

Table S2. Integrative analysis of differential metabolites and DEGs

ID of DEGs	Regulation	ID of DEMs	Regulation	KEGG
MsG0480 020550.01	up	pos-M653T209	up	ko00520
MsG0780 036197.01	up	pos-M148T52_1	up	ko00430
MsG0480 021518.01	up	pos-M147T286	up	ko00940
MsG0480 021518.01	up	pos-M165T285	up	ko00940
MsG0380 016360.01	up	pos-M291T263	up	ko00380;ko00280;ko00310;ko00010;ko00410;ko00071;ko00620;ko00903;ko00330;ko00340;ko00053;ko00561
MsG0380 016360.01	up	pos-M929T234	up	ko00380;ko00280;ko00310;ko00010;ko00410;ko00071;ko00620;ko00903;ko00330;ko00340;ko00053;ko00561
MsG0380 016360.01	up	pos-M170T178	up	ko00380;ko00280;ko00310;ko00010;ko00410;ko00071;ko00620;ko00903;ko00330;ko00340;ko00053;ko00561
MsG0380 016360.01	up	pos-M268T183	up	ko00380;ko00280;ko00310;ko00010;ko00410;ko00071;ko00620;ko00903;ko00330;ko00340;ko00053;ko00561
MsG0380 016360.01	up	pos-M170T178	up	ko00380;ko00280;ko00310;ko00010;ko00410;ko00071;ko00620;ko00903;ko00330;ko00340;ko00053;ko00561
MsG0380 016360.01	up	pos-M148T52_1	up	ko00380;ko00280;ko00310;ko00010;ko00410;ko00071;ko00620;ko00903;ko00330;ko00340;ko00053;ko00561
MsG0380 016360.01	up	pos-M272T184	up	ko00380;ko00280;ko00310;ko00010;ko00410;ko00071;ko00620;ko00903;ko00330;ko00340;ko00053;ko00561
MsG0380 016360.01	up	pos-M215T94	up	ko00380;ko00280;ko00310;ko00010;ko00410;ko00071;ko00620;ko00903;ko00330;ko00340;ko00053;ko00561
MsG0480 019214.01	up	pos-M148T52_1	up	ko00040
MsG0480 019214.01	up	pos-M215T94	up	ko00040
MsG0380 016463.01	up	pos-M139T177	up	ko00071;ko00592;ko00010;ko00350
MsG0380 016463.01	up	pos-M170T178	up	ko00071;ko00592;ko00010;ko00350

MsG0780 040733.01	up	pos-M139T177	up	ko04075;ko04016
MsG0480 021267.01	up	pos-M653T209	up	ko00500;ko00520
MsG0380 015362.01	up	pos-M139T177	up	ko04016;ko04075
MsG0480 021533.01	up	pos-M170T178	up	ko00220;ko00330;ko04626
MsG0480 021533.01	up	pos-M148T52_1	up	ko00220;ko00330;ko04626
MsG0480 021533.01	up	pos-M272T184	up	ko00220;ko00330;ko04626
MsG0180 003601.01	up	pos-M147T286	up	ko00940
MsG0180 003601.01	up	pos-M165T285	up	ko00940
MsG0380 012690.01	up	pos-M233T320	up	ko00620;ko00710
MsG0880 044676.01	up	pos-M165T285	up	ko00130
MsG0880 044676.01	up	pos-M139T177	up	ko00130
MsG0480 018671.01	up	pos-M148T52_1	up	ko00500;ko00460;ko00940
MsG0480 018671.01	up	pos-M147T286	up	ko00500;ko00460;ko00940
MsG0480 018671.01	up	pos-M165T285	up	ko00500;ko00460;ko00940
MsG0280 008343.01	up	pos-M139T177	up	ko04016;ko04075
MsG0380 013501.01	up	pos-M170T178	up	ko00750
MsG0480 018569.01	up	pos-M139T177	up	ko04075;ko04016
MsG0480 019215.01	up	pos-M148T52_1	up	ko00040
MsG0480 019215.01	up	pos-M215T94	up	ko00040
MsG0480 021524.01	up	pos-M147T286	up	ko00940
MsG0480 021524.01	up	pos-M165T285	up	ko00940
MsG0780 041613.01	up	pos-M334T263	up	ko04146;ko00590

