

Phytochemical Properties, Processing, and Applications of Juvenile *Zingiber Officinale*

Bokary Sylla ¹, Kanaya Streeter ¹, Sara Lahoff ¹, Andrew G. Ristvey ², and Victoria V. Volkis ^{1,*}

¹ Department of Natural Sciences, The University of Maryland Eastern Shore, 3, Princess Anne, Maryland 21853, USA

² Wye Research and Education Center, University of Maryland, Queenstown, MD 21658, USA

* Correspondence: vvollkis@umes.edu

Table S1. Y1 blue ring ginger phenolics.

BR (DW)	1	2	3	5	7	9	11	13	15
ABS 1	0.2399	0.2796	0.4938	0.2174	0.3021	0.3167	0.2646	0.2774	0.2249
ABS 2	0.2368	0.2963	0.4308	0.2341	0.3371	0.3106	0.2884	0.3431	0.3486
ABS 3	0.2472	0.302	0.4181	0.2433	0.3359	0.45	0.3668	0.3131	0.2363
Conc 1	10.75	12.15	22.49	9.76	13.73	13.92	11.61	12.29	9.21
Conc 2	10.62	12.88	19.62	10.51	15.32	13.65	12.65	15.20	14.28
Conc 3	11.08	13.12	19.04	10.93	15.27	19.78	16.09	13.87	9.68
Average conc. mg GAE/g	10.82	12.72	20.38	10.40	14.77	15.79	13.45	13.79	11.05
Deviation	0.20	0.41	1.51	0.48	0.74	2.83	1.92	1.19	2.29
m (extract) (mg)	507	523	499	506	500	517	518	513	555
V (extract) (mL)	25	25	25	25	25	25	25	25	25
m (slope)	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011
b (y-intercept)	0	0	0	0	0	0	0	0	0
Dilution factor	1	1	1	1	1	1	1	1	1

Table S2. Y2 blue ring ginger phenolics.

BR (DW)	1	2	3	5	7	9	11	13	15
---------	---	---	---	---	---	---	----	----	----

ABS 1	0.1029	0.5085	0.4031	0.3647	0.2852	0.2781	0.3721	0.3866	0.3725
ABS 2	0.1018	0.5103	0.4044	0.3651	0.2844	0.2751	0.3824	0.3875	0.3726
ABS 3	0.1031	0.5071	0.4004	0.3622	0.2864	0.2765	0.3715	0.3869	0.3736
Conc 1	19.98	16.27	12.90	11.69	8.28	8.06	10.65	11.85	11.94
Conc 2	19.77	16.33	12.94	11.70	8.26	7.98	10.95	11.87	11.95
Conc 3	20.02	16.23	12.81	11.61	8.32	8.02	10.64	11.86	11.98
Average conc. mg GAE/g	19.92	16.28	12.88	11.67	8.29	8.02	10.75	11.86	11.96
Deviation	0.11	0.04	0.05	0.04	0.02	0.04	0.14	0.01	0.02
m (extract) (mg)	103	625	625	624	626	627	635	623	638
V (extract) (mL)	22	22	22	22	20	20	20	21	22.5
m (slope)	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011
b (y-intercept)	0	0	0	0	0	0	0	0	0
Dilution factor	1	1	1	1	1	1	1	1	1

Table S3. Y1 yellow ginger phenolics.

[illegible]

Dilution factor	2	2	2	2	2	2	2	2	2
-----------------	---	---	---	---	---	---	---	---	---

Table S4. Y2 yellow ginger phenolics.

Y (DW)	1	2	3	5	7	9	11	13	15
ABS 1	0.5346	0.5492	0.4822	0.4319	0.3709	0.3672	0.3544	0.3971	
ABS 2	0.5431	0.5539	0.4807	0.4394	0.3611	0.3671	0.3546	0.398	
ABS 3	0.5337	0.549	0.4813	0.4424	0.3595	0.3732	0.3567	0.4014	
Conc 1	17.47	17.86	15.78	14.13	12.14	12.02	12.37	13.86	0.00
Conc 2	17.75	18.01	15.73	14.38	11.82	12.01	12.38	13.89	0.00
Conc 3	17.44	17.85	15.75	14.48	11.77	12.21	12.45	14.01	0.00
Average conc. mg GAE/g	17.55	17.91	15.75	14.33	11.91	12.08	12.40	13.92	0.00
Deviation	0.14	0.07	0.02	0.14	0.16	0.09	0.04	0.06	0.00
m (extract) (mg)	626	629	625	625	625	625	625	625	2000
V (extract) (mL)	22.5	22.5	22.5	22.5	22.5	22.5	24	24	25
m (slope)	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011
b (y-intercept)	0	0	0	0	0	0	0	0	0
Dilution factor	1	1	1	1	1	1	1	1	1

Table S5. Y1 Chinese ginger phenolics.

C (DW)	1	2	3	5	7	9	11	13	15
ABS 1	0.1649	0.2333	0.2706	0.3323	0.3229	0.2484	0.2292	0.1871	0.178
ABS 2	0.2047	0.221	0.3443	0.3149	0.296	0.4284	0.2074	0.1945	0.2428
ABS 3	0.2792	0.2258	0.3138	0.3267	0.3796	0.2637	0.2686	0.2036	0.2894
Conc 1	14.81	20.67	24.65	30.09	29.35	21.84	20.11	16.58	14.58
Conc 2	18.39	19.58	31.36	28.51	26.91	37.66	18.20	17.23	19.89
Conc 3	25.08	20.01	28.58	29.58	34.51	23.18	23.57	18.04	23.70
Average conc. mg GAE/g	19.43	20.09	28.20	29.39	30.26	27.56	20.63	17.28	19.39

Deviation	4.26	0.45	2.75	0.66	3.17	7.16	2.22	0.60	3.74
Std. Error	2.46	0.26	1.59	0.38	1.83	4.14	1.28	0.35	2.16
m (extract) (mg)	506	513	499	502	500	517	518	513	555
V (extract) (mL)	25	25	25	25	25	25	25	25	25
m (slope)	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011
b (y-intercept)	0	0	0	0	0	0	0	0	0
Dilution factor	2	2	2	2	2	2	2	2	2

Table S6. Y2 Chinese ginger phenolics.

C (DW)	1	2	3	5	7	9	11	13	15
ABS 1	0.1335	0.3118	0.3297	0.3264	0.4614	0.4887	0.3678	0.4229	0.4097
ABS 2	0.149	0.3167	0.3322	0.3128	0.4544	0.4879	0.3649	0.3957	0.4377
ABS 3	0.1319	0.3119	0.3293	0.3196	0.4416	0.4916	0.3646	0.3903	0.4103
Conc 1	26.09	19.50	20.61	20.72	14.74	14.86	11.77	11.65	12.47
Conc 2	29.12	19.81	20.76	19.86	14.52	14.83	11.68	10.90	13.33
Conc 3	25.77	19.51	20.58	20.29	14.11	14.94	11.67	10.75	12.49
Average conc. mg GAE/g	26.99	19.61	20.65	20.29	14.46	14.88	11.70	11.10	12.76
Deviation	1.51	0.14	0.08	0.35	0.26	0.05	0.05	0.39	0.40
Std. Error	0.87	0.08	0.05	0.20	0.15	0.03	0.03	0.23	0.23
m (extract) (mg)	107	327	320	315	626	628	625	627	627
V (extract) (mL)	23	22.5	22	22	22	21	22	19	21
m (slope)	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011
b (y-intercept)	0	0	0	0	0	0	0	0	0
Dilution factor	1	1	1	1	1	1	1	1	1

Table S7. Y1 Indian ginger phenolics.

