

Table S1. Changes in physicochemical and microbial properties during kisra fermentation with or without *P. pentosaceus* strains.

Groups ¹	Physicochemical and microbial properties	Processing stages						
		First fermentation			Second fermentation			Baked
		0 h	24 h	48 h	0 h	6 h	12 h	kisra
Blank group	LAB count (log CFU/g)	ND ²	ND	ND	ND	ND	ND	ND
	pH	6.89±0.01 ^{3,a}	6.90±0.01 ^a	6.89±0.01 ^a	6.91±0.01 ^a	6.91±0.01 ^a	6.91±0.01 ^a	6.83±0.01 ^b
	a _w	0.988±0.001 ^b	0.988±0.001 ^b	0.988±0.001 ^b	0.991±0.001 ^a	0.991±0.001 ^a	0.991±0.001 ^a	0.978±0.001 ^c
	TTA (%) ⁴	0.13±0.01 ^b	0.13±0.02 ^b	0.12±0.01 ^b	0.13±0.01 ^b	0.13±0.02 ^b	0.13±0.02 ^b	0.24±0.01 ^a
Control group	LAB count (log CFU/g)	6.00±0.08 ^c	9.12±0.21 ^a	9.06±0.09 ^a	7.93±0.05 ^b	9.13±0.00 ^a	9.19±0.01 ^a	ND ^d
	pH	7.03±0.01 ^a	4.28±0.36 ^b	3.76±0.05 ^b	6.15±0.04 ^a	3.98±0.02 ^b	3.78±0.00 ^b	3.64±0.00 ^b
	a _w	0.987±0.000 ^a	0.987±0.002 ^a	0.983±0.004 ^a	0.984±0.004 ^a	0.984±0.000 ^a	0.985±0.000 ^a	0.973±0.002 ^b
	TTA (%) ⁴	0.15±0.01 ^c	0.89±0.17 ^{cd}	1.28±0.03 ^b	0.23±0.00 ^e	0.80±0.06 ^d	1.02±0.03 ^c	1.98±0.00 ^a
K-B21 group	LAB count (log CFU/g)	7.33±0.08 ^c	9.00±0.00 ^{ab}	8.37±0.13 ^c	7.59±0.10 ^d	8.91±0.03 ^b	9.12±0.08 ^a	ND ^f
	pH	6.85±0.05 ^a	3.87±0.01 ^c	3.79±0.00 ^f	6.08±0.03 ^b	4.40±0.02 ^c	3.99±0.00 ^d	3.82±0.01 ^{cf}
	a _w	0.988±0.007 ^a	0.991±0.002 ^a	0.985±0.002 ^{ab}	0.990±0.004 ^a	0.984±0.000 ^{ab}	0.981±0.001 ^{bc}	0.975±0.000 ^c
	TTA (%)	0.10±0.00 ^c	0.88±0.05 ^b	0.86±0.08 ^b	0.14±0.00 ^e	0.47±0.05 ^d	0.72±0.03 ^c	1.38±0.01 ^a
K-B01 group	LAB count (log CFU/g)	6.88±0.14 ^c	9.05±0.04 ^c	8.39±0.04 ^{ab}	8.08±0.88 ^b	9.00±0.033 ^a	9.08±0.03 ^a	ND ^d
	pH	6.88±0.00 ^a	3.85±0.00 ^c	3.80±0.00 ^f	6.08±0.01 ^b	4.40±0.04 ^c	4.00±0.01 ^d	3.81±0.01 ^{cf}
	a _w	0.988±0.006 ^{ab}	0.986±0.003 ^{ab}	0.987±0.001 ^{ab}	0.989±0.001 ^a	0.984±0.001 ^{ab}	0.983±0.003 ^{ab}	0.979±0.010 ^b
	TTA (%)	0.09±0.00 ^c	0.85±0.03 ^{bc}	0.90±0.03 ^b	0.14±0.00 ^e	0.48±0.03 ^d	0.71±0.05 ^c	1.57±0.14 ^a

¹ Blank group (kisra non-fermented), control group (kisra naturally fermented without an inoculum), K-B21 group (kisra fermented with *P. pentosaceus* K-B21), K-B01 group (kisra fermented with *P. pentosaceus* K-B01).

² ND: not detected.

³ Data represented as mean±standard deviation from triplicate measurements. Values in the same row followed by different letters (a-f) are significantly different ($p < 0.05$).

⁴ Total titratable acidity expressed as lactic acid percentage.

Table S2. Changes in biogenic amine content during kisra fermentation with or without *P. pentosaceus* strains.