MsG0280 011263.01	up	pos-M139T177	up	ko04075
MsG0480 021433.01	up	pos-M170T178	up	ko00330;ko00380;ko00360
MsG0480 021433.01	up	pos-M148T52_1	up	ko00330;ko00380;ko00360
MsG0480 021433.01	up	pos-M272T184	up	ko00330;ko00380;ko00360
MsG0480 021433.01	up	pos-M291T263	up	ko00330;ko00380;ko00360
MsG0480 021433.01	up	pos-M237T285	up	ko00330;ko00380;ko00360
MsG0480 021433.01	up	pos-M165T285	up	ko00330;ko00380;ko00360
MsG0480 021433.01	up	pos-M929T234	up	ko00330;ko00380;ko00360
MsG0380 011489.01	up	pos-M147T286	up	ko00940
MsG0380 011489.01	up	pos-M165T285	up	ko00940
MsG0080 048387.01	up	pos-M148T52_1	up	ko00460
MsG0880 046345.01	up	pos-M147T286	up	ko00940
MsG0880 046345.01	up	pos-M165T285	up	ko00940
MsG0180 005984.01	up	pos-M271T215	up	ko00945;ko00941;ko00130;ko00360;ko00940
MsG0180 005984.01	up	pos-M165T285	up	ko00945;ko00941;ko00130;ko00360;ko00940
MsG0180 005984.01	up	pos-M139T177	up	ko00945;ko00941;ko00130;ko00360;ko00940
MsG0180 005984.01	up	pos-M237T285	up	ko00945;ko00941;ko00130;ko00360;ko00940
MsG0180 005984.01	up	pos-M165T285	up	ko00945;ko00941;ko00130;ko00360;ko00940
MsG0180 005984.01	up	pos-M929T234	up	ko00945;ko00941;ko00130;ko00360;ko00940
MsG0180 005984.01	up	pos-M147T286	up	ko00945;ko00941;ko00130;ko00360;ko00940
MsG0180 005984.01	up	pos-M165T285	up	ko00945;ko00941;ko00130;ko00360;ko00940
MsG0780 040107.01	up	pos-M445T199	down	ko00592

MsG0180 004680.01	up	pos-M527T56	down	ko00052
MsG0480 021518.01	up	pos-M649T272	down	ko00940
MsG0480 021518.01	up	pos-M151T237	down	ko00940
MsG0480 021518.01	up	pos-M349T201	down	ko00940
MsG0480 021518.01	up	pos-M147T253	down	ko00940
MsG0480 018096.01	up	pos-M233T374	down	ko00909
MsG0480 020076.01	up	pos-M231T69	down	ko00945
MsG0380 016463.01	up	pos-M445T199	down	ko00071;ko00592;ko00010;ko00350
MsG0680 031463.01	up	pos- M284T449_3	down	ko00906
MsG0680 031463.01	up	pos-M858T407	down	ko00906
MsG0580 024178.01	up	pos-M445T199	down	ko00592
MsG0180 001827.01	up	pos- M284T449_3	down	ko00906
MsG0180 001827.01	up	pos-M858T407	down	ko00906
MsG0180 003601.01	up	pos-M649T272	down	ko00940
MsG0180 003601.01	up	pos-M151T237	down	ko00940
MsG0180 003601.01	up	pos-M349T201	down	ko00940
MsG0180 003601.01	up	pos-M147T253	down	ko00940
MsG0880 044676.01	up	pos-M439T410	down	ko00130
MsG0380 012002.01	up	pos-M415T191	down	ko02010
MsG0380 012002.01	up	pos-M527T56	down	ko02010
MsG0380 016151.01	up	pos-M307T300	down	ko00061;ko04146;ko00071
MsG0580 029922.01	up	pos-M415T191	down	ko02010

