Supplementary materials

Table S1. Factor and Level for Response Surface Analysis

Level	A/mg	B/%	C/s
-1	15	55	120
0	20	60	150
1	25	65	180

Table S2. BBD-RSM experimental design and results

Number	A/mg	B/%	C/s	OD value
1	15.00	60.00	120.00	63.30
2	20.00	60.00	150.00	90.16
3	20.00	55.00	120.00	52.62
4	15.00	60.00	180.00	66.93
5	25.00	55.00	150.00	57.71
6	20.00	60.00	150.00	92.78
7	15.00	65.00	150.00	56.94
8	20.00	65.00	120.00	68.48
9	25.00	60.00	120.00	76.84
10	25.00	60.00	180.00	75.66
11	20.00	60.00	150.00	91.00
12	20.00	65.00	180.00	60.93
13	20.00	60.00	150.00	94.33
14	15.00	55.00	150.00	49.76
15	20.00	60.00	150.00	93.52
16	20.00	55.00	180.00	56.92
17	25.00	65.00	150.00	76.92

Table S3. Results of the fitted variance analysis

Source	Squares	df	Square	F	*P*-value	Significance
Model	3883.97	9	431.55	118.88	< 0.0001	significant
A	314.75	1	314.75	86.71	< 0.0001	
B	267.27	1	267.27	73.62	< 0.0001	
C	0.080	1	0.080	0.022	0.8862	
AB	36.30	1	36.30	10.00	0.0159	
AC	5.78	1	5.78	1.59	0.2473	
BC	35.11	1	35.11	9.67	0.0171	
A^2	467.55	1	467.55	128.80	< 0.0001	
B^2	1943.19	1	1943.19	535.29	< 0.0001	
C^2	522.31	1	522.31	143.88	< 0.0001	
Residual	25.41	7	3.63	-	-	
Lack of Fit	13.32	3	4.44	1.47	0.3497	no significance
Pure Error	12.09	4	3.02	-	-	
Cor Total	3909.38	16	-	-	-	

Table S4. Relative contents of volatile components of ATEO

CAS	Ingredient Name	Y	1h-M	1h-O	1h-P	3h-M	3h-O	3h-P	8h-M	8h-O	8h-P
000111-84-2	Nonane	0.15 ± 0.01	0.16 ± 0.00	0.15 ± 0.00	0.00 ± 0.00	0.16 ± 0.00	0.16 ± 0.01	0.00 ± 0.00	0.16 ± 0.00	0.15 ± 0.01	0.00 ± 0.00
007785-70-8	4(10)-Thujene	0.35 ± 0.01	0.00 ± 0.00	0.05 ± 0.04	0.34 ± 0.01	0.00 ± 0.00	0.00 ± 0.00	0.33 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.31 ± 0.01
000079-92-5	Camphene	0.30 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.29 ± 0.01	0.00 ± 0.00	0.00 ± 0.00	0.28 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.26 ± 0.01
003387-41-5	Sabenene	0.50 ± 0.01	0.10 ± 0.02	0.16 ± 0.04	0.48 ± 0.02	0.00 ± 0.00	0.00 ± 0.00	0.47 ± 0.01	0.00 ± 0.00	0.00 ± 0.00	0.43 ± 0.02
000127-91-3	beta.-Pinene	0.38 ± 0.00	0.06 ± 0.05	0.11 ± 0.03	0.36 ± 0.02	0.00 ± 0.00	0.00 ± 0.00	0.35 ± 0.01	0.00 ± 0.00	0.00 ± 0.00	0.33 ± 0.02
000500-00-5	4-methyl-1-propan-2-ylcyclohexene	0.13 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.13 ± 0.01	0.00 ± 0.00	0.00 ± 0.00	0.13 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.12 ± 0.00
000110-93-0	6-Methyl-5-hepten-2-one	0.13 ± 0.00	0.00 ± 0.00	0.06 ± 0.05	0.12 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.12 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.10 ± 0.00
000123-35-3	beta.-Myrcene	0.31 ± 0.00	0.11 ± 0.01	0.14 ± 0.03	0.31 ± 0.01	0.00 ± 0.00	0.00 ± 0.00	0.30 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.28 ± 0.00
000099-83-2	alpha.-phellandrene	0.31 ± 0.00	0.11 ± 0.01	0.14 ± 0.03	0.31 ± 0.01	0.00 ± 0.00	0.00 ± 0.00	0.30 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.28 ± 0.00
007785-26-4	(1S)-(-)-alpha-Pinene	0.43 ± 0.00	0.14 ± 0.02	0.19 ± 0.04	0.43 ± 0.01	0.00 ± 0.00	0.00 ± 0.00	0.41 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.39 ± 0.01
000470-67-7	1,4-Cineole	0.37 ± 0.00	0.05 ± 0.09	0.21 ± 0.03	0.35 ± 0.00	0.06 ± 0.05	0.00 ± 0.00	0.34 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.29 ± 0.00
000099-86-5	1-Isopropyl-4-methyl-1,3-cyclohexadiene	0.61 ± 0.01	0.24 ± 0.03	0.31 ± 0.05	0.60 ± 0.01	0.07 ± 0.06	0.00 ± 0.00	0.59 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.54 ± 0.01
000099-87-6	p-Cymene	0.56 ± 0.01	0.30 ± 0.02	0.36 ± 0.04	0.57 ± 0.01	0.14 ± 0.02	0.09 ± 0.02	0.57 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.55 ± 0.01
005989-27-5	D-Limonene	3.71 ± 0.05	1.89 ± 0.16	2.26 ± 0.28	3.76 ± 0.04	0.83 ± 0.14	0.45 ± 0.08	3.72 ± 0.01	0.00 ± 0.00	0.00 ± 0.00	3.50 ± 0.05
000470-82-6	Eucalyptol	0.36 ± 0.01	0.21 ± 0.01	0.24 ± 0.02	0.35 ± 0.01	0.10 ± 0.01	0.00 ± 0.00	0.35 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.30 ± 0.01
000508-32-7	Tricyclene	1.34 ± 0.02	0.79 ± 0.05	0.90 ± 0.09	1.31 ± 0.01	0.44 ± 0.05	0.29 ± 0.03	1.30 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	1.22 ± 0.01
000586-67-4	Cyclohexene, 4-methyl-1-(1-methylethenyl)-	0.14 ± 0.00	0.02 ± 0.04	0.07 ± 0.01	0.13 ± 0.02	0.00 ± 0.00	0.00 ± 0.00	0.14 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.13 ± 0.00
029050-33-7	(+)-4-Carene	0.95 ± 0.01	0.63 ± 0.03	0.69 ± 0.06	0.93 ± 0.01	0.39 ± 0.04	0.28 ± 0.03	0.92 ± 0.00	0.03 ± 0.06	0.15 ± 0.15	0.87 ± 0.01
000586-62-9	4-Isopropylidene-1-cyclohexene	4.31 ± 0.05	3.06 ± 0.13	3.33 ± 0.23	4.35 ± 0.01	2.03 ± 0.19	1.51 ± 0.13	4.32 ± 0.03	0.19 ± 0.16	0.12 ± 0.21	4.10 ± 0.05
000078-70-6	1,6-Octadien-3-ol,3,7-dimethyl-	0.33 ± 0.00	0.32 ± 0.00	0.32 ± 0.00	0.32 ± 0.00	0.30 ± 0.01	0.28 ± 0.00	0.32 ± 0.00	0.17 ± 0.03	0.20 ± 0.00	0.31 ± 0.00
001632-73-1	Fenchol	0.51 ± 0.00	0.50 ± 0.00	0.51 ± 0.01	0.51 ± 0.00	0.47 ± 0.01	0.45 ± 0.00	0.50 ± 0.00	0.29 ± 0.05	0.33 ± 0.01	0.49 ± 0.01

