

Table S5. A list of predicted genes in two QTL support intervals.

Gene ID	Putative function	Physical position	SNP marker	Expressed in flower tissues ^a
Ha5g002680	DNA-binding pseudobarrel domain	Ha5:8067303 -8069892	/	Yes
Ha5g002690	Zinc finger, RING/FYVE/PHD-type	Ha5:8073459 -8074580	Ha5_807661 7	Yes
Ha5g002700	Ubiquitin conjugation factor E4	Ha5:8081716 -8082381	/	Yes
Ha5g002710	Unkown	Ha5:8232302 -8233837	/	No
Ha5g002720 ^b	Reticulon	Ha5:8386875 -8387579	Ha5_838438 9	Yes
Ha5g002730 ^b	Concanavalin A-like lectin/glucanase	Ha5:8413735 -8415588	Ha5_841222 6	Yes
Ha5g002740	Glycoside hydrolase	Ha5:8429516 -8432635	/	Yes
Ha5g002750	S-locus glycoprotein	Ha5:8455670 -8456955	Ha5_845410 0	Yes
Ha5g002760	Serine/threonine- / dual specificity protein kinase	Ha5:8515933 -8517502	/	Yes
Ha5g002770	Cupredoxin	Ha5:8537308 -8537836	/	No
Ha5g002780	Unkown	Ha5:8565985 -8566782	/	No
Ha5g002790 ^b	S-locus glycoprotein	Ha5:8809904 -8811512	Ha5_880949 2	Yes
Ha5g002800	Unkown	Ha5:8780599 -8780977	/	No
Ha5g002810	Unkown	Ha5:8781815 -8784638	/	Yes
Ha5g002820	S-locus glycoprotein	Ha5:8809904 -8811512	/	No
Ha5g002830	Concanavalin A-like lectin/glucanase	Ha5:8811832 -8813590	Ha5_881181 2	No

Ha5g002840	S-locus glycoprotein	Ha5:8819362 -8820690	Ha5_882116 5	No
Ha5g002850	Serine/threonine-/dual specificity protein kinase	Ha5:8821445 -8823234	Ha5_882330 9	No
Ha5g002860	Unkown	Ha5:8869347 -8870270	/	Yes
Ha5g002870	Transposase (putative), gypsy type	Ha5:8991985 -8994519	/	No
Ha5g002880	Zinc finger, RING/FYVE/PHD- type	Ha5:9068497 -9068811	/	Yes
Ha5g002890	Copper chaperone SCO1/SenC	Ha5:9151371 -9152474	/	Yes
Ha5g002900	Unkown	Ha5:9354746 -9356001	/	No
Ha5g002910	Unkown	Ha5:9488476 -9489491	/	No
Ha5g002920	Macro domain	Ha5:9492321 -9500388	/	Yes
Ha5g002930	Amino acid/polyamine transporter I	Ha5:9546184 -9546708	/	No
Ha05g00294 0 ^b	Unknown	Ha5:9553185 -9554523	Ha5_955246 8	Yes
Ha5g002950	Unkown	Ha5:9558182 -9560601	/	Yes
Ha5g002960 ^b	PapD-like	Ha5:9640099 -9641710	Ha5_964015 6	Yes
Ha5g002970	Unkown	Ha5:9660062 -9660429	/	Yes
Ha5g002980	Unkown	Ha5:9724995 -9726269	/	
Ha5g002990 ^b	PapD-like	Ha5:9735653 -9738037	Ha5_973357 4	Yes

