

Supplementary information

Table S1. Significance of analysed factors (different growing conditions of lentils, different fermentation conditions and different duration of fermentation) and their interaction in lentil wholemeal pH, chromaticity and lactic acid bacteria (LAB) viable counts.

Factor	Dependent variable	p
Growing conditions	pH	<0.001
	L*	<0.001
	a*	<0.001
	b*	<0.001
	LAB count	0.093
Type of fermentation	pH	<0.001
	L*	<0.001
	a*	<0.001
	b*	<0.001
	LAB count	0.005
Fermentation duration	pH	<0.001
	L*	<0.001
	a*	<0.001
	b*	<0.001
	LAB count	<0.001
Growing conditions *	pH	<0.001
Type of fermentation	L*	<0.001
	a*	0.005
	b*	0.002
	LAB count	0.682
Growing conditions *	pH	0.312
Fermentation duration	L*	<0.001
	a*	<0.001
	b*	<0.001
	LAB count	0.030
Type of fermentation *	pH	<0.001
Fermentation duration	L*	<0.001
	a*	<0.001
	b*	<0.001
	LAB count	0.522
Growing conditions *	pH	<0.001
Type of fermentation *	L*	<0.001
Fermentation duration	a*	0.829
	b*	<0.001
	LAB count	0.522

L* – lightness; a* – redness (–a* greenness); b* – yellowness (–b* blueness); LAB – lactic acid bacteria, p – significance. The

influence of analysed factors and their interaction are significant, when $p \leq 0.05$. In **Bold** letters are marked significant values.

Table S2. Pearson correlations between the pH, chromaticity and lactic acid bacteria (LAB) viable counts in lentil wholemeal samples.

		pH	L*	a*	b*	LAB count
pH	Pearson Correlation	1	0.763**	-0.679**	0.839**	-0.886**
	Sig. (2-tailed)		<0.001	<0.001	<0.001	<0.001
L*	Pearson Correlation	0.763**	1	-0.871**	0.955**	-0.710**
	Sig. (2-tailed)	<0.001		<0.001	<0.001	<0.001
a*	Pearson Correlation	-0.679**	-0.871**	1	-0.797**	0.552**
	Sig. (2-tailed)	<0.001	<0.001		<0.001	<0.001
b*	Pearson Correlation	0.839**	0.955**	-0.797**	1	-0.799**
	Sig. (2-tailed)	<0.001	<0.001	<0.001		<0.001
LAB count	Pearson Correlation	-0.886**	-0.710**	0.552**	-0.799**	1
	Sig. (2-tailed)	<0.001	<0.001	<0.001	<0.001	

L* – lightness; a* – redness (–a* greenness); b* – yellowness (–b* blueness); LAB – lactic acid bacteria; ** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed). In **Bold** letters are marked significant values.

Table S3. Significance of analysed factors (different growing conditions of lentils, different fermentation conditions and different duration of fermentation) and their interaction in lentil wholemeal free amino acids (FAA) and γ -aminobutyric acid (GABA).

Factor	Dependent variable	p
Growing conditions	Arginine	<0.001
	Glutamine	<0.001
	Asparagine	<0.001
	Glutamic acid	0.008
	Serine	<0.001
	Aspartic acid	<0.001
	Threonine	<0.001
	Glycine	0.259
	Alanine	0.683
	GABA	<0.001
	Proline	<0.001
	Valine	<0.001
	Methionine	<0.001
	Phenylalanine	0.006
	Leucine/Isoleucine	<0.001
	Lysine	<0.001

	histidine	0.363
	Tyrosine	0.048
Type of fermentation	Arginine	<0.001
	Glutamine	<0.001
	Asparagine	<0.001
	Glutamic acid	0.002
	Serine	<0.001
	Aspartic acid	<0.001
	Threonine	<0.001
	Glycine	<0.001
	Alanine	<0.001
	GABA	<0.001
	Proline	<0.001
	Valine	<0.001
	Methionine	0.032
	Phenylalanine	<0.001
	Leucine/Isoleucine	<0.001
	Lysine	<0.001
	histidine	<0.001
	Tyrosine	<0.001
Fermentation duration	Arginine	<0.001
	Glutamine	<0.001
	Asparagine	0.197
	Glutamic acid	<0.001
	Serine	<0.001
	Aspartic acid	<0.001
	Threonine	<0.001
	Glycine	<0.001
	Alanine	0.008
	GABA	0.042
	Proline	<0.001
	Valine	<0.001
	Methionine	<0.001
	Phenylalanine	<0.001
	Leucine/Isoleucine	<0.001
	Lysine	<0.001
	histidine	1.000
	Tyrosine	<0.001
Growing conditions * Type of fermentation	Arginine	<0.001
	Glutamine	<0.001
	Asparagine	0.003
	Glutamic acid	0.532
	Serine	<0.001
	Aspartic acid	0.156
	Threonine	0.003
	Glycine	<0.001

	Alanine	<0.001
	GABA	<0.001
	Proline	0.275
	Valine	0.310
	Methionine	0.912
	Phenylalanine	0.192
	Leucine/Isoleucine	0.039
	Lysine	0.042
	histidine	0.007
	Tyrosine	0.668
	Arginine	<0.001
	Glutamine	<0.001
	Asparagine	0.618
	Glutamic acid	0.446
	Serine	0.002
	Aspartic acid	0.150
	Threonine	0.265
	Glycine	0.891
	Alanine	0.273
	GABA	0.003
Growing conditions * Fermentation duration	Proline	0.200
	Valine	0.006
	Methionine	0.075
	Phenylalanine	<0.001
	Leucine/Isoleucine	<0.001
	Lysine	<0.001
	histidine	0.013
	Tyrosine	<0.001
	Arginine	<0.001
	Glutamine	<0.001
	Asparagine	0.391
	Glutamic acid	0.003
	Serine	<0.001
	Aspartic acid	<0.001
	Threonine	0.047
	Glycine	0.005
	Alanine	0.116
	GABA	0.017
	Proline	0.919
	Valine	<0.001
Type of fermentation * Fermentation duration	Methionine	<0.001
	Phenylalanine	0.004
	Leucine/Isoleucine	<0.001
	Lysine	0.175
	histidine	<0.001
	Tyrosine	<0.001

Growing conditions * Type of fermentation * Fermentation duration	Arginine	<0.001
	Glutamine	<0.001
	Asparagine	0.274
	Glutamic acid	0.073
	Serine	0.383
	Aspartic acid	0.062
	Threonine	0.553
	Glycine	0.683
	Alanine	0.637
	GABA	<0.001
	Proline	0.919
	Valine	0.672
	Methionine	0.137
	Phenylalanine	0.219
	Leucine/Isoleucine	0.415
	Lysine	0.407
	histidine	0.230
	Tyrosine	0.004

The influence of analysed factors and their interaction are significant when $p \leq 0.05$. In **Bold** letters are marked significant values.

Table S4. Pearson correlations between the free amino acids (FAA) and γ -aminobutyric acid (GABA) and pH and lactic acid bacteria (LAB) viable counts in lentil whole samples.

		pH	LAB count
Arginine	Pearson Correlation	0.784**	-0.892**
	Sig. (2-tailed)	<0.001	<0.001
Glutamine	Pearson Correlation	0.479**	-0.593**
	Sig. (2-tailed)	0.003	<0.001
Asparagine	Pearson Correlation	0.103	-0.232
	Sig. (2-tailed)	0.548	0.173
Glutamic acid	Pearson Correlation	-0.828**	0.869**
	Sig. (2-tailed)	<0.001	<0.001
Serine	Pearson Correlation	-0.010	-0.136
	Sig. (2-tailed)	0.952	0.429
Aspartic acid	Pearson Correlation	-0.758**	0.794**
	Sig. (2-tailed)	<0.001	<0.001
Threonine	Pearson Correlation	-0.670**	0.609**
	Sig. (2-tailed)	<0.001	<0.001
Glycine	Pearson Correlation	-0.431**	0.369*
	Sig. (2-tailed)	0.009	0.027
Alanine	Pearson Correlation	-0.360*	0.329*
	Sig. (2-tailed)	0.031	0.050
GABA	Pearson Correlation	-0.032	0.049
	Sig. (2-tailed)	0.851	0.778
Proline	Pearson Correlation	-0.608**	0.472**

	Sig. (2-tailed)	<0.001	0.004
Valine	Pearson Correlation	-0.709**	0.693**
	Sig. (2-tailed)	<0.001	<0.001
Methionine	Pearson Correlation	-0.222	0.122
	Sig. (2-tailed)	0.194	0.477
Phenylalanine	Pearson Correlation	-0.740**	0.714**
	Sig. (2-tailed)	<0.001	<0.001
Leucine/Isoleucine	Pearson Correlation	-0.808**	0.783**
	Sig. (2-tailed)	<0.001	<0.001
Lysine	Pearson Correlation	-0.661**	0.537**
	Sig. (2-tailed)	<0.001	<0.001
Histidine	Pearson Correlation	0.204	-0.314
	Sig. (2-tailed)	0.232	0.062
Tyrosine	Pearson Correlation	-0.442**	0.433**
	Sig. (2-tailed)	0.007	0.008
LAB – lactic acid bacteria; ** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed). In Bold letters are marked significant values.			

Table S5. Pearson correlations between biogenic amines (BA) and free amino acids (FAA), γ -aminobutyric acid (GABA), pH and lactic acid bacteria (LAB) viable counts in lentil whole samples.

		PHE	PUT	SPRMD	SPRM
pH	Pearson Correlation	-0.015	-0.719**	0.178	-0.243
	Sig. (2-tailed)	0.931	<0.001	0.299	0.154
LAB count	Pearson Correlation	0.219	0.761**	-0.008	0.331*
	Sig. (2-tailed)	0.199	<0.001	0.961	0.049
Arginine	Pearson Correlation	-0.214	-0.686**	0.235	-0.152
	Sig. (2-tailed)	0.211	<0.001	0.168	0.376
Glutamine	Pearson Correlation	-0.481**	-0.341*	0.271	0.354*
	Sig. (2-tailed)	0.003	0.042	0.110	0.034
Asparagine	Pearson Correlation	-0.405*	0.268	-0.073	-0.002
	Sig. (2-tailed)	0.014	0.114	0.671	0.992
Glutamic acid	Pearson Correlation	0.069	0.734**	-0.020	0.461**
	Sig. (2-tailed)	0.690	<0.001	0.908	0.005
Serine	Pearson Correlation	-0.410*	-0.085	0.105	0.430**
	Sig. (2-tailed)	0.013	0.621	0.541	0.009
Aspartic acid	Pearson Correlation	0.046	0.881**	-0.056	0.229
	Sig. (2-tailed)	0.791	<0.001	0.745	0.180
Threonine	Pearson Correlation	-0.250	0.594**	0.041	0.563**
	Sig. (2-tailed)	0.142	<0.001	0.814	<0.001
Glycine	Pearson Correlation	-0.343*	0.349*	0.315	0.644**
	Sig. (2-tailed)	0.041	0.037	0.062	<0.001
Alanine	Pearson Correlation	-0.237	0.312	0.314	0.787**
	Sig. (2-tailed)	0.164	0.064	0.062	<0.001
GABA	Pearson Correlation	-0.329	-0.066	0.424**	0.566**
	Sig. (2-tailed)	0.050	0.700	0.010	<0.001
Proline	Pearson Correlation	-0.342*	0.468**	0.023	0.604**
	Sig. (2-tailed)	0.041	0.004	0.895	<0.001
Valine	Pearson Correlation	-0.097	0.614**	0.065	0.520**
	Sig. (2-tailed)	0.575	<0.001	0.704	0.001

Methionine	Pearson Correlation	-0.112	0.319	0.356*	0.211
	Sig. (2-tailed)	0.516	0.058	0.033	0.217
Phenylalanine	Pearson Correlation	-0.046	0.639**	0.067	0.610**
	Sig. (2-tailed)	0.792	<0.001	0.697	<0.001
Leucine/Isoleucine	Pearson Correlation	-0.016	0.697**	0.027	0.425**
	Sig. (2-tailed)	0.925	<0.001	0.876	0.010
Lysine	Pearson Correlation	-0.298	0.583**	0.052	0.575**
	Sig. (2-tailed)	0.077	<0.001	0.763	<0.001
histidine	Pearson Correlation	-0.339*	-0.181	0.316	0.668**
	Sig. (2-tailed)	0.043	0.290	0.061	<0.001
Tyrosine	Pearson Correlation	0.043	0.313	0.534**	0.466**
	Sig. (2-tailed)	0.804	0.063	<0.001	0.004

TRIP – tryptamine; PHE – phenylethylamine; PUT – putrescine; CAD – cadaverine; HIS – histamine; TYR – tyramine; SPRMD – spermidine; SPRM – spermine; BA – biogenic amines; LAB – lactic acid bacteria. ** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed). In **Bold** letters are marked significant values.

