



Figure S1 SB



Figure S2 E0PP_T1



Figure S3 E30PP_T1



Figure S4 E40PP_T1



Figure S5 E0PP_T2



Figure S6 E30PP_T2



Figure S7 E40PP_T2

Table S1. Results of pH and acidity determinations for dough and bread crumb

Kind of technologies	Type of preparation used	Initial pH of the dough	pH of the dough after fermentation	Initial TTA of the dough	Dough TTA after fermentation	TTA of bread crumb
				ml 1M NaOH/100g sample		
Average value and differentiating based on different technology						
SB		4.33 ^a ± 0.01	4.28 ^a ± 0.01	6.65 ^a ± 0.65	7.11 ^a ± 0.18	5.95 ^a ± 0.26
T1		4.32 ^a ± 0.03	4.32 ^b ± 0.03	6.77 ^a ± 0.60	8.26 ^b ± 0.35	6.35 ^b ± 0.31
T2		4.35 ^b ± 0.03	4.33 ^b ± 0.02	6.32 ^a ± 0.43	8.15 ^b ± 1.06	6.40 ^b ± 0.25
Average value and differentiating based on the type of preparation used						
	SB	4.33 ^a ± 0.01	4.28 ^a ± 0.01	6.65 ^a ± 0.65	7.11 ^a ± 0.18	5.95 ^a ± 0.26
	E0PP	4.33 ^a ± 0.05	4.31 ^b ± 0.03	6.63 ^a ± 0.94	7.49 ^a ± 0.79	6.28 ^b ± 0.36
	E30PP	4.32 ^a ± 0.01	4.34 ^c ± 0.01	6.71 ^a ± 0.24	8.80 ^b ± 0.22	6.50 ^b ± 0.12
	E40PP	4.37 ^b ± 0.01	4.32 ^b ± 0.01	6.29 ^a ± 0.23	8.33 ^b ± 0.48	6.35 ^b ± 0.30
Average value and differentiating based on mixed effect						
SB	SB	4.33 ^b ± 0.01	4.28 ^a ± 0.01	6.65 ^{ab} ± 0.65	7.11 ^a ± 0.18	5.95 ^a ± 0.26
T1	E0PP	4.29 ^a ± 0.0	4.28 ^a ± 0.01	7.39 ^b ± 0.47	8.13 ^b ± 0.07	5.96 ^a ± 0.01
T1	E30PP	4.32 ^b ± 0.01	4.35 ^c ± 0.01	6.65 ^{ab} ± 0.37	8.62 ^{bc} ± 0.13	6.49 ^b ± 0.15
T1	E40PP	4.37 ^c ± 0.01	4.33 ^{bc} ± 0.01	6.27 ^a ± 0.38	8.04 ^b ± 0.42	6.60 ^b ± 0.0
T2	E0PP	4.38 ^c ± 0.01	4.34 ^c ± 0.01	5.86 ^a ± 0.23	6.84 ^a ± 0.46	6.59 ^b ± 0.0
T2	E30PP	4.32 ^b ± 0.01	4.34 ^c ± 0.01	6.77 ^{ab} ± 0.15	8.98 ^c ± 0.07	6.50 ^b ± 0.14
T2	E40PP	4.37 ^c ± 0.01	4.31 ^b ± 0.01	6.32 ^a ± 0.06	8.62 ^{bc} ± 0.41	6.10 ^a ± 0.15

Table S2: Quality features of bread with the use of the tested preparations

Kind of technologies	Type of preparation used	Weight of loaf (g)	Volume (cm ³)	Yield (%)	Baking loss (%)
Average value and differentiating based on different technology					
SB		83.74 ^b ± 0.90	198.13 ^b ± 1.83	140.26 ^b ± 1.51	16.26 ^a ± 0.90
T1		83.05 ^a ± 0.49	190.25 ^a ± 2.016	139.11 ^a ± 0.82	16.95 ^b ± 0.49
T2		82.96 ^a ± 0.43	199.92 ^c ± 5.026	138.96 ^a ± 0.72	17.04 ^b ± 0.43
Average value and differentiating based on the type of preparation used					
	SB	83.74 ^b ± 0.90	198.13 ^b ± 1.83	140.26 ^b ± 1.51	16.26 ^a ± 0.90
	E0PP	82.79 ^a ± 0.44	199.42 ^b ± 7.80	138.67 ^a ± 0.74	17.21 ^b ± 0.44
	E30PP	83.15 ^a ± 0.58	193.56 ^a ± 4.84	139.27 ^a ± 0.98	16.85 ^b ± 0.58
	E40PP	83.08 ^a ± 0.23	192.29 ^a ± 3.43	139.16 ^a ± 0.38	16.92 ^b ± 0.23
Average value and differentiating based on mixed effect					
SB	SB	83.7 ^b ± 0.9	198.13 ^d ± 1.83	140.26 ^b ± 1.51	16.26 ^a ± 0.90
T1	E0PP	82.98 ^{ab} ± 0.52	192.16 ^b ± 1.91	139.00 ^{ab} ± 0.88	17.01 ^{ab} ± 0.52
T1	E30PP	83.04 ^{ab} ± 0.67	189.21 ^a ± 2.25	139.10 ^{ab} ± 1.13	16.96 ^{ab} ± 0.68
T1	E40PP	83.11 ^{ab} ± 0.32	189.39 ^a ± 0.89	139.22 ^{ab} ± 0.53	16.89 ^{ab} ± 0.32
T2	E0PP	82.59 ^a ± 0.24	206.68 ^e ± 1.16	138.33 ^a ± 0.40	17.41 ^b ± 0.24
T2	E30PP	83.25 ^{ab} ± 0.53	197.89 ^d ± 0.77	139.45 ^{ab} ± 0.89	16.75 ^{ab} ± 0.53
T2	E40PP	83.05 ^{ab} ± 0.11	195.17 ^c ± 2.16	139.10 ^{ab} ± 0.19	16.95 ^{ab} ± 0.11

