Table S1. Changes in the free amino acids profile of beef steaks during long-term storage (mean±standard deviation).

Amino acid content (mg/kg)	Packaging variant	Storage time (days)					
		0†	**7**	**14**	**21**	**28**	**P-value**
Leucine and isoleucine	MAP80/20/0	52.56^{Aa}±6.13	50.68^{Aa}±2.09	101.23^{Ab}±10.06	118.99^{Ab}±14.46	108.59^{Ab}±38.63	<0.0001
	MAP70/20/10	52.56^{Aa}±6.13	48.87^{Aa}±2.37	99.08^{Ab}±13.14	117.66^{Ab}±22.13	110.39^{Ab}±14.92	<0.0001
	MAP60/20/20	52.56^{Aa}±6.13	50.26^{Aa}±7.17	93.19^{Ab}±13.64	108.96^{Ab}±8.32	98.83^{Ab}±13.27	<0.0001
	VP	52.56^{Aa}±6.13	47.50^{Aa}±3.82	139.88^{Bb}±17.28	185.98^{Bc}±13.96	135.35^{Ab}±18.37	<0.0001
	P-value	1.0000	0.4116	<0.0001	<0.0001	0.0501	
Methionine	MAP80/20/0	21.05^{Aa}±2.61	55.89^{Ab}±6.43	75.98^{Ac}±6.18	87.34^{Ac}±8.02	92.37^{Ac}±32.01	<0.0001
	MAP70/20/10	21.05^{Aa}±2.61	53.03^{Ab}±5.70	75.53^{Ac}±9.07	86.55^{Ac}±12.13	78.64^{Ac}±13.60	<0.0001
	MAP60/20/20	21.05^{Aa}±2.61	51.36^{Ab}±8.16	71.28^{Ac}±11.04	76.26^{Ac}±6.56	76.86^{Ac}±8.77	<0.0001
	VP	21.05^{Aa}±2.61	48.05^{Ab}±4.27	94.11^{Bc}±10.12	106.86^{Bd}±9.83	89.19^{Ac}±5.92	<0.0001
	P-value	1.0000	0.0601	<0.0001	<0.0001	0.2080	
Threonine	MAP80/20/0	41.24^{Aa}±5.99	52.04^{Aa}±9.02	90.41^{Ab}±27.86	101.07^{Ab}±17.36	90.98^{Ab}±11.56	<0.0001
	MAP70/20/10	41.24^{Aa}±5.99	51.11^{Aa}±10.04	93.31^{Ab}±11.41	110.17^{Ab}±10.40	85.45^{Ab}±5.01	<0.0001
	MAP60/20/20	41.24^{Aa}±5.99	52.75^{Aa}±5.45	77.71^{Ab}±5.23	100.25^{Ab}±13.02	89.17^{Ab}±12.04	<0.0001
	VP	41.24^{Aa}±5.99	48.22^{Aa}±6.10	123.76^{Bb}±10.82	174.55^{Bc}±25.08	117.32^{Bb}±21.23	<0.0001
	P-value	1.0000	0.6372	<0.0001	<0.0001	<0.0001	
Valine	MAP80/20/0	41.24^{Aa}±4.21	58.40^{Ab}±2.55	121.46^{Ac}±24.84	146.25^{Ac}±5.91	129.37^{Ac}±37.82	<0.0001
	MAP70/20/10	41.24^{Aa}±4.21	57.38^{Ab}±2.32	132.28^{ABc}±15.89	159.51^{Ac}±11.76	139.11^{Ac}±18.62	<0.0001
	MAP60/20/20	41.24^{Aa}±4.21	58.79^{Ab}±8.56	106.05^{Ac}±15.27	142.45^{Ad}±14.86	122.84^{Ac}±14.50	<0.0001
	VP	41.24^{Aa}±4.21	56.27^{Ab}±4.59	173.29^{Bc}±22.84	238.85^{Bd}±19.24	169.06^{Bc}±10.87	<0.0001
	P-value	1.0000	0.7309	<0.0001	<0.0001	0.0008	
