Table 1S Description and references for the odor properties of the samples.

Odor attributes	**Description**	**References**
Fishy	An aromatic reminiscent of cod liver oil.	Cod liver oil diluted in good-quality soybean oil (1:99).
Frying	Characteristic aroma of oil during frying.	Frying oil at ambient temperature.
Metallic	An aromatic associated with metal coins.	0.01% ferrous sulfate diluted in distilled, filtered water.
Rancid	An aromatic reminiscent of odor or flavor of highly oxidized oils containing high amounts of linoleic acid such as sunflower, cottonseed, or peanut.	Good-quality cottonseed oil aged for four days at 60 ºC.
Grassy	An aromatic reminiscent of the green character of mowed grass.	Fresh cut grass.
Painty	An aromatic reminiscent of oils containing linolenic acid such as linseed or rapeseed(canola) oil.	Good-quality canola oil aged for four to eight days at 60 ºC.

Table 2S Overview of the triangle tests, including codes of samples and serving orders.

Panelist Number	Serving orders			Types
1	416	157	893	AAB
2	416	893	157	ABB
3	157	416	893	AAB
4	157	893	416	ABB
5	893	416	157	AAB
6	157	893	416	AAB
7	416	157	893	ABA
8	157	893	416	ABB
9	893	157	416	ABB
10	416	157	893	ABB
11	157	893	416	ABB
12	416	157	893	AAB
13	893	157	416	ABB
14	157	893	416	AAB
15	893	157	416	ABB
16	416	157	893	AAB

Codes: 157, FO3; 416, recombinant oil; 893, FO3. Total panelists, 16. Correct answers, 4. $p > 0.05$

Table 3S Peroxide value (PV) and anisidine value (AV) changes in fish oil at 60 ºC.

Sample	Time (days)	PV (meq/kg)	AV	Totox
FO0	0.0	5.9±1.2a	1.3±0.2a	13.1±1.2a
FO1	0.5	51.6±2.1b	8.9±0.7b	112.1± 2.2b
FO2	1.0	104.2±7.6c	16.9±0.3c	225.3±7.6c
FO3	1.5	151.7±2.6d	31.6±0.2d	335.0±2.6d
FO4	2.0	187.2±1.8e	47.6±0.5e	422.0±1.9e
FO5	3.0	305±19f	74.6±3.0f	685±19f

Data express mean values and deviation standard of three determinations. Different letters show significant differences (p<0.05) according to Dunnett's test.

Table 4S. Fatty acid compositions (%) of purified sunflower oil, algae oil and fish oil.

	Sunflower oil	**Algae oil**	**Fish oil**
C10:0	0.14±0.01a	4.99±0.25b	0.11±0.01a
C12:0	0.23±0.03a	6.04±0.17c	0.68±0.02b
C14:0	0.86±0.14a	9.01±0.03c	5.69±0.14b
C15:0	0.09±0.00a	0.05±0.00a	1.99±0.03b
C16:0	15.27±0.32b	10.28±0.03a	10.02±0.14a
C16:1	0.65±0.24a	4.94±0.16b	6.41±0.24c
C17:0	0.11±0.01b	0.02±0.00a	1.96±0.06c
C18:0	10.68±0.02c	3.09±0.20a	6.06±0.20b
C18:1ω9	24.70±0.57c	17.32±0.36b	14.49±0.39a
C18:2ω6	37.97±1.38b	6.60±0.02a	7.32±0.03a
C18:3ω3	0.89±0.01b	0.09±0.00a	0.73±0.01b
C20:0	1.38±0.20b	0.28±0.01a	1.22±0.10b
C20:1	0.63±0.09b	0.19±0.01a	2.74±0.15c
C20:2ω6	ND	ND	0.62±0.03
C20:4ω6	ND	0.16±0.01a	7.85±0.11b
C20:5ω3	ND	0.29±0.00a	9.88±0.59b
C22:0	4.70±0.38b	0.82±0.02a	0.58±0.03a
C22:1	ND	0.16±0.01a	0.51±0.01b
C24:0	1.69±0.38c	0.23±0.00a	0.52±0.05b
C24:1	ND	0.12±0.00a	1.63±0.15b
C22:6ω3	ND	35.31±0.09b	19.01±0.83a
SFA	35.16±0.13b	34.83±0.34b	28.83±0.25a
MUFA	25.98±1.73a	22.73±0.69a	25.77±0.65a
PUFA	38.86±0.47a	42.44±0.85ab	45.40±1.05b