000586-82-3	3-Cyclohexen-1-ol,1-methyl-4-(1-methylethyl)-	1.79 ± 0.02	1.80 ± 0.02	1.83 ± 0.01	1.80 ± 0.01	1.73 ± 0.02	1.69 ± 0.01	1.79 ± 0.01	1.20 ± 0.13	1.34 ± 0.03	1.77 ± 0.02
000138-87-4	Cyclohexanol,1-methyl-4-(1-methylethenyl)-	4.79 ± 0.05	4.90 ± 0.05	4.95 ± 0.01	4.89 ± 0.01	4.56 ± 0.16	4.73 ± 0.03	4.88 ± 0.01	3.69 ± 0.28	3.90 ± 0.22	4.83 ± 0.07
000106-23-0	6-Octenal,3,7-dimethyl-	4.90 ± 0.06	4.68 ± 0.04	4.83 ± 0.07	4.95 ± 0.02	4.34 ± 0.09	4.21 ± 0.07	4.94 ± 0.02	2.76 ± 0.39	3.03 ± 0.21	4.81 ± 0.07
000124-76-5	Isoborneol	0.26 ± 0.00	0.20 ± 0.05	0.26 ± 0.00	0.17 ± 0.00	0.19 ± 0.04	0.23 ± 0.00	0.20 ± 0.06	0.16 ± 0.02	0.17 ± 0.00	0.23 ± 0.05
000464-45-9	L(-)-Borneol	0.23 ± 0.00	0.23 ± 0.00	0.24 ± 0.00	0.23 ± 0.00	0.23 ± 0.00	0.23 ± 0.00	0.23 ± 0.00	0.19 ± 0.01	0.20 ± 0.00	0.23 ± 0.00
000562-74-3	3-Cyclohexen-1-ol,4-methyl-1-(1-methylethyl)-	0.37 ± 0.00	0.37 ± 0.00	0.38 ± 0.00	0.37 ± 0.00	0.36 ± 0.00	0.35 ± 0.00	0.37 ± 0.00	0.25 ± 0.02	0.28 ± 0.00	0.37 ± 0.00
055722-59-3	3,6-Octadienal,3,7-dimethyl-	0.12 ± 0.00	0.12 ± 0.00	0.12 ± 0.00	0.12 ± 0.00	0.12 ± 0.00	0.12 ± 0.00	0.12 ± 0.00	0.11 ± 0.00	0.11 ± 0.00	0.12 ± 0.00
007785-53-7	3-Cyclohexene-1-methanol,.alpha.,.alpha.,4-trimethyl-, (R)-	0.66 ± 0.01	0.70 ± 0.01	0.70 ± 0.00	0.66 ± 0.00	0.70 ± 0.00	0.71 ± 0.00	0.65 ± 0.00	0.61 ± 0.02	0.65 ± 0.01	0.66 ± 0.01
000586-81-2	Cyclohexanol,1-methyl-4-(1-methylethylidene)-	0.19 ± 0.01	0.20 ± 0.00	0.20 ± 0.00	0.19 ± 0.00	0.20 ± 0.00	0.20 ± 0.00	0.18 ± 0.00	0.17 ± 0.01	0.18 ± 0.00	0.18 ± 0.00
001117-61-9	6-Octen-1-ol,3,7-dimethyl-,(R)-	2.22 ± 0.01	2.43 ± 0.02	2.39 ± 0.02	2.24 ± 0.00	2.53 ± 0.01	2.56 ± 0.01	2.23 ± 0.01	2.53 ± 0.02	2.58 ± 0.04	2.25 ± 0.03
000106-26-3	Neral	4.11 ± 0.02	4.27 ± 0.03	4.28 ± 0.01	4.17 ± 0.01	4.28 ± 0.03	4.24 ± 0.01	4.16 ± 0.02	3.54 ± 0.19	3.75 ± 0.07	4.13 ± 0.05
000106-24-1	Geraniol	3.32 ± 0.02	3.63 ± 0.02	3.60 ± 0.03	3.34 ± 0.01	3.78 ± 0.02	3.86 ± 0.02	3.34 ± 0.01	3.86 ± 0.02	3.95 ± 0.07	3.37 ± 0.04
000141-27-5	2,6-Octadienal,3,7-dimethyl-,(E)-	5.16 ± 0.04	5.44 ± 0.04	5.43 ± 0.02	5.20 ± 0.03	5.41 ± 0.20	5.44 ± 0.21	5.21 ± 0.02	5.00 ± 0.14	5.22 ± 0.12	5.21 ± 0.06
002792-39-4	2,6-Octadiene,2,6-dimethyl-	0.52 ± 0.00	0.56 ± 0.00	0.56 ± 0.01	0.51 ± 0.00	0.59 ± 0.00	0.60 ± 0.00	0.51 ± 0.00	0.59 ± 0.00	0.61 ± 0.01	0.52 ± 0.01
000097-53-0	Eugenol	0.26 ± 0.00	0.30 ± 0.00	0.29 ± 0.00	0.29 ± 0.02	0.31 ± 0.00	0.32 ± 0.01	0.26 ± 0.00	0.37 ± 0.03	0.35 ± 0.01	0.26 ± 0.00
068705-63-5	geranyl 2-methyl butyrate	0.63 ± 0.00	0.69 ± 0.01	0.67 ± 0.01	0.60 ± 0.01	0.72 ± 0.00	0.73 ± 0.00	0.61 ± 0.00	0.74 ± 0.01	0.76 ± 0.03	0.61 ± 0.01
000515-13-9	1-Methyl-1-ethenyl-2,4-bis(1'-methylethenyl)cyclohexane	0.57 ± 0.00	0.62 ± 0.01	0.61 ± 0.00	0.56 ± 0.00	0.65 ± 0.00	0.65 ± 0.01	0.56 ± 0.00	0.65 ± 0.00	0.66 ± 0.01	0.57 ± 0.00
000469-61-4	.alpha.-Cedrene	0.52 ± 0.00	0.56 ± 0.00	0.55 ± 0.00	0.51 ± 0.00	0.58 ± 0.00	0.59 ± 0.02	0.51 ± 0.00	0.56 ± 0.02	0.58 ± 0.01	0.52 ± 0.00
000546-28-1	1H-3a,7-Methanoazulene, octahydro-3,8,8-trimethyl-6-meth	0.73 ± 0.00	0.79 ± 0.00	0.79 ± 0.01	0.73 ± 0.00	0.82 ± 0.01	0.82 ± 0.01	0.73 ± 0.00	0.80 ± 0.01	0.83 ± 0.01	0.73 ± 0.01