Groups ¹	Processing stages		Biogenic amine content (mg/kg) ²							
			TRP	PHE	PUT	CAD	HIS	TYR	SPD	SPM
Blank group	First Fermentation	0 h	ND ³	ND	2.23±0.17 ^{4,ab}	ND	3.95±0.23 ^a	ND	5.16±0.05 ^c	5.95±0.10 ^c
		24 h	ND	ND	2.17±0.08 ^b	ND	3.61±0.08 ^b	ND	5.10±0.03 ^c	5.95±0.04 ^c
		48 h	ND	ND	2.18±0.04 ^b	ND	3.68±0.13 ^{ab}	ND	5.09±0.01 ^c	5.99±0.06 ^c
	Second Fermentation	0 h	ND	ND	1.82±0.09 ^c	ND	3.05±0.09 ^c	ND	5.79±0.02 ^b	6.47±0.12 ^b
		6 h	ND	ND	1.61±0.21 ^c	ND	3.11±0.13 ^c	ND	5.80±0.04 ^b	6.42±0.09 ^b
		12 h	ND	ND	1.67±0.16 ^c	ND	3.12±0.05 ^c	ND	5.79±0.01 ^b	6.33±0.16 ^b
	Baked	kisra	ND	ND	2.52±0.06 ^a	ND	3.35±0.18 ^{bc}	ND	6.80±0.04 ^a	8.16±0.21 ^a
Control group	First Fermentation	0 h	ND	ND	2.32±0.44 ^d	ND ^e	2.00±0.43 ^d	ND ^g	7.38±1.55 ^b	4.65±0.11 ^{cd}
		24 h	ND	ND	96.00±4.78 ^b	135.08±6.08 ^b	4.16±0.05 ^c	42.40±0.63 ^b	7.60±0.46 ^b	3.24±0.14 ^c
		48 h	ND	ND	127.81±24.38 ^a	158.45±9.73 ^a	39.68±0.47 ^a	68.21±1.28 ^a	8.02±0.22 ^b	3.89±0.59 ^{de}
	Second Fermentation	0 h	ND	ND	13.34±0.23 ^{cd}	12.58±0.61 ^d	2.24±1.21 ^d	6.64±0.69 ^f	6.82±0.23 ^b	4.77±0.15 ^{cd}
		6 h	ND	ND	17.02±1.08 ^{cd}	15.08±0.85 ^{cd}	4.18±0.17 ^c	17.65±0.44 ^c	7.01±1.12 ^b	5.16±0.03 ^c
		12 h	ND	ND	14.53±1.15 ^{cd}	15.31±2.91 ^{cd}	4.08±0.10 ^c	8.55±0.49 ^e	7.23±0.56 ^b	7.71±0.20 ^b
	Baked	kisra	ND	ND	25.40±5.18 ^c	25.68±0.78 ^c	7.78±0.81 ^b	12.39±0.03 ^c	10.46±0.04 ^a	9.42±1.18 ^a
K-B21 group	First Fermentation	0 h	ND	ND	2.01±0.17 ^a	ND	4.72±0.17 ^{ab}	ND	5.01±0.22 ^{de}	5.03±0.55 ^a
		24 h	ND	ND	2.57±0.50 ^a	ND	3.39±0.10 ^{bc}	ND	4.80±0.10 ^c	2.32±0.02 ^b
		48 h	ND	ND	2.95±0.28 ^a	ND	3.24±0.36 ^c	ND	5.51±0.51 ^{cde}	2.07±0.91 ^b
	Second Fermentation	0 h	ND	ND	1.46±0.03 ^a	ND	3.81±0.06 ^{abc}	ND	6.06±0.30 ^{cd}	5.38±0.33 ^a
		6 h	ND	ND	1.69±0.29 ^a	ND	3.88±0.16 ^{abc}	ND	6.56±0.73 ^{bc}	4.48±0.53 ^a
		12 h	ND	ND	1.46±2.06 ^a	ND	5.05±0.51 ^a	ND	7.49±0.32 ^b	2.60±0.08 ^b
	Baked	kisra	ND	ND	2.66±0.98 ^a	ND	5.11±1.36 ^a	ND	9.50±0.79 ^a	4.24±0.68 ^a
K-B01 group	First Fermentation	0 h	ND	ND	2.00±0.29 ^{bcd}	ND	5.10±0.23 ^a	ND	5.01±0.30 ^{de}	2.67±0.21 ^{bc}
		24 h	ND	ND	3.02±0.16 ^a	ND	3.89±0.16 ^{bc}	ND	4.89±0.53 ^c	2.07±0.01 ^c
		48 h	ND	ND	2.92±0.12 ^a	ND	3.16±0.19 ^c	ND	5.70±1.09 ^{cde}	1.70±0.27 ^c
	Second Fermentation	0 h	ND	ND	1.50±0.15 ^d	ND	3.96±0.19 ^{bc}	ND	6.14±0.03 ^{bcd}	4.83±0.50 ^a
		6 h	ND	ND	2.06±0.19 ^{bc}	ND	4.10±0.63 ^{bc}	ND	7.00±0.10 ^{ab}	3.48±1.05 ^b
		12 h	ND	ND	1.96±0.40 ^{cd}	ND	4.46±0.57 ^{ab}	ND	6.77±0.53 ^{abc}	2.21±0.15 ^c
	Baked	kisra	ND	ND	2.53±0.11 ^{ab}	ND	5.32±0.59 ^a	ND	7.90±0.10 ^a	3.67±0.14 ^b