Table S3: Color parameters for obtained bread

Kind of technologies	Type of preparation used	Crumb			Crust		
		L*	a *	b*	L*	a *	b*
Average value and differentiating based on different technology							
SB		60.70 ^c ± 0.39	4.00 ^a ± 0.03	19.25 ^a ± 0.06	52.62 ^c ± 0.32	16.82 ^c ± 0.19	36.82 ^c ± 0.14
T1		54.57 ^a ± 3.61	6.44 ^c ± 1.71	23.17 ^c ± 2.77	45.57 ^a ± 1.91	16.42 ^b ± 1.59	29.39 ^b ± 3.53
T2		54.97 ^b ± 4.29	6.37 ^b ± 1.78	22.65 ^b ± 2.57	49.39 ^b ± 5.29	14.01 ^a ± 3.33	27.43 ^a ± 2.14
Average value and differentiating based on the type of preparation used							
	SB	60.70 ^d ± 0.39	4.00 ^a ± 0.03	19.25 ^a ± 0.06	52.62 ^c ± 0.32	16.82 ^c ± 0.19	36.82 ^d ± 0.14
	E0PP	60.16 ^c ± 0.78	4.03 ^a ± 0.10	19.24 ^a ± 0.20	52.97 ^c ± 3.95	12.76 ^a ± 3.93	28.13 ^b ± 4.51
	E30PP	53.40 ^b ± 0.28	7.15 ^b ± 0.08	24.30 ^b ± 0.35	44.43 ^a ± 0.74	15.77 ^b ± 1.48	27.11 ^a ± 2.05
	E40PP	50.88 ^a ± 0.31	8.01 ^c ± 0.07	25.02 ^c ± 0.39	45.67 ^b ± 1.90	16.59 ^c ± 0.95	29.43 ^c ± 0.77
Average value and differentiating based on mixed effect							
SB	SB	60.70 ^d ± 0.39	4.00 ^a ± 0.03	19.25 ^{ab} ± 0.06	52.62 ^e ± 0.32	16.82 ^c ± 0.19	36.82 ^f ± 0.14
T1	E0PP	59.27 ^c ± 0.35	4.14 ^b ± 0.05	19.42 ^b ± 0.14	48.18 ^d ± 0.27	17.54 ^d ± 0.09	33.60 ^e ± 0.15
T1	E30PP	53.43 ^b ± 0.16	7.23 ^d ± 0.04	24.62 ^d ± 0.06	45.06 ^b ± 0.14	14.37 ^b ± 0.16	25.19 ^b ± 0.40
T1	E40PP	50.99 ^a ± 0.30	7.96 ^e ± 0.06	25.46 ^e ± 0.14	43.91 ^a ± 1.10	17.54 ^d ± 0.52	30.09 ^d ± 0.43
T2	E0PP	60.71 ^d ± 0.24	3.97 ^a ± 0.06	19.13 ^a ± 0.15	55.96 ^f ± 0.29	9.78 ^a ± 0.08	24.71 ^a ± 0.17
T2	E30PP	53.37 ^b ± 0.34	7.10 ^c ± 0.05	24.09 ^c ± 0.30	43.81 ^a ± 0.50	17.16 ^c ± 0.39	29.03 ^c ± 0.48
T2	E40PP	50.82 ^a ± 0.32	8.04 ^f ± 0.05	24.74 ^d ± 0.12	47.02 ^c ± 1.04	15.88 ^b ± 0.39	28.94 ^c ± 0.56