MsG0580 029922.01	up	pos-M527T56	down	ko02010
MsG0480 018671.01	up	pos-M649T272	down	ko00500;ko00460;ko00940
MsG0480 018671.01	up	pos-M151T237	down	ko00500;ko00460;ko00940
MsG0480 018671.01	up	pos-M349T201	down	ko00500;ko00460;ko00940
MsG0480 018671.01	up	pos-M147T253	down	ko00500;ko00460;ko00940
MsG0580 028567.01	up	pos-M231T69	down	ko00945
MsG0580 024168.01	up	pos-M445T199	down	ko00592
MsG0480 021524.01	up	pos-M649T272	down	ko00940
MsG0480 021524.01	up	pos-M151T237	down	ko00940
MsG0480 021524.01	up	pos-M349T201	down	ko00940
MsG0480 021524.01	up	pos-M147T253	down	ko00940
MsG0580 024567.01	up	pos- M284T449_3	down	ko00906
MsG0580 024567.01	up	pos-M858T407	down	ko00906
MsG0780 041613.01	up	pos-M359T420	down	ko04146;ko00590
MsG0780 036262.01	up	pos-M233T374	down	ko00909
MsG0480 021433.01	up	pos-M151T237	down	ko00330;ko00380;ko00360
MsG0380 011489.01	up	pos-M649T272	down	ko00940
MsG0380 011489.01	up	pos-M151T237	down	ko00940
MsG0380 011489.01	up	pos-M349T201	down	ko00940
MsG0380 011489.01	up	pos-M147T253	down	ko00940
MsG0880 047256.01	up	pos-M415T191	down	ko02010
MsG0880 047256.01	up	pos-M527T56	down	ko02010

MsG0880 046345.01	up	pos-M649T272	down	ko00940
MsG0880 046345.01	up	pos-M151T237	down	ko00940
MsG0880 046345.01	up	pos-M349T201	down	ko00940
MsG0880 046345.01	up	pos-M147T253	down	ko00940
MsG0180 005984.01	up	pos-M231T69	down	ko00945;ko00941;ko00130;ko00360;k o00940
MsG0180 005984.01	up	pos-M433T253	down	ko00945;ko00941;ko00130;ko00360;k o00940
MsG0180 005984.01	up	pos-M439T410	down	ko00945;ko00941;ko00130;ko00360;k o00940
MsG0180 005984.01	up	pos-M151T237	down	ko00945;ko00941;ko00130;ko00360;k o00940
MsG0180 005984.01	up	pos-M649T272	down	ko00945;ko00941;ko00130;ko00360;k o00940
MsG0180 005984.01	up	pos-M151T237	down	ko00945;ko00941;ko00130;ko00360;k o00940
MsG0180 005984.01	up	pos-M349T201	down	ko00945;ko00941;ko00130;ko00360;k o00940
MsG0180 005984.01	up	pos-M147T253	down	ko00945;ko00941;ko00130;ko00360;k o00940
MsG0780 039574.01	down	pos-M433T253	down	ko00943
MsG0580 030181.01	down	pos-M649T272	down	ko00940;ko00360
MsG0580 030181.01	down	pos-M151T237	down	ko00940;ko00360
MsG0580 030181.01	down	pos-M349T201	down	ko00940;ko00360
MsG0580 030181.01	down	pos-M147T253	down	ko00940;ko00360
MsG0580 030181.01	down	pos-M151T237	down	ko00940;ko00360
MsG0880 045881.01	down	pos-M433T253	down	ko00941;ko00945;ko00360;ko00940
MsG0880 045881.01	down	pos-M231T69	down	ko00941;ko00945;ko00360;ko00940
MsG0880 045881.01	down	pos-M151T237	down	ko00941;ko00945;ko00360;ko00940
MsG0880 045881.01	down	pos-M649T272	down	ko00941;ko00945;ko00360;ko00940