Table S6. Significance of analysed factors (different growing conditions of lentils, different fermentation conditions and different duration of fermentation) and their interaction in biogenic amine (BA) lentil wholemeal concentration.

Factor	Dependent variable	p
Growing conditions	PHE	<0.001
	PUT	<0.001
	SPRMD	<0.001
	SPRM	0.170
Type of fermentation	PHE	<0.001
	PUT	<0.001
	SPRMD	0.066
	SPRM	<0.001
Fermentation duration	PHE	<0.001
	PUT	<0.001
	SPRMD	<0.001
	SPRM	0.249
Growing conditions * Type of fermentation	PHE	<0.001
	PUT	0.019
	SPRMD	<0.001
	SPRM	<0.001
Growing conditions * Fermentation duration	PHE	<0.001
	PUT	0.102
	SPRMD	<0.001
	SPRM	0.040
Type of fermentation * Fermentation duration	PHE	<0.001
	PUT	0.117
	SPRMD	<0.001
	SPRM	0.220
Growing conditions * Type of fermentation * Fermentation duration	PHE	<0.001
	PUT	0.154
	SPRMD	<0.001
	SPRM	0.937

p – significance; TRIP – tryptamine; PHE – phenylethylamine; PUT – putrescine; CAD – cadaverine; HIS – histamine; TYR – tyramine; SPRMD – spermidine; SPRM – spermine; BA – biogenic amines. The influence of analysed factors and their interaction are significant when $p \leq 0.05$. In **Bold** letters are marked significant values.

Table S7. Pearson correlations between fatty acids (FA) and pH and lactic acid bacteria (LAB) viable counts in lentil wholemeal samples.

		pH	LAB count
C14:0	Pearson Correlation	0.159	0.148
	Sig. (2-tailed)	0.355	0.388
C16:0	Pearson Correlation	0.212	-0.028
	Sig. (2-tailed)	0.214	0.873
C18:0	Pearson Correlation	-0.112	0.363*
	Sig. (2-tailed)	0.517	0.030
C18:1	Pearson Correlation	-0.041	0.014
	Sig. (2-tailed)	0.811	0.937
C18:2	Pearson Correlation	-0.069	0.026
	Sig. (2-tailed)	0.689	0.879
C18:3 α	Pearson Correlation	0.031	-0.032
	Sig. (2-tailed)	0.857	0.855
C20:0	Pearson Correlation	-0.235	0.249
	Sig. (2-tailed)	0.168	0.142
C20:1	Pearson Correlation	-0.240	0.088
	Sig. (2-tailed)	0.159	0.608
C14:0 - tetradecanoic acid; C16:0 - palmitic acid; C18:0 - stearic acid; C18:1 - 9-octadecenoic acid; C18:2 - linoleic acid; C18:3 α - α -linolenic acid; C20:0 - eicosanoic acid; C20:1 - cis-11-eicosenoic acid. ** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed). In Bold letters are marked significant values.			

Table S8. Significance of analysed factors (different growing conditions of lentils, different fermentation conditions and different duration of fermentation) and their interaction in fatty acid (FA) lentil wholemeal composition.

Factor	Dependent variable	p
Growing conditions	C14:0	<0.001
	C16:0	0.325
	C18:0	0.824
	C18:1	<0.001
	C18:2	0.015
	C18:3 α	<0.001
	C20:0	<0.001
	C20:1	<0.001
Type of fermentation	C14:0	<0.001
	C16:0	<0.001
	C18:0	0.364
	C18:1	<0.001
	C18:2	0.398
	C18:3 α	<0.001
	C20:0	<0.001
	C20:1	<0.001
Fermentation duration	C14:0	<0.001
	C16:0	<0.001
	C18:0	0.276
	C18:1	0.881
	C18:2	0.125
	C18:3 α	0.005
	C20:0	<0.001
	C20:1	<0.001
Growing conditions * Type of fermentation	C14:0	<0.001
	C16:0	0.022
	C18:0	<0.001
	C18:1	0.376
	C18:2	0.113
	C18:3 α	0.031
	C20:0	<0.001
	C20:1	<0.001
Growing conditions * Fermentation duration	C14:0	<0.001
	C16:0	<0.001
	C18:0	<0.001
	C18:1	0.552
	C18:2	0.003
	C18:3 α	0.012
	C20:0	<0.001
	C20:1	<0.001
	C14:0	<0.001

Type of fermentation * Fermentation duration	C16:0	0.005
	C18:0	<0.001
	C18:1	0.376
	C18:2	0.102
	C18:3 α	0.005
	C20:0	<0.001
	C20:1	<0.001
Growing conditions * Type of fermentation * Fermentation duration	C14:0	<0.001
	C16:0	<0.001
	C18:0	<0.001
	C18:1	0.020
	C18:2	0.002
	C18:3 α	0.012
	C20:0	<0.001
	C20:1	<0.001
p – significance; C14:0 - tetradecanoic acid; C16:0 - palmitic acid; C18:0 - stearic acid; C18:1 - 9-octadecenoic acid; C18:2 - linoleic acid; C18:3 α - α -linolenic acid; C20:0 - eicosanoic acid; C20:1 - cis-11-eicosenoic acid. The influence of analysed factors and their interaction are significant, when $p \leq 0.05$. In Bold letters are marked significant values.		

Table S9. Volatile compound (VC) profile (% from the total volatile compounds content) in lentil whole samples.

Name	LR						L					
	C _{LR} SM	C _{LR} SS	SMF _{LR} 24	SMF _{LR} 48	SSF _{LR} 24	SSF _{LR} 48	C _L SM	C _L SS	SMF _L 24	SMF _L 48	SSF _L 24	SSF _L 48
Hexanal	23.82 ±2.25 ^{a,D}	15.50 ±1.51 ^{b,B}	nd	nd	18.71 ±1.38 ^{b,C}	9.57 ±0.47 ^{b,A}	30.77 ±1.74 ^{b,D}	8.70 ±0.656 ^{a,B}	7.95 ±0.262 ^{a,B}	nd	10.52 ±0.56 ^{a,C}	3.12 ±0.23 ^{a,A}
2-Hexenal	4.89 ±0.48 ^{a,C}	3.15 ±0.242 ^{a,B}	nd	nd	0.546 ±0.029 ^{a,A}	nd	11.16 ±0.49 ^{b,A}	nd	nd	nd	nd	nd
1-Hexanol	35.03 ±1.33 ^{b,D}	31.10 ±1.66 ^{b,C,D}	5.44 ±0.368 ^{a,A}	22.22 ±2.06 ^{b,B}	28.54 ±1.19 ^{a,C}	32.85 ±1.20 ^{b,D}	21.41 ±1.46 ^{a,B}	25.05 ±0.917 ^{a,C}	26.72 ±1.25 ^{b,C}	14.00 ±0.996 ^{a,A}	32.17 ±2.14 ^{b,D}	27.45 ±1.67 ^{a,C}
Hept-2-enal	nd	nd	0.252 ±0.015 ^{a,A}	nd	0.830 ±0.079 ^{a,B}	1.20 ±0.107 ^{a,C}	nd	nd	0.415 ±0.022 ^{b,A}	nd	nd	nd
Benzaldehyde	nd	nd	0.629 ±0.06 ^{a,A}	nd	3.53 ±0.276 ^{a,B}	6.05 ±0.366 ^{a,C}	nd	nd	nd	nd	5.52 ±0.433 ^{b,A}	6.63 ±0.49 ^{a,B}
Vinyl amyl carbinol	nd	nd	nd	nd	0.357 ±0.036 ^{a,A}	nd	nd	nd	nd	nd	0.573 ±0.042 ^{b,B}	0.462 ±0.024 ^{a,A}
Hexanoic acid	4.75 ±0.311 ^{a,A}	5.93 ±0.471 ^{a,B}	5.58 ±0.328 ^{a,B}	14.00 ±0.724 ^{b,E}	9.13 ±0.396 ^{b,C}	11.45 ±0.519 ^{b,D}	5.74 ±0.479 ^{b,B}	7.13 ±0.633 ^{a,C}	4.98 ±0.294 ^{a,A,B}	4.80 ±0.206 ^{a,A}	4.63 ±0.144 ^{a,A}	6.61 ±0.358 ^{a,C}

Acetic acid hexyl ester	nd	nd	nd	nd	1.13 ±0.063 b,A	2.26 ±0.072 b,B	nd	nd	nd	nd	0.782 ±0.027 a,A	1.07 ±0.098 a,B
Oct-3-en-2- one	nd	nd	nd	nd	nd	0.544 ±0.042 a,A	nd	nd	nd	nd	0.562 ±0.05 a,A	0.499 ±0.031 a,A
Phenylacet aldehyde	0.14 ±0.013 a,A	nd	nd	nd	1.25 ±0.095 b,B	1.39 ±0.086 a,B	0.280 ±0.015 b,A	nd	1.83 ±0.085 ^{b, D}	nd	0.995 ±0.034 a,B	1.34 ±0.108 a,C
Oct-2-enal	0.402 ±0.031 a,A	0.590 ±0.044 ^{a,B}	0.936 ±0.065 a,C	nd	2.41 ±0.132 b,E	1.55 ±0.079 b,D	0.371 ±0.029 a,A	nd	1.74 ±0.173 b,C	nd	1.96 ±0.144 a,C	1.35 ±0.074 a,B
Octahydro- 2,3'-bifuran	nd	nd	nd	nd	0.606 ±0.041 a,A	nd	nd	nd	nd	nd	0.879 ±0.081 ^{b,} A	nd
Nonanal	0.961 ±0.072 a,A	1.63 ±0.104 ^{a,B}	1.83 ±0.1 ^{a,C}	3.27 ±0.116 ^{b,D}	1.93 ±0.114 b,C	1.92 ±0.125 ^{a,C}	1.23 ±0.122 b,A	1.67 ±0.132 ^{a,B}	1.65 ±0.093 a,B	2.89 ±0.113 a,C	1.70 ±0.068 a,B	1.89 ±0.175 a,B
Phenethyl alcohol	nd	nd	nd	nd	2.18 ±0.117 a,A	5.58 ±0.282 a,B	nd	nd	3.70 ±0.368 ^{a,B}	8.08 ±0.788 a,D	2.85 ±0.194 b,A	5.44 ±0.198 a,C
2- ethylhexan oic acid	0.673 ±0.065 a,A	1.14 ±0.074 ^{a,B}	2.00 ±0.066 a,D	nd	1.91 ±0.183 b,D	1.50 ±0.058 b,C	0.945 ±0.065 b,A	2.74 ±0.186 ^{b,D}	2.06 ±0.202 a,C	3.27 ±0.099 a,E	1.28 ±0.121 a,B	0.81 ±0.073 a,A

