Influence of fermented faba bean flour on the nutritional, technological and sensory quality of fortified pasta

Supporting material

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Figure 1S. Kinetics of water absorption of pasta at 25°C. WP, pasta made with wheat semolina; FP, Faba bean pasta including 10, 30, or 50% (wt/wt) unfermented faba bean flour in replacement of semolina (FP10, FP30, and FP50, respectively); FFP, fermented faba bean pasta, including the fermented dough made with faba bean flour as ingredient. Fermented faba bean dough was added to the final dough to obtain the same semolina replacement percentages of the FP samples: 10, 30, and 50% (FFP10, FFP30, and FFP50). Data are the means of three independent analyses. [a-e] Values observed at the same time, having different superscript letters, differ significantly ($P<0.05$). Bars of standard deviations are also represented.

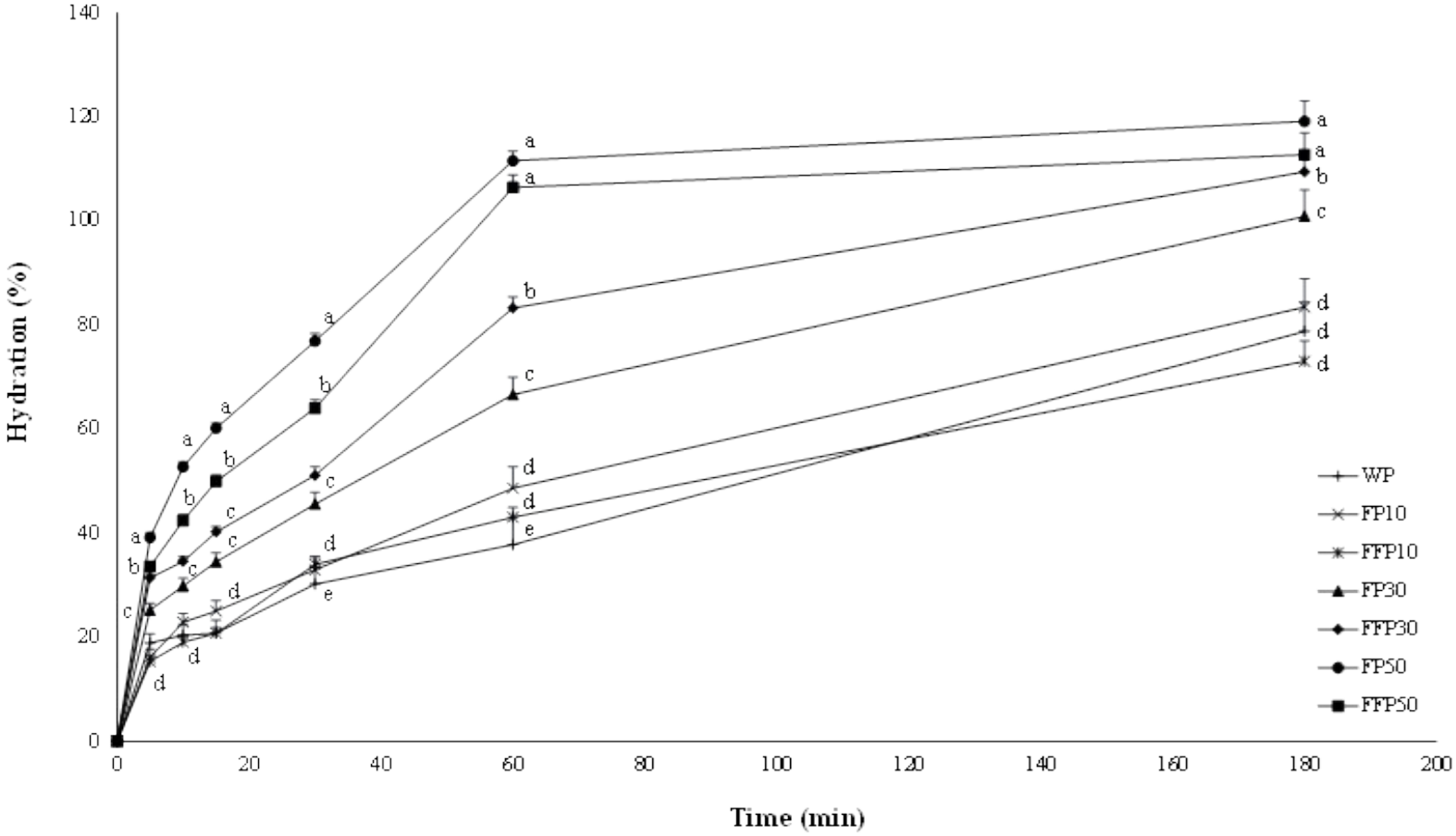

Table 1S. Drying cycle used for making pasta.