729602-94-2	Spiro[4.5]dec-7-ene, 1,8-dimethyl-4-(1-methylethenyl)-, (1R,4R,5S)-	0.60 ± 0.24	0.76 ± 0.20	0.61 ± 0.19	0.51 ± 0.04	0.78 ± 0.22	0.69 ± 0.50	0.47 ± 0.01	1.03 ± 0.01	0.62 ± 0.34	0.60 ± 0.19
103827-22-1	4a,8-Dimethyl-2-(prop-1-en-2-yl)-1,2,3,4,4a,5,6,7-octahydrona	1.31 ± 0.06	1.47 ± 0.13	1.37 ± 0.12	1.25 ± 0.06	1.53 ± 0.13	1.62 ± 0.04	1.28 ± 0.05	1.81 ± 0.04	1.68 ± 0.20	1.26 ± 0.16
030021-74-0	gamma.-Muurolene	0.64 ± 0.04	0.71 ± 0.05	0.66 ± 0.03	0.62 ± 0.04	0.76 ± 0.06	0.77 ± 0.03	0.63 ± 0.02	0.85 ± 0.05	0.83 ± 0.06	0.64 ± 0.02
014912-44-8	Tricyclo[4.4.0.02,7]dec-3-ene, 1,3-dimethyl-8-(1-methylethyl)-,	1.72 ± 0.04	1.91 ± 0.08	1.81 ± 0.05	1.67 ± 0.03	2.00 ± 0.09	2.04 ± 0.05	1.70 ± 0.04	2.26 ± 0.03	2.16 ± 0.11	1.71 ± 0.06
017066-67-0	beta.-Selinene	3.31 ± 0.04	3.70 ± 0.08	3.57 ± 0.05	3.29 ± 0.02	3.91 ± 0.09	3.98 ± 0.07	3.34 ± 0.04	4.35 ± 0.05	4.27 ± 0.10	3.41 ± 0.06
028624-23-9	delta.-Selinene	0.52 ± 0.03	0.59 ± 0.06	0.51 ± 0.01	0.46 ± 0.02	0.61 ± 0.06	0.62 ± 0.07	0.51 ± 0.03	0.81 ± 0.01	0.70 ± 0.12	0.52 ± 0.06
086495-16-1	4,5-dimethyl-11-methylenetricyclo[7.2.1.0 (4.9)]dodecane	4.39 ± 0.03	4.88 ± 0.04	4.76 ± 0.05	4.39 ± 0.03	5.13 ± 0.06	5.21 ± 0.06	4.42 ± 0.03	0.00 ± 0.00	0.00 ± 0.00	4.50 ± 0.01
029621-78-1	alpha.-Cuprenene	1.98 ± 0.01	2.12 ± 0.01	2.07 ± 0.02	1.93 ± 0.02	2.25 ± 0.02	2.25 ± 0.03	1.96 ± 0.02	2.38 ± 0.00	2.34 ± 0.02	1.97 ± 0.01
010208-80-7	alpha.-Muurolene	2.97 ± 0.01	3.31 ± 0.03	3.24 ± 0.04	3.01 ± 0.02	3.50 ± 0.02	3.55 ± 0.01	3.00 ± 0.01	3.89 ± 0.06	3.84 ± 0.02	3.05 ± 0.01
016982-00-6	Benzene, 1-methyl-4-(1,2,2-trimethylcyclopentyl)-, (R)-	5.62 ± 0.04	6.37 ± 0.11	6.26 ± 0.15	5.74 ± 0.05	6.75 ± 0.13	6.71 ± 0.01	5.76 ± 0.01	7.49 ± 0.10	7.43 ± 0.05	5.86 ± 0.04
028400-12-6	(1R,5S)-1,8-Dimethyl-4-(propan-2-ylidene)spiro[4.5]dec-7-ene	7.89 ± 0.03	8.71 ± 0.05	8.57 ± 0.11	7.26 ± 1.27	9.23 ± 0.01	8.55 ± 1.42	8.02 ± 0.01	9.24 ± 1.42	10.04 ± 0.08	8.13 ± 0.05
016204-67-4	1,1,4,5,6-pentamethyl-2,3-dihydro-1H-indene	0.58 ± 0.00	0.65 ± 0.00	0.64 ± 0.01	0.59 ± 0.00	0.70 ± 0.00	0.70 ± 0.01	0.59 ± 0.01	0.90 ± 0.02	0.81 ± 0.08	0.60 ± 0.00
000483-76-1	delta.-Cadinene	10.08 ± 0.05	11.11 ± 0.08	10.96 ± 0.15	10.27 ± 0.11	11.81 ± 0.02	11.96 ± 0.03	10.30 ± 0.02	13.00 ± 0.20	12.88 ± 0.10	10.42 ± 0.08
997220-96-6	gamma.-Curcumene	1.05 ± 0.06	1.18 ± 0.04	1.11 ± 0.03	1.07 ± 0.01	1.22 ± 0.03	1.21 ± 0.02	1.04 ± 0.03	1.31 ± 0.06	1.35 ± 0.03	1.03 ± 0.02
053585-13-0	(E)-1-Methyl-4-(6-methylhept-5-en-2-ylidene)cyclohex-1-ene	1.53 ± 0.07	1.64 ± 0.04	1.67 ± 0.01	1.50 ± 0.03	1.77 ± 0.03	1.83 ± 0.01	1.53 ± 0.03	1.99 ± 0.05	1.91 ± 0.02	1.56 ± 0.05

