

**Root transcriptome reveals responses to plastic film mulching and grass cover in wine grape  
'Cabernet Sauvignon' root and berry**

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Table S1

Summary of sequencing data

Sample	Raw reads	Raw data (bp)	Clean reads	Clean data (bp)	Clean percent	Q30(%)	GC(%)	rRNA mapping reads	rRNA mapping ratio
Clean tillage 1	49972756	7785455700	49221362	7687908043	98.50 %	90.27 %	47.37 %	207428	0.42 %
Clean tillage 2	58903406	8173146300	58477160	8101039847	99.28 %	91.08 %	47.44 %	101452	0.17 %
Clean tillage 3	64108238	7466210400	63602136	7405255938	99.21 %	91.22 %	46.55 %	72972	0.11 %
Portulacae 1	51903038	8874945600	51288378	8792273777	98.82 %	90.85 %	46.23 %	102762	0.20 %
Portulacae 2	54487642	11906247900	54040452	11813982534	99.18 %	90.95 %	47.16 %	55388	0.10 %
Portulacae 3	49774736	8339147700	49400798	8257820760	99.25 %	90.82 %	46.63 %	69722	0.14 %
<i>E. humifusa</i> 1	59166304	11873022300	58653818	11794040775	99.13 %	91.49 %	46.69 %	116662	0.20 %
<i>E. humifusa</i> 2	79374986	9699163200	78811610	9629510294	99.13 %	91.48 %	6.74 %	107916	0.14 %
<i>E. humifusa</i> 3	55594318	10337224500	55087760	10264424699	99.09 %	91.49 %	47.34 %	207976	0.38 %
Film 1	79153482	7495913400	78683294	7377917667	99.41 %	89.04 %	47.71 %	64700	0.08 %
Film 2	64661088	8835510900	64236558	8765569803	99.34 %	91.37 %	46.76 %	66374	0.01 %
Film 3	68914830	9616235700	68472912	9534456348	99.36 %	91.14 %	47.06 %	60862	0.09 %
<b>Total/Average</b>	<b>701.92 M</b>	<b>102.82 G</b>	<b>696.16 M</b>	<b>101.91 G</b>	<b>99.14 %</b>	<b>90.93 %</b>	<b>43.64 %</b>	<b>1.17 M</b>	<b>0.17 %</b>

Sample	Statistical reads	Unique mapped pair reads	Multiple mapped pair reads	Total mapping ratio	Known gene num	Novel gene num
Clean tillage 1	49013934	34934574 (71.27 %)	167253 (0.34 %)	71.62 %	19061 (73.78 %)	720
Clean tillage 2	58375708	44315670 (75.91 %)	224134 (0.38 %)	76.30 %	21374 (82.74%)	847
Clean tillage 3	63529164	48161985 (75.81 %)	271550 (0.43 %)	76.24 %	21428 (82.94%)	841
Portulacae 1	51185616	37372516 (73.01 %)	207729 (0.41 %)	73.42 %	21521 (83.30%)	860
Portulacae 2	53985064	41310333 (76.52 %)	216655 (0.40 %)	76.92 %	21787 (84.33%)	869
Portulacae 3	49331076	37689190 (76.40 %)	242101 (0.49 %)	76.89 %	21584 (83.55%)	858
<i>E. humifusa</i> 1	58537156	43534105 (74.37 %)	232096 (0.40 %)	74.77 %	20808 (80.55%)	819
<i>E. humifusa</i> 2	78703694	58057246 (73.77 %)	345633 (0.44 %)	74.21 %	21359 (82.68%)	848
<i>E. humifusa</i> 3	54879784	40307068 (73.45 %)	218627 (0.40 %)	73.84 %	20574 (79.64%)	817
Film 1	78618594	58738632 (74.71 %)	303253 (0.39 %)	75.10 %	19328 (74.82%)	724
Film 2	64170184	49216272 (76.70 %)	269581 (0.42 %)	77.12 %	21023 (81.38%)	842
Film 3	68412050	52457939 (76.68 %)	304300 (0.44 %)	77.12 %	21433 (82.96%)	853
<b>Total/Average</b>	<b>698.98 M</b>	-	-	<b>75.30 %</b>	-	-

Table S 2

GO enrichment analysis of DEGs in grape root under film mulching relative to clean tillage