Non-2-enal	2.86 ±0.167 ^{a,C}	1.86 ±0.106 ^{a,B}	1.07 ±0.091 ^{a,A}	nd	2.17 ±0.214 ^{b,B}	0.930 ±0.067 ^{b,A}	4.90 ±0.314 ^{b,D}	1.76 ±0.174 ^{a,C}	1.81 ±0.18 ^{b,C}	nd	0.955 ±0.053 ^{a,B}	0.651 ±0.047 ^{b,A}
Octanoic acid	0.876 ±0.041 ^{a,A}	1.81 ±0.115 ^{a,C}	5.48 ±0.548 ^{a,E}	3.96 ±0.292 ^{a,D}	3.80 ±0.312 ^{b,D}	1.52 ±0.084 ^{a,B}	1.41 ±0.131 ^{b,A}	4.71 ±0.193 ^{b,D}	5.40 ±0.325 ^{a,E}	4.47 ±0.433 ^{a,D}	2.77 ±0.108 ^{a,C}	1.88 ±0.165 ^{b,B}
Decanal	0.532 ±0.021 ^{b,A}	0.720 ±0.025 ^{a,B}	0.844 ±0.08 ^{a,BC}	nd	0.727 ±0.044 ^{a,B}	0.839 ±0.066 ^{b,C}	0.419 ±0.031 ^{a,A}	1.22 ±0.09 ^{b,E}	0.884 ±0.043 ^{a,D}	1.33 ±0.059 ^{a,E}	0.756 ±0.036 ^{a,C}	0.683 ±0.022 ^{a,B}
Nona-2,4-dienal	nd	nd	nd	nd	nd	0.323 ±0.032 ^{a,A}	nd	nd	nd	nd	nd	0.306 ±0.022 ^{a,A}
Dec-2-enal	nd	nd	nd	nd	0.201 ±0.015 ^{a,A}	nd	nd	nd	nd	nd	0.294 ±0.016 ^{b,B}	0.171 ±0.015 ^{a,A}
Nonanoic acid	0.510 ±0.038 ^{a,A}	2.05 ±0.186 ^{a,B}	2.61 ±0.22 ^{a,C}	nd	3.50 ±0.334 ^{a,D}	2.37 ±0.203 ^{b,BC}	0.789 ±0.079 ^{b,A}	5.33 ±0.258 ^{b,E}	2.53 ±0.245 ^{a,C}	5.05 ±0.213 ^{a,E}	3.55 ±0.153 ^{a,D}	1.83 ±0.18 ^{a,B}
Anethole	nd	nd	nd	nd	nd	nd	3.15 ±0.272 ^{a,C}	4.56 ±0.25 ^{a,D}	7.68 ±0.372 ^{a,F}	6.62 ±0.658 ^{a,E}	1.27 ±0.045 ^{a,A}	2.19 ±0.08 ^{a,B}
Tridecane	nd	nd	nd	nd	nd	nd	nd	nd	0.346 ±0.024 ^{a,B}	nd	nd	0.234 ±0.014 ^{a,A}
Undecanal	0.133 ±0.006 ^{a,A}	nd	nd	1.52 ±0.07 ^{a,C}	nd	0.451 ±0.019 ^{b,B}	nd	nd	nd	nd	0.090 ±0.006 ^{a,A}	0.240 ±0.015 ^{a,B}

2-methylprop anoic acid 2,2- dimethyl-1- (2-hydroxy- 1- methylethy l)propyl ester	2.07 ±0.087 a,A	2.56 ±0.199 ^{a,B} C	4.72 ±0.162 b,D	nd	2.91 ±0.244 ^{a,C}	2.41 ±0.09 ^{b,B}	1.91 ±0.169 ^{a,B}	3.32 ±0.319 ^{b,C}	3.29 ±0.165 ^{a,C}	5.86 ±0.389 a,D	2.88 ±0.272 a,C	1.22 ±0.094 ^{a,A}
Eugenol	nd	nd	nd	nd	nd	nd	1.36 ±0.109 a,A	12.1 ±0.925 ^{a,E}	7.69 ±0.498 ^{a,D}	12.50 ±0.757 a,E	2.14 ±0.144 a,B	3.72 ±0.282 ^{a,C}
2-methylprop anoic acid 2-ethyl-3- hydroxyhe xyl ester	2.53 ±0.119 a,A	2.88 ±0.197 ^{a,B}	5.28 ±0.419 b,D	4.91 ±0.329 a,D	3.57 ±0.252 ^{a,C}	3.42 ±0.228 b,C	2.57 ±0.218 ^{a,B}	5.57 ±0.38 ^{b,D}	4.33 ±0.257 ^{a,C}	9.02 ±0.829 b,E	4.17 ±0.375 a,C	1.63 ±0.1 ^{a,A}
β- Damasceno ne	2.67 ±0.189 b,A	3.52 ±0.351 ^{b,B}	6.17 ±0.607 ^{a,C}	31.39 ±2.488 b,D	2.54 ±0.13 ^{a,A}	3.92 ±0.379 ^{b,B}	1.88 ±0.095 ^{a,B}	1.60 ±0.12 ^{a,A}	5.61 ±0.308 ^{a,D}	7.86 ±0.274 a,E	2.65 ±0.25 ^{a,C}	2.97 ±0.205 ^{a,C}
1- Tetradecen e	0.404 ±0.016 a,A	1.13 ±0.057 ^{a,C}	nd	nd	0.983 ±0.036 ^{a,B}	nd	nd	2.28 ±0.223 ^{b,A}	nd	nd	nd	nd
Tetradecan e	0.333 ±0.011 a,A	0.430 ±0.03 ^{a,B}	1.14 ±0.037 b,D	3.08 ±0.129 ^{b,E}	0.443 ±0.037 ^{a,B}	0.939 ±0.047 ^{a,C}	0.389 ±0.034 b,A	0.635 ±0.03 ^{b,C}	0.852 ±0.084 ^{a,D}	2.38 ±0.113 a,F	0.542 ±0.035 b,B	1.09 ±0.062 ^{b,E}

Dodecanal	0.612 ±0.047 a,A	1.44 ±0.114 a,C	1.05 ±0.064 ^{a,B}	2.75 ±0.127 b,D	1.28 ±0.087 b,C	1.35 ±0.077 b,C	0.676 ±0.064 ^{a,A}	2.41 ±0.108 ^{b,F}	1.33 ±0.056 b,D	1.71 ±0.104 a,E	1.13 ±0.041 a,C	0.879 ±0.041 ^{a,B}
3-(2,2,6-Trimethyl-7-oxabicyclo[4.1.0]heptan-1-yl)prop-2-enal	0.63 ±0.031 b,A	1.06 ±0.096 a,B	1.53 ±0.078 ^{a,C}	6.20 ±0.437 b,D	1.24 ±0.106 a,B	1.55 ±0.146 b,C	0.369 ±0.034 a,A	1.52 ±0.047 ^{b,D}	1.43 ±0.101 a,D	3.51 ±0.235 a,E	1.18 ±0.042 a,C	0.811 ±0.061 ^{a,B}
Tridecanal	0.13 ±0.004 ^{a,A}	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd
((Butoxymethyl)ethoxy)methyl-ethoxy)-propanol	1.02 ±0.039 a,A	1.64 ±0.128 a ^B	2.03 ±0.1 ^{a,C}	4.47 ±0.306 ^{a,E}	2.20 ±0.15 ^{b,C}	2.63 ±0.101 b,D	1.85 ±0.069 ^{b,C}	4.02 ±0.176 ^{b,E}	2.40 ±0.208 b,D	5.95 ±0.215 b,F	1.63 ±0.115 a,B	1.20 ±0.086 a,A
Hexadecane	0.354 ±0.035 a,A	0	0.900 ±0.085 ^{a,C}	2.20 ±0.193 ^{a,E}	0.640 ±0.032 a,B	1.04 ±0.049 b,D	nd	nd	0.936 ±0.06 ^{a,C}	nd	0.821 ±0.045 b,B	0.521 ±0.034 a,A
Tetradecanal	0.628 ±0.061 a,A	0.800 ±0.043 b,B	1.68 ±0.11 ^{a,C}	nd	nd	nd	0.543 ±0.034 ^{a,B}	0.653 ±0.058 ^{a,C}	nd	nd	0.462 ±0.044 aA	0.881 ±0.087 a,D
Tridecanedial	0.120 ±0.01 ^{b,B}	0.090 ±0.007 a,A	nd	nd	nd	nd	0.068 ±0.006 ^{a,A}	nd	0.247 ±0.009 a,B	nd	nd	0.310 ±0.018 a,C

Pentadecanal	6.03 ±0.582 ^{b,B}	7.31 ±0.245 ^{b,C}	23.9 ±1.085 ^{b,D}	nd	0.581 ±0.027 ^{a,A}	nd	2.77 ±0.096 ^{a,C}	1.45 ±0.087 ^{a,B}	1.19 ±0.101 ^{a,A}	nd	3.42 ±0.232 ^{b,D}	10.5 ±0.454 ^{a,E}
cis,cis-7,10,- Hexadecadienal	0.069 ±0.003 ^{a,A}	nd	0.348 ±0.028 ^{a,B}	nd	nd	nd	nd	nd	nd	nd	nd	0.195 ±0.014 ^{a,A}
7- Hexadecenal	nd	nd	0.864 ±0.072 ^{a,A}	nd	nd	nd	nd	nd	nd	nd	nd	nd
11- Hexadecyn- -1-ol	4.03 ±0.369 ^{b,A}	5.71 ±0.525 ^{b,B}	11.02 ±0.714 ^{a,C}	nd	nd	nd	1.26 ±0.083 ^{a,B}	0.347 ±0.027 ^{a,A}	nd	nd	1.85 ±0.095 ^{a,C}	3.50 ±0.154 ^{a,D}
14-methyl- 8- Hexadecenal	2.55 ±0.159 ^{b,A}	5.31 ±0.305 ^{b,B}	10.6 ±0.652 ^{b,C}	nd	nd	nd	1.72 ±0.125 ^{a,C}	0.730 ±0.036 ^{a,B}	0.522 ±0.024 ^{a,A}	nd	2.33 ±0.178 ^{a,D}	3.85 ±0.294 ^{a,E}
Methyl hexadecanoate	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	0.4964±0.019 ^{a,A}
Hexadecanoic acid ethyl ester	0.131 ±0.009 ^{a,B}	0.550 ±0.026 ^{b,D}	1.50 ±0.113 ^{b,E}	nd	0.080 ±0.004 ^{a,A}	0.349 ±0.012 ^{a,C}	nd	0.366 ±0.034 ^{a,A}	0.387 ±0.038 ^{a, A}	0.605 ±0.043 ^{a,B}	0.428 ±0.04 ^{b,A}	0.793 ±0.077 ^{b,C}
Ethyl Oleate	0.047 ±0.004 ^{a,A}	nd	0.450 ±0.026 ^{a,B}	nd	nd	nd	nd	nd	nd	nd	0.150 ±0.007 ^{a,A}	0.428 ±0.018 ^{a,B}

C – control samples (non-fermented); L – lentil obtained from pure stands; LR – lentils obtained from relay incorporated with winter rye; SM – submerged conditions (lentils/water ratio 1:5, w/w); SS – submerged conditions (lentils/water ratio 1:1, w/w); SMF – fermented under submerged conditions; SSF – fermented under solid-state conditions; 24, 48 – duration of fermentation (in hours).

