Supplementary Table S1. Proximate flours contents.

Flour types	Protein (%)	Carbohydrates (g)	Fiber (g)	Fats (g)
Rice[1]	7.0	79.0	1.0	0.5
Maize[2]	8.5	76.1	2.1	1.3
Algae[3]	31.0	3.1	49.0	8.1

Commercial organic flours from: [1]rice (Molino Rossetto SpA, Pontelongo, Italy), [2]maize (Molino Rossetto SpA, Italy), [3]algae – Spirulina (Erbavoglio Production Srl, San Zeno Naviglio, Brescia).

Supplementary Table S2. Dough formulations.

Dough types	Rice[1] (g)	Maize[2] (g)	Algae[3] (g)	Sourdough (g)	NaCl (g)	sterile water (ml)	HPMC[4] (g)
A	308.61	75.20	15.87		4.00	340.00	5.60
YA+	246.88	60.16	12.70	140.00[5]	3.20	272.00	4.48
S	309.40	90.60			4.00	340.00	5.60
YS+	255.52	64.77		140.00[6]	3.20	272.00	4.48

Commercial organic flours from: [1]rice (Molino Rossetto SpA, Pontelongo, Italy) [2]maize (Molino Rossetto SpA, Italy), [3]algae – Spirulina (Erbavoglio Production Srl, San Zeno Naviglio, Brescia); [4]HPMC = Hydroxy propyl methyl cellulose (Bioline Integratori, Canaro, Italy); [5]LAB fermented algae enriched dough; [6]LAB fermented maize/rice dough

Supplementary table S3. pH values

Sample	Baseline			End of fermentation		
SX	6.24	±	0.04[c]	4.70	±	0.08[b]
SL	5.35	±	0.04[b]	3.60	±	0.08[a]
SY	5.95	±	0.03[c]	4.92	±	0.15[b]
AX	6.27	±	0.05[c]	5.35	±	0.17[b]
AL	5.22	±	0.04[c]	4.04	±	0.12[a]
AY	6.16	±	0.03[c]	4.98	±	0.21[b]
YS	5.80	±	0.03[c]	5.92	±	0.06[c]
YS+	5.29	±	0.09[b]	4.22	±	0.09[a]
YA	6.11	±	0.07[c]	5.05	±	0.11[c]
YA+	5.08	±	0.12[b]	4.31	±	0.15[a]