Ontology	Class	number_of_ZHW- vs-ZHM_up	number_of_ZHW- vs-ZHM_down	genes_of_ZHW-vs-ZHM_up	genes_of_ZHW-vs-ZHM_down
	response to stimulus	3	4	gene14655;gene8371;gene8372	gene11389;gene17096;gene25759;gene8795
	localization	2	2	gene8371;gene8372	gene10730;gene22695
	single-organism process	2	7	gene14655;gene15737	gene11389;gene1415;gene14242;gene17096; gene22695;gene24694;gene8795
	developmental process	0	2		gene14242;gene8795
	signaling	0	2		gene17096;gene8795
	reproduction	0	1		gene8795
biological_process	reproductive process	0	1		gene8795
	biological regulation	1	4	gene15737	gene14242;gene17096;gene1910;gene8795
	multicellular organismal process	0	1		gene8795
	cellular process	5	5	gene14655;gene15737;gene17120;gene8371; gene8372	gene11389;gene14242;gene17096;gene1910; gene8795
	cellular component organization or biogenesis	1	0	gene17120	
	metabolic process	2	4	gene15737;gene21181	gene11389;gene1415;gene1910;gene24694
	transporter activity	3	3	gene16678;gene8371;gene8372	gene10730;gene18085;gene22695
	antioxidant activity	0	1		gene17096
	transcription factor activity, protein binding	0	1		gene14242
molecular_function	nucleic acid binding transcription factor activity	0	1		gene14242
	catalytic activity	4	3	gene15737;gene20810;gene21181;gene8605	gene1415;gene17096;gene24694
	binding	0	5		gene1415;gene14242;gene1910;gene24694; gene6066
	membrane part	3	8	gene16678;gene8371;gene8372	gene10730;gene1415;gene18085;gene1910; gene19249;gene22695;gene22717;gene24694
	membrane	4	8	gene16678;gene17120;gene8371;gene8372	gene10730;gene1415;gene18085;gene1910; gene19249;gene22695;gene22717;gene24694
	extracellular region	1	0	gene17120	
cellular_component	cell part	5	7	gene14655;gene15737;gene17120; gene8371;gene8372	gene10730;gene14242;gene17096;gene1910; gene22695;gene25759;gene8795
	cell	5	7	gene14655;gene15737;gene17120; gene8371;gene8372	gene10730;gene14242;gene17096;gene1910; gene22695;gene25759;gene8795
	organelle	3	4	gene14655;gene8371;gene8372	gene14242;gene1910;gene25759;gene8795
	organelle part	2	0	gene8371;gene8372	

Table S3

GO enrichment analysis of DEGs in grape root under film mulching relative to *E. humifusa* wild mulching

Ontology	Class	number_ of_ZHM- vs-ZHC2_ up	number_ of_ZHM- vs-ZHC2_ down	genes_of_ZHM-vs-ZHC2_up	genes_of_ZHM-vs-ZHC2_down
	response to stimulus	15	9	gene14655;gene1527;gene18549;gene18776;gene20715;gene22068;gene22078; gene22080;gene22082;gene22944;gene22945;gene25657;gene8371;gene8372; gene9706	gene11389;gene12477;gene14881;gene17096; gene22531;gene25759;gene5163;gene5675;gene8795
	single-organism process	30	10	gene1034;gene1035;gene11489;gene11961;gene12930;gene14393;gene14655; gene18137;gene18155;gene18752;gene18776;gene20715;gene21293; gene21392;gene21394;gene21395;gene21396;gene21400;gene23393;gene24136; gene24355;gene25657;gene26135;gene28449;gene5688;gene581;gene5985; gene604;gene6311;gene8302	gene10359;gene11389;gene1415;gene14242;gene16706; gene17096;gene22695;gene24694;gene6748;gene8795
	reproduction	2	2	gene26135;gene581	gene20687;gene8795
	reproductive process	2	2	gene26135;gene581	gene20687;gene8795
	multi-organism process	1	2	gene581	gene14881;gene20687
	multicellular organismal process	3	1	gene24355;gene26135;gene581	gene8795
	developmental process	3	2	gene24355;gene26135;gene6311	gene14242;gene8795
	metabolic process	45	6	gene1034;gene1035;gene11445;gene11489;gene11891;gene11961;gene12930; gene14393;gene14417;gene14655;gene17723;gene18137;gene18155; gene18752;gene19101;gene21293;gene21392;gene21394;gene21395;gene21396; gene21400;gene22068;gene22075;gene22077;gene22078;gene22079;gene22080; gene22082;gene23393;gene24136;gene24330;gene24355;gene25032;gene26135; gene28010;gene28449;gene4594;gene4691;gene5688;gene581;gene5985; gene604;gene8302;gene9200;gene9706	gene10359;gene11389;gene1415;gene15408; gene16706;gene24694
	signaling	2	2	gene18776;gene25657	gene17096;gene8795
	localization	5	2	gene27260;gene28010;gene3951;gene8371;gene8372	gene22695;gene6748
	cellular component organization or biogenesis	5	1	gene11031;gene11891;gene14417;gene17723;gene25300	gene15408
	cellular process	38	7	gene1034;gene1035;gene11031;gene11489;gene11891;gene12930;gene14393; gene14399;gene14417;gene14655;gene17723;gene18137;gene18752; gene18776;gene20715;gene21293;gene21392;gene21394;gene21395;gene21396; gene21400;gene24136;gene24355;gene25032;gene25300;gene25657;gene26135; gene28010;gene4594;gene581;gene5985;gene604;gene6311;gene8302; gene8371;gene8372;gene9200;gene9706	gene11389;gene14242;gene14881;gene15408; gene16706;gene17096;gene8795
	biological regulation	6	3	gene1527;gene18776;gene24330;gene25657;gene26135;gene6311	gene14242;gene17096;gene8795

