

Supplementary Material

Identification of Floral Volatile Components and Expression Analysis of Controlling Gene in *Paeonia ostii* 'Fengdan' under Different Cultivation Conditions

Huili Ma^{1,†}, Chenjie Zhang^{2,†}, Tongfei Niu², Meida Chen², Lili Guo^{2,*} and Xiaogai Hou^{2,*}

¹ College of Horticulture and Plant Protection, Henan University of Science and Technology, Luoyang 471023, China; xiaoma_77@163.com

² College of Agriculture/Tree Peony, Henan University of Science and Technology, Luoyang 471023, China; zhangchenjie@stu.haust.edu.cn (C.Z.); niutongfei@stu.haust.edu.cn (T.N.); d972749522@163.com (M.C.)

* Correspondence: guolili@haust.edu.cn (L.G.); hkdhxg@haust.edu.cn (X.H.); Tel.: +86-185-6760-5906 (L.G.); +86-0379-69980776 (X.H.)

† These authors contributed equally to this work.

Table S1 Analysis of floral volatile components of *Paeonia ostia* 'Fengdan' at different flower development stages under potted cultivation

Peak Time	Substance Name	CE	BS	IF	HO	FB	ID	DE
3.025	Ethylbenzene	0.049±0.001	0.094±0.020	0.049±0.013	0.042±0.009	0.054±0.013	0.055±0.006	0.042±0.006
3.112	p-Xylene	0.145±0.011	0.240±0.077	0.185±0.047	0.132±0.024	0.123±0.006	0.112±0.017	0.112±0.013
3.406	m-Xylene	0.069±0.009	0.124±0	0.062±0.014	/	0.041±0.006	0.068±0.020	0.042±0.005
4.171	Hexyl methacrylate	0.063±0.020	0.071±0.01	0.044±0.006	0.057±0.008	0.045±0.007	/	/
5.087	(3Z)-hex-3-en-1-yl acetate	0.232±0	0.113±0.063	/	0.591±0	/	/	0.101±0
5.897	(E)-β-ocimene	/	2.942±2.712	0.613±0.308	6.486±5.244	3.048±2.009	/	0.071±0.024
6.923	Undecane	0.084±0.036	0.140±0.052	0.075±0.036	0.122±0.056	0.054±0.003	0.107±0.013	0.064±0.015
9.075	Dodecane	0.174±0.043	0.171±0.071	0.118±0.061	0.167±0.095	0.084±0.001	0.128±0.040	0.113±0.022
9.718	nerol	/	0.177±0	0.113±0.065	0.576±0	0.668±0.168	0.411±0.216	1.611±0.556
10.274	geraniol	/	/	0.061±0	0.809±0.305	1.202±0.447	1.179±0.849	3.385±0.921
11.266	Tridecane	0.142±0.044	0.275±0.135	0.315±0.154	0.776±0.425	0.242±0.027	0.189±0.073	0.341±0.095
13.558	Tetradecane	0.329±0.053	0.298±0.102	0.204±0.067	0.401±0.099	0.149±0.039	0.298±0.032	0.307±0.048
13.846	1,3,5-trimethoxybenzene	0.235±0.050	2.895±2.014	1.789±0.818	2.671±1.010	1.620±0.202	0.943±0.563	0.192±0.086
16.480	Pentadecane	0.306±0.086	1.523±0.983	0.839±0.284	2.764±0.406	0.818±0.141	0.611±0.166	0.725±0.103
16.901	2,4-Di-tert-butylphenol	0.300±0.114	0.196±0.022	0.094±0	/	/	0.498±0.162	0.418±0.136
20.276	hexadecane	0.728±0.128	0.545±0.185	0.199±0.028	0.217±0.106	0.263±0.086	0.745±0.048	0.862±0.087
22.305	(-)-methyl jasmonate	0.395±0.197	0.257±0	/	/	/	0.523±0.145	0.649±0.211
22.954	2-methylhexadecane	/	0.161±0.005	0.191±0.056	0.226±0.046	0.117±0.015	/	0.095±0
23.226	(z)-7-tetradecen-1-yl acetate	/	/	0.406±0.194	0.889±0.094	0.292±0	0.202±0.011	0.211±0.033
23.547	8-Heptadecene	/	0.528±0.109	0.442±0.050	0.810±0.144	0.740±0.461	0.177±0.020	0.338±0
24.580	Heptadecane	0.275±0.080	1.350±1.005	0.749±0.400	1.754±0.081	0.749±0.151	0.518±0.171	0.708±0.053
24.857	phytane	/	/	/	/	/	0.167±0	0.195±0.014
27.591	3-methylheptadecane	/	/	0.083±0	0.092±0	0.070±0	0.088±0	0.105±0.007
28.293	nonadec-1-ene	0.162±0.029	/	/	/	/	0.161±0.038	0.146±0.012
28.494	octadecane	0.298±0.073	0.226±0.080	0.082±0.013	/	0.160±0	0.311±0.031	0.432±0.017