^{a-b} Mean values denoted with different letters indicate significantly different values between the different lentil sample groups (LR and L) with the same treatment (SM, SF, SMF24, SMF48, SSF24, SSF48); ^{A-E} Mean values denoted with different letters indicate significantly different values between different treatment (SM, SF, SMF24, SMF48, SSF24, SSF48) within the same group (LR or L). Results are statistically significant when $p \leq 0.05$. nd – not detected.

Table S10. Pearson correlations between volatiles (VC) and pH, lactic acid bacteria (LAB) viable counts, biogenic amines (BA) and fatty acid (FA) composition in lentil whole samples.

		pH	LAB count	PHE	PUT	SPR MD	SPR M	C14: 0	C16: 0	C18: 0	C18: 1	C18: 2	C18: 3 α	C20: 0	C20: 1
Hexanal	Pearson Correlation	0.714**	- 0.737**	- 0.339*	- 0.694**	0.003	- 0.389*	- 0.087	0.268	- 0.095	0.087	- 0.059	- 0.057	- 0.036	- 0.006
	Sig. (2-tailed)	<0.001	<0.001	0.043	<0.001	0.987	0.019	0.613	0.114	0.582	0.612	0.733	0.740	0.837	0.973
2-Hexenal	Pearson Correlation	0.610**	- 0.711**	- 0.152	- 0.642**	- 0.043	- 0.779**	- 0.152	- 0.060	- 0.226	- 0.008	0.087	0.157	- 0.152	- 0.153
	Sig. (2-tailed)	<0.001	<0.001	0.375	<0.001	0.805	<0.001	0.375	0.726	0.184	0.962	0.613	0.361	0.375	0.374
1-Hexanol	Pearson Correlation	0.212	- 0.299	- 0.720**	- 0.200	- 0.081	0.301	0.060	0.692**	0.310	0.335*	- 0.336*	- 0.388*	0.284	0.259
	Sig. (2-tailed)	0.214	0.077	<0.001	0.242	0.640	0.074	0.730	<0.001	0.066	0.046	0.045	0.019	0.094	0.127
Hept-2-enal	Pearson Correlation	-0.162	0.391*	0.022	- 0.004	0.419*	0.403*	0.150	0.339*	0.444**	- 0.179	- 0.129	- 0.108	0.769**	- 0.176
	Sig. (2-tailed)	0.345	0.018	0.899	0.981	0.011	0.015	0.383	0.043	0.007	0.297	0.452	0.529	<0.001	0.304
Benzaldehyde	Pearson Correlation	- 0.541**	0.451**	- 0.141	0.331*	- 0.165	0.414*	- 0.213	0.241	0.133	0.336*	- 0.103	- 0.451**	0.482**	0.422*
	Sig. (2-tailed)	<0.001	0.006	0.412	0.049	0.337	0.012	0.211	0.157	0.439	0.045	0.551	0.006	0.003	0.010
Vinyl amyl carbinol	Pearson Correlation	-0.407*	0.292	- 0.169	0.381*	- 0.443**	0.319	- 0.169	0.214	- 0.025	0.478**	- 0.132	- 0.501**	- 0.169	0.670**

	Sig. (2-tailed)	0.014	0.084	0.324	0.022	0.007	0.058	0.32 4	0.209	0.88 4	0.003	0.444	0.002	0.32 4	<0.0 01
Hexanoic acid	Pearson Correlation	-0.419*	0.361*	- 0.153	- 0.125	0.344*	0.199	- 0.21 6	0.119	0.29 9	0.343*	0.112	0.372*	0.462**	- 0.25 4
	Sig. (2-tailed)	0.011	0.031	0.373	0.467	0.040	0.244	0.20 7	0.491	0.07 6	0.040	0.516	0.025	0.00 5	0.13 5
Acetic acid hexyl ester	Pearson Correlation	- 0.438**	0.420*	- 0.188	0.143	0.135	0.453**	- 0.18 8	0.265	0.23 6	0.105	- 0.084	- 0.299	0.786**	0.14 8
	Sig. (2-tailed)	0.007	0.011	0.272	0.405	0.433	0.006	0.27 2	0.119	0.16 6	0.542	0.625	0.077	<0.0 01	0.38 8
Oct-3-en-2-one	Pearson Correlation	- 0.523**	0.365*	- 0.173	0.359*	- 0.374*	0.283	- 0.17 3	0.199	0.08 2	0.378*	- 0.121	- 0.459**	0.533**	0.557**
	Sig. (2-tailed)	0.001	0.029	0.313	0.031	0.024	0.095	0.31 3	0.244	0.63 6	0.023	0.483	0.005	<0.0 01	<0.0 01
Phenylacetaldehyde	Pearson Correlation	-0.247	0.426**	- 0.270	0.425**	0.028	0.291	0.552**	0.656**	0.658**	0.489**	- 0.558**	- 0.709**	0.356*	0.17 6
	Sig. (2-tailed)	0.146	0.010	0.111	0.010	0.871	0.085	<0.0 01	<0.0 1	<0.0 01	0.002	<0.0 1	<0.0 1	0.03 3	0.30 4
Oct-2-enal	Pearson Correlation	-0.190	0.390*	- 0.002	0.274	- 0.106	0.401*	0.30 2	0.597**	0.472**	0.248	- 0.350*	- 0.532**	0.22 8	0.381*
	Sig. (2-tailed)	0.268	0.019	0.992	0.106	0.540	0.015	0.07 4	<0.0 1	0.00 4	0.144	0.036	<0.0 1	0.18 2	0.02 2
Octahydro-2,3'-bifuran	Pearson Correlation	-0.209	0.167	- 0.131	0.185	- 0.538**	0.313	- 0.13 1	0.218	0.07 2	0.213	- 0.075	- 0.317	- 0.13 1	0.806**
	Sig. (2-tailed)	0.221	0.329	0.445	0.279	<0.0 1	0.063	0.44 5	0.202	0.67 6	0.212	0.666	0.060	0.44 5	<0.0 01

Nonanal	Pearson Correlation	- 0.760**	0.686 **	- 0.021	0.533 **	0.131	0.211	- 0.110	- 0.269	0.162	- 0.160	0.258	0.387 *	0.025	- 0.089
	Sig. (2-tailed)	<0.001	<0.001	0.902	<0.001	0.446	0.217	0.523	0.112	0.344	0.351	0.129	0.020	0.885	0.606
Phenethyl alcohol	Pearson Correlation	- 0.636**	0.639 **	- 0.257	0.799 **	0.086	0.312	0.156	- 0.067	0.221	0.420 *	- 0.085	- 0.366 *	0.36 3*	0.060
	Sig. (2-tailed)	<0.001	<0.001	0.131	<0.001	0.619	0.064	0.365	0.698	0.196	0.011	0.623	0.028	0.030	0.730
2-ethylhexanoic acid	Pearson Correlation	0.025	0.152	0.161	0.389 *	0.292	0.392 *	0.184	- 0.298	- 0.144	0.213	0.175	- 0.077	- 0.009	- 0.082
	Sig. (2-tailed)	0.887	0.375	0.348	0.019	0.084	0.018	0.283	0.078	0.403	0.211	0.306	0.656	0.961	0.633
Non-2-enal	Pearson Correlation	0.801**	- 0.752 **	- 0.116	- 0.687 **	0.074	- 0.549 **	0.056	0.174	- 0.099	0.109	- 0.043	- 0.031	- 0.150	- 0.145
	Sig. (2-tailed)	<0.001	<0.001	0.499	<0.001	0.670	<0.001	0.747	0.310	0.567	0.526	0.805	0.859	0.383	0.400
Octanoic acid	Pearson Correlation	-0.186	0.443 **	0.439 **	0.454 **	0.136	0.252	0.421 *	- 0.130	0.154	- 0.016	0.060	0.114	- 0.309	- 0.076
	Sig. (2-tailed)	0.277	0.007	0.007	0.005	0.428	0.138	0.011	0.448	0.370	0.928	0.730	0.510	0.067	0.660
Decanal	Pearson Correlation	0.040	0.083	0.091	0.405 *	0.225	0.494 **	0.126	- 0.214	- 0.165	0.335 *	0.136	- 0.210	0.087	0.010
	Sig. (2-tailed)	0.818	0.629	0.597	0.014	0.187	0.002	0.465	0.209	0.336	0.046	0.430	0.219	0.615	0.955
Nona-2,4-dienal	Pearson Correlation	- 0.434**	0.364 *	- 0.134	0.208	0.244	0.252	- 0.134	0.141	0.229	0.213	- 0.078	- 0.272	0.697 **	- 0.134

	Sig. (2-tailed)	0.008	0.029	0.436	0.224	0.151	0.137	0.436	0.413	0.180	0.213	0.652	0.108	<0.001	0.435
Dec-2-enal	Pearson Correlation	-0.367*	0.272	-0.167	0.337*	-0.469**	0.339*	0.167	0.228	0.034	0.417*	-0.121	-0.469**	0.167	0.722**
	Sig. (2-tailed)	0.028	0.109	0.330	0.044	0.004	0.043	0.330	0.182	0.842	0.011	0.483	0.004	0.330	<0.001
Nonanoic acid	Pearson Correlation	-0.098	0.158	0.022	0.432**	0.132	0.600**	0.007	-0.236	-0.232	0.327	0.159	-0.192	-0.024	0.196
	Sig. (2-tailed)	0.571	0.359	0.901	0.009	0.442	<0.001	0.969	0.166	0.173	0.051	0.353	0.263	0.889	0.252
Anethole	Pearson Correlation	0.038	0.061	-0.238	0.542**	0.088	-0.094	0.625**	-0.058	0.157	0.592**	-0.258	-0.379*	-0.028	-0.095
	Sig. (2-tailed)	0.825	0.722	0.162	<0.001	0.609	0.586	<0.001	0.738	0.362	<0.001	0.128	0.022	0.162	0.582
Tridecane	Pearson Correlation	-0.070	0.270	-0.131	0.513**	0.091	0.020	0.812**	0.511**	0.649**	0.545**	-0.594**	-0.611**	-0.131	-0.132
	Sig. (2-tailed)	0.683	0.112	0.445	0.001	0.598	0.906	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	0.445	0.444
Undecanal	Pearson Correlation	-0.507**	0.358*	-0.146	0.014	-0.051	-0.087	-0.146	0.018	0.218	-0.315	0.032	0.361*	0.178	-0.081
	Sig. (2-tailed)	0.002	0.032	0.397	0.935	0.770	0.616	0.397	0.918	0.201	0.061	0.851	0.031	0.298	0.640
2-methylpropanoic acid 2,2-dimethyl-1-(2-hydroxy-	Pearson Correlation	0.035	0.159	0.404*	0.357*	0.078	0.228	0.111	0.372*	-0.212	0.037	0.298	0.062	-0.072	0.027
	Sig. (2-tailed)	0.841	0.353	0.015	0.033	0.653	0.181	0.519	0.025	0.215	0.832	0.078	0.718	0.678	0.878