Data express mean values and deviation standard of three determinations. Different letters show significant differences ($p<0.05$) according to Dunnett's test. SFA, saturated fatty acids; MUFA, monounsaturated fatty acids; PUFA, polyunsaturated fatty acids; ND, not detected.

Table 5S Qualitative analysis of volatile compounds in algae oil and fish oil using GC-IMS library.

Number	Compound	CAS[a]	MW[b]	RI[c]	DT[d]
1	Anisylalcohol, formate	C122918	166.2	1302.9	1.0773
2	Citral	C5392405	152.2	1274.1	1.1866
3	Linalyl acetate	C115957	196.3	1251.2	1.2199
4	Cyclopentanone	C120923	84.1	1203.4	1.1098
5	2-Methylisoborneol	C2371428	168.3	1203.2	1.2659
6	Methyl chavicol	C140670	148.2	1203.2	1.2319
7	4-Ethyl phenol	C123079	122.2	1143.3	1.1923
8	Butyl acetate	C123864	116.2	1121.1	1.6238
9	2-Methyl-2-pentenal	C623369	98.1	1125.7	1.1587
10	1,8-Cineole	C470826	154.3	1050	1.2803
11	2,2,4,6,6-Pentamethylheptane	C13475826	170.3	990.7	1.0523
12*	2,2,4,6,6-Pentamethylheptane	C13475826	170.3	1009.7	1.0962
13	Unknown				
14	α-Phellandrene	C99832	136.2	988.6	1.2148
15	α-Pinene	C80568	136.2	948.9	1.2183
16	Ethyl 3-hydroxybutanoate	C5405414	132.2	946.9	1.1718
17	Styrene	C100425	104.2	919.6	1.0562
18	2-Acetylfuran	C1192627	110.1	905.6	1.1235
19	Unknown				
20	Ethyl 3-hydroxybutyrate	C5405414	132.2	919.9	1.1789
21	3-Methyl-butanoic acid	C503742	102.1	857.4	1.227
22	3-Furanmethanol	C4412913	98.1	841.9	1.3547
23	2,3-Butanediol	C513859	90.1	820.3	1.3671
24	Methyl 3-methylbutanoate	C556241	116.2	766.4	1.2
25	1-Pentanol	C71410	88.1	756.4	1.2589
26	Hexanal	C66251	100.2	772.2	1.2637
27	Mesityl oxide	C141797	98.1	776.7	1.1255
28	Methyl isobutyl ketone	C108101	100.2	731.8	1.1827
29	Unknown				
30	Acetic acid	C64197	60.1	668.2	1.1449
31	1,2-Dimethoxyethane	C110714	90.1	646.8	1.2856
32	Ethyl Acetate	C141786	88.1	631.1	1.3417
33	(*E*)-2-Pentene	C646048	70.1	505.5	1.3624
34	*tert*-Butanol	C75650	74.1	548.8	1.1349
35	Unknown				
36	Butyl methyl ketone	C591786	100.2	790.6	1.1897