MsG0880 045881.01	down	pos-M151T237	down	ko00941;ko00945;ko00360;ko00940
MsG0880 045881.01	down	pos-M349T201	down	ko00941;ko00945;ko00360;ko00940
MsG0880 045881.01	down	pos-M147T253	down	ko00941;ko00945;ko00360;ko00940
MsG0180 000030.01	down	pos-M649T272	down	ko00940
MsG0180 000030.01	down	pos-M151T237	down	ko00940
MsG0180 000030.01	down	pos-M349T201	down	ko00940
MsG0180 000030.01	down	pos-M147T253	down	ko00940
MsG0180 005051.01	down	pos-M415T191	down	ko02010
MsG0180 005051.01	down	pos-M527T56	down	ko02010
MsG0280 008072.01	down	pos-M433T253	down	ko00943
MsG0780 038491.01	down	pos-M649T272	down	ko00940
MsG0780 038491.01	down	pos-M151T237	down	ko00940
MsG0780 038491.01	down	pos-M349T201	down	ko00940
MsG0780 038491.01	down	pos-M147T253	down	ko00940
MsG0580 028020.01	down	pos-M439T410	down	ko00130
MsG0380 013348.01	down	pos-M649T272	down	ko00940
MsG0380 013348.01	down	pos-M151T237	down	ko00940
MsG0380 013348.01	down	pos-M349T201	down	ko00940
MsG0380 013348.01	down	pos-M147T253	down	ko00940
MsG0380 016745.01	down	pos-M649T272	down	ko00940
MsG0380 016745.01	down	pos-M151T237	down	ko00940
MsG0380 016745.01	down	pos-M349T201	down	ko00940

MsG0380 016745.01	down	pos-M147T253	down	ko00940
MsG0380 014934.01	down	pos-M649T272	down	ko00940
MsG0380 014934.01	down	pos-M151T237	down	ko00940
MsG0380 014934.01	down	pos-M349T201	down	ko00940
MsG0380 014934.01	down	pos-M147T253	down	ko00940
MsG0480 018433.01	down	pos-M415T191	down	ko02010
MsG0480 018433.01	down	pos-M527T56	down	ko02010
MsG0480 020786.01	down	pos-M307T300	down	ko00333;ko01040;ko00061;ko00780
MsG0480 020786.01	down	pos-M307T300	down	ko00333;ko01040;ko00061;ko00780
MsG0680 030961.01	down	pos-M433T253	down	ko00943;ko00944
MsG0680 030961.01	down	pos-M579T241	down	ko00943;ko00944
MsG0680 030961.01	down	pos-M433T253	down	ko00943;ko00944
MsG0580 030055.01	down	pos-M527T56	down	ko00052
MsG0480 022309.01	down	pos-M433T253	down	ko00943
MsG0580 025234.01	down	pos-M649T272	down	ko00940
MsG0580 025234.01	down	pos-M151T237	down	ko00940
MsG0580 025234.01	down	pos-M349T201	down	ko00940
MsG0580 025234.01	down	pos-M147T253	down	ko00940
MsG0380 017247.01	down	pos-M345T206	down	ko00770;ko00290;ko00270;ko00280
MsG0380 017247.01	down	pos-M340T206	down	ko00770;ko00290;ko00270;ko00280
MsG0380 017247.01	down	pos-M181T206	down	ko00770;ko00290;ko00270;ko00280
MsG0480 022835.01	down	pos-M433T253	down	ko00943