I (DW)	1	2	3	5	7	9	11	13	15
ABS 1	0.2524	0.1071	0.2983	0.2158	0.2389	0.261	0.2062	0.1716	0.1401

[illegible]

Table S8. Y2 Indian ginger phenolics.

[illegible]

Table S9. Y2 red ginger phenolics.

R (DW)	1	2	3	5	7	9	11	13	15
ABS 1	0.1163	0.6465	0.5917	0.3619	0.3746	0.3716	0.3486	0.3556	0.2892
ABS 2	0.11	0.638	0.562	0.3626	0.3733	0.3522	0.3474	0.3598	0.2897
ABS 3	0.1103	0.6671	0.5625	0.3637	0.3717	0.3544	0.3487	0.3593	0.2916
Conc 1	24.08	20.69	18.90	11.81	12.28	12.26	11.16	12.37	9.64
Conc 2	22.77	20.42	17.96	11.83	12.24	11.62	11.12	12.52	9.66
Conc 3	22.83	21.35	17.97	11.86	12.18	11.69	11.16	12.50	9.72
Average conc. mg GAE/g	23.23	20.82	18.28	11.83	12.23	11.86	11.14	12.47	9.68
Deviation	0.60	0.39	0.44	0.02	0.04	0.29	0.02	0.07	0.03
m (extract) (mg)	101	625	626	627	624	620	625	627	627
V (extract) (mL)	23	22	22	22.5	22.5	22.5	22	24	23
m (slope)	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011	0.0011
b (y-intercept)	0	0	0	0	0	0	0	0	0
Dilution factor	1	1	1	1	1	1	1	1	1

Table S10. Y1 blue ring ginger flavonoids.

BR (DW)	1	2	3	5	7	9	11	13	15
ABS 1	0.0943	0.1344	0.0608	0.1221	0.0488	0.0325	0.0339	0.0324	0.0282
ABS 2	0.1453	0.1254	0.0615	0.0665	0.059	0.055	0.0323	0.0357	0.0334
ABS 3	0.1061	0.1382	0.0611	0.1223	0.0615	0.0367	0.0331	0.0313	0.034
Conc 1	15.50	21.41	10.15	20.11	8.13	5.24	5.45	5.26	4.23
Conc 2	23.88	19.98	10.27	10.95	9.83	8.87	5.20	5.80	5.02
Conc 3	17.44	22.02	10.20	20.14	10.25	5.92	5.32	5.08	5.11
Average conc. mg QE/g	18.94	21.14	10.21	17.07	9.41	6.67	5.32	5.38	4.78
Deviation	3.58	0.86	0.05	4.32	0.92	1.57	0.11	0.30	0.39

m (extract) (mg)	507	523	499	506	500	517	518	513	555
V (extract) (mL)	25	25	25	25	25	25	25	25	25
m (slope)	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
b (y-intercept)	0	0	0	0	0	0	0	0	0
Dilution factor	2	2	2	2	2	2	2	2	2

Table S11. Y2 blue ring ginger flavonoids.

BR (DW)	1	2	3	5	7	9	11	13	15
ABS 1	0.0468	0.136	0.1091	0.1159	0.0756	0.0787	0.0636	0.0437	0.0441
ABS 2	0.0466	0.1326	0.1152	0.0945	0.0742	0.0753	0.0763	0.0399	0.0694
ABS 3	0.0369	0.1334	0.1227	0.0962	0.099	0.0766	0.044	0.0568	0.0558
Conc 1	16.66	7.98	6.40	6.81	4.03	4.18	3.34	2.46	2.59
Conc 2	16.59	7.78	6.76	5.55	3.95	4.00	4.01	2.24	4.08
Conc 3	13.14	7.83	7.20	5.65	5.27	4.07	2.31	3.19	3.28
Average conc. mg QE/g	15.46	7.86	6.79	6.01	4.42	4.09	3.22	2.63	3.32
Deviation	1.64	0.09	0.33	0.57	0.61	0.07	0.70	0.41	0.61
m (extract) (mg)	103	625	625	624	626	627	635	623	638
V (extract) (mL)	22	22	22	22	20	20	20	21	22.5
m (slope)	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
b (y-intercept)	0	0	0	0	0	0	0	0	0
Dilution factor	1	1	1	1	1	1	1	1	1

Table S12. Y1 yellow ginger flavonoids.

Y (DW)	1	2	3	5	7	9	11	13	15
ABS 1	0.1221	0.1032	0.0821	0.1008	0.1403	0.1073	0.0898	0.0931	0.1032
ABS 2	0.1354	0.1171	0.0959	0.11	0.1497	0.1227	0.0883	0.095	0.1329
ABS 3	0.1394	0.1359	0.0952	0.1155	0.1513	0.1274	0.095	0.1021	0.1111

[illegible]

Table S13. Y2 yellow ginger flavonoids.

[illegible]

Table S14. Y1 Chinese ginger flavonoids.

C (DW)	1	2	3	5	7	9	11	13	15
ABS 1	0.076	0.0979	0.0767	0.1267	0.0918	0.0804	0.0602	0.037	0.0556
ABS 2	0.0897	0.1124	0.1006	0.1401	0.1079	0.094	0.0679	0.0484	0.0699
ABS 3	0.0906	0.1098	0.0981	0.1412	0.1094	0.0847	0.0721	0.0485	0.0708
Conc 1	12.59	15.90	12.76	21.03	15.24	12.79	9.07	5.36	8.94
Conc 2	14.86	18.26	16.73	23.26	17.91	14.95	10.23	7.01	11.25
Conc 3	15.01	17.84	16.32	23.44	18.16	13.47	10.86	7.03	11.39
Average conc. mg QE/g	14.15	17.33	15.27	22.58	17.10	13.74	10.06	6.47	10.53
Deviation	1.11	1.03	1.78	1.09	1.32	0.90	0.74	0.78	1.12
m (extract) (mg)	503	513	501	502	502	524	553	575	518
V (extract) (mL)	25	25	25	25	25	25	25	25	25
m (slope)	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
b (y-intercept)	0	0	0	0	0	0	0	0	0
Dilution factor	2	2	2	2	2	2	2	2	2

Table S15. Y2 Chinese ginger flavonoids.

C (DW)	1	2	3	5	7	9	11	13	15
ABS 1	0.012	0.0269	0.0427	0.0451	0.077	0.0679	0.0463	0.0574	0.0605
ABS 2	0.0096	0.035	0.0568	0.0433	0.0542	0.0679	0.0484	0.0606	0.0519
ABS 3	0.011	0.0256	0.0576	0.0584	0.0575	0.0675	0.0531	0.0731	0.0676
Conc 1	4.30	3.08	4.89	5.25	4.51	3.78	2.72	2.90	3.38
Conc 2	3.44	4.01	6.51	5.04	3.17	3.78	2.84	3.06	2.90
Conc 3	3.94	2.94	6.60	6.80	3.37	3.76	3.12	3.69	3.77
Average conc. mg QE/g	3.89	3.34	6.00	5.70	3.68	3.78	2.89	3.22	3.35
Deviation	0.35	0.48	0.78	0.78	0.59	0.01	0.17	0.34	0.36
m (extract) (mg)	107	327	320	315	626	628	625	627	627
V (extract) (mL)	23	22.5	22	22	22	21	22	19	21

m (slope)	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
b (y-intercept)	0	0	0	0	0	0	0	0	0
Dilution factor	1	1	1	1	1	1	1	1	1

Table S16. Y1 Indian ginger flavonoids.