024406-05-1	Naphthalene, 1,2,4a,5,6,8a-hexahydro-4,7-dimethyl-1-(1-met	1.32 ± 0.01	1.46 ± 0.01	1.45 ± 0.02	1.32 ± 0.02	1.55 ± 0.01	1.59 ± 0.01	1.32 ± 0.00	1.73 ± 0.04	1.73 ± 0.01	1.34 ± 0.02
000515-17-3	gamma.-Selinene	0.72 ± 0.00	0.80 ± 0.01	0.79 ± 0.01	0.73 ± 0.01	0.84 ± 0.00	0.87 ± 0.01	0.73 ± 0.01	0.94 ± 0.01	0.94 ± 0.00	0.74 ± 0.01
021391-99-1	alpha.-Calacorene	1.42 ± 0.01	1.58 ± 0.01	1.55 ± 0.02	1.43 ± 0.01	1.68 ± 0.01	1.71 ± 0.01	1.42 ± 0.00	1.87 ± 0.04	1.87 ± 0.01	1.45 ± 0.01
025532-79-0	Cyclohexene, 4-[(1E)-1,5-dimethyl-1,4-hexadien-1-yl]-1-meth	0.69 ± 0.00	0.76 ± 0.01	0.75 ± 0.01	0.68 ± 0.01	0.81 ± 0.01	0.83 ± 0.00	0.68 ± 0.00	0.91 ± 0.02	0.91 ± 0.01	0.70 ± 0.01
000639-99-6	Cyclohexanemethanol, 4-ethenyl-.alpha.,.alpha.,4-trimethyl-3-	1.05 ± 0.00	1.18 ± 0.01	1.16 ± 0.02	1.05 ± 0.01	1.26 ± 0.01	1.29 ± 0.01	1.05 ± 0.01	1.46 ± 0.03	1.45 ± 0.02	1.07 ± 0.02
158930-41-7	Eremophila ketone	0.48 ± 0.00	0.53 ± 0.00	0.52 ± 0.01	0.48 ± 0.01	0.57 ± 0.00	0.58 ± 0.00	0.48 ± 0.00	0.63 ± 0.01	0.63 ± 0.01	0.49 ± 0.00
997226-86-2	Polyvinyl chloride	0.28 ± 0.24	0.44 ± 0.03	0.45 ± 0.03	0.39 ± 0.01	0.50 ± 0.01	0.51 ± 0.01	0.41 ± 0.01	0.60 ± 0.01	0.60 ± 0.01	0.41 ± 0.03
000077-53-2	Cedrol	0.53 ± 0.02	0.62 ± 0.03	0.64 ± 0.01	0.54 ± 0.00	0.70 ± 0.01	0.71 ± 0.00	0.54 ± 0.01	0.87 ± 0.04	0.81 ± 0.02	0.55 ± 0.01
000629-97-0	Docosane	1.65 ± 0.14	1.81 ± 0.03	1.72 ± 0.02	1.68 ± 0.06	1.82 ± 0.04	1.76 ± 0.04	1.70 ± 0.14	1.71 ± 0.01	1.67 ± 0.15	1.65 ± 0.14
018675-33-7	Neodihydrocarveol	0.09 ± 0.08	0.04 ± 0.08	0.09 ± 0.08	0.04 ± 0.07	0.13 ± 0.00	0.13 ± 0.00	0.08 ± 0.07	0.12 ± 0.00	0.08 ± 0.07	0.09 ± 0.07
092471-23-3	(1R,2S,4R)-2-Hydroxy-alpha,alpha,4-trimethylcyclohexanemetha	0.00 ± 0.00	0.13 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.10 ± 0.09	0.00 ± 0.00	0.14 ± 0.00	0.10 ± 0.01	0.00 ± 0.00	0.13 ± 0.01
002050-24-0	Benzene,1,3-diethyl-5-methyl-	0.00 ± 0.00	0.13 ± 0.00	0.13 ± 0.00	0.00 ± 0.00	0.14 ± 0.00	0.14 ± 0.00	0.00 ± 0.00	0.18 ± 0.01	0.18 ± 0.00	0.04 ± 0.07
021290-09-5	Cyclohexanol, 5-methyl-2-(1-methylethenyl)-, (1R,2R,5R)-rel-	0.00 ± 0.00	0.02 ± 0.04	0.00 ± 0.00	0.03 ± 0.05	0.02 ± 0.04	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00
017699-14-8	(-)-Alpha-Cubebene	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.75 ± 1.30	0.00 ± 0.00	0.81 ± 1.41	0.00 ± 0.00	0.90 ± 1.56	0.00 ± 0.00	0.00 ± 0.00
913176-41-7	Bicyclo[7.2.0]undec-3-en-5-ol, 4,8,11,11-tetramethyl-, (3Z)-	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.35 ± 0.30	0.52 ± 0.00	0.00 ± 0.00	0.62 ± 0.01	0.63 ± 0.01	0.00 ± 0.00
094535-52-1	Cyclopenta[1,4]cyclobuta[1,2]ben	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.14 ± 0.15	0.20 ± 0.17	0.00 ± 0.00	0.35 ± 0.01	0.14 ± 0.16	0.00 ± 0.00