1-methylethyl)propyl ester															
Eugenol	Pearson Correlation	-0.041	0.048	-0.216	0.507**	0.154	0.198	0.289	-0.286	-0.137	0.522**	-0.022	-0.235	-0.216	-0.075
	Sig. (2-tailed)	0.814	0.779	0.207	0.002	0.370	0.247	0.087	0.091	0.427	0.001	0.899	0.167	0.207	0.662
2-methylpropanoic acid 2-ethyl-3-hydroxyhexyl ester	Pearson Correlation	-0.321	0.371*	0.183	0.487**	0.033	0.179	0.030	0.514**	-0.187	-0.053	0.364*	0.322	-0.115	0.004
	Sig. (2-tailed)	0.056	0.026	0.286	0.003	0.848	0.296	0.863	0.001	0.274	0.757	0.029	0.055	0.504	0.982
β -Damascenone	Pearson Correlation	-0.480**	0.404*	0.005	0.137	-0.044	-0.145	-0.017	-0.095	0.214	0.374*	0.095	0.479**	-0.081	-0.130
	Sig. (2-tailed)	0.003	0.015	0.975	0.425	0.797	0.398	0.924	0.581	0.211	0.025	0.581	0.003	0.638	0.448
1-Tetradecene	Pearson Correlation	0.558**	0.622**	-0.174	0.605**	0.151	0.548**	0.174	0.042	0.103	-0.069	0.065	0.144	0.174	0.174
	Sig. (2-tailed)	<0.001	<0.001	0.310	<0.001	0.381	<0.001	0.311	0.808	0.550	0.688	0.706	0.401	0.310	0.310
Tetradecane	Pearson Correlation	-0.698**	0.611**	0.044	0.469**	0.037	-0.046	0.060	0.375*	0.087	-0.214	0.224	0.422*	-0.030	-0.175
	Sig. (2-tailed)	<0.001	<0.001	0.797	0.004	0.828	0.790	0.726	0.024	0.614	0.210	0.190	0.010	0.864	0.307
Dodecanal	Pearson Correlation	-0.281	0.209	-0.159	0.157	0.229	0.344*	-0.023	-0.115	0.073	-0.144	0.127	0.336*	-0.016	-0.124

	Sig. (2-tailed)	0.097	0.222	0.356	0.360	0.178	0.040	0.89 4	0.503	0.67 3	0.402	0.461	0.045	0.92 8	0.47 2
3-(2,2,6-Trimethyl-7-oxabicyclo[4.1.0]heptan-1-yl)prop-2-enal	Pearson Correlation	- 0.577**	0.493**	- 0.042	0.304	0.020	0.030	- 0.06 2	- 0.244	0.11 9	- 0.311	0.184	0.474**	- 0.03 8	- 0.11 1
	Sig. (2-tailed)	<0.001	0.002	0.807	0.072	0.906	0.862	0.72 0	0.152	0.49 1	0.065	0.281	0.003	0.82 4	0.52 1
Tridecanal	Pearson Correlation	0.407*	- 0.390*	- 0.091	- 0.413*	- 0.153	- 0.173	- 0.09 1	0.049	- 0.19 4	- 0.094	0.056	0.112	- 0.09 1	- 0.09 1
	Sig. (2-tailed)	0.014	0.019	0.599	0.012	0.372	0.313	0.59 9	0.777	0.25 7	0.584	0.745	0.517	0.59 9	0.59 8
((Butoxy methylethoxy)methylethoxy)-propanol	Pearson Correlation	-0.398*	0.344*	- 0.117	0.392*	0.237	0.139	- 0.03 7	- 0.476**	- 0.10 3	- 0.057	0.282	0.349*	0.01 0	- 0.20 1
	Sig. (2-tailed)	0.016	0.040	0.498	0.018	0.164	0.420	0.83 0	0.003	0.54 9	0.742	0.095	0.037	0.95 2	0.24 0
Hexadecane	Pearson Correlation	- 0.554**	0.611**	0.140	0.190	- 0.176	0.038	0.15 7	0.244	0.449**	- 0.292	- 0.106	0.182	0.21 1	0.10 0
	Sig. (2-tailed)	<0.001	<0.00 1	0.416	0.267	0.304	0.828	0.36 1	0.152	0.00 6	0.084	0.537	0.289	0.21 7	0.56 1
Tetradecanal	Pearson Correlation	0.283	- 0.256	0.741**	- 0.278	- 0.117	- 0.137	- 0.28 6	- 0.251	- 0.388*	- 0.169	0.359*	0.235	- 0.28 6	- 0.00 5
	Sig. (2-tailed)	0.095	0.132	<0.00 1	0.101	0.498	0.427	0.09 1	0.139	0.01 9	0.323	0.032	0.168	0.09 1	0.97 8
Tridecanedial	Pearson Correlation	0.096	- 0.015	- 0.204	0.250	0.089	- 0.113	0.521**	0.457**	0.459**	0.519**	- 0.469**	- 0.514**	- 0.20 4	- 0.20 4
	Sig. (2-tailed)	0.579	0.932	0.233	0.142	0.606	0.512	0.00 1	0.005	0.00 5	0.001	0.004	0.001	0.23 3	0.23 2

Pentadecanal	Pearson Correlation	0.078	0.043	0.874**	-	-	-	-	-	-	-	0.304	0.245	-	-
	Sig. (2-tailed)	0.652	0.803	<0.001	0.102	0.090	0.104	0.162	0.215	0.205	0.291	0.071	0.149	0.217	0.061
cis,cis-7,10-Hexadecadienal	Pearson Correlation	-0.122	0.254	0.852**	0.045	-	-	-	-	-	-	0.299	0.201	-	-
	Sig. (2-tailed)	0.480	0.136	<0.001	0.794	0.929	0.684	0.397	0.104	0.313	0.229	0.076	0.241	0.397	0.396
7-Hexadecenal	Pearson Correlation	-0.015	0.219	1.000**	-	-	-	-	-	-	-	0.372*	0.394*	-	-
	Sig. (2-tailed)	0.931	0.199	<0.001	0.060	0.038	0.096	0.090	0.338*	0.193	0.464**	0.025	0.018	0.090	0.091
11-Hexadecyn-1-ol	Pearson Correlation	0.146	-	0.818**	-	-	-	-	-	-	-	0.326	0.332*	-	-
	Sig. (2-tailed)	0.395	0.037	<0.001	0.203	0.091	0.025	0.216	0.136	0.175	0.433**	0.052	0.048	0.098	0.042
14-methyl-8-Hexadecenal	Pearson Correlation	0.168	-	0.836**	-	-	-	-	-	-	-	0.306	0.276	-	-
	Sig. (2-tailed)	0.327	0.073	<0.001	0.167	0.133	0.110	0.178	0.169	0.206	0.334*	0.069	0.103	0.231	0.004
Methyl hexadecanoate	Pearson Correlation	-0.355*	0.241	-	0.339*	0.090	0.094	-	-	-	-	-	-	-	-
	Sig. (2-tailed)	0.034	0.157	0.091	0.043	0.603	0.586	0.091	0.047	0.071	0.456**	0.107	0.354*	0.091	0.091
Hexadecanoic acid ethyl ester	Pearson Correlation	-0.187	0.327	0.806**	0.322	-	0.186	-	-	-	-	0.290	0.112	-	-
	Sig. (2-tailed)	0.034	0.157	0.091	0.043	0.603	0.586	0.091	0.047	0.071	0.456**	0.107	0.354*	0.091	0.091

	Sig. (2-tailed)	0.275	0.051	<0.00 1	0.056	0.928	0.277	0.85 1	0.103	0.49 6	0.492	0.086	0.517	0.72 0	0.98 7
Ethyl Oleate	Pearson Correlation	-0.300	0.336 *	0.672 **	0.241	- 0.199	0.007	- 0.16 6	- 0.193	- 0.15 5	0.046	0.189	- 0.039	- 0.16 6	0.11 3
	Sig. (2-tailed)	0.075	0.045	<0.00 1	0.156	0.245	0.969	0.33 2	0.258	0.36 6	0.790	0.269	0.823	0.33 2	0.51 1

LAB – lactic acid bacteria; TRIP – tryptamine; PHE – phenylethylamine; PUT – putrescine; CAD – cadaverine; HIS – histamine; TYR – tyramine; SPRMD – spermidine; SPRM – spermine; C14:0 - tetradecanoic acid; C16:0 - palmitic acid; C18:0 - stearic acid; C18:1 - 9-octadecenoic acid; C18:2 - linoleic acid; C18:3 α - α -linolenic acid; C20:0 - eicosanoic acid; C20:1 - cis-11-eicosenoic acid. ** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed). In **Bold** letters are marked significant values.

Table S11. Pearson correlations between volatiles and free amino acids (FAA) and γ -aminobutyric acid (GABA).

		Arg inin e	Glut ami ne	Aspa ragin e	Glu tam ic acid	Ser ine	As par tic aci d	Thre onin e	Gl yci ne	Ala nin e	G AB A	Pro lin e	Val ine	Meth ionin e	Pheny lalani ne	Leucine/ Isoleuci ne	Lys ine	His tidi ne
Hexanal	Pearson Correlation	0.562**	0.511**	0.077	- 0.684**	0.308	- 0.750**	- 0.368*	- 0.246	- 0.305	0.178	- 0.277	- 0.453*	- 0.379*	- 0.551*	-0.559**	- 0.339*	0.109
	Sig. (2-tailed)	<0.001	0.001	0.656	<0.001	0.067	<0.001	0.027	0.148	0.070	0.299	0.102	0.006	0.022	<0.001	<0.001	0.043	0.525
2-Hexenal	Pearson Correlation	0.534**	0.216	0.084	- 0.719**	- 0.007	- 0.604*	- 0.565**	- 0.480*	- 0.599*	- 0.206	- 0.499*	- 0.585*	- 0.211	- 0.685*	-0.593**	- 0.507*	- 0.210
	Sig. (2-tailed)	<0.001	0.206	0.624	<0.001	0.969	<0.001	<0.001	0.003	<0.001	0.228	0.002	<0.001	0.217	<0.001	<0.001	0.002	0.219
1-Hexanol	Pearson Correlation	0.157	0.530**	0.074	- 0.036	0.611*	- 0.226	0.235	0.338*	0.273	0.338*	0.370*	0.164	- 0.043	0.105	0.021	0.233	0.402*
	Sig. (2-tailed)	0.360	<0.001	0.670	0.833	<0.001	0.185	0.167	0.044	0.107	0.044	0.026	0.340	0.802	0.544	0.905	0.172	0.015
Hept-2-enal	Pearson Correlation	- 0.321	0.037	- 0.309	0.375*	0.334*	0.061	0.473**	0.532*	0.492*	0.577*	0.373*	0.468*	- 0.008	0.364*	0.366*	0.299	0.079
	Sig. (2-tailed)	0.056	0.832	0.066	0.024	0.047	0.723	0.004	<0.001	0.002	<0.001	0.025	0.004	0.962	0.029	0.028	0.077	0.648
Benzald ehyde	Pearson Correlation	- 0.446**	0.167	0.085	0.590**	0.756*	0.327	0.860**	0.740*	0.643*	0.476*	0.894*	0.883*	0.268	0.824*	0.813**	0.834*	0.209