Alanine	MAP80/20/0	357.61^{Aa}±41.81	383.99^{Aa}±74.35	580.95^{Ab}±170.84	629.08^{Ab}±146.52	388.48^{Aa}±95.45	<0.0001
	MAP70/20/10	357.61^{Aa}±41.81	371.44^{Aa}±68.52	580.67^{Ab}±111.11	638.63^{Ab}±75.76	344.68^{Aa}±46.71	<0.0001
	MAP60/20/20	357.61^{Aa}±41.81	366.60^{Aa}±47.98	481.48^{Ab}±90.76	594.66^{Ab}±92.32	350.67^{Aa}±42.1	<0.0001
	VP	357.61^{Aa}±41.81	313.76^{Aa}±48.13	556.11^{Ab}±70.38	658.68^{Ab}±102.68	337.97^{Aa}±49.79	<0.0001
	P-value	1.0000	0.0928	0.2455	0.6475	0.3309	
Asparagine	MAP80/20/0	28.50^{Aa}±3.48	34.64^{Aab}±7.60	42.33^{Bb}±6.79	48.57^{Bb}±8.25	44.10^{Bb}±11.54	<0.0001
	MAP70/20/10	28.50^{Aa}±3.48	34.40^{Aab}±8.64	30.78^{Bab}±13.55	42.92^{Bb}±5.37	21.80^{Ba}±16.00	0.0004
	MAP60/20/20	28.50^{Aab}±3.48	33.20^{Abc}±5.55	39.95^{Bc}±5.39	35.05^{Bbc}±8.67	19.24^{ABa}±13.98	<0.0001
	VP	28.50^{Ac}±3.48	30.40^{Ac}±5.04	19.01^{Ab}±6.37	15.68^{Ab}±7.74	5.68^{Aa}±1.16	<0.0001
	P-value	1.0000	0.5457	<0.0001	<0.0001	<0.0001	
Aspartic acid	MAP80/20/0	2.83^{Aa}±2.89	45.71^{BCb}±23.10	19.99^{Aab}±24.29	13.32^{ABa}±17.00	16.18^{Aa}±14.85	<0.0001
	MAP70/20/10	2.83^{Aa}±2.89	36.05^{Bb}±11.31	36.31^{ABb}±23.52	13.58^{ABab}±14.89	33.29^{Ab}±9.20	<0.0001
	MAP60/20/20	2.83^{Aa}±2.89	67.63^{Cb}±30.20	48.15^{Bb}±39.67	9.94^{Aa}±7.44	13.77^{Aab}±6.98	<0.0001

	VP	2.83^{Aa}±2.89	6.24^{Aa}±4.74	16.05^{Ab}±4.93	28.43^{Bc}±7.74	19.54^{Ab}±6.42	<0.0001
	P-value	1.0000	<0.0001	0.0497	0.0174	0.0509	
Glutamic acid	MAP80/20/0	74.2^{Aa}±9.14	100.02^{Ba}±17.89	158.86^{ABb}±45.65	151.20^{Ab}±30.56	177.86^{Ab}±53.39	<0.0001
	MAP70/20/10	74.2^{Aa}±9.14	104.05^{Bb}±12.52	218.17^{Bc}±75.84	185.26^{Ac}±28.52	169.91^{Abc}±115.1	<0.0001
	MAP60/20/20	74.2^{Aa}±9.14	66.39^{Aa}±25.23	127.56^{Ab}±25.12	198.86^{Ab}±27.22	203.79^{ABb}±37.46	<0.0001
	VP	74.2^{Aa}±9.14	136.56^{Cb}±10.07	353.20^{Ccd}±36.76	488.32^{Bd}±78.35	272.34^{Bc}±19.47	<0.0001
	P-value	1.0000	<0.0001	<0.0001	<0.0001	0.1066	
Glutamine	MAP80/20/0	970.53^{Ac}±159.48	773.76^{Abc}±300.21	862.72^{Abc}±312.37	654.33^{Aab}±266.52	439.72^{Ba}±170.43	<0.0001
	MAP70/20/10	970.53^{Ac}±159.48	707.75^{Ab}±289.75	637.87^{Ab}±209.35	498.99^{Aab}±168.83	164.65^{Aa}±27.09	<0.0001