Ha5g003000 ^b	Peptidoglycan-binding lysin domain	Ha5:9744885 -9745348	Ha5_974479 3	No
Ha5g003010	Unkown	Ha5:9771113 -9771289	/	Yes
Ha5g003020	Isopenicillin N synthase-like	Ha5:9793888 -9800555	Ha5_979647 4	No
Ha5g003030	Oxoglutarate/iron-dependent dioxygenase	Ha5:9834392 -9839383	Ha5_983497 7	No
Ha5g003040 ^b	Protein of unknown function DUF616	Ha5:9853932 -9859320	Ha5_985393 2	Yes
Ha5g003050	Unkown	Ha5:9859877 -9859997	/	No
Ha5g003060	Protein of unknown function DUF616	Ha5:9862110 -9862289	/	Yes
Ha5g003070 ^b	Glycoside hydrolase	Ha5:9897724 -9898634	Ha5_989774 9	No
Ha5g003080	General substrate transporter	Ha5:9933389 -9936007	/	Yes
Ha5g003090	SAM dependent carboxyl methyltransferase	Ha5:1000469 6-10005102	/	No
Ha5g003100	Glycosyl transferase	Ha5:1013774 1-10139355	Ha5_101369 15	Yes
Ha5g003110	Proton-dependent oligopeptide transporter family	Ha5:1014720 4-10147630	/	Yes
Ha5g003120 ^b	Winged helix-turn-helix DNA- binding domain	Ha5:1014938 4-10150305	Ha5_101499 06	No
Ha5g003130	Heat shock protein 70 family	Ha5:1023509 7-10238054	/	Yes
Ha5g003140	Unkown	Ha5:1026405 6-10264216	/	No
Ha5g003150	Protein kinase C-like	Ha5:1026840 1-10270522	/	No

Ha5g003160	Protein of unknown function DUF617	Ha5:1033814 / 9-10338916	Yes
Ha5g003170	Heat shock protein 70 family	Ha5:1033952 / 8-10341460	Yes
Ha5g003180	Heat shock protein 70 family	Ha5:1034399 / 6-10344820	Yes
Ha5g003190	Six-bladed beta-propeller, TolB-like	Ha5:1036414 / 9-10366326	Yes
Ha5g003200	Unkown	Ha5:1040751 / 8-10408185	No
Ha5g003210	P-loop containing nucleoside triphosphate hydrolase	Ha5:1040826 / 4-10408584	No
Ha5g003220	Uncharacterised protein family Ycf2	Ha5:1042046 / 7-10420955	No
Ha5g003230	Ubiquitin supergroup	Ha5:1042704 / 7-10427757	No
Ha5g003240	Unkown	Ha5:1043303 / 6-10435287	No
Ha5g003250	Cysteine peptidase	Ha5:1045366 / 4-10454903	No
Ha5g003260	HAD hydrolase, subfamily IA	Ha5:1046368 / 4-10464365	Yes
Ha5g003270	Riboflavin kinase	Ha5:1049887 / 6-10500070	No
Ha5g003280	Cysteine peptidase	Ha5:1050549 / 0-10506707	No
Ha5g003290	Unkown	Ha5:1054730 / 7-10548263	No

Ha5g003300	Ubiquitin supergroup	Ha5:1056418 / 7-10565098	No
Ha5g003310	Unkown	Ha5:1068269 / 9-10683716	Yes
Ha5g003320	F-box domain	Ha5:1068579 / 9-10686943	Yes
Ha5g003330	Gnk2-homologous domain	Ha5:1083685 / 0-10837614	No
Ha5g003340	Unkown	Ha5:1084096 / 6-10842948	No
Ha5g003350	Unkown	Ha5:1084596 / 7-10846185	No
Ha5g003360	Unkown	Ha5:1089028 / 5-10896233	No
Ha5g003370	Glutamyl/glutaminyI-tRNA synthetase	Ha5:1089623 / 5-10905638	Yes
Ha5g003380	C1-like protein	Ha5:1096964 / 3-10970491	Yes
Ha5g003390	C1-like protein	Ha5:1098500 / 2-10985850	Yes
Ha5g003400	C1-like protein	Ha5:1098705 / 1-10988403	Yes
Ha5g003410	C1-like protein	Ha5:1104990 / 8-11051044	No
Ha5g003420	Unkown	Ha5:1110082 / 5-11105458	Yes
Ha5g003430	Unkown	Ha5:1112704 / 9-11129262	Yes