biological\_process

Tab. S3, continued

Ontology	Class	number_ of_ZHM- vs-ZHC2_ up	number_ of_ZHM- vs-ZHC2_ down	genes_of_ZHM-vs-ZHC2_up	genes_of_ZHM-vs-ZHC2_down
	catalytic activity	62	9	gene1034;gene1035;gene11445;gene11489;gene11891;gene11961;gene12357; gene12359;gene12361;gene12370;gene12710;gene12930;gene13097; gene14393;gene14399;gene14417;gene14423;gene17723;gene18137;gene18155; gene18752;gene19101;gene20810;gene21293;gene21392;gene21394;gene21395; gene21396;gene21400;gene21461;gene22068;gene22075;gene22077;gene22078; gene22079;gene22080;gene22082;gene23393;gene23826;gene24136;gene24330; gene24355;gene2624;gene27323;gene28449;gene3033;gene4238;gene4691; gene5445;gene5688;gene581;gene5865;gene5985;gene604;gene8146;gene8281; gene8302;gene8605;gene8683;gene9200;gene9706;gene9868	gene10359;gene1415;gene15408;gene16706;gene17096; gene17531;gene24694;gene9138;gene9139
	transcription factor activity, protein binding	2	1	gene1527;gene6311	gene14242
	antioxidant activity	1	1	gene9706	gene17096
molecular_function	nutrient reservoir activity	1	0	gene13795	
	transporter activity	7	2	gene12370;gene27260;gene27263;gene3951;gene4342;gene8371;gene8372	gene22695;gene6748
	molecular function regulator	2	0	gene11891;gene17723	
	nucleic acid binding transcription factor activity	2	2	gene4594;gene6311	gene14242;gene22543
	binding	42	11	gene11489;gene11961;gene12357;gene12359;gene12361;gene12370; gene12930;gene13795;gene14393;gene14399;gene14423;gene15698;gene18137; gene18549;gene18752;gene18776;gene20024;gene20025;gene21461;gene22944; gene22945;gene23826;gene24136;gene25032;gene25300;gene25657;gene26135; gene2624;gene27323;gene4238;gene4594;gene5445;gene581;gene5865; gene5985;gene6311;gene6881;gene8146;gene8281;gene8683;gene9706;gene9868	gene10359;gene1415;gene14242;gene14881;gene17531; gene18635;gene22543;gene24694;gene3744;gene6066; gene7669
	extracellular region	4	2	gene11031;gene13795;gene9706;gene9868	gene15408;gene20687
	symplast	1	0	gene27323	
	cell junction	1	0	gene27323	
cellular_component	membrane	26	7	gene11031;gene11891;gene11961;gene12370;gene14423;gene18776;gene19101; gene20561;gene21293;gene21461;gene25657;gene2624;gene26702;gene27260; gene27263;gene27323;gene3951;gene4238;gene4342;gene4769;gene581; gene7392;gene8146;gene8281;gene8371;gene8372	gene10359;gene1415;gene14881;gene17531;gene22695; gene24694;gene6748
	membrane part	23	5	gene11891;gene11961;gene12370;gene14423;gene19101;gene20561; gene21293;gene21461;gene2624;gene26702;gene27260;gene27263;gene27323; gene3951;gene4238;gene4342;gene4769;gene581;gene7392;gene8146; gene8281;gene8371;gene8372	gene1415;gene17531;gene22695;gene24694;gene6748