Note: '/' indicates trace amount or not detected, the data are represented by the mean ± standard deviation (n=3). CE: Color-exposure stage; BS: Blooming stage; IF: Initial flowering stage; HO: Half opening stage; FB: Full blooming stage; ID: Initial decay stage; DE: Decay stage.

Table S2 Analysis of floral volatile components of *Paeonia ostia* 'Fengdan' at different flower development stages under field cultivation

Peak Time	Substance Name	CE	BS	IF	HO	FB	ID	DE
2.901	Styrene	0.053±0.002	0.078±0	0.020±0.013	/	/	/	/
2.936	m-Xylene	0.126±0.073	0.133±0.055	0.047±0.016	0.139±0.108	/	0.030±0	/
3.65	3-Hexanol	0.169±0.028	0.145±0.030	0.138±0.130	/	/	/	/
4.299	Heptane,2,2,4,6,6-pentamethyl-	0.215±0.062	/	/	/	/	/	/
4.728	(3Z)-hex-3-en-1-yl acetate	0.173±0.076	/	0.027±0	0.061±0	/	/	/
5.59	(E)- β -ocimene	2.782±2.125	4.319±1.760	5.002±4.383	/	0.665±0.142	0.181±0.118	0.846±0.093
6.671	Undecane	/	/	0.144±0.127	0.300±0.138	0.426±0	/	0.290±0
6.698	Nonanal	0.296±0.053	/	0.051±0.038	/	/	/	/
6.97	Phenylethyl Alcohol	/	/	0.276±0	1.158±0.627	0.811±0	0.040±0	/
7.577	(-)-Myrtenol	0.430±0.364	/	/	/	/	/	/
8.873	Dodecane	0.203±0.057	0.154±0.033	1.464±1.433	/	0.252±0	0.069±0.012	/
8.996	Decanal	0.152±0.039	/	/	/	/	/	/
9.55	3-Carene	0.302±0	0.436±0.151	1.011±1.007	0.672±0.362	0.645±0.134	0.233±0.106	1.397±0
9.599	3-Phenylpropanol	/	0.245±0.048	/	/	/	/	/
10.12	nerol	/	0.679±0.228	0.464±0.427	0.813±0.484	0.898±0.312	0.022±0	/
10.276	2-Propen-1-ol, 3-phenyl-	/	0.309±0.056	0.038±0	/	0.350±0.050	/	/
11.126	Tridecane	0.153±0.027	0.484±0.140	0.689±0.551	0.272±0.123	0.942±0.110	0.411±0.135	1.040±0.347
12.52	(+)-3-Carene	/	0.405±0.200	0.092±0.038	1.708±0	/	0.465±0.185	0.425±0
13.411	Tetradecane	3.584±3.169	0.776±0.298	0.501±0.212	0.194±0.129	1.451±0.090	0.791±0.288	2.566±0.795
13.692	1,3,5-trimethoxybenzene	4.407±2.856	1.807±0.405	0.132±0.038	/	2.110±0.274	0.315±0.240	0.925±0
16.309	Pentadecane	0.778±0.089	2.510±0.788	1.096±0.687	1.529±0.722	2.787±0.118	1.062±0.433	8.969±3.523
16.724	2,4-Di-tert-butylphenol	0.113±0.033	0.362±0.106	0.157±0.078	/	/	/	/
20.067	hexadecane	0.529±0.140	1.391±0.462	0.439±0.084	/	1.505±0.069	0.814±0.283	5.045±1.520
22.741	2-methylhexadecane	0.186±0.043	0.397±0.097	0.116±0.048	/	/	/	/
24.358	Heptadecane	1.170±0.317	2.370±0.336	0.371±0.211	1.230±0.063	1.427±0.110	0.765±0.438	2.031±0.767
28.139	1-Octadecene	0.124±0	0.386±0.035	0.075±0.014	/	/	/	/
28.345	octadecane	0.406±0.150	0.651±0.218	0.186±0.032	/	0.796±0.055	0.405±0.142	/
30.029	nonadec-1-ene	0.095±0.041	/	0.010±0	/	/	/	/