I (DW)	1	2	3	5	7	9	11	13	15
ABS 1	0.1094	0.0429	0.0998	0.086	0.0846	0.1323	0.0845	0.0584	0.0556
ABS 2	0.1072	0.0407	0.1039	0.0971	0.1008	0.1094	0.0897	0.0863	0.053
ABS 3	0.1008	0.0449	0.1091	0.1003	0.0967	0.1097	0.1	0.0628	0.0532
Conc 1	17.95	10.67	16.60	14.14	13.96	21.41	13.75	9.58	9.00
Conc 2	17.59	10.12	17.28	15.96	16.63	17.70	14.60	14.16	8.58
Conc 3	16.54	11.17	18.15	16.49	15.96	17.75	16.28	10.30	8.61
Average conc. mg QE/g	17.36	10.66	17.34	15.53	15.52	18.95	14.88	11.35	8.73
Deviation	0.60	0.43	0.63	1.01	1.13	1.74	1.05	2.01	0.19
m (extract) (mg)	508	335	501	507	505	515	512	508	515
V (extract) (mL)	25	25	25	25	25	25	25	25	25
m (slope)	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
b (y-intercept)	0	0	0	0	0	0	0	0	0
Dilution factor	2	2	2	2	2	2	2	2	2

Table S17. Y2 Indian ginger flavonoids

I (DW)	1	2	3	5	7	9	11	13	15
ABS 1	0.0237	0.1	0.0376	0.0845	0.0746	0.0612	0.0548	0.0564	0.0516
ABS 2	0.0259	0.1002	0.036	0.0843	0.0718	0.0628	0.0523	0.0564	0.0554
ABS 3	0.0251	0.1014	0.0365	0.0824	0.0724	0.0634	0.0597	0.056	0.0526
Conc 1	6.82	5.84	4.62	5.62	4.57	4.08	3.65	3.75	3.44
Conc 2	7.46	5.85	4.42	5.60	4.40	4.19	3.48	3.75	3.69

Conc 3	7.23	5.92	4.48	5.48	4.43	4.23	3.97	3.73	3.51
Average conc. mg QE/g	7.17	5.87	4.51	5.56	4.47	4.16	3.70	3.75	3.55
Deviation	0.26	0.04	0.08	0.06	0.07	0.06	0.20	0.01	0.11
m (extract) (mg)	110	628	312	627	626	625	626	626	625
V (extract) (mL)	19	22	23	25	23	25	25	25	25
m (slope)	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
b (y-intercept)	0	0	0	0	0	0	0	0	0
Dilution factor	1	1	1	1	1	1	1	1	1

Table S18. Y2 red ginger flavonoids

R (DW)	1	2	3	5	7	9	11	13	15
ABS 1	0.0209	0.1914	0.1511	0.0877	0.1199	0.0897	0.0974	0.092	0.0764
ABS 2	0.0384	0.1912	0.146	0.0986	0.0956	0.0891	0.0967	0.092	0.0752
ABS 3	0.0277	0.1917	0.1485	0.0923	0.1055	0.1227	0.1005	0.0967	0.075
Conc 1	7.93	11.23	8.85	5.25	7.21	5.43	5.71	5.87	4.67
Conc 2	14.57	11.22	8.55	5.90	5.75	5.39	5.67	5.87	4.60
Conc 3	10.51	11.25	8.70	5.52	6.34	7.42	5.90	6.17	4.59
Average conc. mg QE/g	11.01	11.23	8.70	5.55	6.43	6.08	5.76	5.97	4.62
Deviation	2.73	0.01	0.12	0.27	0.60	0.95	0.10	0.14	0.04
m (extract) (mg)	101	625	626	627	624	620	625	627	627
V (extract) (mL)	23	22	22	22.5	22.5	22.5	22	24	23
m (slope)	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006	0.0006
b (y-intercept)	0	0	0	0	0	0	0	0	0
Dilution factor	1	1	1	1	1	1	1	1	1

Table S19. Y1 blue ring ginger tannins.

BR (DW)	1	2	3	5	7	9	11	13	15
----------------	----------	----------	----------	----------	----------	----------	-----------	-----------	-----------

Dilution factor	1	1	1	1	1	1	1	1	1
-----------------	---	---	---	---	---	---	---	---	---

Table S21. Y1 yellow ginger tannins

Y (DW)	1	2	3	5	7	9	11	13	15
ABS 1	0.1625	0.086	0.0445	0.1838	0.1389	0.1148	0.7906	0.7731	0.9816
ABS 2	0.1633	0.0845	0.0461	0.1814	0.1469	0.1179	0.7903	1.1013	1.1566
ABS 3	0.1692	0.0873	0.0457	0.2016	0.1476	0.1115	0.7734	1.1012	1.0661
Conc 1	6.19	3.26	1.70	7.08	5.23	4.32	3.74	3.50	4.51
Conc 2	6.22	3.21	1.77	6.99	5.53	4.44	3.74	4.99	5.32
Conc 3	6.44	3.31	1.75	7.77	5.55	4.20	3.66	4.98	4.90
Average conc. mg TAE/g	6.28	3.26	1.74	7.28	5.44	4.32	3.71	4.49	4.91
Deviation	0.11	0.04	0.03	0.35	0.15	0.10	0.04	0.70	0.33
m (extract) (mg)	505	507	502	499	511	511	499	521	513
V (extract) (mL)	25	25	25	25	25	25	25	25	25
m (slope)	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0053	0.0053	0.0053
b (y-intercept)	0	0	0	0	0	0	0	0	0
Dilution factor	1	1	1	1	1	1	0.5	0.5	0.5

Table S22. Y2 yellow ginger tannins.

Y (DW)	1	2	3	5	7	9	11	13	15
ABS 1	0.13	0.0625	0.0955	0.0616	0.0599	0.0469	0.0317	0.0764	
ABS 2	0.0797	0.0617	0.093	0.0589	0.0329	0.0416	0.0366	0.0553	
ABS 3	0.0576	0.0615	0.1054	0.0418	0.0345	0.0521	0.0931	0.0576	
Conc 1	3.59	1.72	2.64	1.71	1.66	1.30	0.94	2.26	0.00
Conc 2	2.20	1.70	2.58	1.63	0.91	1.15	1.08	1.63	0.00
Conc 3	1.59	1.69	2.92	1.16	0.96	1.44	2.75	1.70	0.00
Average conc. mg TAE/g	2.46	1.70	2.71	1.50	1.18	1.30	1.59	1.86	0.00

Deviation	0.84	0.01	0.15	0.24	0.34	0.12	0.82	0.28	0.00
m (extract) (mg)	626	629	625	625	625	625	625	625	2000
V (extract) (mL)	22.5	22.5	22.5	22.5	22.5	22.5	24	24	25
m (slope)	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013
b (y-intercept)	0	0	0	0	0	0	0	0	0
Dilution factor	1	1	1	1	1	1	1	1	1

Table S23. Y1 Chinese ginger tannins.

C (DW)	1	2	3	5	7	9	11	13	15
ABS 1	0.7079	0.2535	0.5541	1.1964	0.8316	0.8585	0.3363	0.4182	0.3592
ABS 2	0.7356	0.2329	0.6608	1.1091	0.8208	0.765	0.3953	0.3915	0.3744
ABS 3	0.7363	0.2339	0.6202	1.1076	1.0042	1.0957	0.3951	0.5187	0.4293
Conc 1	6.60	2.33	5.24	11.24	7.85	7.83	3.06	3.85	3.05
Conc 2	6.86	2.14	6.25	10.42	7.74	6.98	3.60	3.60	3.18
Conc 3	6.86	2.15	5.86	10.41	9.47	10.00	3.60	4.77	3.65
Average conc. mg TAE/g	6.77	2.21	5.78	10.69	8.35	8.27	3.42	4.07	3.29
Deviation	0.12	0.09	0.42	0.39	0.79	1.27	0.25	0.50	0.26
m (extract) (mg)	506	513	499	502	500	517	518	513	555
V (extract) (mL)	25	25	25	25	25	25	25	25	25
m (slope)	0.0053	0.0053	0.0053	0.0053	0.0053	0.0053	0.0053	0.0053	0.0053
b (y-intercept)	0	0	0	0	0	0	0	0	0
Dilution factor	1	1	1	1	1	1	1	1	1

Table S24. Y2 Chinese ginger tannins.