	Ventilation			Recovery		
Cycle	Temperature (°C)	U.R.%	Time (min)	Temperature (°C)	U.R.%	Time (min)
1	55	85	3	55	85	2
2	55	85	3	55	85	2
3	55	70	3	55	70	4
4	55	70	3	40	65	8
5	55	70	3	40	60	10
6	55	70	3	40	60	10
7	55	70	3	40	55	10
8	55	70	3	40	55	12
9	55	70	3	40	55	12
10	55	70	3	40	55	12
11	55	70	3	40	55	12
12	55	70	3	40	55	14
13	55	70	3	40	50	14
14	55	70	3	40	50	16
15	55	70	3	40	50	16
16	55	70	3	40	50	16
17	55	65	3	40	50	16
18	55	65	3	40	50	18
19	55	65	3	40	50	18
20	55	65	3	40	45	18
21	55	65	3	40	45	18
22	55	60	3	35	45	18
23	55	60	3	35	45	18
24	50	55	3	35	45	18
25	45	55	3	35	15	18
26	40	40	3	15	15	10
27	15	10	20	15	10	20
28	15	10	20	15	10	20

Table 2S. TTA and pH of pasta doughs before extrusion and cooked pasta. WP, pasta made with wheat semolina; FP, Faba bean pasta including 10, 30, or 50% (wt/wt) unfermented faba bean flour in replacement of semolina (FP10, FP30, and FP50, respectively); FFP, fermented faba bean pasta, including the fermented dough made with faba bean flour as ingredient. Fermented faba bean dough was added to the final dough to obtain the same semolina replacement percentages of the FP samples: 10, 30, and 50% (FFP10, FFP30, and FFP50).

	WP	**FP10**	**FFP10**	**FP30**	**FFP30**	**FP50**	**FFP50**
Pasta doughs before extrusion							
pH	6.12 ± 0.08 ^{a}	6.20 ± 0.05 ^{a}	5.58 ± 0.04 ^{b}	6.10 ± 0.03 ^{a}	4.64 ± 0.02 ^{c}	6.21 ± 0.09 ^{a}	4.50 ± 0.06 ^{c}
TTA	2.00 ± 0.21 ^{e}	3.20 ± 0.19 ^{d}	5.40 ± 0.32 ^{c}	5.40 ± 0.25 ^{c}	10.60 ± 0.43 ^{b}	5.20 ± 0.22 ^{c}	18.40 ± 0.27 ^{a}
Pasta cooked until OCT							
pH	6.65 ± 0.10 ^{a}	6.42 ± 0.09 ^{a}	5.95 ± 0.08 ^{b}	6.45 ± 0.07 ^{a}	5.16 ± 0.06 ^{c}	6.46 ± 0.08 ^{a}	4.99 ± 0.04 ^{c}
TTA	0.50 ± 0.09 ^{e}	0.80 ± 0.10 ^{d}	1.60 ± 0.16 ^{c}	1.00 ± 0.15 ^{d}	2.60 ± 0.22 ^{b}	1.00 ± 0.16 ^{d}	4.00 ± 0.19 ^{a}

The data are the means of three independent experiments ± standard deviations (n = 3).

$^{a\text{-}e}$ Values in the same row with different superscript letters differ significantly ($P<0.05$)

Table 3S. Attribute intensity mean ratings in descriptive analysis of pasta samples, n=13*2. Letters O and F denote odor and flavor, respectively.

		WP	FP30	FFP30	FP50	FFP50
O-intensity	Mean	2,3	3,5	6,6	5,6	8,5
	SEM	0,4	0,4	0,5	0,4	0,3
	x)	a	a	b	b	c
O-pungent	Mean	0,9	2,1	7,2	4,7	8,7
	SEM	0,3	0,4	0,6	0,5	0,3
	x)	a	a	c	b	c
Color	Mean	0,4	3,0	5,4	5,7	8,1
	SEM	0,1	0,3	0,4	0,4	0,3
	x)	a	b	c	c	d
Heterogenity	Mean	2,4	4,0	4,7	5,5	5,9
	SEM	0,7	0,5	0,5	0,4	0,5
	x)	a	ab	b	b	b
F-pungent	Mean	0,6	1,6	6,8	4,7	8,4
	SEM	0,2	0,3	0,5	0,6	0,5
	x)	a	a	c	b	c
F-wheaty	Mean	8,5	5,3	2,3	3,2	1,3
	SEM	0,4	0,5	0,5	0,4	0,4
	x)	d	c	ab	b	a
Aftertaste	Mean	1,0	1,8	6,5	4,3	8,1
	SEM	0,2	0,3	0,5	0,5	0,5
	x)	a	a	c	b	c
Breakdown	Mean	2,4	5,9	5,8	7,8	8,8
	SEM	0,6	0,5	0,4	0,3	0,3
	x)	a	b	b	c	c
Softness	Mean	8,5	4,9	4,5	3,3	2,7
	SEM	0,3	0,5	0,4	0,5	0,6
	x)	c	b	ab	ab	a
Toothpacking	Mean	3,3	3,4	6,6	4,3	5,4
	SEM	0,6	0,4	0,4	0,5	0,6
	x)	a	ab	c	ab	bc

SEM (Standard Error of the Mean)
x) The letters $^{a-d}$ indicate significant difference between the samples in the attribute in question ($p<0.05$), based on Tukey's HSD.

Table 4S. Results of analysis of variance performed on data: main effects and interactions (sample, replicate).

ATTRIBUTE [a]		sample	replicate	sample * replicate
	df; df_{err} [b]	4; 48	1; 12	4; 48
O-intensity	F [c]	27,7	2,7	2,0
	[d]	***		
O-pungent	F	45,6	0,4	0,2
		***		
Color	F	60,3	2,0	0,4
		***		
Heterogenity	F	8,9	0,0	0,3
		***		
F-pungent	F	35,6	0,2	0,2
		***		
F-wheaty	F	26,5	0,4	0,6
		***		
Aftertaste	F	33,6	1,0	0,4
		***		
Breakdown	F	26,9	1,3	0,3
		***		
Softness	F	24,8	7,6	0,5
		***	*	
Toothpacking	F	5,6	0,5	0,5
		**		

a) O= odour and F=flavour attributes
b) df = degrees of freedom; dferr = error degrees of freedom
c) F-ratio
d) *** $p<0.001$; ** $p<0.01$; * $p<0.05$