MsG0580 030022.01	down	pos-M527T56	down	ko00052
MsG0380 012312.01	down	pos-M415T191	down	ko02010
MsG0380 012312.01	down	pos-M527T56	down	ko02010
MsG0880 042881.01	down	pos-M433T253	down	ko00941
MsG0680 032461.01	down	pos-M649T272	down	ko00940
MsG0680 032461.01	down	pos-M151T237	down	ko00940
MsG0680 032461.01	down	pos-M349T201	down	ko00940
MsG0680 032461.01	down	pos-M147T253	down	ko00940
MsG0180 000436.01	down	pos-M527T56	down	ko00052;ko00500
MsG0280 007686.01	down	pos-M649T272	down	ko00940
MsG0280 007686.01	down	pos-M151T237	down	ko00940
MsG0280 007686.01	down	pos-M349T201	down	ko00940
MsG0280 007686.01	down	pos-M147T253	down	ko00940
MsG0580 025965.01	down	pos-M433T253	down	ko00941
MsG0580 025922.01	down	pos-M345T206	down	ko00770;ko00290;ko00280;ko00270
MsG0580 025922.01	down	pos-M340T206	down	ko00770;ko00290;ko00280;ko00270
MsG0580 025922.01	down	pos-M181T206	down	ko00770;ko00290;ko00280;ko00270
MsG0480 018440.01	down	pos-M291T281	down	ko00904
MsG0480 018440.01	down	pos-M307T300	down	ko00904
MsG0180 000437.01	down	pos-M527T56	down	ko00052;ko00500
MsG0780 036575.01	down	pos-M433T253	down	ko00943
MsG0780 039574.01	down	pos-M301T296	up	ko00943

MsG0780 039574.01	down	pos-M271T215	up	ko00943
MsG0780 039574.01	down	pos- M286T448_6	up	ko00943
MsG0580 030181.01	down	pos-M147T286	up	ko00940;ko00360
MsG0580 030181.01	down	pos-M165T285	up	ko00940;ko00360
MsG0580 030181.01	down	pos-M237T285	up	ko00940;ko00360
MsG0580 030181.01	down	pos-M165T285	up	ko00940;ko00360
MsG0580 030181.01	down	pos-M929T234	up	ko00940;ko00360
MsG0280 006550.01	down	pos-M139T177	up	ko04075;ko04016;ko04626
MsG0880 045881.01	down	pos-M271T215	up	ko00941;ko00945;ko00360;ko00940
MsG0880 045881.01	down	pos-M237T285	up	ko00941;ko00945;ko00360;ko00940
MsG0880 045881.01	down	pos-M165T285	up	ko00941;ko00945;ko00360;ko00940
MsG0880 045881.01	down	pos-M929T234	up	ko00941;ko00945;ko00360;ko00940
MsG0880 045881.01	down	pos-M147T286	up	ko00941;ko00945;ko00360;ko00940
MsG0880 045881.01	down	pos-M165T285	up	ko00941;ko00945;ko00360;ko00940
MsG0180 000030.01	down	pos-M147T286	up	ko00940
MsG0180 000030.01	down	pos-M165T285	up	ko00940
MsG0380 018070.01	down	pos-M653T209	up	ko00520;ko04016
MsG0780 041428.01	down	pos-M139T177	up	ko04075;ko04712
MsG0280 008072.01	down	pos-M301T296	up	ko00943
MsG0280 008072.01	down	pos-M271T215	up	ko00943
MsG0280 008072.01	down	pos- M286T448_6	up	ko00943
MsG0880 042495.01	down	pos-M215T94	up	ko00562;ko00053