C (DW)	1	2	3	5	7	9	11	13	15
ABS 1	0.048	0.12	0.1476	0.0888	0.1382	0.1632	0.1208	0.1026	0.1399
ABS 2	0.0493	0.1122	0.1329	0.0744	0.1418	0.147	0.139	0.0949	0.1493

Table S26. Y2 Indian ginger tannins.

I (DW)	1	2	3	5	7	9	11	13	15
ABS 1	0.05	0.1539	0.1001	0.1962	0.0437	0.085	0.0282	0.1135	0.1164
ABS 2	0.0661	0.2051	0.0943	0.1984	0.0406	0.0824	0.0821	0.1077	0.1112
ABS 3	0.0599	0.1708	0.1048	0.159	0.0414	0.1016	0.0789	0.1078	0.1136
Conc 1	6.64	4.15	5.68	6.02	1.24	2.62	0.87	3.49	3.58
Conc 2	8.78	5.53	5.35	6.09	1.15	2.54	2.52	3.31	3.42
Conc 3	7.96	4.60	5.94	4.88	1.17	3.13	2.42	3.31	3.50
Average conc. mg TAE/g	7.79	4.76	5.66	5.66	1.18	2.76	1.94	3.37	3.50
Deviation	0.88	0.57	0.24	0.55	0.04	0.26	0.76	0.08	0.07
m (extract) (mg)	110	628	312	627	626	625	626	626	625
V (extract) (mL)	19	22	23	25	23	25	25	25	25
m (slope)	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013	0.0013
b (y-intercept)	0	0	0	0	0	0	0	0	0
Dilution factor	1	1	1	1	1	1	1	1	1

Table S27. Y2 red ginger tannins.

R (DW)	1	2	3	5	7	9	11	13	15
ABS 1	0.0426	0.2953	0.2277	0.1595	0.1559	0.1565	0.138	0.0931	0.0879
ABS 2	0.0388	0.297	0.2302	0.1668	0.1692	0.1601	0.0837	0.0913	0.097
ABS 3	0.0657	0.3172	0.2626	0.1574	0.1841	0.1569	0.0739	0.0918	0.0926
Conc 1	7.46	8.00	6.16	4.40	4.32	4.37	3.74	2.74	2.48
Conc 2	6.80	8.04	6.22	4.60	4.69	4.47	2.27	2.69	2.74
Conc 3	11.51	8.59	7.10	4.34	5.11	4.38	2.00	2.70	2.61
Average conc. mg TAE/g	8.59	8.21	6.49	4.45	4.71	4.41	2.67	2.71	2.61
Deviation	2.08	0.27	0.43	0.11	0.32	0.04	0.76	0.02	0.10
m (extract) (mg)	101	625	626	627	624	620	625	627	627
V (extract) (mL)	23	22	22	22.5	22.5	22.5	22	24	23

Table S31. Y2 ginger conductivity.

	1	2	3	5	7	9	11	13	15
Blue Ring	5.564	5.209	5.364	5.563	5.636	3.714	4.819	5.120	3.833
Chinese	5.267	7.429	6.514	5.188	5.821	4.812	5.981	4.459	5.355
Indian	6.088	5.033	5.359	6.918		4.062	6.472	5.339	6.090
Yellow	5.632	7.228	7.116	5.304		7.090	6.132	5.600	
Red	2.569	6.081	7.054	7.323	7.275	5.333	6.009	7.007	5.890

Table S32. Concentration of various cations/100g of respective ginger.

Analyte	Ca	Cu	Fe	K	Mg	Mn	Na	Se	Zn
B3	25.2	0.1	0.83	879.7	87.2	4.2	24.6	0.017	1.5
B5	20.9	0.1	0.82	622.2	49.7	6.4	10.1	0.007	0.7
B7	15.1	0.1	0.69	415.9	44.7	2.8	11.2	0.013	0.7
B9	16.28	0.1	0.74	412.76	48.93	1.63	10.83	0.020	0.9
B11	29.7	0.1	0.69	327.9	60.5	3.7	21.4	0.002	0.9
B13	22.3	0.1	0.66	491.6	47.1	1.4	24.7	0.005	0.8
B15	28.9	0.1	0.86	399.2	66.4	2.2	18.2	0.010	0.9
C2	28.0	0.1	0.80	782.7	55.3	5.9	19.2	0.006	0.6
C3	32.6	0.1	0.61	727.0	69.1	4.2	19.8	0.012	0.3
C5	34.9	0.1	0.67	832.3	74.8	6.1	18.7	0.000	0.6
C7	22.5	0.1	0.40	517.9	63.7	2.1	16.4	0.009	0.6
C9	28.5	0.0	0.44	494.5	46.3	3.0	23.9	0.011	0.3
C11	22.4	0.1	0.40	393.7	60.7	4.8	10.0	0.005	0.5
C13	16.0	0.1	0.37	730.6	47.0	0.4	10.7	-0.001	0.3
C15	24.3	0.1	0.89	244.9	68.0	5.0	14.5	0.007	0.8
I2	35.2	0.1	0.82	799.7	76.6	3.2	20.7	0.011	0.9
I5	28.0	0.1	0.52	510.8	55.6	1.2	14.5	0.008	0.5
I7	24.1	0.1	0.57	485.2	53.7	2.4	16.8	0.007	0.6
I9	22.9	0.1	0.62	445.2	46.3	1.6	16.0	-0.001	0.4

I11	20.5	0.0	0.65	508.6	56.8	2.6	16.6	0.011	0.4
I13	25.4	0.0	0.82	343.0	58.3	1.4	10.5	0.003	0.5
I15	20.2	0.0	0.51	499.6	55.6	1.5	9.3	0.003	0.4
R2	34.5	0.1	0.74	811.4	50.7	3.4	30.4	0.001	1.0
R3	34.9	0.1	0.91	787.6	84.4	6.2	44.0	0.014	1.1
R5	29.9	1.8	2.07	765.8	54.4	6.1	33.3	0.004	2.0
R7	21.8	0.1	0.65	630.2	52.2	3.7	20.2	0.006	0.7
R9	18.1	0.4	0.72	535.5	42.9	1.7	18.1	0.002	1.0
R11	20.4	0.2	0.98	483.5	44.0	3.8	22.8	0.010	0.8
R13	25.5	0.1	0.78	524.9	59.5	1.1	21.6	0.017	0.9
R15	19.2	0.1	0.62	516.7	52.7	1.5	18.6	0.016	0.8
Y2	17.9	0.1	0.69	496.8	42.4	1.2	17.8	0.012	0.6
Y3	27.0	2.4	1.41	830.5	63.5	2.4	18.0	-0.003	1.2
Y5	21.3	0.1	0.73	480.0	53.9	3.0	17.3	0.005	0.8
Y7	18.3	0.8	1.42	374.3	58.2	2.9	16.0	0.000	0.8
Y9	27.4	0.1	0.53	301.3	53.9	3.0	18.5	0.002	0.6
Y11	18.7	0.1	0.44	465.9	48.5	1.0	15.5	0.013	0.3
Y13	19.4	0.1	0.37	367.6	38.6	0.7	17.7	0.004	0.3

Table S33. Polyphenol limit of detection.