Tab. S3, continued

Ontology	Class	number_ of_ZHM- vs-ZHC2_ up	number_ of_ZHM- vs-ZHC2_ down	genes_of_ZHM-vs-ZHC2_up	genes_of_ZHM-vs-ZHC2_down
	cell part	38	10	gene1034;gene1035;gene11031;gene11445;gene11489;gene11891;gene12370; gene14393;gene14399;gene14417;gene14655;gene1527; gene17723;gene18776;gene20715;gene21293;gene21392;gene21394; gene21395;gene21396;gene21400;gene22068;gene22078;gene22080; gene22082;gene24355;gene25300;gene25657;gene26135;gene27260; gene27323;gene3033;gene3951;gene4594;gene581;gene6311;gene8371; gene8372	gene14242;gene14881;gene16706;gene17096; gene22543;gene22695;gene25759;gene5163; gene7669;gene8795
	cell	38	10	gene1034;gene1035;gene11031;gene11445;gene11489;gene11891; gene12370;gene14393;gene14399;gene14417;gene14655;gene1527; gene17723;gene18776;gene20715;gene21293;gene21392;gene21394; gene21395;gene21396;gene21400;gene22068;gene22078;gene22080; gene22082;gene24355;gene25300;gene25657;gene26135;gene27260; gene27323;gene3033;gene3951;gene4594;gene581;gene6311;gene8371; gene8372	gene14242;gene14881;gene16706;gene17096; gene22543;gene22695;gene25759;gene5163;gene7669; gene8795
cellular_component	organelle part	3	0	gene25300;gene8371;gene8372	
	organelle	12	6	gene11445;gene14655;gene1527;gene20715;gene24355;gene25300;gene26135; gene3033;gene4594;gene6311;gene8371;gene8372	gene14242;gene14881;gene22543;gene25759;gene7669; gene8795
	macromolecular complex	1	0	gene25300	

Table S4

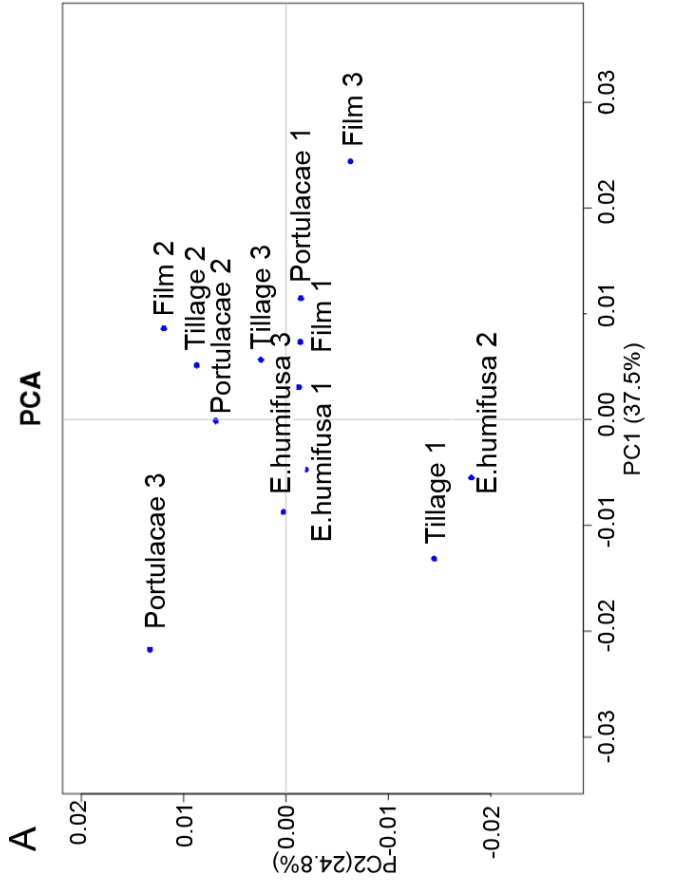
GO enrichment analysis of DEGs in grape root under film mulching relative to Herba portulacae mulching