	zene, 1,2,3,3a,4,4a,7,8-octahydro-1,4,4,6-tetramethyl-, (1R,3aS,4aS,8aS)-rel-(-)-										
019912-62-0	T-muurolol	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.21 ± 0.18	0.31 ± 0.01	0.00 ± 0.00	0.42 ± 0.01	0.42 ± 0.01	0.00 ± 0.00
000473-13-2	α- Selinene	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	3.46 ± 3.00	0.00 ± 0.00	5.62 ± 0.09	5.57 ± 0.06	0.00 ± 0.00
000473-15-4	beta-Eudesmol	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.29 ± 0.01	0.30 ± 0.01	0.00 ± 0.00
110983-38-5	Phenol, 2-(2-[1,1'-biphenyl]-4-ylethenyl)-, (E)- (9CI)	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.16 ± 0.01	0.16 ± 0.00	0.00 ± 0.00
997462-58-2	(1.alpha.,4a.alpha.,10a.alpha.)-6-Methoxy-1,4a-dimethyl-3,4,4a,10a-tetrahydrophenanthrene-2,9(1H,10H)-dione	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.08 ± 0.08	0.03 ± 0.04	0.00 ± 0.00

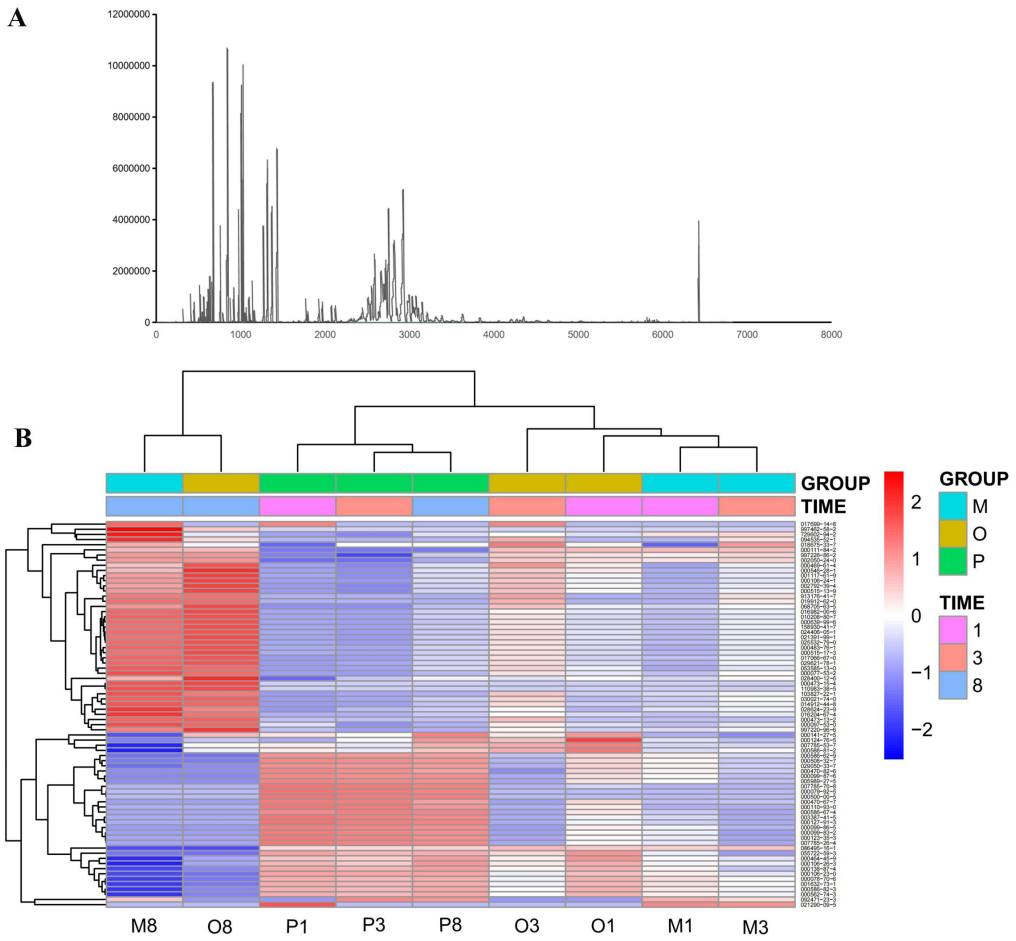

Fig. S1 Analysis of volatile components in AT Total ion flow diagram and heat map. GC-MS total ion chromatogram of EOs components of AT (A), and average relative content characteristic spectrum of EO components of AT under different heating time conditions (B).

Investigation of in vitro dissolution methodology

1.1 Preparation of reference solution

The appropriate amount of *α*-asarone and *β*-asarone standard was accurately weighed, and the volume was constant with n-hexane. The reference stock solution with a concentration of 2.09 mg/mL and 0.98 mg/mL was obtained.

1.2 Preparation of test solution

Appropriate amounts of ATEO and laboratory-made Pickering emulsion were accurately removed in a dialysis bag with a molecular retention of 300 kDa. 200 mL artificial gastric juice and artificial intestinal juice were taken as the release medium and placed in a water bath thermostatic shaker. The temperature was set to 37 °C and the speed was 100 r/min. When the temperature rose to the set value, the dialysis bag containing ATEO and Pickering emulsion was placed in a beaker, immediately started, and timed. At 48 h of dissolution, 2 mL of the dissolution solution was taken, 2 mL of n-hexane was added, vortexed for 3 min, and allowed to stand. The upper solution was collected, dehydrated with anhydrous sodium sulfate, and passed through a 0.22 μm microporous membrane. The filtrate was taken as the test solution and determined according to the conditions under '2.6.2'.

1.3 Methodological investigation

1.3.1 Investigation of specificity

The blank solvent, mixed reference solution, and test solution of ATEO after 48 h of dissolution in artificial intestinal fluid were taken and analyzed according to the conditions under '2.6.2'. In the chromatogram of the test solution, *α*-asarone and *β*-asarone had no chromatographic peaks at the retention time corresponding to the blank solvent, which proved that the blank solvent determination had no interference, indicating that the method had good specificity (Fig.S2).