Table S4: . Changes in the moisture content of the tested bread during storage

Kind of technologies	Type of preparation used	Crumb moisture (g/100g)		
		Baking day	After 24 hrs	After 48 hrs
Average value and differentiating based on different technology				
SB		43.14 ^c ± 0.51	41.75 ^c ± 0.36	41.20 ^c ± 0.14
T1		42.38 ^b ± 0.30	41.11 ^a ± 0.61	39.83 ^a ± 0.82
T2		41.70 ^a ± 0.40	41.44 ^{ab} ± 0.42	40.59 ^b ± 0.55
Average value and differentiating based on the type of preparation used				
	SB	43.14 ^c ± 0.51	41.75 ^c ± 0.36	41.20 ^c ± 0.14
	E0PP	41.94 ^a ± 0.53	40.73 ^a ± 0.38	40.10 ^{ab} ± 0.26
	E30PP	41.92 ^a ± 0.55	41.14 ^b ± 0.29	39.84 ^a ± 0.85
	E40PP	42.21 ^a ± 0.40	41.79 ^c ± 0.31	40.62 ^{bc} ± 0.91
Average value and differentiating based on mixed effect				
SB	SB	43.14 ^c ± 0.51	41.75 ^c ± 0.36	41.20 ^c ± 0.14
T1	E0PP	42.34 ^b ± 0.32	40.50 ^a ± 0.44	40.20 ^b ± 0.08
T1	E30PP	42.44 ^b ± 0.23	40.96 ^{ab} ± 0.26	39.07 ^a ± 0.02
T1	E40PP	42.37 ^b ± 0.40	41.72 ^c ± 0.40	40.11 ^b ± 1.09
T2	E0PP	41.54 ^a ± 0.35	40.96 ^{ab} ± 0.11	40.03 ^b ± 0.34
T2	E30PP	41.53 ^a ± 0.29	41.37 ^{bc} ± 0.10	40.60 ^{bc} ± 0.21
T2	E40PP	42.05 ^{ab} ± 0.38	41.85 ^c ± 0.24	41.15 ^c ± 0.21

Table S5: Changes crumb hardness of the tested bread during storage

Kind of technologies	Type of preparation used	Hardness (N)		
		Baking day	After 24 hrs	After 48 hrs
Average value and differentiating based on different technology				
SB		10.20 ^b ± 1.27	19.98 ^{ab} ± 0.09	27.16 ^a ± 0.12
T1		10.55 ^b ± 0.94	21.40 ^b ± 0.86	27.52 ^a ± 4.88
T2		8.23 ^a ± 0.31	17.89 ^a ± 2.12	22.98 ^a ± 1.27
Average value and differentiating based on the type of preparation used				
	SB	10.20 ^a ± 1.27	19.98 ^{ab} ± 0.09	27.16 ^a ± 0.12
	E0PP	9.72 ^a ± 1.98	18.93 ^a ± 4.08	27.01 ^a ± 6.48
	E30PP	9.29 ^a ± 1.51	19.58 ^{ab} ± 1.32	23.66 ^a ± 1.96
	E40PP	9.16 ^a ± 0.75	20.41 ^b ± 1.10	25.08 ^a ± 3.09
Average value and differentiating based on mixed effect				
SB	SB	10.20 ^{bc} ± 1.27	19.98 ^{bc} ± 0.09	27.16 ^a ± 0.12
T1	E0PP	11.34 ^c ± 1.12	22.45 ^d ± 0.30	30.79 ^a ± 8.25
T1	E30PP	10.50 ^c ± 0.90	20.65 ^c ± 0.14	24.80 ^a ± 0.02
T1	E40PP	9.81 ^{abc} ± 0.14	21.09 ^{cd} ± 0.26	26.97 ^a ± 3.78
T2	E0PP	8.10 ^a ± 0.12	15.42 ^a ± 0.59	23.24 ^a ± 1.07
T2	E30PP	8.08 ^a ± 0.46	18.52 ^b ± 0.80	22.51 ^a ± 2.05
T2	E40PP	8.52 ^{ab} ± 0.01	19.73 ^{bc} ± 1.30	23.18 ^a ± 0.19