37	Hexanal	C66251	100.2	792.1	1.2602
38	3-Furanmethanol	C4412913	98.1	841.9	1.3547
39	Cyclopentanone	C120923	84.1	816.1	1.1119
40	Isobutyl formate	C542552	102.1	661.7	1.2027
41	2,3-Dimethyl-1-butene	C563780	84.2	541.5	1.4554
42	Styrene	C100425	104.2	919.6	1.0562
43	1-Octen-3-ol	C3391864	128.2	991.2	1.1527
44	Acetoin (3-hydroxy-2-	C513860	88.1	747.1	1.0681
45	Unknown				
46	Toluene	C108883	92.1	758.5	1.0301
47	l-Menthone	C10458147	154.3	1163.5	1.3434
48	Isophorone oxide	C10276218	154.2	1163.3	1.3444
49	3-Methyl-3-buten-1-ol	C763326	86.1	711	1.2888
50	2-Methyl-1-butanol	C137326	88.1	780.7	1.2325
51	Heptanal	C111717	114.2	888.6	1.3295
52	3-Octanol	C589980	130.2	981.1	1.4022
53	1-Propanol	C71238	60.1	541	1.2572
54	Unknown				
55	Hexan-1-ol	C111273	102.2	888.8	1.332
56	Unknown				
57	trans-2-Heptenal	C18829555	112.2	939.8	1.2524
58	Pentanoic acid	C109524	102.1	918.3	1.5079
59	Heptanal	C111717	114.2	886.7	1.6866
60	Ethyl 2-methylpropanoate	C97621	116.2	742.5	1.1907
61	2,6-Dimethyl-phenol	C576261	122.2	1116.4	1.1281
62	Pentanal	C110623	86.1	713.6	1.1907
63	*trans*-2-Pentenal	C1576870	84.1	748.9	1.1112
64	Butanoic acid	C107926	88.1	792.7	1.3915
65	Dihydro-2-methyl-3(2H)-	C3188009	100.1	778.8	1.4156
66	Unknown				
67	Hexanoic acid	C142621	116.2	1007.8	1.6558
68	(*E*,*E*)-2,4-Heptadienal	C4313035	110.2	971.7	1.1931
69	Unknown				
70	6-Methylhepta-3,5-dien-2-one	C1604280	124.2	1122	1.2011
71	Limonene	C138863	136.2	1039.1	1.2172
72	Unknown				
73	Unknown				
74	Ethylidenecyclohexane	C1003641	110.2	864	0.9426
75	Ethylbenzene	C100414	106.2	852.4	0.9426
76	2-Methylbutanoic acid	C116530	102.1	846.3	1.2054

77	2-Methylbutyric acid	C116530	102.1	827.6	1.2054
78	3-Methylbutyric acid	C503742	102.1	810.6	1.2067
79	2-Ethylfuran	C3208160	96.1	719.4	1.058
80	Ethanol	C64175	46.1	469.4	1.0419
81	Propanal	C123386	58.1	469.4	1.0419
82	5-Methylfurfural	C620020	110.1	947.3	1.1315
83	3-Methyl-2-butenal	C107868	84.1	766.6	1.3513
84	Ethyl methyl ketone	C78933	72.1	593.3	1.0607
85	Butanal	C123728	72.1	571.7	1.0911
86	3-Methylbutanal	C590863	86.1	611	1.2016
87	2-Propanol	C67630	60.1	492.4	1.0915
88	iso-Pentane	C78784	72.2	464.9	1.2679
89	Unknown				
90	Benzeneacetaldehyde	C122781	120.2	1010.2	1.2568
91	Ethyl formate	C109944	74.1	524.5	1.0662
92	Propionic acid	C79094	74.1	686.6	1.2573
93	(*E*)-2-Heptene	C14686136	98.2	712.2	1.3879
94	Hept-3-en-2-one	C1119444	112.2	940.8	1.228
95	2,3-Pentanedione	C600146	100.1	711.9	1.2166
96	n-Decanol	C112301	158.3	1253.3	1.6028
97	3-Methyl-3-Buten-1-ol	C763326	86.1	711	1.2888
98	Unknown				
99	Propanoic acid	C79094	74.1	710.9	1.1099
100	2,5-Dimethyl-Furan	C625865	96.1	685.8	1.0391
101	3-Methyl-2-Butenal	C107868	84.1	712.1	1.3576
102	2-Propanol	C67630	60.1	976.3	1.236
103	Pentanal	C110623	86.1	715.6	1.4174
104	Unknown				
105	2-Methyl-2-Pentenal	C623369	98.1	824.4	1.1614
106	Butanoic acid	C107926	88.1	811.5	1.164
107	Dihydro-2-Methyl-3(2H)-	C3188009	100.1	774.4	1.0798
108	Unknown				
109	Unknown				
110	2-Propenal	C107028	56.1	465.4	1.0681
111*	2-Propenal	C107028	56.1	465.4	1.0681
112	Unknown				

