

Table S1. Parameters of OPLS-DA model for different petal types at the same stage of flower development in ‘AM’

Group	R^2X	R^2Y	Q^2
S1QB_vs_S1YB	0.930	1	0.997
S1QB_vs_S1LGB	0.923	1	0.996
S1YB_vs_S1LGB	0.816	0.999	0.991
S2QB_vs_S2YB	0.947	1	0.998
S2QB_vs_S2LGB	0.965	1	0.998
S2YB_vs_S2LGB	0.845	1	0.994
S3QB_vs_S3YB	0.951	1	0.999
S3QB_vs_S3LGB	0.975	1	0.999
S3YB_vs_S3LGB	0.890	1	0.998
S4QB_vs_S4YB	0.956	1	0.997
S4QB_vs_S4LGB	0.950	1	1
S4YB_vs_S4LGB	0.927	1	0.997

The Q^2 values for all models exceeded 0.8, indicating the reliability of the incoming data.

Table S2. Statistical table of metabolites related to ‘AM’ anthocyanin synthesis

Class	Number	Compounds	Proportion(%)
Cyanidin	9	Cyanidin-3-O-glucoside、Cyanidin-3-O-rutinoside、Cyanidin-3-O-sophoroside、 Cyanidin-3-O-sambubioside-5-O-glucoside、Cyanidin-3-(6-O-p-caffeoyl)-glucoside、 Cyanidin-3-O-(6-O-malonyl-beta-D-glucoside、Cyanidin-3-O-(6-O-p-coumaroyl)-glucoside、 Cyanidin-3-O-rutinoside-5-O-glucoside、Cyanidin-3-O-xyloside	20%
Delphinidin	9	Delphinidin、Delphinidin-3-O-(6-O-acetyl)-glucoside、Delphinidin-3-O-sophoroside、 Delphinidin-3-O-rutinoside、Delphinidin-3-O-rutinoside-5-O-glucoside、Delphinidin-3-O-galactoside、Delphinidin-3-O- glucoside、Delphinidin-3-O-rhamnoside、Delphinidin-3-O-arabinoside	20%
Malvidin	1	Malvidin-3-O-glucoside	2.22%
Pelargonidin	5	Pelargonidin-3-O-glucoside、Pelargonidin-3-O-rutinoside、Pelargonidin-3-O-galactoside、 Pelargonidin-3-O-sophoroside、Pelargonidin-3-O-5-O-(6-O-coumaroyl)-diglucoside	11.11%
Peonidin	6	Peonidin-3-O-rutinoside、Peonidin-3,5-O-diglucoside、Peonidin-3-O-glucoside、 Peonidin-3-O-(6-O-p-coumaroyl)-glucoside、Peonidin-3-O-sambubioside、 Peonidin-3-O-(6-O-malonyl-beta-D-glucoside)	13.33%
Petunidin	5	Petunidin-3-O-rutinoside、Petunidin-3-O-glucoside、Petunidin-3,5-O-diglucoside、 Petunidin-3-O-(6-O-p-coumaroyl)-glucoside、Petunidin-3-O-sambubioside-5-O-glucoside	11.11%
Procyanidin	5	Procyanidin B2、Procyanidin B3、Procyanidin A1、Procyanidin B1、Procyanidin C1	11.11%
flavonoid	5	Rutin、Kaempferol-3-O-rutinoside、Naringenin、Afzelin、Quercetin-3-O-glucoside	11.11%

Tab S3 Comparison of differential metabolites

Group name	All sig diff	Up regulated	Down regulated
S1QB_vs_S1YB	24	14	10
S1QB_vs_S1LGB	24	12	12
S1YB_vs_S1LGB	4	1	3
S2QB_vs_S2YB	26	17	9
S2QB_vs_S2LGB	27	17	10
S2YB_vs_S2LGB	3	1	2
S3QB_vs_S3YB	27	16	11
S3QB_vs_S3LGB	26	17	9
S3YB_vs_S3LGB	8	3	5
S4QB_vs_S4YB	29	16	13
S4QB_vs_S4LGB	24	14	10
S4YB_vs_S4LGB	12	5	7

Table S4. statistical table of differential metabolites

Class	Number	Compounds	kegg_map
Cyanidin	3	Cyanidin-3-O-glucoside	ko00942, ko01110
		Cyanidin-3-O-sambubioside-5-O-glucoside,	
		Cyanidin-3-O-(6-O-p-coumaroyl)-glucoside	
Malvidin	1	Malvidin-3-O-glucoside	ko00942
Pelargonidin	2	Pelargonidin-3-O-glucoside,	ko00942,ko01100,ko01110
		Pelargonidin-3-O-galactoside	
Peonidin	2	Peonidin-3-O-rutinoside,	
		Peonidin-3-O-sambubioside	
Petunidin	1	Petunidin-3-O-rutinoside	
Procyanidin	1	Procyanidin B1	

Table S5. Statistical table of differential metabolite content

Compound	S1QB	S2QB	S3QB	S4QB	S1YB	S2YB	S3YB	S4YB	S1LGB	S2LGB	S3LGB	S4LGB
Cyanidin-3-O-glucoside	9.97±0.49	25.28±0.62	16.35±0.21	18.49±0.97	138.28±0.36	292.56±1.09	245.63±2.55	271.66±5.03	97.61±0.91	209.42±2.58	152.11±2.00	166.72±0.66
Cyanidin-3-O-sambubioside-5-O-glucoside	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	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00
Cyanidin-3-O-(6-O-p-coumaroyl)-glucoside	0.00±0.00	0.48±0.03	0.47±0.03	0.59±0.01	0.86±0.10	3.77±0.06	4.02±0.15	3.75±0.69	0.90±0.09	6.51±0.68	5.43±0.15	5.58±0.18
Malvidin-3-O-glucoside	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.01±0.00	0.02±0.00	0.01±0.00	0.02±0.00	0.01±0.00	0.02±0.00	0.01±0.00	0.02±0.00
Pelargonidin-3-O-glucoside	0.01±0.00	0.01±0.00	0.01±0.00	0.02±0.00	0.05±0.00	0.13±0.00	0.11±0.00	0.11±0.00	0.03±0.00	0.10±0.00	0.07±0.00	0.08±0.00
Pelargonidin-3-O-galactoside	0.05±0.00	0.04±0.00	0.03±0.00	0.03±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±0.00	0.00±0.00
Peonidin-3-O-rutinoside	0.24±0.00	0.43±0.00	0.31±0.01	0.41±0.01	4.25±0.07	6.79±0.22	3.90±0.06	4.50±0.06	2.17±0.03	4.07±0.13	2.26±0.02	3.11±0.07
Peonidin-3-O-sambubioside	0.00±0.00	0.00±0.00	0.00±0.00	0.00±0.00	0.02±0.00	0.04±0.00	0.02±0.00	0.03±0.00	0.01±0.00	0.03±0.00	0.02±0.00	0.02±0.00
Petunidin-3-O-rutinoside	0.20±0.01	0.18±0.01	0.12±0.00	0.16±0.00	0.056±0.00	0.037±0.00	0.02±0.00	0.02±0.00	0.07±0.00	0.044±0.00	0.03±0.00	0.04±0.00
Procyanidin B1	0.15±0.01	0.09±0.00	0.06±0.00	0.07±0.00	0.02±0.00	0.0±±0.00	0.01±0.00	0.01±0.00	0.01±0.00	0.02±±0.00	0.01±0.00	0.01±0.00