Ha5g003440	Unkown	Ha5:1112977 0-11130434	/	Yes
Ha5g003450	WD40/YVTN repeat-like- containing domain	Ha5:1113043 6-11131275	/	Yes
Ha5g003460	Unkown	Ha5:1113127 7-11131553	/	No
Ha5g003470	Nucleosome assembly protein	Ha5:1113155 5-11133140	/	Yes
Ha5g003480	Photosystem II PsbP	Ha5:1115977 6-11160666	/	Yes
Ha5g003490	Photosystem II PsbP	Ha5:1116092 3-11161378	/	Yes
Ha5g003500	Unkown	Ha5:1116773 6-11169466	/	No
Ha5g003510	EF-hand domain pair	Ha5:1117132 9-11176579	/	Yes
Ha5g003520	Unkown	Ha5:1117665 3-11181097	/	No
Ha5g003530 ^b	Unkown	Ha5:1119415 8-11194852	Ha5_111943 88	No
Ha5g003540	WD40/YVTN repeat-like- containing domain	Ha5:1126136 9-11269269	/	No
Ha5g003550	Unkown	Ha5:1128914 4-11291632	/	Yes
Ha5g003560	Bifunctional 3-hexulose-6- phosphate synthase	Ha5:1130956 1-11311698	/	No

Ha5g003570	Glutaredoxin-like	Ha5:1133086 6-11331276	/	No
Ha5g003580	Cyclophilin-like peptidyl-prolyl cis-trans isomerase	Ha5:1133819 5-11340464	/	Yes
Ha5g003590	ACT domain	Ha5:1134226 8-11345028	/	No
Ha5g003600	Peptidase S8	Ha5:1135141 9-11352171	/	No
Ha5g003610	Glycoside hydrolase	Ha5:1136088 6-11364205	Ha5_113603 55	No
Ha5g003620	Pectin lyase fold/virulence factor	Ha5:1139121 3-11392393	/	No
Ha5g003630	Unkown	Ha5:1142680 9-11427487	/	NO
Ha5g003640 ^b	Proton-dependent oligopeptide transporter family	Ha5:1147048 7-11473096	Ha5_114694 60	Yes
Ha5g003650	Serine/threonine- / dual specificity protein kinase,	Ha5:1147788 6-11480821	/	No
Ha5g003660	Unkown	Ha5:1148364 7-11483979	/	Yes
Ha5g003670	Myosin head, motor domain	Ha5:1150687 8-11510151	/	Yes
Ha5g003680	Myosin head, motor domain	Ha5:1157745 7-11578267	/	Yes

Ha5g003690	Zinc finger, PHD-type	Ha5:1158352 4-11584387	/	No
Ha5g003700	Lipoxygenase	Ha5:1165132 3-11653045	/	No
Ha5g003710	EF-hand domain pair	Ha5:1173360 8-11734105	/	Yes
Ha5g003720 ^b	DNA-dependent epimerase/dehydratase	Ha5:1174249 8-11743332	Ha5_117402 23	No
Ha5g003730	NAD(P)-binding domain	Ha5:1177005 4-11770329	/	Yes
Ha5g003740	Unkown	Ha5:1180183 7-11802709	/	No
Ha5g003750	Unkown	Ha5:1181741 3-11818593	/	Yes
Ha5g003760	Glucose/ribitol dehydrogenase	Ha5:1185406 8-11855424	/	Yes
Ha5g003770	Photosynthetic reaction centre, L/M	Ha5:1185824 1-11858420	/	No
Ha5g003780	Remorin	Ha5:1189273 9-11893802	Ha5_118935 14	Yes
Ha5g003790	Glucose/ribitol dehydrogenase	Ha5:1197237 4-11973953	/	Yes
Ha5g003800	Glutamate/phenylalanine/leucine/valine dehydrogenase	Ha5:1199510 0-11998411	/	Yes
Ha5g003810	SRA-YDG	Ha5:1199932 2-12000617	/	No
Ha5g003820	Peptide methionine sulfoxide reductase MsrA	Ha5:1200734 7-12009948	/	Yes
Ha5g003830	Short-chain dehydrogenase/reductase SDR	Ha5:1213937 4-12139634	/	Yes
Ha5g003840 ^b	Zona occludens protein ZO-3	Ha5:1216125 3-12162362	Ha5_121613 45	Yes