Polyphenols LOD								
Concentration (mg/L)	1000	500	250	125	62.5	31.25	15.625	7.8125
1	1.0226	0.5216	0.2526	0.1331	0.0631	0.0302	0.0152	0.0302
2	0.9913	0.4985	0.2599	0.1256	0.0618	0.0316	0.0169	0.0073
3	0.9695	0.4906	0.2423	0.1418	0.0741	0.03	0.0198	0.0126
Average Abs.	0.9945	0.5036	0.2516	0.1335	0.0663	0.0306	0.0173	0.0167
Deviation	0.0267	0.0161	0.0088	0.0081	0.0068	0.0009	0.0023	0.0120

Table S34. Flavonoid limit of detection.

Flavonoids LOD								
Concentration (mg/L)	1500	750	375	187.5	93.75	46.875	23.4375	11.7188
1	3.1696	3.1399	2.1357	1.0994	0.5309	0.271	0.1123	0.038
2	3.2543	3.2431	2.2298	1.1661	0.6072	0.2911	0.138	0.0425
3	3.2581	3.1858	2.2299	1.1674	0.5644	0.2687	0.1365	0.0426
Average Abs.	3.2273	3.1896	2.1985	1.1443	0.5675	0.2769	0.1289	0.0410
Deviation	0.0500	0.0517	0.0544	0.0389	0.0382	0.0123	0.0144	0.0026

Table S35. Tannin limit of detection.

Tannins LOD								
Concentration (mg/L)	1500	750	375	187.5	93.75	46.875	23.4375	11.7188
1	0.8668	0.4394	0.2627	0.1288	0.056	0.018	0.0023	0
2	0.9929	0.4567	0.2813	0.1446	0.0773	0.0339	0.027	0
3	0.9011	0.4586	0.2863	0.1533	0.0701	0.033	0.0119	0
Average Abs.	0.9203	0.4516	0.2768	0.1422	0.0678	0.0283	0.0137	0.0000
Deviation	0.0652	0.0106	0.0124	0.0124	0.0108	0.0089	0.0125	0.0000

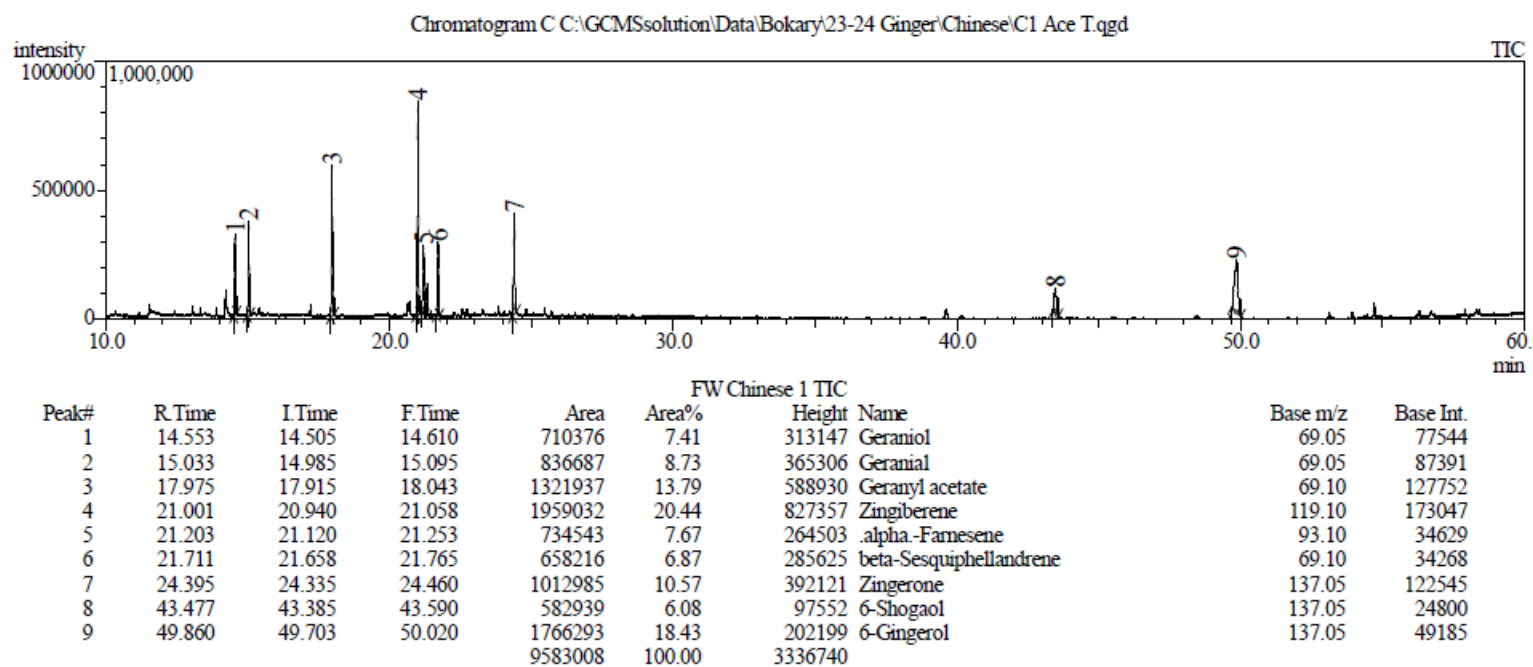


Figure S1. Chinese ginger chromatogram week 1.