Table S6: Changes crumb cohesiveness of the tested bread during storage

Kind of technologies	Type of preparation used	Cohesiveness (-)		
		Baking day	After 24 hrs	After 48 hrs
Average value and differentiating based on different technology				
SB		0.77 ^a ± 0.02	0.60 ^a ± 0.01	0.52 ^a ± 0
T1		0.78 ^a ± 0.02	0.62 ^b ± 0.01	0.52 ^a ± 0.02
T2		0.78 ^a ± 0.01	0.59 ^a ± 0.02	0.49 ^a ± 0.02
Average value and differentiating based on the type of preparation used				
	SB	0.77 ^a ± 0.02	0.60 ^a ± 0.01	0.52 ^a ± 0
	E0PP	0.77 ^a ± 0.02	0.59 ^a ± 0.02	0.50 ^a ± 0.02
	E30PP	0.79 ^b ± 0.01	0.61 ^a ± 0.02	0.51 ^a ± 0.01
	E40PP	0.79 ^b ± 0.02	0.61 ^a ± 0.02	0.50 ^a ± 0.04
Average value and differentiating based on mixed effect				
SB	SB	0.77 ^{ab} ± 0.02	0.60 ^{ab} ± 0.01	0.52 ^{ab} ± 0.0
T1	E0PP	0.75 ^a ± 0.01	0.61 ^{ab} ± 0.01	0.51 ^{ab} ± 0.01
T1	E30PP	0.79 ^{bc} ± 0.01	0.63 ^b ± 0	0.51 ^{ab} ± 0.02
T1	E40PP	0.80 ^c ± 0.01	0.62 ^b ± 0.02	0.53 ^b ± 0.02
T2	E0PP	0.77 ^{abc} ± 0	0.58 ^a ± 0.02	0.49 ^{ab} ± 0.03
T2	E30PP	0.79 ^{bc} ± 0.0	0.59 ^{ab} ± 0.0	0.51 ^{ab} ± 0.0
T2	E40PP	0.78 ^{abc} ± 0.0	0.60 ^{ab} ± 0.01	0.47 ^a ± 0.03

Table S7: Chemical composition of obtained breads

Kind of technolo gies	Type of preparat ion used	Protein	Fat	Ash	Dietary fiber		
		(g/ 100 g d.m.)					
		Average value and differentiating based on different technology					
SB		10.69 ^a ± 0.03	1.92 ^c ± 0.02	2.77 ^a ± 0.01	2.49 ^a ± 0.06	2.28 ^a ± 0.03	4.77 ^a ± 0.03
T1		10.75 ^a ± 0.10	1.88 ^b ± 0.13	2.82 ^b ± 0.05	3.04 ^b ± 0.35	2.78 ^b ± 0.30	5.82 ^b ± 0.65
T2		10.87 ^b ± 0.05	1.79 ^a ± 0.10	2.84 ^c ± 0.06	3.13 ^c ± 0.36	2.83 ^b ± 0.30	5.96 ^c ± 0.66
Average value and differentiating based on the type of preparation used							
	SB	10.69 ^a ± 0.03	1.92 ^c ± 0.02	2.77 ^a ± 0.01	2.49 ^a ± 0.06	2.28 ^a ± 0.03	4.77 ^a ± 0.03
	E0PP	10.81 ^b ± 0.16	1.82 ^{ab} ± 0.17	2.77 ^a ± 0.01	2.71 ^b ± 0.05	2.44 ^b ± 0.05	5.15 ^b ± 0.08
	E30PP	10.78 ^b ± 0.07	1.81 ^a ± 0.10	2.81 ^b ± 0.01	3.03 ^c ± 0.06	2.86 ^c ± 0.03	5.90 ^c ± 0.06
	E40PP	10.84 ^b ± 0.02	1.87 ^{bc} ± 0.11	2.90 ^c ± 0.03	3.50 ^d ± 0.05	3.11 ^d ± 0.05	6.61 ^d ± 0.09
Average value and differentiating based on mixed effect							
SB	SB	10.69 ^a ± 0.03	1.92 ^c ± 0.02	2.77 ^a ± 0.01	2.49 ^a ± 0.06	2.28 ^a ± 0.03	4.77 ^a ± 0.03
T1	E0PP	10.68 ^a ± 0.11	1.96 ^c ± 0.03	2.76 ^a ± 0.02	2.68 ^b ± 0.03	2.41 ^b ± 0.02	5.09 ^b ± 0.02
T1	E30PP	10.73 ^{ab} ± 0.05	1.72 ^{ab} ± 0.02	2.81 ^b ± 0	2.98 ^c ± 0.02	2.87 ^c ± 0.01	5.84 ^d ± 0.02
T1	E40PP	10.86 ^c ± 0.02	1.96 ^c ± 0.04	2.87 ^c ± 0	3.46 ^d ± 0.02	3.07 ^d ± 0.01	6.53 ^f ± 0.01
T2	E0PP	10.93 ^d ± 0.01	1.68 ^a ± 0.05	2.78 ^a ± 0	2.75 ^b ± 0.02	2.48 ^b ± 0.05	5.22 ^c ± 0.03
T2	E30PP	10.84 ^{bc} ± 0.04	1.89 ^c ± 0.02	2.82 ^b ± 0.01	3.08 ^c ± 0.05	2.87 ^c ± 0.05	5.95 ^e ± 0
T2	E40PP	10.83 ^{bc} ± 0.02	1.78 ^b ± 0.02	2.92 ^d ± 0	3.55 ^e ± 0.02	3.14 ^c ± 0.04	6.69 ^g ± 0.02