[a]CAS registry number by the Chemical Abstracts Service. [b]Molecular weight. [c]Retention index. [d]Drift time. * Dimeric species formed through reaction between the parent ionized molecules.

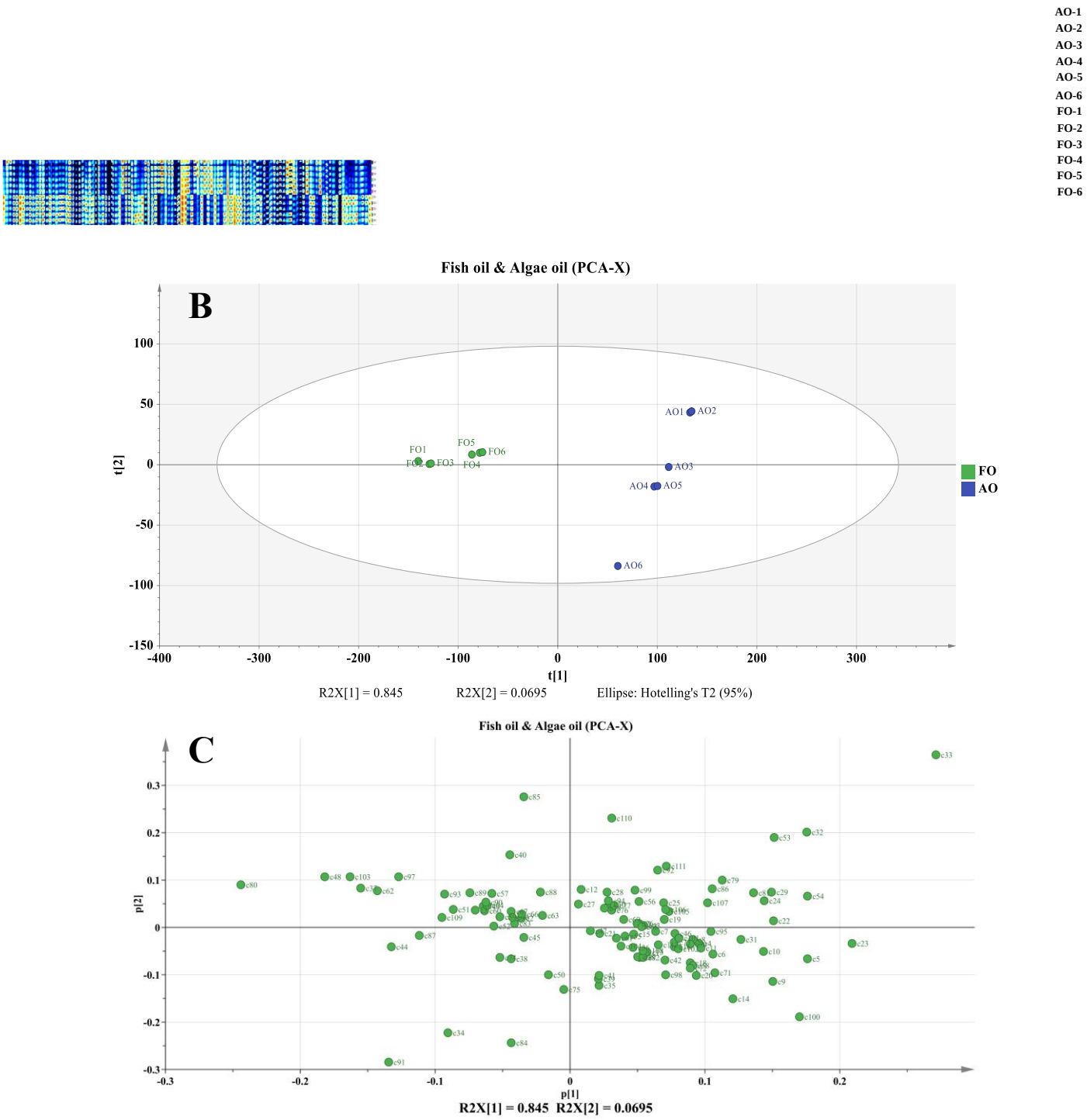

Figure 1S SHS-GC-IMS fingerprint (**A**), PCA score plot (**B**) and loading scatter plot (**C**) of the data for volatile substances of fish oil (FO) and algae oil (AO) oxidized at 60 ºC for 2 days. Data obtained from 6 determinations. Color in **A** provides