VOC 1 Carbon dioxide
VOC 2 Heptane
VOC 3 Acetaldehyde
VOC 4 Carbon disulfide
VOC 5 Dimethyl sulfide
VOC 6 Octane
VOC 7 Acetone
VOC 8 Furan-2-methyl
VOC 9 1,4-Butanediamine
VOC 10 2-Butanone
VOC 11 2,3-Butanedione
VOC 12 Butanal, 3-methyl
VOC 13 Pentanal
VOC 14 Decane
VOC 15 2-Butenal, 3-methyl
VOC 16 2-Nonenal, (Z)
VOC 17 Cyclohexane, 1-methyl-2-pentyl
VOC 18 R(-)-2-Methyl-pyrrolidine
VOC 19 1-Octanol, 3-butyl
VOC 20 Decane, 3,6-dimethyl
VOC 21 Methylpent-4-enylamine
VOC 22 Undecane
VOC 23 Piperidine, 3,3-dimethyl
VOC 24 Hexanal
VOC 25 2-Hexanone
VOC 26 Heptane, 3-ethyl
VOC 27 2-Butenal, 2-methyl, (E)
VOC 28 Octane, 2,3-dimethyl
VOC 29 3-Undecene, 6-methyl, (E)
VOC 30 1-Hexanol, ethyl
VOC 31 2-hexanone, 4-methyl
VOC 32 1-ethyl, dodecanol
VOC 33 2-N-butyl furan
VOC 34 2-propyl, 1-pentanol
VOC 35 3-Hexen-2-one
VOC 36 Eicosane
VOC 37 4-Heptanone, 2,6-dimethyl
VOC 38 Dodecane
VOC 39 2-Hexanone, 5-methyl
VOC 40 2-Heptanone
VOC 41 Heptanal
VOC 42 1-Hexanol, 2-ethyl
VOC 43 9-Eicosene, (E)
VOC 44 Hexanoic acid, ethyl ester
VOC 45 Decadien-1-ol, (E,E)
VOC 46 1-Hexanol, 3,5,5-trimethyl
VOC 47 Octacosane
VOC 48 2-Decanol
VOC 49 Hexenal, (E)
VOC 50 Furan, 2-pentyl
VOC 51 2,4-Nonadienal, (E,E)
VOC 52 1-Pentanol
VOC 53 1,2-Dipentylcyclopropene
VOC 54 Isoxazole, 3,5-dimethyl
VOC 55 1-allylazetidine
VOC 56 2-Octanone
VOC 57 2,7-Octadienone
VOC 58 Octanal
VOC 59 1H Pyrrolizine, hexahydro
VOC 60 6-Undecen-3-one, 5-butyl 2,2-dimethyl, (E)
VOC 61 7-Hexadecene (Z)
VOC 62 1-Octadecene
VOC 63 5-Hepten-2-one, 5-methyl
VOC 64 7 Octen-2-one
VOC 65 Formic acid, hexyl ester
VOC 66 1-Hexanol
VOC 67 Thiophene, 2-decyl
VOC 68 Pentanoic acid, decyl ester
VOC 69 Phycocyanine
VOC 70 1-Decanol, 2-ethyl
VOC 71 6-Undecen-3-one, 5-butyl-2,2-dimethyl, (E)
VOC 72 3-Cyclohexen-1-ol, 3-methyl
VOC 73 2-Nonanone
VOC 74 Oxalic acid, allyl undecyl ester
VOC 75 Nonanal
VOC 76 Oxalic acid, 6-ethyloct-3-yl propyl ester
VOC 77 1-Decanol, 2-methyl
VOC 78 2-ethyl, 1-dodecanol
VOC 79 2-hexyl, 1-octanol
VOC 80 1-Octanol, 2-butyl
VOC 81 1-Octanol, 2,2-dimethyl
VOC 82 Sorbic acid
VOC 83 3-Tetradecene, (E)
VOC 84 1-Octen-3-ol
VOC 85 Octadecanal
VOC 86 1-Heptanol
VOC 87 N-Chloro-3,3-dimethylbutanamide
VOC 88 3-(But-3-enyl), cyclohexanone
VOC 89 Dimethylcyclohexanol
VOC 90 Furfural
VOC 91 2-Pentenoic acid, 3-methyl, 5-(2,6,6-trimethyl, 1-cyclohexenyl)
VOC 92 Benzamide, 3,5-dihydroxy-N,N-diethyl