Note: '/' indicates trace amount or not detected, the data are represented by the mean \pm standard deviation (n=3). CE: Color-exposure stage; BS: Blooming stage; IF: Initial flowering stage; HO: Half opening stage; FB: Full blooming stage; ID: Initial decay stage; DE: Decay stage.

Table S3 Daily variation analysis of floral volatile components of *Paeonia ostia* 'Fengdan' under potted cultivation

Peak Time	Substance Name	6:00-9:00	9:00-12:00	12:00-15:00	15:00-18:00
3.025	Ethylbenzene	0.048±0.007	0.045±0	0.044±0.004	0.083±0.002
3.112	p-Xylene	0.150±0.019	0.151±0.020	0.136±0.018	0.165±0.024
3.406	m-Xylene	0.050±0	/	0.056±0.001	0.131±0.014
4.970	Decane	/	/	/	0.095±0.022
5.897	(E)- β -ocimene	0.698±0.252	0.301±0.155	1.140±0.537	1.150±0.545
6.923	Undecane	0.072±0.011	/	0.045±0	0.294±0.082
7.026	Nonanal	/	/	0.071±0	0.329±0.033
9.075	Dodecane	0.148±0.028	0.081±0	0.083±0.014	0.341±0.171
11.266	Tridecane	0.430±0.228	0.154±0.021	0.201±0.058	0.505±0.222
13.558	Tetradecane	0.485±0.157	0.188±0.024	0.251±0.017	0.497±0.155
13.846	1,3,5-trimethoxybenzene	2.124±0.724	1.193±0.222	2.377±0.865	2.404±0.732
16.480	Pentadecane	1.391±0.452	0.631±0.228	1.201±0.247	1.687±0.900
16.901	2,4-Di-tert-butylphenol	0.390±0.142	0.249±0.028	0.167±0.112	0.354±0.087
20.276	hexadecane	0.883±0.186	0.188±0.002	0.432±0.123	0.964±0.188
22.305	(-)-methyl jasmonate	0.621±0.087	0.142±0	0.509±0	/
22.954	2-methylhexadecane	0.231±0.060	/	0.138±0.017	0.234±0.128
23.226	(z)-7-tetradecen-1-yl acetate	0.684±0.201	0.365±0.169	0.533±0.052	0.669±0.345
23.547	8-Heptadecene	/	0.518±0.361	0.673±0.111	0.837±0.424
24.580	Heptadecane	1.324±0.219	0.944±0.484	2.015±0.134	1.990±1.134
24.857	phytane	/	/	/	0.203±0.020
27.591	3-methylheptadecane	0.348±0.043	/	0.138±0.027	0.217±0.079
28.293	nonadec-1-ene	/	/	/	0.193±0.045
28.494	octadecane	0.360±0.092	/	0.193±0.047	0.364±0.074

Note: '/' indicates trace amount or not detected, the data are represented by the mean \pm standard deviation (n=3).