information on the content of the volatile compounds. When this increases the color changes in the order blue, white, yellow and red.

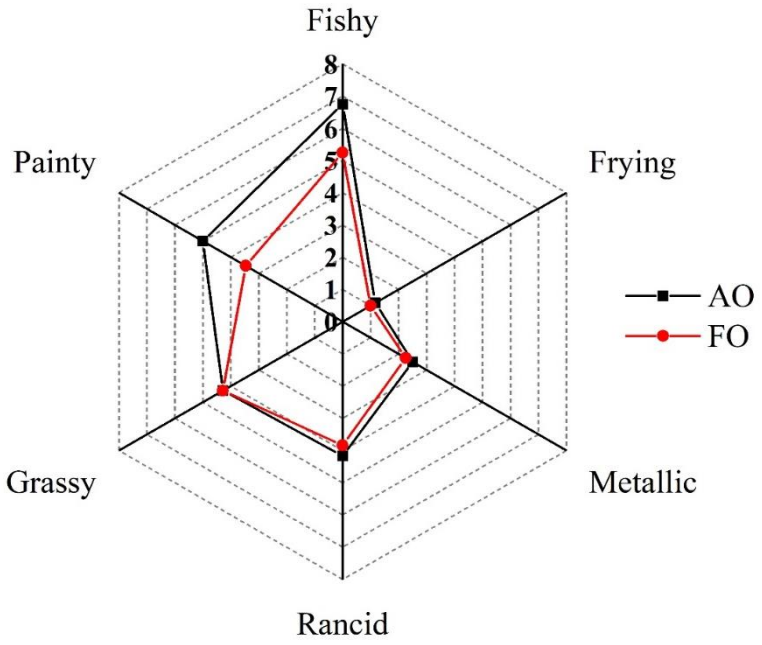

Figure 2S Sensory odor profiles of fish oil (FO) and algae oil (AO) oxidized at 60 ºC for 2 days. The intensity values for each odor attribute are indicated next. 0-not perceptible, 2-slightly perceptible, 4-perceptible, 6-considerably perceptible, 8-strongly perceptible and 10-very strongly perceptible.