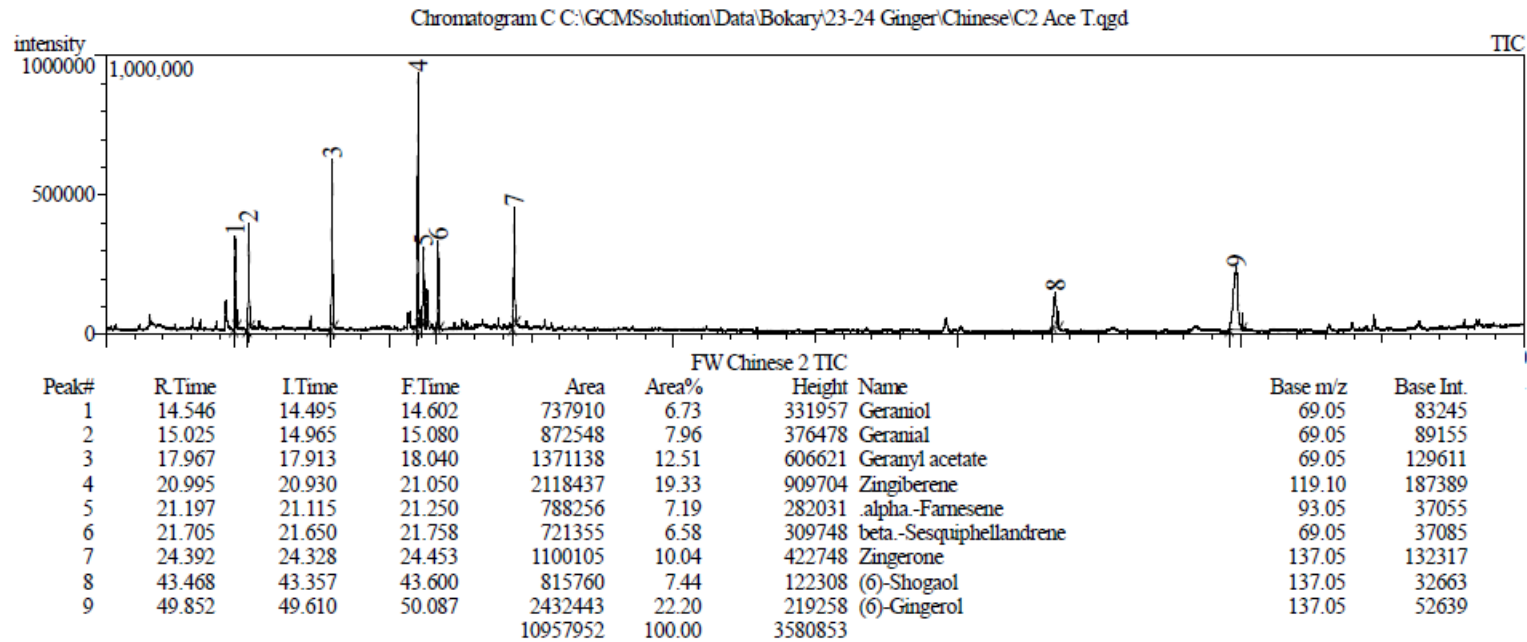
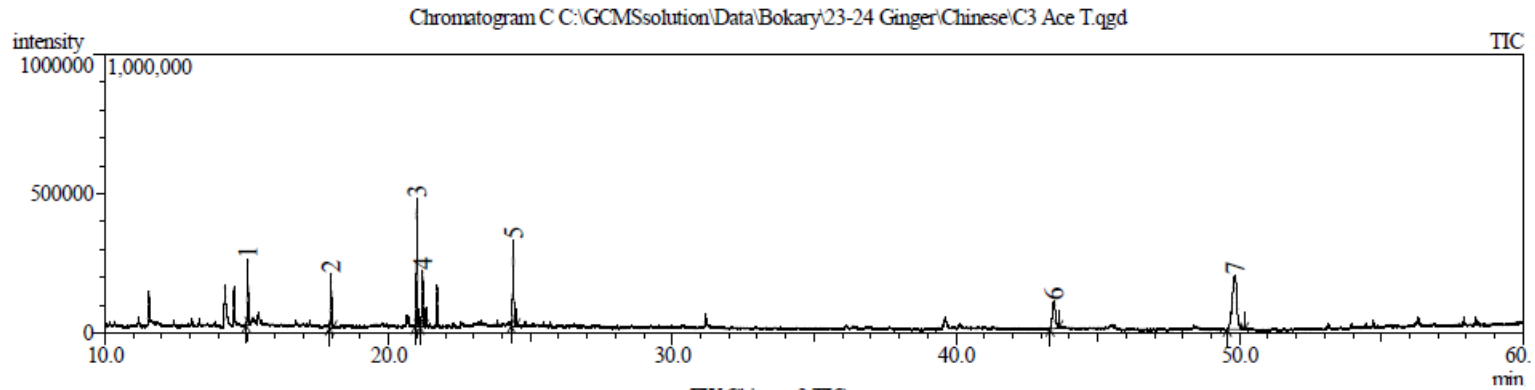


Figure S2. Chinese ginger chromatogram week 2.



Peak#	R.Time	I.Time	F.Time	Area	Area%	Height	Name	Base m/z	Base Int.
1	15.035	14.983	15.088	536819	8.36	236819	Geranial	69.10	56218
2	17.974	17.922	18.033	461835	7.19	194917	Geranyl acetate	69.05	39852
3	20.998	20.938	21.055	1070339	16.67	457572	Zingiberene	119.10	93594
4	21.204	21.120	21.262	588815	9.17	203054	alpha-Farnesene	93.05	25995
5	24.395	24.328	24.488	842097	13.11	310745	Zingerone	137.05	99042

Peak#	R.Time	I.Time	F.Time	Area	Area%	Height	Name	Base m/z	Base Int.
6	43.459	43.318	43.633	761207	11.85	97657	(6)-Shogaol	137.00	25270
7	49.838	49.572	50.170	2161268	33.65	188864	(6)-Gingerol	137.05	45383
				6422380	100.00	1689628			

Figure S3. Chinese ginger chromatogram week 3.

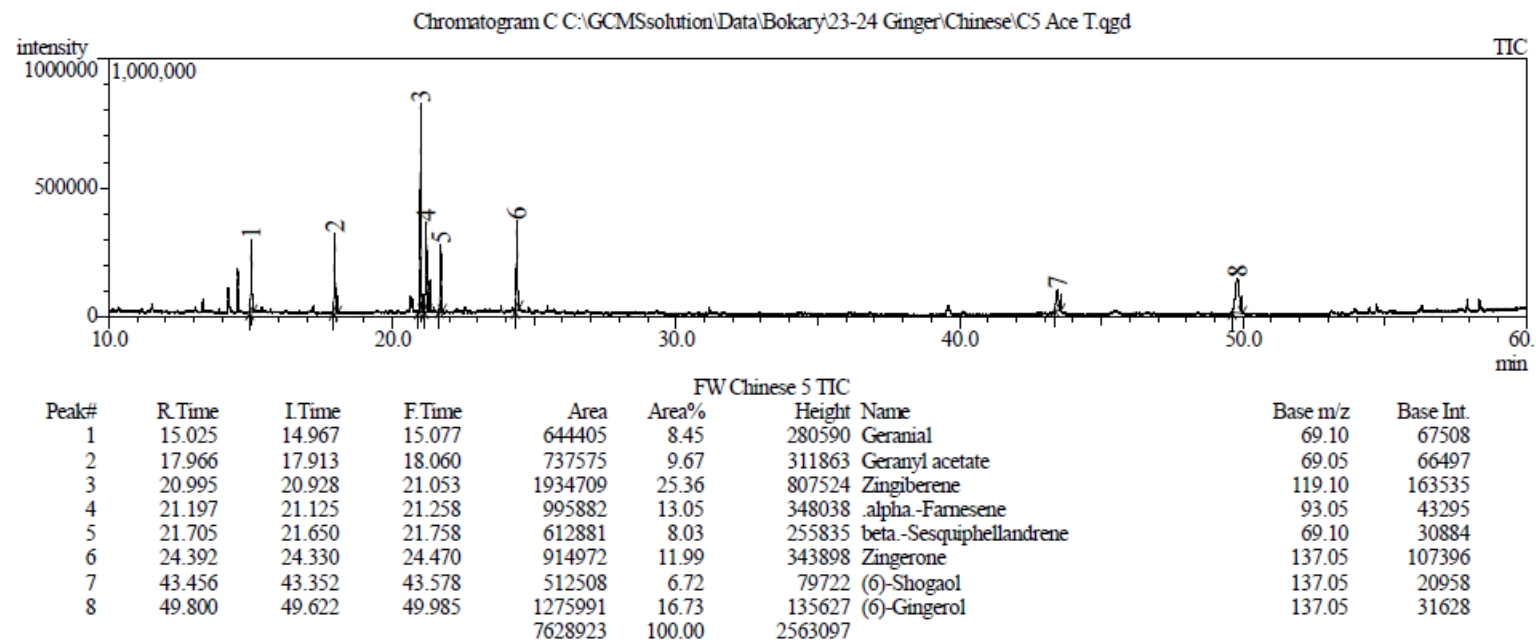


Figure S4. Chinese ginger chromatogram week 5.