	Sig. (2-tailed)	0.00 6	0.33 0	0.624	<0.0 01	<0. 001	0.0 51	<0.0 01	<0. 001	<0. 001	0.0 03	<0. 001	<0. 001	0.113	<0.001	<0.001	<0. 001	0.22 0
Vinyl amyl carbinol	Pearson Correlation	- 0.32 4	0.23 5	0.240	0.35 5*	0.5 66* *	0.2 30	0.62 1**	0.4 03*	0.4 14*	0.3 67*	0.6 86* *	0.5 94* *	- 0.064	0.629* *	0.547**	0.6 80* *	0.23 8
	Sig. (2-tailed)	0.05 4	0.16 8	0.158	0.03 4	<0. 001	0.1 77	<0.0 01	0.0 15	0.0 12	0.0 28	<0. 001	<0. 001	0.711	<0.001	<0.001	<0. 001	0.16 2
Hexanoi c acid	Pearson Correlation	- 0.18 5	- 0.15 6	- 0.371 *	0.24 5	0.0 22	0.0 51	0.19 3	0.3 13	0.2 89	0.2 98	0.2 47	0.2 28	0.053	0.239	0.209	0.1 47	0.08 8
	Sig. (2-tailed)	0.28 0	0.36 4	0.026	0.14 9	0.8 99	0.7 67	0.25 8	0.0 63	0.0 87	0.0 78	0.1 46	0.1 81	0.758	0.161	0.222	0.3 91	0.60 8
Acetic acid hexyl ester	Pearson Correlation	- 0.37 3*	0.18 7	- 0.083	0.54 1**	0.7 27* *	0.1 93	0.80 3**	0.7 96* *	0.6 88* *	0.6 12* *	0.8 07* *	0.7 99* *	0.242	0.700* *	0.702**	0.7 22* *	0.23 8
	Sig. (2-tailed)	0.02 5	0.27 5	0.632	<0.0 01	<0. 001	0.2 58	<0.0 01	<0. 001	<0. 001	<0. 001	<0. 001	<0. 001	0.155	<0.001	<0.001	<0. 001	0.16 1
Oct-3- en-2-one	Pearson Correlation	- 0.40 8*	0.08 0	0.168	0.54 4**	0.6 58* *	0.3 57*	0.76 3**	0.6 45* *	0.5 17* *	0.2 28	0.8 02* *	0.7 89* *	0.370 *	0.705* *	0.737**	0.7 24* *	0.11 0
	Sig. (2-tailed)	0.01 3	0.64 4	0.327	<0.0 01	<0. 001	0.0 32	<0.0 01	<0. 001	0.0 01	0.1 80	<0. 001	<0. 001	0.026	<0.001	<0.001	<0. 001	0.52 2
Phenyla cetaldeh yde	Pearson Correlation	- 0.46 1**	0.07 3	0.148	0.47 6**	0.4 38* *	0.3 83*	0.66 3**	0.5 59* *	0.4 62* *	0.4 33* *	0.5 65* *	0.6 82* *	0.123	0.569* *	0.591**	0.5 10* *	- 0.02 5
	Sig. (2-tailed)	0.00 5	0.67 4	0.388	0.00 3	0.0 07	0.0 21	<0.0 01	<0. 001	0.0 05	0.0 08	<0. 001	<0. 001	0.474	<0.001	<0.001	0.0 01	0.88 5
Oct-2- enal	Pearson Correlation	- 0.46 9**	0.13 8	- 0.082	0.42 8**	0.4 51* *	0.2 19	0.58 4**	0.4 30* *	0.4 50* *	0.4 93* *	0.5 15* *	0.5 93* *	- 0.179	0.538* *	0.487**	0.4 62* *	0.08 0
	Sig. (2-tailed)	0.00 4	0.42 3	0.634	0.00 9	0.0 06	0.1 99	<0.0 01	0.0 09	0.0 06	0.0 02	0.0 01	<0. 001	0.295	<0.001	0.003	0.0 05	0.64 2

Octahydro-2,3'-bifuran	Pearson Correlation	- 0.217	0.228	0.080	0.130	0.348*	- 0.052	0.353*	0.165	0.278	0.390*	0.399*	0.244	- 0.471**	0.283	0.161	0.368*	0.246
	Sig. (2-tailed)	0.204	0.182	0.642	0.452	0.037	0.763	0.035	0.336	0.101	0.019	0.016	0.151	0.004	0.094	0.348	0.027	0.148
Nonanal	Pearson Correlation	- 0.488**	- 0.448**	- 0.166	0.526**	- 0.368*	0.590**	0.236	0.151	0.166	- 0.070	0.204	0.257	0.154	0.354*	0.372*	0.279	- 0.119
	Sig. (2-tailed)	0.003	0.006	0.332	<0.001	0.027	<0.001	0.165	0.379	0.333	0.684	0.233	0.130	0.370	0.034	0.025	0.100	0.491
Phenethyl alcohol	Pearson Correlation	- 0.571**	- 0.124	0.245	0.719**	0.251	0.721**	0.743**	0.596*	0.447*	0.164	0.626*	0.720*	0.449**	0.660*	0.767**	0.734*	- 0.073
	Sig. (2-tailed)	<0.001	0.472	0.150	<0.001	0.140	<0.001	<0.001	<0.001	0.006	0.339	<0.001	<0.001	0.006	<0.001	<0.001	<0.001	0.674
2-ethylhexanoic acid	Pearson Correlation	0.085	0.151	0.409*	0.052	- 0.037	0.124	0.152	0.209	0.316	0.247	0.045	0.064	0.227	0.083	0.051	0.173	0.272
	Sig. (2-tailed)	0.622	0.380	0.013	0.762	0.832	0.471	0.377	0.221	0.061	0.147	0.796	0.710	0.183	0.630	0.766	0.313	0.108
Non-2-enal	Pearson Correlation	0.629**	0.401*	0.175	- 0.795**	0.126	0.745*	- 0.512**	- 0.370*	- 0.423*	0.064	0.464*	0.550*	- 0.287	- 0.655*	-0.635**	- 0.501*	- 0.015
	Sig. (2-tailed)	<0.001	0.015	0.308	<0.001	0.462	<0.001	0.001	0.026	0.010	0.712	0.004	<0.001	0.089	<0.001	<0.001	0.002	0.931
Octanoic acid	Pearson Correlation	- 0.202	- 0.356*	0.084	0.143	0.552*	0.303	- 0.071	- 0.109	0.069	- 0.037	- 0.202	- 0.046	- 0.030	0.055	0.002	- 0.120	- 0.075
	Sig. (2-tailed)	0.238	0.033	0.627	0.404	<0.001	0.073	0.680	0.527	0.689	0.832	0.237	0.790	0.862	0.752	0.991	0.487	0.664
Decanal	Pearson Correlation	0.101	0.280	0.476**	0.127	0.185	0.163	0.283	0.354*	0.423*	0.244	0.210	0.203	0.392*	0.212	0.172	0.310	0.377*

	Sig. (2-tailed)	0.558	0.098	0.003	0.461	0.281	0.343	0.095	0.034	0.010	0.152	0.220	0.234	0.018	0.215	0.317	0.066	0.024
Nona-2,4-dienal	Pearson Correlation	-0.317	0.056	0.033	0.550**	0.614*	0.373*	0.711**	0.737*	0.536*	0.294	0.716*	0.800*	0.634**	0.695*	0.770**	0.662*	0.080
	Sig. (2-tailed)	0.060	0.746	0.848	<0.001	<0.001	0.025	<0.001	<0.001	<0.001	0.082	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.641
Dec-2-enal	Pearson Correlation	-0.307	0.250	0.200	0.307	0.535*	0.156	0.576**	0.359*	0.400*	0.410*	0.640*	0.524*	-0.192	0.564*	0.464**	0.625*	0.258
	Sig. (2-tailed)	0.069	0.142	0.243	0.069	<0.001	0.364	<0.001	0.032	0.016	0.013	<0.001	0.001	0.263	<0.001	0.004	<0.001	0.128
Nonanoic acid	Pearson Correlation	0.109	0.345*	0.526**	0.113	0.217	0.117	0.352*	0.407*	0.547*	0.424*	0.318	0.226	0.260	0.281	0.173	0.404*	0.531**
	Sig. (2-tailed)	0.525	0.039	<0.001	0.510	0.204	0.495	0.036	0.014	<0.001	0.010	0.058	0.184	0.126	0.097	0.313	0.015	<0.001
Anethole	Pearson Correlation	0.069	-0.027	0.682**	-0.051	-0.239	0.299	0.020	0.022	0.015	0.093	0.105	0.037	0.329	-0.077	-0.007	0.008	-0.097
	Sig. (2-tailed)	0.688	0.876	<0.001	0.769	0.160	0.076	0.910	0.900	0.931	0.591	0.544	0.831	0.050	0.656	0.966	0.962	0.575
Tridecane	Pearson Correlation	-0.310	-0.139	0.273	0.308	-0.040	0.529*	0.256	0.168	0.085	-0.077	0.134	0.354*	0.320	0.298	0.360*	0.152	-0.239
	Sig. (2-tailed)	0.066	0.419	0.108	0.068	0.818	<0.001	0.132	0.328	0.622	0.657	0.437	0.034	0.057	0.078	0.031	0.376	0.161
Undecanal	Pearson Correlation	-0.309	-0.473**	0.393*	0.257	-0.286	0.209	-0.001	-0.018	-0.077	-0.188	0.049	0.067	-0.038	0.103	0.135	-0.024	-0.243
	Sig. (2-tailed)	0.066	0.004	0.018	0.130	0.091	0.222	0.995	0.916	0.653	0.272	0.775	0.699	0.826	0.550	0.432	0.890	0.154

2-methylpropanoic acid	Pearson Correlation	-0.073	-0.057	0.156	0.090	-0.201	0.158	0.008	-0.046	0.055	-0.044	-0.123	-0.039	0.047	-0.013	-0.001	0.028	0.015
2,2-dimethyl-1-(2-hydroxy-1-methyl-ethyl)propyl ester	Sig. (2-tailed)	0.671	0.742	0.362	0.600	0.240	0.357	0.963	0.791	0.751	0.799	0.476	0.823	0.784	0.942	0.996	0.871	0.929
Eugenol	Pearson Correlation	0.206	0.120	0.728**	-0.036	-0.099	0.215	0.101	0.175	0.203	0.052	0.050	0.010	0.430**	0.037	0.031	0.166	0.230
	Sig. (2-tailed)	0.227	0.487	<0.001	0.835	0.566	0.207	0.558	0.307	0.234	0.763	0.770	0.952	0.009	0.828	0.859	0.332	0.176
2-methylpropanoic acid 2-ethyl-3-hydroxyhexyl ester	Pearson Correlation	-0.157	-0.333*	0.128	0.161	0.496*	0.292	-0.051	-0.089	0.001	-0.167	-0.140	-0.110	0.048	-0.028	-0.014	-0.001	0.061
	Sig. (2-tailed)	0.362	0.047	0.457	0.349	0.002	0.084	0.768	0.606	0.995	0.331	0.414	0.521	0.782	0.872	0.934	0.996	0.722
β-Damascenone	Pearson Correlation	0.345*	0.610**	0.409*	0.226	0.599*	0.300	-0.182	-0.243	-0.241	0.356*	-0.180	-0.113	-0.132	-0.030	0.004	-0.189	0.361*
	Sig. (2-tailed)	0.039	<0.001	0.013	0.185	<0.001	0.076	0.287	0.154	0.157	0.033	0.293	0.512	0.441	0.862	0.982	0.271	0.030
1-Tetradecene	Pearson Correlation	0.502**	0.422*	0.045	-0.629**	0.111	-0.05	0.404*	-0.300	-0.335	-0.101	0.341*	-0.04	-0.229	0.520*	-0.507**	-0.348*	0.018