VOC 93 Pentadecane
VOC 94 4-Heneicosanone, 1-cyclopentyl
VOC 95 1,3,6-p-Menthatriene
VOC 96 Hepten-1-ol (E)
VOC 97 Dodecanal
VOC 98 1H-Indene-2,3-dihydromethyl
VOC 99 Benzaldehyde
VOC 100 4-Undecene, 3-methyl, (Z)
VOC 101 1-Octanol
VOC 102 4-Nonene, 5-butyl
VOC 103 Hexadecane
VOC 104 3,5-Octadien-2-one, (E,E)
VOC 105 2-Ethyl, 1-dodecanol
VOC 106 2-Octen-1-ol, (E)
VOC 107 2-Undecanone
VOC 108 Cyclohexanol, 2,6-dimethyl
VOC 109 Hydrazine 1,1-dimethyl
VOC 110 Thiophene acetic acid
VOC 111 7-Hexadecene
VOC 112 Hexanoic acid, 4-hexadecyl ester
VOC 113 1-Nonanol
VOC 114 1-Decene
VOC 115 5-Nonen-4-ol
VOC 116 5-Octadecene, (E)
VOC 117 2-Furanmethanol
VOC 118 Benzeneacetaldehyde
VOC 119 1,3-Cyclooctadiene
VOC 120 Heptadecene
VOC 121 cis-4-Hydroxy-3-methyldecanoic acid lactone
VOC 122 1,2,4-Triazol-4-amine, N-(2-thienylmethyl)
VOC 123 8-Heptadecene, (Z)
VOC 124 1(R)-alpha-pinene
VOC 125 Nonadienal
VOC 126 Benzene, 1,2-dimethoxy
VOC 127 2(3H)-Furanone, 5-ethyldihydro
VOC 128 Benzenamine, N-ethyl
VOC 129 Aniline
VOC 130 Azulene
VOC 131 2-Propenoic acid
VOC 132 2-Cyclopentn-1-one, 2-hydroxy
VOC 133 1,4-Dioxan-2-ol
VOC 134 Pyrrolidine, 2,5-dicarbonitrile
VOC 135 Formamide, N,N-dibutyl
VOC 136 Ethanone
VOC 137 Nonadienone
VOC 138 2,4-Decadienal
VOC 139 Hexanoic acid
VOC 140 Thimol
VOC 141 5,9-Undecadien-2-one, 6,10-dimethyl, (E)
VOC 142 3-Buten-2-one, 4-(2,6,6-trimethyl, 2-cyclohexen-1-yl), (E)
VOC 143 Propanoic acid, 2-methyl, 2-methylpropyl ester
VOC 144 Benzyl Alcohol
VOC 145 Butylated hydroxytoluene
VOC 146 Butanoic acid, butyl ester
VOC 147 Borneolo
VOC 148 5,9-undecadien-2-one, 6,10 -dimethyl (Z)
VOC 149 Phenylethyl alcohol
VOC 150 Nepetalactone
VOC 151 Heptanoic acid
VOC 152 1H-Imidazole, 2-methanol
VOC 153 1,2,3-Trimethoxybenzene
VOC 154 Ethanol, 2,2-oxybis
VOC 155 Maltol
VOC 156 1,2,4-Butanetriol
VOC 157 Benzothiazole
VOC 158 3,5-Octadien-2-ol
VOC 159 Phenol
VOC 160 Levoglucosenone
VOC 161 2-Pentadecanone
VOC 162 Nicotinic acid propyl ester
VOC 163 Octanoic acid
VOC 164 2(3H)-Furanone dihydro, 5-pentyl
VOC 165 Benzenamine, 4-butyl
VOC 166 Butanamide
VOC 167 2-Octenal, 2-butyl
VOC 168 Phenol, 4-ethyl
VOC 169 1,3-Propanediamine, N-methyl
VOC 170 2-methoxy-4-vinylphenol
VOC 171 n-Hexadecanoic acid
VOC 172 Dehydroacetic acid
VOC 173 Tetracosane
VOC 174 Benzofuranone
VOC 175 Octadecane
VOC 176 2-Furancarboxaldehyde, 3-hydroxymethyl
VOC 177 Linoleic acid ethyl ester