Ontology	Class	number_of_ZHM-vs-ZHC1_down	number_of_ZHM-vs-ZHC1_up	genes_of_ZHM-vs-ZHC1_down	genes_of_ZHM-vs-ZHC1_up
	reproduction	0	4		gene2997;gene3878;gene3883;gene6057
	reproductive process	0	4		gene2997;gene3878;gene3883;gene6057
	single-organism process	2	23	gene14242;gene22865	gene10010;gene11960;gene11963;gene12930;gene13679;gene13681;gene15737;gene15986;gene16816;gene2052;gene21313;gene21475;gene24035;gene2408;gene24919;gene26975;gene27045;gene29505;gene4646;gene5664;gene6057;gene9624;gene9821
	growth	0	1		gene5664
	multi-organism process	0	2		gene2997;gene6057
	response to stimulus	4	8	gene13129;gene25759;gene26186;gene8125	gene11963;gene13311;gene14184;gene2052;gene26975;gene27045;gene9624;gene9821
	developmental process	1	3	gene14242	gene15986;gene3878;gene3883
	cellular component organization or biogenesis	1	7	gene13129	gene15238;gene15240;gene15244;gene1940;gene21475;gene2408;gene5664
biological_process	metabolic process	4	30	gene13129;gene20433;gene22865;gene9263	gene10010;gene11960;gene11963;gene12930;gene13679;gene13681;gene15238;gene15240;gene15244;gene15737;gene1643;gene16816;gene1728;gene1874;gene21475;gene21668;gene2408;gene24919;gene26409;gene26975;gene284;gene29505;gene29510;gene2995;gene4594;gene4646;gene6052;gene6057;gene8582;gene9821
	signaling	0	4		gene11963;gene27045;gene9624;gene9821
	biological regulation	2	10	gene14242;gene26186	gene11963;gene14184;gene15737;gene15986;gene21313;gene27045;gene2995;gene8582;gene9624;gene9821
	multicellular organismal process	0	1		gene6057
	cellular process	5	26	gene13129;gene14242;gene20433;gene22865;gene9263	gene11960;gene11963;gene12930;gene15238;gene15240;gene15244;gene15737;gene15986;gene1940;gene21313;gene21475;gene21668;gene2408;gene26409;gene26975;gene27045;gene284;gene29505;gene2995;gene4594;gene4646;gene5664;gene6057;gene8582;gene9624;gene9821
	localization	0	3		gene2052;gene21313;gene24035
	nucleic acid binding transcription factor activity	2	10	gene14242;gene9263	gene10590;gene12813;gene15986;gene1732;gene21668;gene22363;gene26409;gene284;gene4570;gene4594
molecular_function	transcription factor activity, protein binding	1	2	gene14242	gene14184;gene15986
	antioxidant activity	1	1	gene13129	gene11087