¹ Blank group (kisra non-fermented), control group (kisra naturally fermented without an inoculum), K-B21 group (kisra fermented with *P. pentosaceus* K-B21), K-B01 group (kisra fermented with *P. pentosaceus* K-B01).

² TRP: tryptamine; PHE: β-phenylethylamine; PUT: putrescine; CAD: cadaverine; HIS: histamine; TYR: tyramine; SPD: spermidine; SPM: spermine.

³ ND: not detected.

⁴ Data represented as mean±standard deviation from triplicate measurements. Values in the same column of the same group followed by different letters (a-g) are significantly different ($p < 0.05$).

Table S3. Changes in antioxidant indices during kiswa fermentation with or without *P. pentosaceus* strains.

Groups ¹	Processing stages		Antioxidant indices	
			DPPH (%)	TPC (µg/g) ²
Blank group	First Fermentation	0 h	70.88±0.87 ^{3,b}	1325.10±19.72 ^{bc}
		24 h	70.93±0.83 ^b	1337.73±16.67 ^{bc}
		48 h	70.70±0.94 ^b	1341.37±11.30 ^b
	Second Fermentation	0 h	70.74±0.74 ^b	1321.17±25.42 ^{bc}
		6 h	70.52±0.47 ^b	1309.62±19.82 ^c
		12 h	70.22±0.59 ^b	1319.64±18.61 ^{bc}
	Baked	kisra	74.47±0.65 ^a	1522.24±19.81 ^a
Control group	First Fermentation	0 h	71.00±7.10 ^b	1230.60±58.20 ^c
		24 h	83.67±0.50 ^a	1301.20±49.90 ^{bc}
		48 h	80.50±2.60 ^a	1395.30±8.30 ^b
	Second Fermentation	0 h	77.83±0.20 ^{ab}	1274.70±37.40 ^{bc}
		6 h	80.17±2.60 ^a	1312.90±74.90 ^{bc}
		12 h	81.67±0.50 ^a	1257.10±112.30 ^{bc}
	Baked	kisra	83.17±1.20 ^a	1977.60±25.00 ^a
K-B21 group	First Fermentation	0 h	72.50±0.20 ^c	1321.80±4.02 ^b
		24 h	79.33±0.00 ^{ab}	1233.50±45.80 ^b
		48 h	79.33±2.80 ^{ab}	1248.20±83.20 ^b
	Second Fermentation	0 h	77.67±4.20 ^{bc}	1230.60±66.60 ^b
		6 h	79.00±3.30 ^{ab}	1233.50±54.10 ^b
		12 h	83.17±0.70 ^a	1342.40±25.00 ^b
	Baked	kisra	84.17±0.20 ^a	1851.20±70.70 ^a
K-B01 group	First Fermentation	0 h	75.50±0.70 ^d	1374.70±4.20 ^b
		24 h	82.50±0.20 ^{ab}	1351.20±4.20 ^b
		48 h	81.33±0.00 ^{bc}	1162.90±137.30 ^c
	Second Fermentation	0 h	74.00±0.94 ^d	1145.30±29.10 ^c
		6 h	79.67±1.41 ^c	1289.40±33.30 ^{bc}
		12 h	81.17±0.70 ^{bc}	1236.50±74.90 ^{bc}
	Baked	kisra	83.50±0.20 ^a	1880.50±128.90 ^a

¹ Blank group (kiswa non-fermented), control group (kiswa naturally fermented without an inoculum), K-B21 group (kiswa fermented with *P. pentosaceus* K-B21), K-B01 group (kiswa fermented with *P. pentosaceus* K-B01).

² Total phenolic content is expressed as µg of gallic acid equivalent/g of wet samples.

³ Data represented as mean±standard deviation from triplicate measurements. Values in the same column of the same group followed by different letters (a-d) are significantly different ($p < 0.05$).