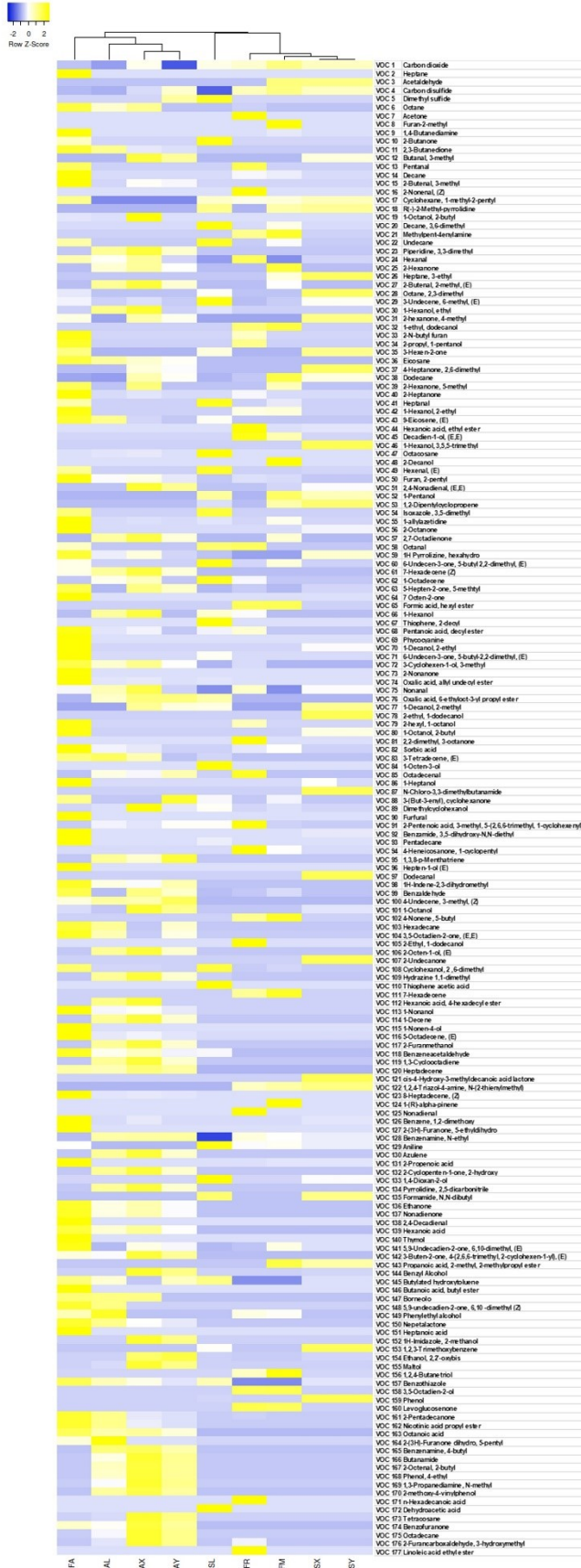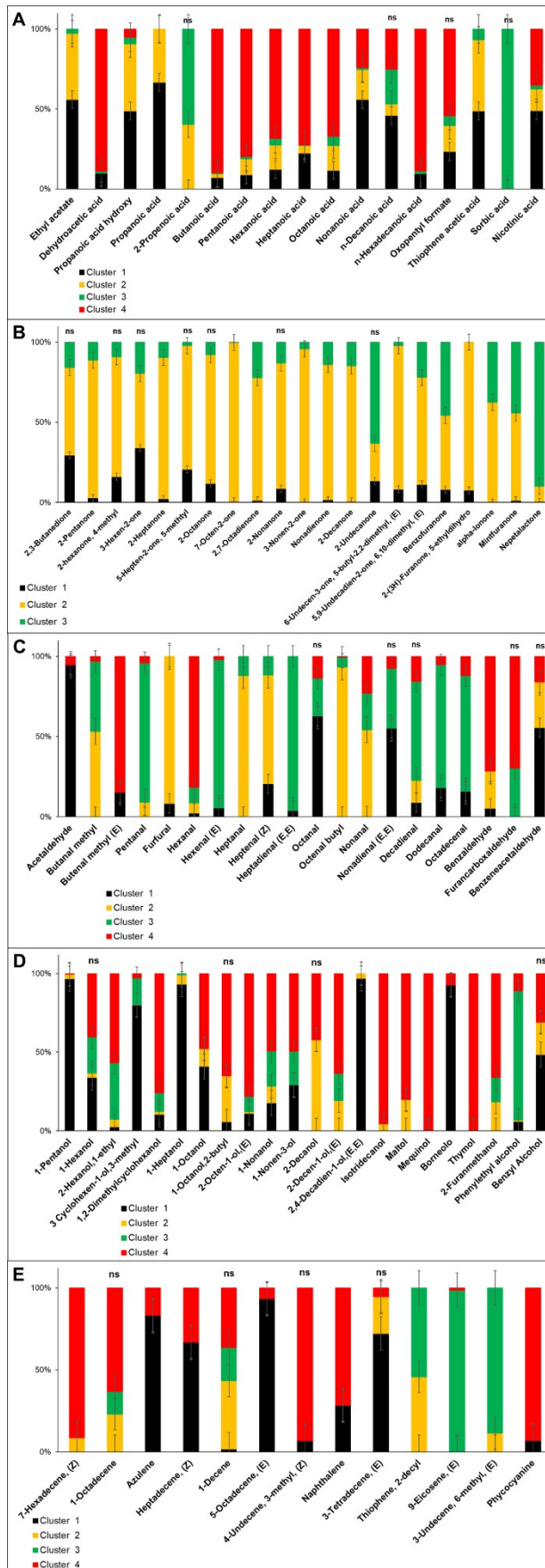FA   AL   AX   AY   SL   FR   FM   SX   SY