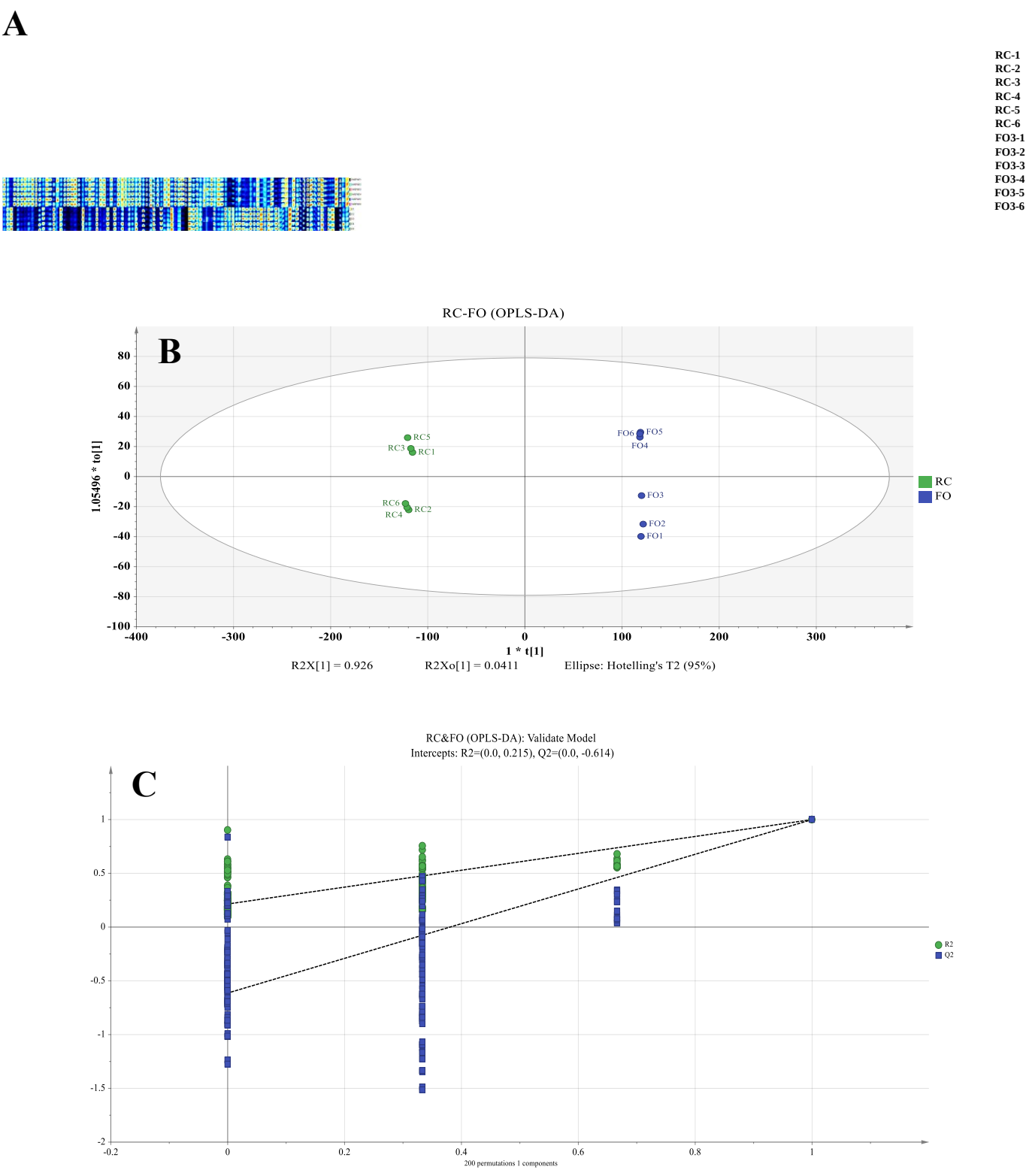

Figure 3S

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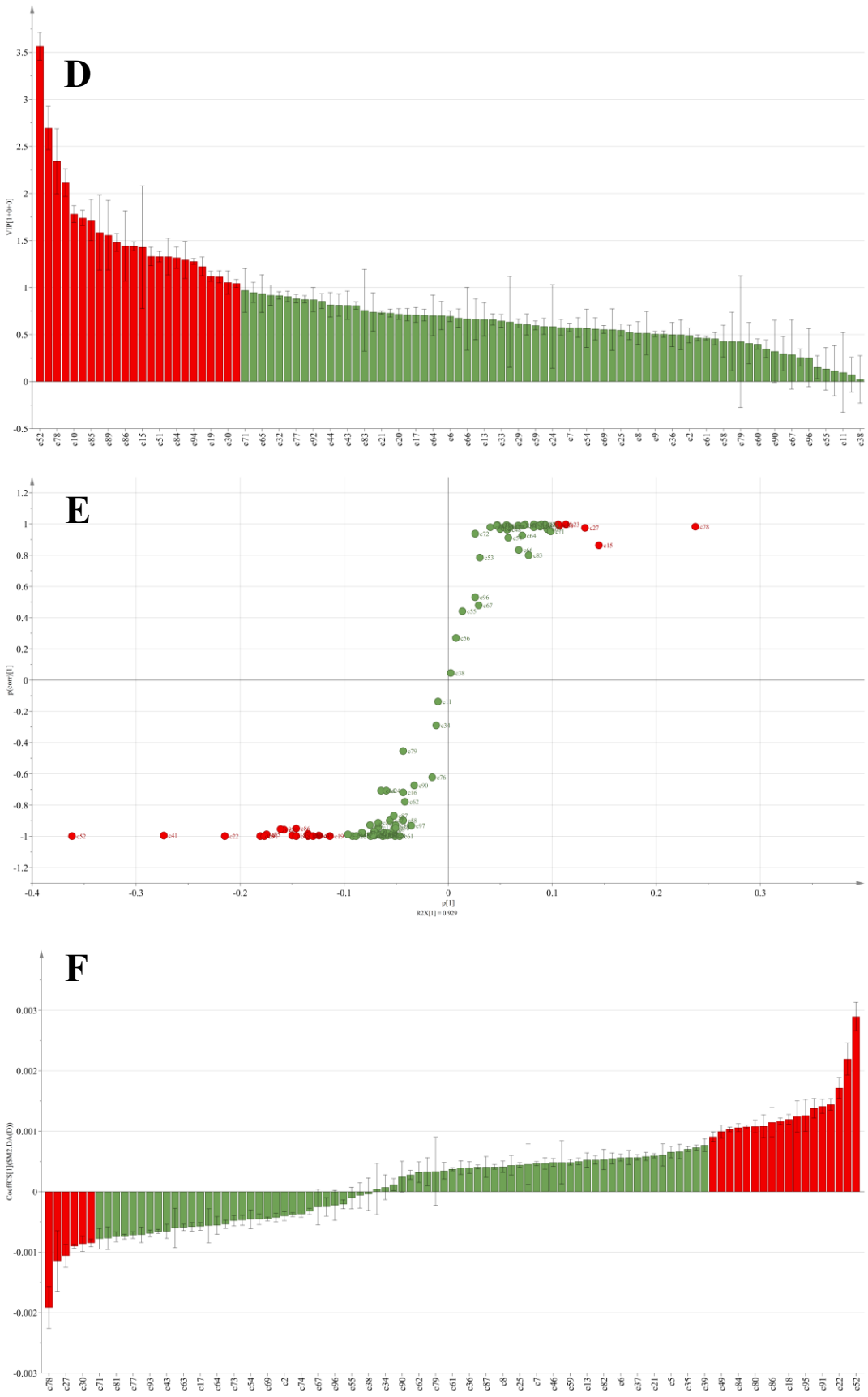

Figure 3S SHS-GC-MS fingerprint of the recombined oil (RC, DHA&EPA&SO) and oxidized fish oil (FO3) (**A**). Score plot of the OPLS-DA model (R^2X= 0.929, R^2Y = 0.996, Q^2=0.996) (**B**). Permutation test of the OPLS-DA model with intercepts of R^2=0.215 and Q^2= -0.614 (**C**). Variable importance in the projection (VIP) plot of the independent OPLS-DA model (**D**). S-plot of the OPLS-DA model (**E**). Loading plot with jack-knifed confidence intervals (**F**). Data obtained from 6 determinations. Color in **A** provides information on the content of the volatile compounds. When this increases the color changes in the order blue, white, yellow and red.