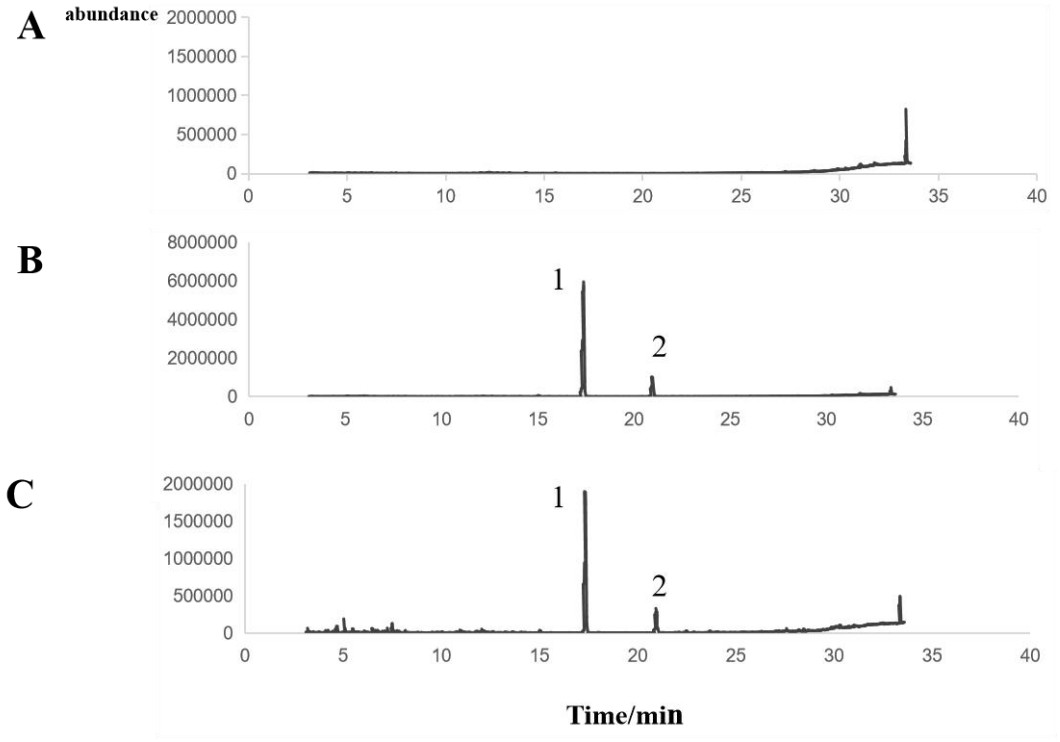

Fig. S2 GC-MS chromatogram of *β*-asarone and *α*-asarone

1.3.2 Standard curve and linear range

The appropriate amount of *β*-asarone stock solution was accurately transferred to a 2 mL volumetric flask, and the *β*-asarone standard solution was obtained by constant volume. The *β*-asarone standard solution was diluted 2, 4, 8, 20, 50, 100, 200, and 400 times with n-hexane, respectively. The appropriate amount of *α*-asarone stock solution was taken in a 2 mL volumetric flask, and the standard solution of *α*-asarone was obtained by constant volume, which was diluted 2,4,8,20 and 50 times, respectively. The standard curve was drawn according to the peak area (Y) of *α*-asarone and *β*-asarone and the concentration of the standard solution (X, μg/mL), and the regression equation was calculated. The results are shown in Table S5.

Table S5. *β*-asarone, *α*-asarone standard curve regression equation, and linear range

Component	Regression equation	*r*	range of linearity（μg/mL）
β-asarone	*Y*=1229063.33*X*+374280.58	0.9998	0.7350 - 294.0000
α-asarone	*Y*=1229488.77*X*-473586.32	0.9995	1.0427 - 52.1360

1.3.3 Investigation of precision

The reserve solution of *β*-asarone and *α*-asarone was accurately transferred to a 2 mL volumetric flask, constant volume filtered through a 0.22 μm microporous

membrane, and the filtrate was repeatedly injected 6 times according to the conditions of ' 2.6.2 '. Results The RSD of the peak area of *β*-asarone and *α*-asarone were 0.81 % and 0.86 %, respectively, which were less than 3.00 %, indicating that the instrument had good precision.

1.3.4 Repeatability investigation

Six portions of ATEO dissolved in artificial intestinal fluid for 48 h were accurately removed and treated according to the method under '1.2', and determined according to the conditions under '2.6.2'. Results The RSD of the peak area of *β*-asarone and *α*-asarone were 2.97% and 2.85%, respectively, indicating good repeatability.

1.3.5 Stability study