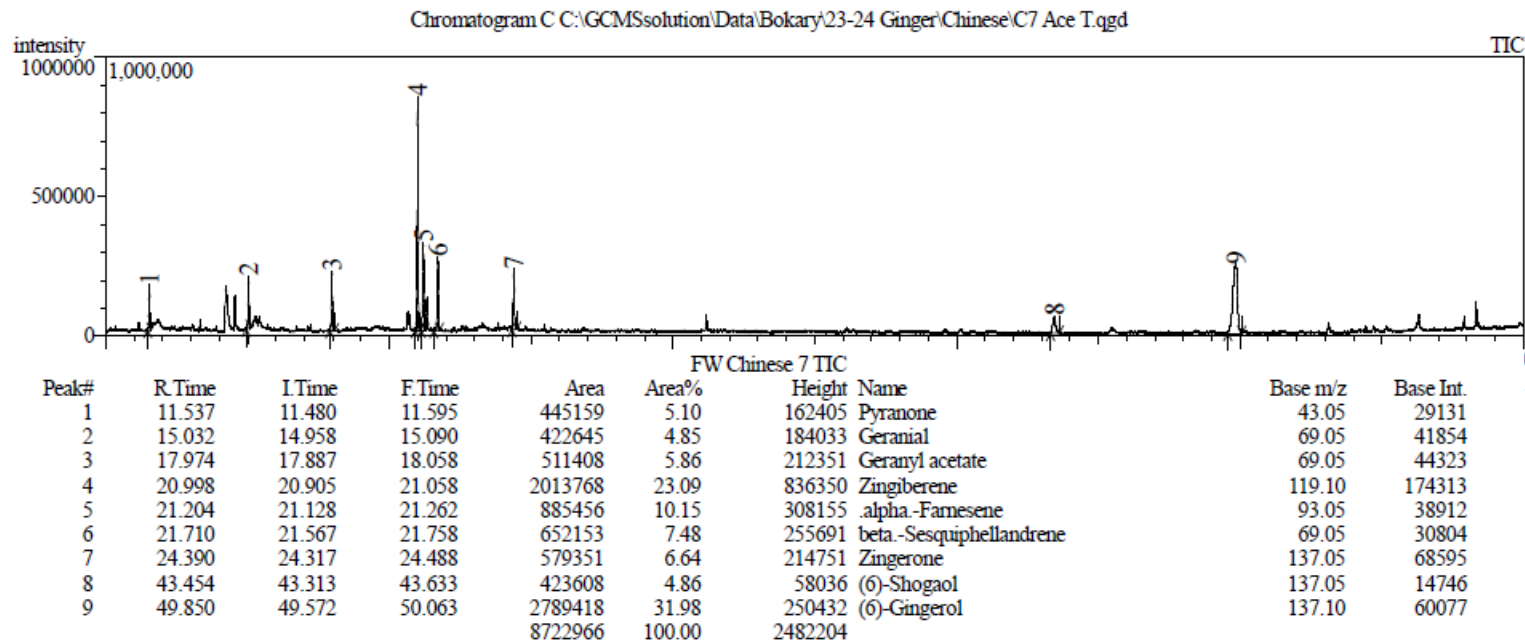
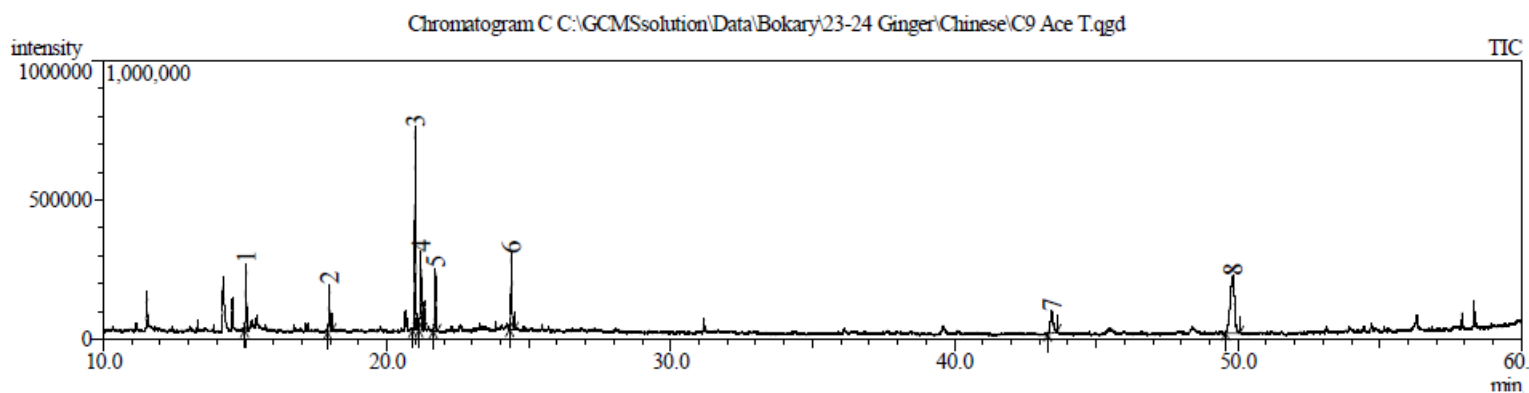


Figure S5. Chinese ginger chromatogram week 7.



FW Chinese 9 TIC									
Peak#	R.Time	I.Time	F.Time	Area	Area%	Height	Name	Base m/z	Base Int.
1	15.031	14.977	15.090	555640	7.37	239438	Geranial	69.05	56518
2	17.970	17.910	18.060	406160	5.39	165920	Geranyl acetate	69.05	34591
3	20.997	20.910	21.065	1738544	23.07	722307	Zingiberene	119.10	146970
4	21.199	21.125	21.275	774620	10.28	277298	alpha.-Farnesene	93.05	35746
5	21.708	21.625	21.765	545186	7.24	217913	beta.-Sesquiphellandrene	69.05	25345

Peak#	R.Time	I.Time	F.Time	Area	Area%	Height	Name	Base m/z	Base Int.
6	24.389	24.320	24.495	754793	10.02	270668	Zingerone	137.05	84625
7	43.441	43.290	43.610	578708	7.68	78317	(6)-Shogaol	137.05	19053
8	49.823	49.565	50.060	2180898	28.95	202886	(6)-Gingerol	137.05	48642
				7534549	100.00	2174747			

Figure S6. Chinese ginger chromatogram week 9.