		51*							55*									
		*							*									
Tetradecane	Sig. (2-tailed)	0.002	0.010	0.795	<0.01	0.518	<0.001	0.014	0.075	0.046	0.557	0.042	0.005	0.180	0.001	0.002	0.037	0.916
	Pearson Correlation	-0.469**	-0.654**	-0.211	0.439**	0.554**	0.562**	0.047	-0.059	-0.097	-0.345*	-0.005	0.102	0.134	0.180	0.264	0.081	-0.359*
	Sig. (2-tailed)	0.004	<0.001	0.217	0.007	<0.001	<0.001	0.787	0.731	0.573	0.039	0.978	0.552	0.436	0.294	0.120	0.641	0.031
Dodecanal	Pearson Correlation	0.084	-0.069	0.064	0.061	-0.297	0.126	-0.030	0.126	0.253	0.094	0.014	-0.077	0.178	0.034	-0.069	-0.008	0.295
	Sig. (2-tailed)	0.625	0.688	0.710	0.726	0.078	0.463	0.860	0.464	0.137	0.587	0.934	0.657	0.299	0.846	0.689	0.963	0.081
3-(2,2,6-Trimethyl-7-oxabicyclo[4.1.0]heptan-1-yl)prop-2-enal	Pearson Correlation	-0.347*	-0.550**	-0.277	0.306	0.561**	0.377*	-0.058	0.106	0.085	0.252	0.072	0.040	-0.039	0.057	0.079	0.039	0.230
	Sig. (2-tailed)	0.038	<0.001	0.102	0.069	<0.001	0.024	0.738	0.539	0.621	0.139	0.677	0.818	0.819	0.739	0.649	0.822	0.177
Tridecanal	Pearson Correlation	0.177	-0.084	-0.286	-0.287	-0.052	-0.429**	-0.409*	-0.413*	-0.491**	-0.312	-0.349*	-0.404*	-0.428**	-0.410*	-0.378*	-0.358*	-0.173
	Sig. (2-tailed)	0.302	0.625	0.091	0.090	0.765	0.009	0.013	0.012	0.002	0.064	0.037	0.015	0.009	0.013	0.023	0.032	0.314
((Butoxy)methyl)ethoxym	Pearson Correlation	-0.056	-0.246	0.170	0.141	-0.402**	0.272	0.010	0.066	0.100	-0.029	-0.034	-0.061	0.199	0.003	0.022	0.072	0.031

ethylethoxy)-propanol	Sig. (2-tailed)	0.744	0.149	0.320	0.411	0.015	0.108	0.953	0.702	0.561	0.868	0.846	0.722	0.244	0.984	0.900	0.677	0.856
Hexadecane	Pearson Correlation	-0.606**	-0.644**	-0.511**	0.445**	-0.343*	0.342*	0.111	-0.016	-0.026	-0.149	0.073	0.222	-0.215	0.243	0.272	-0.011	-0.394*
	Sig. (2-tailed)	<0.001	<0.001	0.001	0.007	0.040	0.041	0.520	0.928	0.881	0.386	0.674	0.194	0.208	0.153	0.109	0.948	0.017
Tetradecanal	Pearson Correlation	0.196	-0.029	-0.098	-0.211	-0.054	-0.177	-0.307	-0.310	-0.228	0.330*	0.257	0.164	0.105	-0.106	-0.126	0.244	-0.026
	Sig. (2-tailed)	0.251	0.866	0.568	0.217	0.754	0.302	0.069	0.066	0.181	0.049	0.130	0.340	0.544	0.539	0.463	0.152	0.882
Tridecanedial	Pearson Correlation	-0.125	0.024	0.216	0.157	0.129	0.348*	0.145	0.084	-0.050	-0.165	0.109	0.257	0.340*	0.208	0.274	0.125	-0.183
	Sig. (2-tailed)	0.469	0.889	0.206	0.360	0.453	0.037	0.399	0.627	0.772	0.335	0.527	0.130	0.042	0.224	0.106	0.469	0.285
Pentadecanal	Pearson Correlation	-0.135	-0.289	0.330*	0.061	-0.188	0.063	-0.199	-0.300	-0.235	0.382*	-0.227	0.017	0.028	0.037	0.058	0.190	-0.246
	Sig. (2-tailed)	0.431	0.087	0.049	0.723	0.272	0.716	0.244	0.075	0.168	0.021	0.183	0.920	0.873	0.829	0.739	0.266	0.149
cis,cis-7,10-Hexadecadienal	Pearson Correlation	-0.273	0.416*	-0.292	0.208	-0.164	0.185	-0.042	-0.171	-0.155	-0.312	-0.093	0.156	0.096	0.205	0.253	0.036	-0.311
	Sig. (2-tailed)	0.107	0.012	0.085	0.223	0.339	0.281	0.806	0.318	0.367	0.064	0.590	0.364	0.576	0.230	0.137	0.834	0.065
7-Hexadecenal	Pearson Correlation	-0.214	0.481**	0.405*	0.069	-0.410*	0.046	-0.250	0.343*	-0.237	-0.329	0.342*	0.097	-0.112	-0.046	-0.016	-0.298	0.339*
	Sig. (2-tailed)	0.211	0.003	0.014	0.690	0.013	0.791	0.142	0.041	0.164	0.050	0.041	0.575	0.516	0.792	0.925	0.077	0.043

11-Hexadec yn-1-ol	Pearson Correlation	- 0.12 2	- 0.23 6	- 0.490 **	0.07 4	- 0.1 73	0.0 17	- 0.24 4	- 0.3 15	- 0.2 38	- 0.4 15*	- 0.2 56	- 0.0 81	- 0.025	-0.025	-0.020	- 0.2 45	- 0.19 2
	Sig. (2-tailed)	0.48 0	0.16 6	0.002	0.66 9	0.3 14	0.9 23	0.15 2	0.0 61	0.1 62	0.0 12	0.1 31	0.6 39	0.884	0.883	0.908	0.1 50	0.26 1
14-methyl- 8-Hexadec enal	Pearson Correlation	- 0.05 9	- 0.19 8	- 0.341 *	- 0.00 9	- 0.1 94	0.0 16	- 0.27 1	- 0.3 49*	- 0.2 58	- 0.4 15*	- 0.2 82	- 0.1 08	0.010	-0.049	-0.048	- 0.2 59	- 0.18 8
	Sig. (2-tailed)	0.73 2	0.24 7	0.042	0.96 1	0.2 57	0.9 28	0.11 0	0.0 37	0.1 29	0.0 12	0.0 96	0.5 30	0.955	0.779	0.781	0.1 28	0.27 1
Methyl hexadec anoate	Pearson Correlation	- 0.21 4	- 0.07 6	0.255	0.38 8*	0.4 31* *	0.4 31* *	0.51 0**	0.4 28* *	0.2 97	0.0 87	0.5 51* *	0.6 20* *	0.543 **	0.626* *	0.656**	0.5 88* *	0.05 9
	Sig. (2-tailed)	0.21 0	0.66 1	0.133	0.01 9	0.0 09	0.0 09	0.00 1	0.0 09	0.0 78	0.6 13	<0. 001	<0. 001	<0.00 1	<0.001	<0.001	<0. 001	0.73 3
Hexadec anoic acid ethyl ester	Pearson Correlation	- 0.31 1	- 0.29 2	- 0.127	0.36 2*	- 0.1 53	0.4 11*	0.10 8	- 0.0 02	0.0 74	- 0.2 84	0.0 25	0.2 58	0.318	0.316	0.338*	0.1 06	- 0.13 4
	Sig. (2-tailed)	0.06 5	0.08 4	0.462	0.03 0	0.3 73	0.0 13	0.52 9	0.9 89	0.6 70	0.0 93	0.8 87	0.1 28	0.059	0.060	0.044	0.5 37	0.43 7
Ethyl Oleate	Pearson Correlation	- 0.36 2*	- 0.30 9	- 0.092	0.34 5*	0.0 51	0.3 34*	0.21 4	0.0 26	0.0 20	- 0.2 20	0.1 90	0.3 93*	0.214	0.437* *	0.473**	0.2 37	- 0.21 6
	Sig. (2-tailed)	0.03 0	0.06 7	0.594	0.03 9	0.7 69	0.0 47	0.21 1	0.8 78	0.9 10	0.1 97	0.2 66	0.0 18	0.210	0.008	0.004	0.1 64	0.20 5
GABA – γ -aminobutyric acid. ** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed). In Bold letters are marked significant values.																		

Table S12. Significance of analysed factors (different growing conditions of lentils, different fermentation conditions, and different duration of fermentation) and their interaction in volatile compound (VC) lentil wholemeal composition.

Factor	Dependent variable	p
Growing conditions	Hexanal	<0.001
	2-Hexenal	<0.001
	1-Hexanol	<0.001
	Hept-2-enal	<0.001
	Benzaldehyde	<0.001
	Vinyl amyl carbinol	<0.001
	Hexanoic acid	<0.001
	Acetic acid hexyl ester	<0.001
	Oct-3-en-2-one	<0.001
	Phenylacetaldehyde	<0.001
	Oct-2-enal	0.345
	Octahydro-2,3'-bifuran	<0.001
	Nonanal	<0.001
	Phenethyl alcohol	<0.001
	2-ethylhexanoic acid	<0.001
	Non-2-enal	<0.001
	Octanoic acid	0.640
	Decanal	<0.001
	Nona-2,4-dienal	0.457
	Dec-2-enal	<0.001
	Nonanoic acid	<0.001
	Anethole	<0.001
	Tridecane	<0.001
	Undecanal	<0.001
	2-methylpropanoic acid 2,2-dimethyl-1-(2-hydroxy-1-methylethyl)propyl ester	<0.001
	Eugenol	<0.001
	2-methylpropanoic acid 2-ethyl-3-hydroxyhexyl ester	0.009
	β -Damascenone	<0.001
	1-Tetradecene	<0.001
	Tetradecane	<0.001
	Dodecanal	<0.001
	3-(2,2,6-Trimethyl-7-oxabicyclo[4.1.0]heptan-1-yl)prop-2-enal	<0.001
	Tridecanal	<0.001
	((Butoxymethylethoxy)methylethoxy)-propanol	0.632
	Hexadecane	<0.001
	Tetradecanal	<0.001
	Tridecanedial	<0.001
	Pentadecanal	<0.001
	cis,cis-7,10,-Hexadecadienal	<0.001