The dissolution solution of ATEO in artificial intestinal fluid at 48 h was accurately removed. After treatment according to the method under '1.2', the samples were injected at 0, 2, 4, 8, 12, and 24 h according to the conditions under '2.6.2'. Results The RSD of the peak area of *β*-asarone and *α*-asarone were 2.09% and 1.70%, respectively, indicating that the test solution was stable within 24 h.

1.3.6 Investigation of sample recovery rate

Six parts of the dissolution solution of ATEO with known content at 48 h were accurately removed. The reference solution was added according to 100 % of the content of *β*-asarone and *α*-asarone at 48 h of dissolution, and the recovery rate was determined and calculated according to the conditions under '2.6.2'. The RSD of the recovery rate of *β*-asarone and *α*-asarone in ATEO were 1.69% and 1.07%, respectively, indicating that the recovery rate was good. The results are shown in Table S6.

Table S6. The recovery of *β*-asarone and *α*-asarone in ATEO（*n*=6）

Component	Content in samples （μg/mL）	adding quantity （μg/mL）	measured value （μg/mL）	recovery rate %	RSD %
β-asarone	76.30	75.60	149.00	98.90	1.69
	74.41	75.60	149.38	102.01	
	75.50	75.60	148.39	99.17	
	73.87	75.60	149.12	102.38	
	76.63	75.60	149.01	98.48	
	76.86	75.60	149.89	99.32	
α-asarone	14.62	14.59	28.89	97.73	1.07
	14.68	14.59	28.89	97.36	
	14.66	14.59	29.14	99.16	
	14.17	14.59	28.72	99.72	
	14.54	14.59	28.93	98.53	
	14.88	14.59	29.05	97.05	

Table S7. The cumulative release of β-asarone and α-asarone in artificial gastric juice（n=3）

Component	Time（h）	ATEO（%）	Pickering emulsion（%）
β-asarone	0.08	0.48 ± 0.02	3.83 ± 0.08
	0.25	0.98 ± 0.03	4.28 ± 0.01
	0.5	1.40 ± 0.06	5.11 ± 0.11
	0.75	1.67 ± 0.12	4.99 ± 0.26
	1	2.24 ± 0.04	6.00 ± 0.11
	2	3.78 ± 0.21	7.28 ± 0.36
	4	6.45 ± 0.47	9.40 ± 0.66
	6	9.07 ± 0.64	12.76 ± 0.20
	8	10.51 ± 0.81	14.36 ± 0.42
	12	16.42 ± 0.26	19.19 ± 0.22
	24	26.15 ± 0.79	29.42 ± 0.71
	36	28.51 ± 4.51	34.46 ± 4.33
	48	34.10 ± 0.19	39.22 ± 0.74
α-asarone	0.08	0.63 ± 0.04	3.60 ± 0.14
	0.25	0.97 ± 0.02	3.77 ± 0.10
	0.5	1.16 ± 0.14	4.47 ± 0.12
	0.75	1.29 ± 0.08	4.46 ± 0.17
	1	1.62 ± 0.13	4.87 ± 0.17
	2	2.34 ± 0.15	5.90 ± 0.38
	4	3.51 ± 0.25	7.08 ± 0.64
	6	4.93 ± 0.60	9.34 ± 0.51
	8	5.53 ± 0.33	10.50 ± 0.39
	12	8.61 ± 0.15	12.67 ± 2.10
	24	12.83 ± 1.32	20.44 ± 0.77
	36	15.02 ± 2.68	23.19 ± 3.10
	48	17.89 ± 0.12	25.09 ± 0.53