	MAP60/20/20	970.53^{Ac}±159.48	691.60^{Ab}±212.29	704.17^{Ab}±312.96	488.78^{Aab}±207.87	150.72^{Aa}±159.51	<0.0001
	VP	970.53^{Ad}±159.48	625.23^{Abc}±233.11	757.05^{Ac}±199.54	434.29^{Aab}±193.50	311.48^{ABa}±117.92	<0.0001
	P-value	1.0000	0.6919	0.3389	0,1698	0.0001	
Glycine	80/20/0	98.34^{Aa}±33.22	96.14^{Aa}±34.39	128.29^{Aa}±42.82	126.87^{Aa}±39.28	103.89^{Aa}±28.90	0.1130
	70/20/10	98.34^{Aa}±33.22	93.33^{Aa}±32.57	130.48^{Aa}±37.91	137.04^{Aa}±35.44	94.24^{Aa}±36.14	0.0518
	60/20/20	98.34^{Aa}±33.22	89.11^{Aa}±27.17	117.08^{Aa}±33.77	123.66^{Aa}±34.23	90.99^{Aa}±17.06	0.0595
	VP	98.34^{Aa}±33.22	81.5^{Aa}±27.70	149.59^{Abc}±34.71	164.01^{Ac}±40.88	119.85^{Aab}±22.13	<0.0001
	P-value	1.0000	0.7611	0.3372	0.1144	0.1242	
Proline	80/20/0	22.91^{Aa}±2.65	36.52^{Aab}±5.99	67.03^{Ac}±19.17	40.70^{Aab}±14.22	43.61^{Abc}±11.61	<0.0001
	70/20/10	22.91^{Aa}±2.65	38.51^{Aab}±8.76	67.52^{Ac}±23.77	43.68^{Aab}±11.49	51.63^{Abc}±30.85	<0.0001
	60/20/20	22.91^{Aa}±2.65	38.21^{Aab}±6.47	47.26^{Ab}±10.08	40.19^{Ab}±10.09	44.01^{Ab}±12.02	<0.0001
	VP	22.91^{Aa}±2.65	36.79^{Ab}±4.40	65.04^{Ac}±5.73	47.25^{Abc}±11.55	43.51^{Abc}±5.97	<0.0001
	P-value	1.0000	0.8913	0.2293	0.5770	0.7214	
Serine	80/20/0	67.19^{Aa}±8.63	93.74^{Ab}±16.85	145.84^{Ac}±29.42	159.27^{Ac}±24.96	142.50^{Bc}±34.03	<0.0001
	70/20/10	67.19^{Aa}±8.63	95.05^{Ab}±19.67	121.18^{Abc}±39.06	152.75^{Ac}±10.96	84.39^{Aa}±45.35	<0.0001
	60/20/20	67.19^{Aa}±8.63	94.38^{Ab}±13.10	132.42^{Ac}±12.10	134.93^{Ac}±15.21	94.38^{Ab}±25.25	<0.0001
	VP	67.19^{Aa}±8.63	83.87^{Aa}±10.07	156.62^{Ab}±10.53	152.50^{Ab}±16.58	73.44^{Aa}±33.66	<0.0001
	P-value	1.0000	0.3768	0.0544	0.0588	0.0012	

†the average values presented for day 0 correspond to analyses conducted prior to meat packaging, meaning they are identical for all packaging variants. The symbols identifying significant differences are as follows: A-C – means with different letters differ significantly at $p \leq 0.05$ within packaging variants at particular day of storage; a-c – means with different letters differ significantly at $p \leq 0.05$ within storage days for particular packaging variant; nd – not detected.