Figure S1. Heatmap of relative quantification by SPME GC-MS of means of VOCs of not fermented samples. Pearson dendrogram and complete linkage on independent variables. FA = Flours of Algae; FM = Flours of Maize; FR = Flours of Rice; AL, AX, AY = Algae type not fermented doughs: SL, SX, SY = Standard type not fermented doughs.

Supplementary Figure 2. K-means (p<0.01) of VOCs on samples. A) Organic acids; B) Ketones; C) Aldehydes; D) Alcohols; E) Alkenes. The cluster legends can be found from Figure 3 to Figure 7.
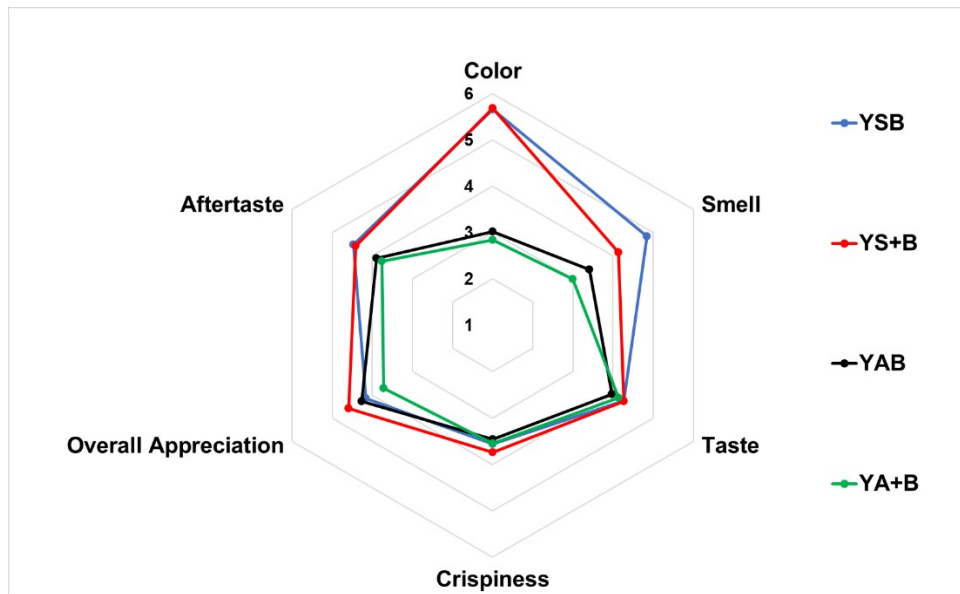
Supplementary Figure 3. Spider chart of two independent consumer's tests. Blue plot = YSB (ST bread fermented 6 h by yeast); red plot = YS+B (ST sourdough bread); black plot = YAB (AT bread fermented 6 h by yeast); green plot = YA+B (AT sourdough bread). 0 = unacceptable; 6 = excellent.