Table S8. The cumulative release of *β*-asarone and *α*-asarone in artificial intestinal fluid（*n*=3）

Component	Time（h）	ATEO（%）	Pickering emulsion（%）
β-asarone	0.08	0.09 ± 0.02	0.09 ± 0.00
	0.25	0.14 ± 0.01	0.24 ± 0.01
	0.5	0.40 ± 0.09	0.57 ± 0.04
	0.75	0.55 ± 0.01	0.86 ± 0.04
	1	0.81 ± 0.10	1.10 ± 0.16
	2	1.46 ± 0.10	1.96 ± 0.05
	4	2.79 ± 0.27	3.88 ± 0.46
	6	4.30 ± 0.19	6.29 ± 0.22
	8	5.33 ± 0.38	8.52 ± 0.76
	12	7.73 ± 0.56	12.64 ± 0.24
	24	12.13 ± 0.58	17.16 ± 0.23
	36	14.99 ± 1.58	16.85 ± 3.29
	48	16.35 ± 1.88	17.52 ± 0.76
α-asarone	0.08	0.14 ± 0.00	0.14 ± 0.00
	0.25	0.14 ± 0.00	0.23 ± 0.01
	0.5	0.30 ± 0.05	0.36 ± 0.02
	0.75	0.40 ± 0.03	0.50 ± 0.03
	1	0.52 ± 0.08	0.62 ± 0.12
	2	0.76 ± 0.03	0.89 ± 0.02
	4	1.28 ± 0.07	1.75 ± 0.16
	6	2.00 ± 0.13	3.15 ± 0.08
	8	2.46 ± 0.21	4.42 ± 0.50
	12	3.79 ± 0.39	7.05 ± 0.27
	24	6.25 ± 0.31	10.22 ± 0.17
	36	8.48 ± 1.12	10.30 ± 2.39
	48	9.32 ± 1.03	10.74 ± 0.51

Table S9. Comparative study with existing articles of the same type

Particles	Modifiers	Methods	stabilizing mechanism	Advantages	Reference
chitosan	CA	Free radical mediated	Graft copolymerization occurred between the amino groups of chitosan and the carbonyl of the phenolic acids.	Synthesis of chitosan-based bifunctional stabilizer with antioxidant and emulsion stability.	1
WPI	Oligo-chitosan	Maillard reaction	The covalent modification and hydrophilic-hydrophobic interactions of conjugate particles.	Glycosylated WPI had small droplets covered by dense interface layers, exhibited optimal emulsifying properties and emulsion stability.	2
PPI	FUD	Maillard reaction dry heating method	The covalent modification and hydrophilic-hydrophobic interactions of conjugate particles	The Zeta potential of the conjugated particles increases, which enhances the electrostatic repulsion and improves the dispersibility and interface affinity.	3
ZP	SSPS	Maillard Reaction	The free amino acids of the protein and the carbonyl groups of reducing sugars via the covalent bond.	The hydrophilicity and Zeta potential also increased significantly with the increase of reaction time.	4
HSPI	Casein (MTGase)	Enzyme treatment	MTGase could form inter- and intra-molecular isopeptide bonds with proteins between Lys ε-amino and Gln γ-amide groupsand act as a safe protein crossliking agent.	Enhanced emulsification and water-holding capacity.	5
CNC	Alg	heterogeneous condensation	Alg is used as a polyanion to reduce the positive surface charge of chitin nanocrystals.	Alginic acid in the system will potentially not only compensate the charge of chitin nanocrystals, but also modify the surface of nanocrystals at the interface.	6
Fe_3O_4	CNC	heterogeneous condensation	Near-zero surface charge lack electrostatic repulsion and form a denser adsorption layer at the O/W interface.	Improved stability of emulsions without introducing salt additives, the ability to give them specific properties characteristic of inorganic particles.	7
MP	chitosan	pH shift method	H-bonding and non-covalent interactions.	CS can improve the solubility and emulsifying properties of MP.	8

Cinnabaris	SiO_2	Solvent evaporation	The wettability of cinnabar particles was changed by surface coating.	The light stability and emulsifying ability of Pickering emulsion were enhanced.	
WPI	CS	Heat treatment	Thermal denaturation of proteins and their electrostatic interactions with polysaccharides.	The emulsifying ability of the composite particles was improved	9
SPI	SDA	Heat treatment	Hydrophobic interactions occurred between SPI and SDA.	SDA addition strengthened the compactness of the interface film and increased the distribution uniformity of emulsions.	10
PPI	MBS	Ultrasound treatment	Ultrasound altered the secondary structure of PPI, ultrasound enhanced the strength of hydrogen bonding in these complexes	Smaller particle size, higher H_0,and excellent wettability. These properties contributed to enhancing emulsifying properties of proteins.	11

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