14451	0.10488	-0.16787	-0.01695	0.60878	0.10488*	-0.06561
	Sweet	-4.98720	0.21720	0.26741*	8.63354*	-2.91463*	0.09110	-0.02215	0.03366	-0.03463	0.12683
	Sour	-2.41707	0.52707	0.12878	5.02195	-1.58049	-0.00146	-0.01780	0.01512	0.00151	0.10756
	Salty	0.91159	0.44341	0.00976	-1.05061	1.54390	-0.16579	0.00144	-0.24098	0.06390*	0.02951
Aroma	Characteristic	9.71037	-2.72037*	0.12810	-0.43476	-0.39756	-0.22268	-0.01298	0.62439	0.11644*	-0.07780
	Sour	-2.39024	0.32024	0.16127	4.97317	-1.56829	0.07012	-0.01768	0.05707	0.00171	0.06854
	Yeast	0.548171	1.661829*	-0.140488*	1.873780	-0.512195	-0.116585	0.003878	0.058049	-0.008195	0.119024*
	Pungent	7.71768*	1.17732*	-0.03395	-6.92988	2.25122	-0.52384*	0.01651	-0.08780	0.01122	0.26610*
Texture	Firmness	7.44207	1.34293	-0.14078	-0.44695	0.58049	-1.14104	0.01380	-0.93512	0.15449*	0.18244
	Elasticity	-15.6585*	1.4185	-0.1636	25.3610*	-8.6902*	1.1993*	-0.0929*	-0.1224	-0.1202*	0.1588
	Wall thickness	11.23415	0.78585	-0.04556	-4.94390	1.86098	-1.10707	0.01261	-0.85024	0.14298*	0.21488
	Pores uniformity	-4.51707	-0.17793	0.05278	10.22195	-3.38049	1.21604*	-0.04680	0.33512	-0.09249	-0.09244

34 * Statistically significant at $p < 0.05$ level