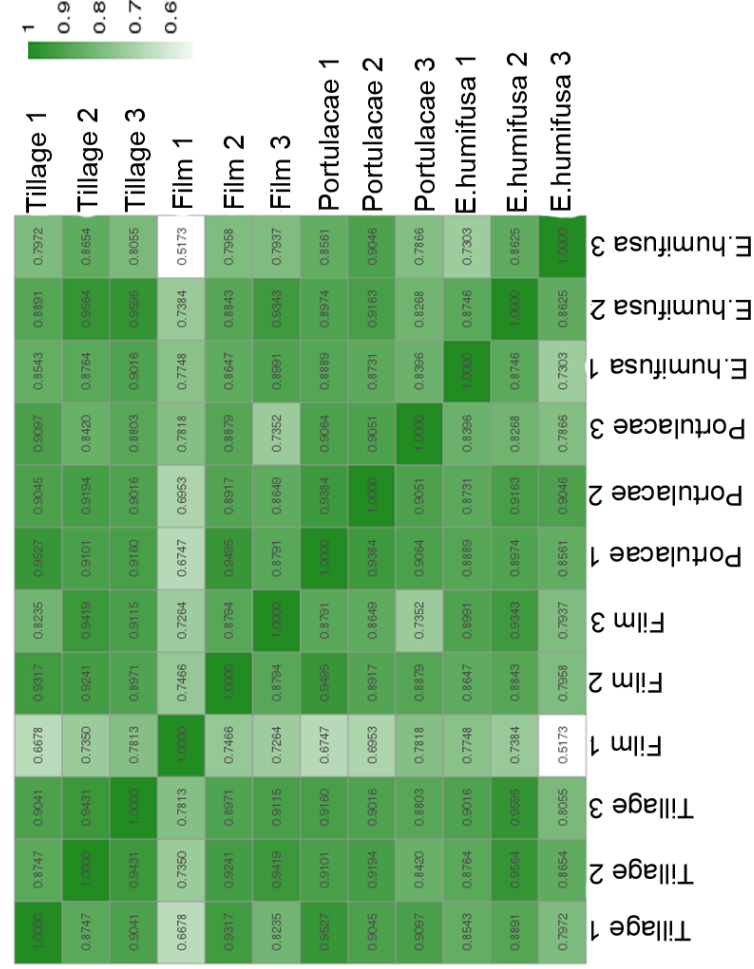
Tab. S4, continued

Ontology	Class	number_of_ZHM-vs-ZHC1_down	number_of_ZHM-vs-ZHC1_up	genes_of_ZHM-vs-ZHC1_down	genes_of_ZHM-vs-ZHC1_up
	binding	7	41	gene13129;gene14242;gene20433;gene22865;gene26186;gene8125;gene9263	gene10590;gene11960;gene11963;gene12813;gene12930;gene13311;gene1339;gene1340;gene15128;gene15986;gene1643;gene1732;gene1903;gene21166;gene21313;gene21668;gene22363;gene24919;gene25318;gene25563;gene26409;gene26975;gene27045;gene284;gene28919;gene29510;gene2995;gene3024;gene3727;gene3997;gene4031;gene4570;gene4594;gene6057;gene6168;gene6207;gene7878;gene8514;gene8582;gene9624;gene9821
	nutrient reservoir activity	0	1		gene8729
molecular_function					
	catalytic activity	3	38	gene13129;gene20433;gene22865	gene10010;gene11020;gene11087;gene11960;gene11963;gene12930;gene13679;gene13681;gene15238;gene15240;gene15244;gene15737;gene1643;gene16816;gene1728;gene1874;gene1903;gene19157;gene2022;gene21166;gene21475;gene2408;gene24919;gene25318;gene25563;gene26975;gene27045;gene29505;gene29510;gene3024;gene4031;gene4646;gene6052;gene6057;gene6168;gene7878;gene8514;gene9821
	molecular transducer activity	0	1		gene11963
	signal transducer activity	0	1		gene11963
	transporter activity	0	3		gene2052;gene24035;gene6168
	extracellular region	2	4	gene13129;gene22865	gene15238;gene15240;gene15244;gene2997
	symplast	1	1	gene13129	gene3024
	cell junction	1	1	gene13129	gene3024
	membrane	0	24		gene11087;gene11156;gene11963;gene13311;gene16816;gene2022;gene2052;gene21475;gene24035;gene2408;gene24919;gene25318;gene25563;gene26579;gene27045;gene3727;gene3878;gene3883;gene4031;gene5664;gene6057;gene6168;gene8514;gene9624
cellular_component					
	cell part	5	28	gene13129;gene14242;gene25759;gene26186;gene9263	gene11087;gene11963;gene14184;gene15238;gene15240;gene15244;gene15737;gene15986;gene1728;gene19157;gene21313;gene21475;gene21668;gene24035;gene26409;gene27045;gene284;gene2995;gene3024;gene3878;gene3883;gene4594;gene4646;gene6057;gene6168;gene8582;gene9624;gene9821
	cell	5	28	gene13129;gene14242;gene25759;gene26186;gene9263	gene11087;gene11963;gene14184;gene15238;gene15240;gene15244;gene15737;gene15986;gene1728;gene19157;gene21313;gene21475;gene21668;gene24035;gene26409;gene27045;gene2995;gene3024;gene3878;gene3883;gene4594;gene4646;gene6057;gene6168;gene8582;gene9624;gene9821
	membrane part	0	17		gene11087;gene11156;gene13311;gene16816;gene2022;gene2052;gene21475;gene24035;gene2408;gene25318;gene25563;gene26579;gene4031;gene5664;gene6057;gene6168;gene8514
	organelle	4	13	gene14242;gene25759;gene26186;gene9263	gene14184;gene15986;gene1728;gene19157;gene21475;gene21668;gene26409;gene27045;gene284;gene2995;gene4594;gene6168;gene8582

**B**



**A**



Suppl. Figure: PCA analysis (A) and Pearson's correlation analysis of samples (B) based on the FPKM of genes.