MsG0780 036260.01	down	pos-M653T209	up	ko00520;ko04016
MsG0680 030315.01	down	pos-M215T94	up	ko00053;ko00520;ko00040
MsG0680 030315.01	down	pos-M653T209	up	ko00053;ko00520;ko00040
MsG0680 030315.01	down	pos-M148T52_1	up	ko00053;ko00520;ko00040
MsG0680 030315.01	down	pos-M215T94	up	ko00053;ko00520;ko00040
MsG0780 038491.01	down	pos-M147T286	up	ko00940
MsG0780 038491.01	down	pos-M165T285	up	ko00940
MsG0580 028020.01	down	pos-M165T285	up	ko00130
MsG0580 028020.01	down	pos-M139T177	up	ko00130
MsG0180 000751.01	down	pos-M653T209	up	ko00520
MsG0380 013348.01	down	pos-M147T286	up	ko00940
MsG0380 013348.01	down	pos-M165T285	up	ko00940
MsG0880 046970.01	down	pos-M233T320	up	ko00710;ko00620
MsG0380 016745.01	down	pos-M147T286	up	ko00940
MsG0380 016745.01	down	pos-M165T285	up	ko00940
MsG0680 031118.01	down	pos-M139T177	up	ko00260;ko00400
MsG0380 014934.01	down	pos-M147T286	up	ko00940
MsG0380 014934.01	down	pos-M165T285	up	ko00940
MsG0080 048889.01	down	pos-M148T52_1	up	ko00040
MsG0080 048889.01	down	pos-M215T94	up	ko00040
MsG0880 045572.01	down	pos-M653T209	up	ko00520;ko04016
MsG0880 047320.01	down	pos-M291T263	up	ko00380

MsG0680 031451.01	down	pos-M653T209	up	ko00520
MsG0680 030961.01	down	pos-M301T296	up	ko00943;ko00944
MsG0680 030961.01	down	pos-M271T215	up	ko00943;ko00944
MsG0680 030961.01	down	pos- M286T448_6	up	ko00943;ko00944
MsG0680 030961.01	down	pos-M301T296	up	ko00943;ko00944
MsG0680 030961.01	down	pos- M635T214_2	up	ko00943;ko00944
MsG0480 022309.01	down	pos-M301T296	up	ko00943
MsG0480 022309.01	down	pos-M271T215	up	ko00943
MsG0480 022309.01	down	pos- M286T448_6	up	ko00943
MsG0580 025234.01	down	pos-M147T286	up	ko00940
MsG0580 025234.01	down	pos-M165T285	up	ko00940
MsG0380 017247.01	down	pos-M244T263	up	ko00770;ko00290;ko00270;ko00280
MsG0380 017247.01	down	pos-M148T52_1	up	ko00770;ko00290;ko00270;ko00280
MsG0380 017247.01	down	pos-M929T234	up	ko00770;ko00290;ko00270;ko00280
MsG0480 022835.01	down	pos-M301T296	up	ko00943
MsG0480 022835.01	down	pos-M271T215	up	ko00943
MsG0480 022835.01	down	pos- M286T448_6	up	ko00943
MsG0880 045571.01	down	pos-M653T209	up	ko04016;ko00520
MsG0880 042881.01	down	pos-M271T215	up	ko00941
MsG0280 006552.01	down	pos-M139T177	up	ko04016;ko04626;ko04075
MsG0680 032461.01	down	pos-M147T286	up	ko00940
MsG0680 032461.01	down	pos-M165T285	up	ko00940

MsG0280 007686.01	down	pos-M147T286	up	ko00940
MsG0280 007686.01	down	pos-M165T285	up	ko00940
MsG0580 026720.01	down	pos-M653T209	up	ko00520;ko00051;ko00500
MsG0580 025965.01	down	pos-M271T215	up	ko00941
MsG0580 025922.01	down	pos-M244T263	up	ko00770;ko00290;ko00280;ko00270
MsG0580 025922.01	down	pos-M148T52_1	up	ko00770;ko00290;ko00280;ko00270
MsG0580 025922.01	down	pos-M929T234	up	ko00770;ko00290;ko00280;ko00270
MsG0480 018440.01	down	pos-M334T263	up	ko00904
MsG0780 038305.01	down	pos-M148T52_1	up	ko00040
MsG0780 038305.01	down	pos-M215T94	up	ko00040
MsG0280 006553.01	down	pos-M139T177	up	ko04626;ko04016;ko04075
MsG0780 036575.01	down	pos-M301T296	up	ko00943
MsG0780 036575.01	down	pos-M271T215	up	ko00943
MsG0780 036575.01	down	pos- M286T448_6	up	ko00943
MsG0180 002935.01	down	pos-M139T177	up	ko04075

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