Type of fermentation	7-Hexadecenal	<0.001
	11-Hexadecyn-1-ol	<0.001
	14-methyl-8-Hexadecenal	<0.001
	Methyl hexadecanoate	<0.001
	Hexadecanoic acid ethyl ester	0.006
	Ethyl Oleate	<0.001
	Hexanal	<0.001
	2-Hexenal	<0.001
	1-Hexanol	<0.001
	Hept-2-enal	<0.001
	Benzaldehyde	<0.001
	Vinyl amyl carbinol	<0.001
	Hexanoic acid	0.002
	Acetic acid hexyl ester	<0.001
	Oct-3-en-2-one	<0.001
	Phenylacetaldehyde	<0.001
	Oct-2-enal	<0.001
	Octahydro-2,3'-bifuran	<0.001
	Nonanal	<0.001
	Phenethyl alcohol	<0.001
	2-ethylhexanoic acid	<0.001
	Non-2-enal	<0.001
	Octanoic acid	<0.001
	Decanal	0.483
	Nona-2,4-dienal	<0.001
	Dec-2-enal	<0.001
	Nonanoic acid	0.008
	Anethole	<0.001
	Tridecane	<0.001
	Undecanal	<0.001
	2-methylpropanoic acid 2,2-dimethyl-1-(2-hydroxy-1-methylethyl)propyl ester	<0.001
	Eugenol	<0.001
	2-methylpropanoic acid 2-ethyl-3-hydroxyhexyl ester	<0.001
	β -Damascenone	<0.001
	1-Tetradecene	<0.001
	Tetradecane	<0.001
	Dodecanal	<0.001
	3-(2,2,6-Trimethyl-7-oxabicyclo[4.1.0]heptan-1-yl)prop-2-enal	<0.001
	Tridecanal	<0.001
	((Butoxymethylethoxy)methylethoxy)-propanol	<0.001
	Hexadecane	<0.001
	Tetradecanal	<0.001
	Tridecanedial	<0.001
	Pentadecanal	<0.001

	cis,cis-7,10,-Hexadecadienal	<0.001
	7-Hexadecenal	<0.001
	11-Hexadecyn-1-ol	<0.001
	14-methyl-8-Hexadecenal	<0.001
	Methyl hexadecanoate	<0.001
	Hexadecanoic acid ethyl ester	<0.001
	Ethyl Oleate	<0.001
	Hexanal	<0.001
	2-Hexenal	<0.001
	1-Hexanol	0.146
	Hept-2-enal	0.002
	Benzaldehyde	<0.001
	Vinyl amyl carbinol	<0.001
	Hexanoic acid	<0.001
	Acetic acid hexyl ester	<0.001
	Oct-3-en-2-one	<0.001
	Phenylacetaldehyde	<0.001
	Oct-2-enal	<0.001
	Octahydro-2,3'-bifuran	<0.001
	Nonanal	<0.001
	Phenethyl alcohol	<0.001
	2-ethylhexanoic acid	<0.001
	Non-2-enal	<0.001
	Octanoic acid	<0.001
	Decanal	<0.001
	Nona-2,4-dienal	<0.001
	Dec-2-enal	<0.001
	Nonanoic acid	<0.001
	Anethole	0.755
	Tridecane	<0.001
	Undecanal	<0.001
	2-methylpropanoic acid 2,2-dimethyl-1-(2-hydroxy-1-methylethyl)propyl ester	<0.001
	Eugenol	<0.001
	2-methylpropanoic acid 2-ethyl-3-hydroxyhexyl ester	0.024
	β -Damascenone	<0.001
	1-Tetradecene	<0.001
	Tetradecane	<0.001
	Dodecanal	<0.001
	3-(2,2,6-Trimethyl-7-oxabicyclo[4.1.0]heptan-1-yl)prop-2-enal	<0.001
	Tridecanal	<0.001
	((Butoxymethylethoxy)methylethoxy)-propanol	<0.001
	Hexadecane	0.003
	Tetradecanal	<0.001
	Tridecanedial	<0.001

Fermentation duration

Growing conditions * Type of fermentation	Pentadecanal	<0.001
	cis,cis-7,10,-Hexadecadienal	<0.001
	7-Hexadecenal	<0.001
	11-Hexadecyn-1-ol	<0.001
	14-methyl-8-Hexadecenal	<0.001
	Methyl hexadecanoate	<0.001
	Hexadecanoic acid ethyl ester	<0.001
	Ethyl Oleate	<0.001
	Hexanal	<0.001
	2-Hexenal	<0.001
	1-Hexanol	<0.001
	Hept-2-enal	<0.001
	Benzaldehyde	<0.001
	Vinyl amyl carbinol	<0.001
	Hexanoic acid	0.514
	Acetic acid hexyl ester	<0.001
	Oct-3-en-2-one	<0.001
	Phenylacetaldehyde	<0.001
	Oct-2-enal	<0.001
	Octahydro-2,3'-bifuran	<0.001
	Nonanal	0.140
	Phenethyl alcohol	<0.001
	2-ethylhexanoic acid	<0.001
	Non-2-enal	<0.001
	Octanoic acid	0.051
	Decanal	<0.001
	Nona-2,4-dienal	0.457
	Dec-2-enal	<0.001
	Nonanoic acid	<0.001
	Anethole	<0.001
	Tridecane	<0.001
	Undecanal	<0.001
	2-methylpropanoic acid 2,2-dimethyl-1-(2-hydroxy-1-methylethyl)propyl ester	<0.001
	Eugenol	<0.001
	2-methylpropanoic acid 2-ethyl-3-hydroxyhexyl ester	<0.001
	β -Damascenone	<0.001
	1-Tetradecene	<0.001
	Tetradecane	<0.001
	Dodecanal	0.372
	3-(2,2,6-Trimethyl-7-oxabicyclo[4.1.0]heptan-1-yl)prop-2-enal	<0.001
	Tridecanal	<0.001
	((Butoxymethylethoxy)methylethoxy)-propanol	<0.001
	Hexadecane	<0.001
	Tetradecanal	<0.001

Growing conditions * Fermentation duration	Tridecanedial	<0.001
	Pentadecanal	<0.001
	cis,cis-7,10,-Hexadecadienal	<0.001
	7-Hexadecenal	<0.001
	11-Hexadecyn-1-ol	<0.001
	14-methyl-8-Hexadecenal	<0.001
	Methyl hexadecanoate	<0.001
	Hexadecanoic acid ethyl ester	<0.001
	Ethyl Oleate	<0.001
	Hexanal	<0.001
	2-Hexenal	<0.001
	1-Hexanol	<0.001
	Hept-2-enal	<0.001
	Benzaldehyde	0.108
	Vinyl amyl carbinol	<0.001
	Hexanoic acid	<0.001
	Acetic acid hexyl ester	<0.001
	Oct-3-en-2-one	<0.001
	Phenylacetaldehyde	<0.001
	Oct-2-enal	0.004
	Octahydro-2,3'-bifuran	<0.001
	Nonanal	0.983
	Phenethyl alcohol	<0.001
	2-ethylhexanoic acid	<0.001
	Non-2-enal	0.279
	Octanoic acid	0.002
	Decanal	<0.001
	Nona-2,4-dienal	0.457
	Dec-2-enal	<0.001
	Nonanoic acid	<0.001
	Anethole	0.755
	Tridecane	<0.001
	Undecanal	<0.001
	2-methylpropanoic acid 2,2-dimethyl-1-(2-hydroxy-1-methylethyl)propyl ester	<0.001
	Eugenol	<0.001
	2-methylpropanoic acid 2-ethyl-3-hydroxyhexyl ester	<0.001
	β -Damascenone	<0.001
	1-Tetradecene	<0.001
	Tetradecane	0.012
	Dodecanal	<0.001
	3-(2,2,6-Trimethyl-7-oxabicyclo[4.1.0]heptan-1-yl)prop-2-enal	<0.001
	Tridecanal	<0.001
	((Butoxymethylethoxy)methylethoxy)-propanol	0.396
	Hexadecane	<0.001

Type of fermentation * Fermentation duration	Tetradecanal	<0.001
	Tridecanedial	<0.001
	Pentadecanal	<0.001
	cis,cis-7,10,-Hexadecadienal	<0.001
	7-Hexadecenal	<0.001
	11-Hexadecyn-1-ol	<0.001
	14-methyl-8-Hexadecenal	<0.001
	Methyl hexadecanoate	<0.001
	Hexadecanoic acid ethyl ester	<0.001
	Ethyl Oleate	<0.001
	Hexanal	<0.001
	2-Hexenal	<0.001
	1-Hexanol	0.081
	Hept-2-enal	<0.001
	Benzaldehyde	<0.001
	Vinyl amyl carbinol	<0.001
	Hexanoic acid	<0.001
	Acetic acid hexyl ester	<0.001
	Oct-3-en-2-one	<0.001
	Phenylacetaldehyde	<0.001
	Oct-2-enal	<0.001
	Octahydro-2,3'-bifuran	<0.001
	Nonanal	<0.001
	Phenethyl alcohol	0.010
	2-ethylhexanoic acid	0.623
	Non-2-enal	<0.001
	Octanoic acid	0.189
	Decanal	<0.001
	Nona-2,4-dienal	<0.001
	Dec-2-enal	<0.001
	Nonanoic acid	<0.001
	Anethole	<0.001
	Tridecane	<0.001
	Undecanal	<0.001
	2-methylpropanoic acid 2,2-dimethyl-1-(2-hydroxy-1-methylethyl)propyl ester	0.989
	Eugenol	<0.001
	2-methylpropanoic acid 2-ethyl-3-hydroxyhexyl ester	<0.001
	β -Damascenone	<0.001
	1-Tetradecene	<0.001
	Tetradecane	<0.001
	Dodecanal	<0.001
	3-(2,2,6-Trimethyl-7-oxabicyclo[4.1.0]heptan-1-yl)prop-2-enal	<0.001
	Tridecanal	<0.001
	((Butoxymethylethoxy)methylethoxy)-propanol	<0.001

Growing conditions * Type of fermentation * Fermentation duration	Hexadecane	0.075
	Tetradecanal	<0.001
	Tridecanedial	<0.001
	Pentadecanal	<0.001
	cis,cis-7,10,-Hexadecadienal	<0.001
	7-Hexadecenal	<0.001
	11-Hexadecyn-1-ol	<0.001
	14-methyl-8-Hexadecenal	<0.001
	Methyl hexadecanoate	<0.001
	Hexadecanoic acid ethyl ester	<0.001
	Ethyl Oleate	<0.001
	Hexanal	<0.001
	2-Hexenal	<0.001
	1-Hexanol	<0.001
	Hept-2-enal	0.017
	Benzaldehyde	<0.001
	Vinyl amyl carbinol	<0.001
	Hexanoic acid	<0.001
	Acetic acid hexyl ester	<0.001
	Oct-3-en-2-one	<0.001
	Phenylacetaldehyde	<0.001
	Oct-2-enal	<0.001
	Octahydro-2,3'-bifuran	<0.001
	Nonanal	0.050
	Phenethyl alcohol	<0.001
	2-ethylhexanoic acid	<0.001
	Non-2-enal	<0.001
	Octanoic acid	0.146
	Decanal	<0.001
	Nona-2,4-dienal	0.457
	Dec-2-enal	<0.001
	Nonanoic acid	<0.001
	Anethole	<0.001
	Tridecane	<0.001
	Undecanal	<0.001
	2-methylpropanoic acid 2,2-dimethyl-1-(2-hydroxy-1-methylethyl)propyl ester	<0.001
	Eugenol	<0.001
	2-methylpropanoic acid 2-ethyl-3-hydroxyhexyl ester	<0.001
	β -Damascenone	<0.001
	1-Tetradecene	<0.001
	Tetradecane	0.002
	Dodecanal	<0.001
	3-(2,2,6-Trimethyl-7-oxabicyclo[4.1.0]heptan-1-yl)prop-2-enal	<0.001
	Tridecanal	<0.001

((Butoxymethylethoxy)methylethoxy)-propanol	<0.001
Hexadecane	<0.001
Tetradecanal	<0.001
Tridecanedial	<0.001
Pentadecanal	<0.001
cis,cis-7,10,-Hexadecadienal	<0.001
7-Hexadecenol	<0.001
11-Hexadecyn-1-ol	<0.001
14-methyl-8-Hexadecenol	<0.001
Methyl hexadecanoate	<0.001
Hexadecanoic acid ethyl ester	<0.001
Ethyl Oleate	<0.001

p – significance. The influence of analysed factors and their interaction are significant when $p \leq 0.05$. In **Bold** letters are marked significant values.



Figure S1. Image of the relay intercropped lentil with winter rye (LR).