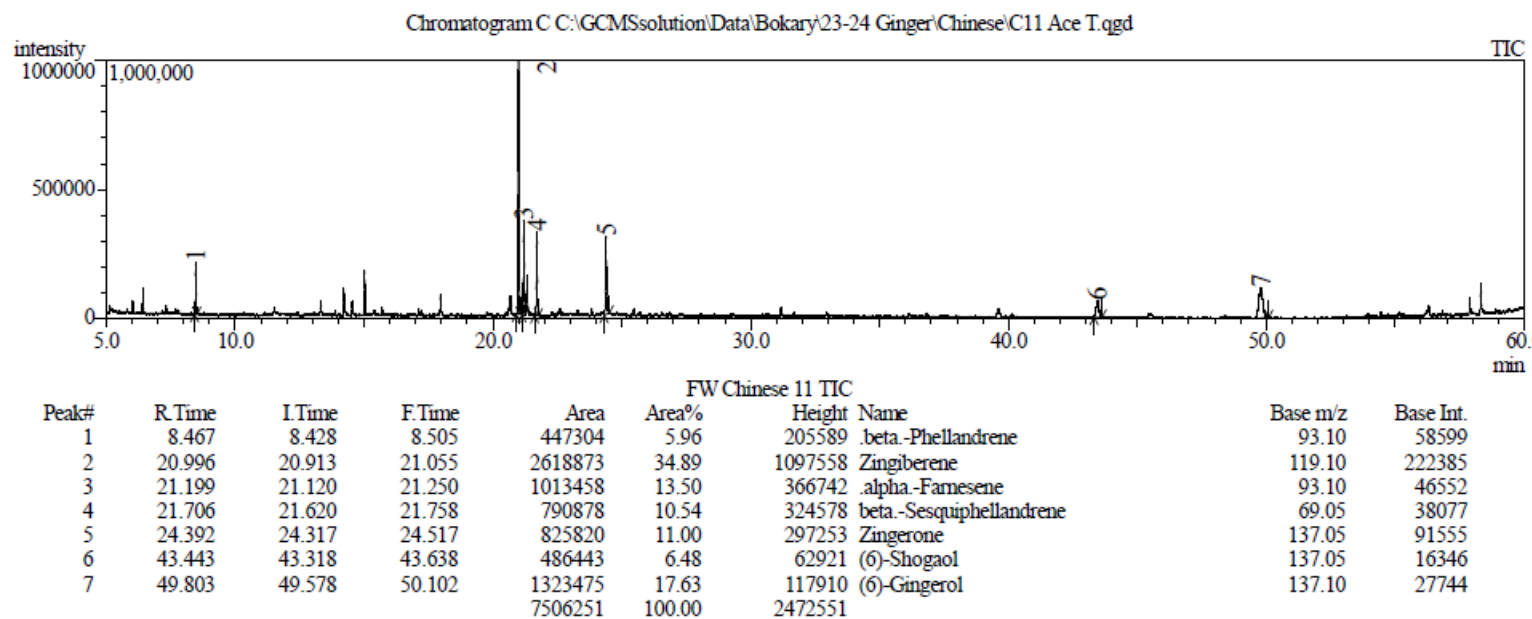


Figure S7. Chinese ginger chromatogram week 11.

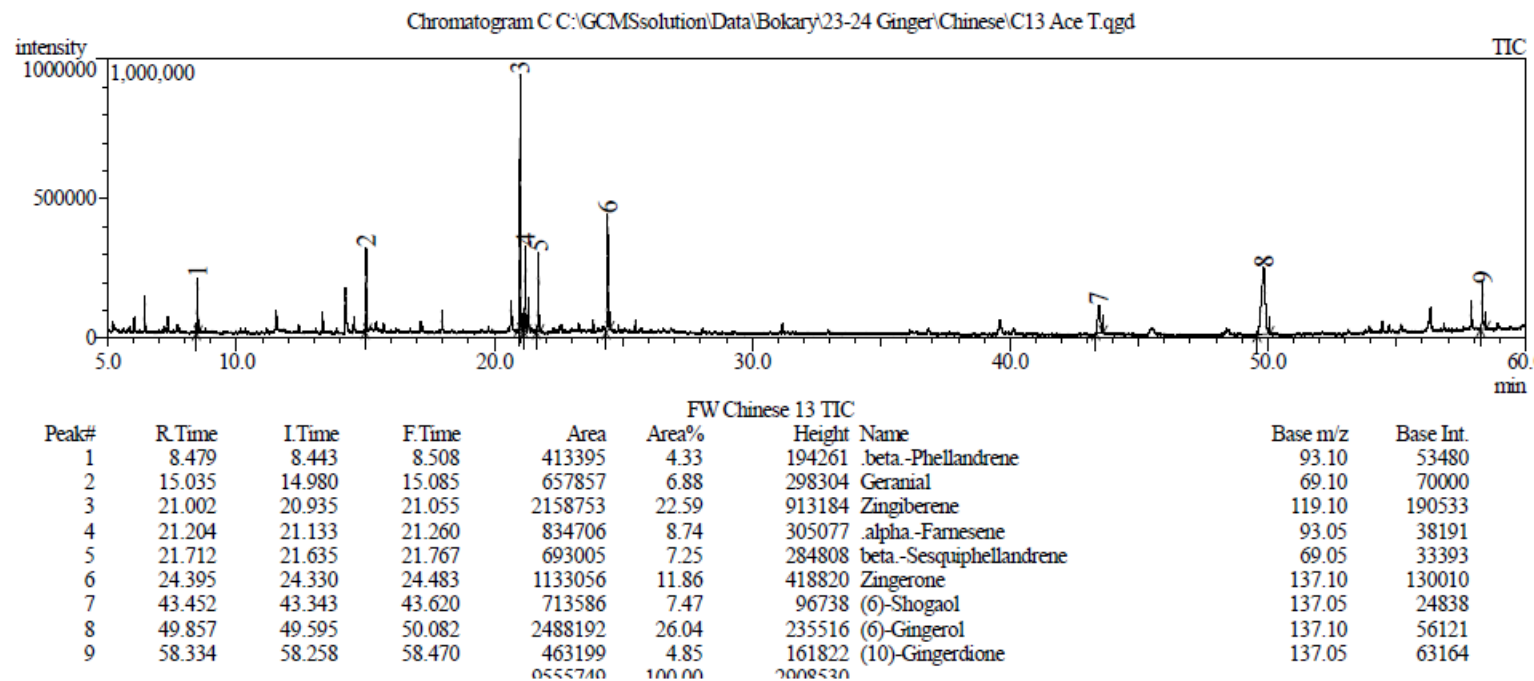
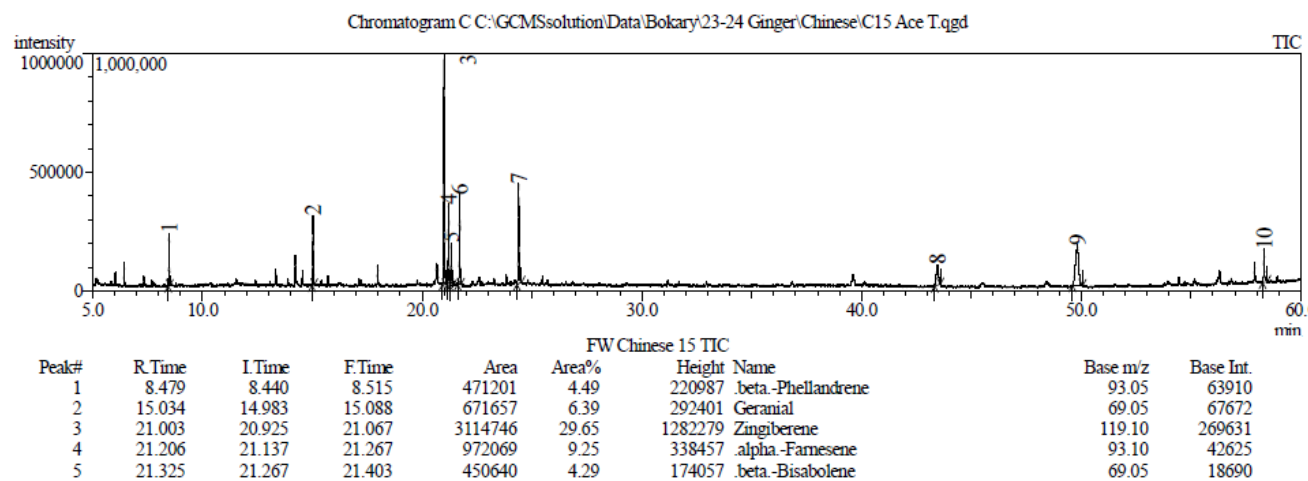


Figure S8. Chinese ginger chromatogram week 13.



Peak#	R.Time	I.Time	F.Time	Area	Area%	Height	Name	Base m/z	Base Int.
6	21.714	21.628	21.767	908445	8.65	375080	beta-Sesquiphellandrene	69.05	45924
7	24.397	24.313	24.522	1158397	11.03	418748	Zingerone	137.05	130297
8	43.462	43.332	43.593	618910	5.89	84292	(6)-Shogaol	137.05	20981
9	49.829	49.607	50.065	1716542	16.34	170331	(6)-Gingerol	137.05	40250
10	58.335	58.265	58.477	421341	4.01	131749	(10)-Gingerdione	137.05	53035
				10503948	100.00	3488381			

Figure S9. Chinese ginger chromatogram week 15.