Table S4 Daily variation analysis of floral volatile components of *Paeonia ostia* 'Fengdan' under field cultivation

Peak Time	Substance Name	6:00-9:00	9:00-12:00	12:00-15:00	15:00-18:00
2.936	m-Xylene	0.078 \pm 0.011	0.036 \pm 0.006	0.204 \pm 0.020	0.062 \pm 0.007
3.650	3-Hexanol	0.016 \pm 0	0.052 \pm 0.019	0.111 \pm 0.039	0.217 \pm 0
4.299	Heptane, 2,2,4,6,6-pentamethyl-	0.041 \pm 0.005	0.065 \pm 0.009	/	0.237 \pm 0
5.590	(E)- β -ocimene	0.090 \pm 0.028	0.415 \pm 0.266	0.660 \pm 0.410	5.445 \pm 4.916
5.797	Hexane, 3,3-dimethyl-	0.016 \pm 0	0.029 \pm 0.005	/	0.089 \pm 0
6.671	Undecane	0.048 \pm 0.025	0.171 \pm 0.156	0.078 \pm 0.030	0.212 \pm 0
8.873	Dodecane	0.037 \pm 0.005	0.033 \pm 0.001	0.094 \pm 0	/
9.550	3-Carene	0.066 \pm 0.034	0.151 \pm 0.054	0.292 \pm 0.112	0.271 \pm 0.161
10.120	nerol	0.069 \pm 0.031	0.348 \pm 0.075	0.559 \pm 0.179	0.257 \pm 0.128
10.276	2-Propen-1-ol, 3-phenyl-	0.044 \pm 0	0.449 \pm 0.334	0.181 \pm 0	0.166 \pm 0.075
11.126	Tridecane	0.088 \pm 0.010	0.132 \pm 0.038	0.374 \pm 0.096	0.943 \pm 0.843
13.411	Tetradecane	0.090 \pm 0.031	0.127 \pm 0.021	1.318 \pm 0.462	0.552 \pm 0.278
13.692	1,3,5-trimethoxybenzene	0.689 \pm 0.309	1.734 \pm 0.448	2.317 \pm 0.783	3.486 \pm 2.845
16.309	Pentadecane	0.474 \pm 0.299	0.643 \pm 0.269	3.791 \pm 1.186	1.919 \pm 1.252
16.724	2,4-Di-tert-butylphenol	0.024 \pm 0	0.097 \pm 0.025	0.171 \pm 0	0.167 \pm 0
20.067	hexadecane	0.083 \pm 0.054	0.116 \pm 0.014	2.214 \pm 0.795	0.579 \pm 0.201
22.741	2-methylhexadecane	0.059 \pm 0.010	0.151 \pm 0.102	0.322 \pm 0.019	0.202 \pm 0
24.358	Heptadecane	0.388 \pm 0.198	0.811 \pm 0.418	1.339 \pm 0.397	1.069 \pm 0.468
28.345	octadecane	0.068 \pm 0.034	0.112 \pm 0.022	0.309 \pm 0.125	0.234 \pm 0.027
29.671	Nonadecane, 2-methyl-	0.025 \pm 0.007	0.030 \pm 0	/	/
30.029	nonadec-1-ene	0.170 \pm 0.055	0.079 \pm 0.048	0.594 \pm 0	1.377 \pm 0
30.116	1-Eicosene	0.041 \pm 0	0.145 \pm 0.079	0.092 \pm 0	0.194 \pm 0

Note: '/' indicates trace amount or not detected, the data are represented by the mean \pm standard deviation (n=3).