Ha5g003850 ^b	Guanylate kinase/L-type calcium channel beta subunit	Ha5:1223896 5-12239917	Ha5_122370 38	Yes
Ha5g003860	Unkown	Ha5:1229229 5-12292428	/	No
Ha5g003870	Unkown	Ha5:1229251 2-12292649	/	No
Ha5g003880	Unkown	Ha5:1233284 5-12332982	/	No
Ha5g003890 ^b	D-aminoacyl-tRNA deacylase	Ha5:1239516 8-12398448	Ha5_123952 45	Yes
Ha5g003900	Unkown	Ha5:1240276 9-12402929	/	No
Ha5g003910	Unkown	Ha5:1240322 4-12403373	/	No
Ha5g003920	DNA recombination and repair protein Rad51	Ha5:1240500 6-12406273	/	Yes
Ha5g003930	G-box binding, MFMR	Ha5:1249200 9-12492453	/	Yes
Ha5g003940	Diacylglycerol kinase	Ha5:1251173 1-12512502	/	Yes
Ha5g003950	Unkown	Ha5:1252410 1-12524248	/	No
Ha5g003960	C-terminal-processing peptidase S41A	Ha5:1259349 6-12596841	/	Yes
Ha5g003970	Zinc finger, RING/FYVE/PHD-type	Ha5:1259813 0-12602693	Ha5_126032 57	Yes
Ha5g003980 ^b	DnaJ domain	Ha5:1261394 8-12615607	Ha5_126131 23	Yes
Ha6g003490	RNA helicase	Ha6:7496840 -7499966	/	Yes
Ha6g003500	Unkown	Ha6:7514747 -7516769	/	Yes

Ha6g003510	Unkown	Ha6:7521009 -7522762	/	Yes
Ha6g003520	Unkown	MULE transposase domain	/	Yes
Ha6g003530 ^c	DNA-binding WRKY	Ha6:7535068 -7535610	Ha6_753481 6	Yes
Ha6g003540	Unkown	Ha6:7590506 -7592320	/	Yes
Ha6g003550	Unkown	Ha6:7606538 -7610391	/	Yes
Ha6g003560 ^c	DNA-binding WRKY	Ha6:7634391 -7636099	Ha6_763394 6	No
Ha6g003570	Unkown	Ha6:7643938 -7644573	/	No
Ha6g003580 ^c	Glycoside hydrolase	Ha6:7647852 -7648932	Ha6_765096 2	Yes
Ha6g003590	Helicase	Ha6:7654881 -7657085	Ha6_765563 7	Yes
Ha6g003600	Glucose/ribitol dehydrogenase	Ha6:7663482 -7672056	/	Yes
Ha6g003610	Translation initiation factor 3 complex subunit L;	Ha6:7680558 -7682224	/	Yes
Ha6g003620	DNA-binding WRKY	Ha6:7685564 -7685860	/	No
Ha6g003630	Zinc finger, MIZ-type	Ha6:7734757 -7742703	/	Yes
Ha6g003640	Nucleotide-binding, alpha-beta plait	Ha6:7750286 -7753722	/	Yes
Ha6g003650	Unkown	Ha6:7756298 -7760513	/	Yes
Ha6g003660	Unkown	Ha6:7782845 -7783132	/	No
Ha6g003670	Reticulon	Ha6:7798591 -7801199	/	Yes

Ha6g003680	P-loop containing nucleoside triphosphate hydrolase	Ha6:7802379 / -7803700		No
Ha6g003690	P-loop containing nucleoside triphosphate hydrolase	Ha6:7804323 / -7805092		No
Ha6g003700	Unkown	Ha6:7807615 / -7808302		No
Ha6g003710	Unkown	Ha6:7828730 / -7831138		Yes
Ha6g003720	Glycoside hydrolase	Ha6:7832356 / -7833993		No
Ha6g003730	Glycoside hydrolase	Ha6:7838240 / -7840201		No
Ha6g003740	Unkown	Ha6:7860006 / -7860606		Yes
Ha6g003750	Unkown	Ha6:7879888 / -7882500		Yes
Ha6g003760	Unkown	Ha6:7941965 / -7943332		Yes
Ha6g003770	Cytochrome b245	Ha6:7977417 / -7986898		Yes
Ha6g003780	Unkown	Ha6:8040789 / -8041438		Yes
Ha6g003790	Cation/H ⁺ exchanger	Ha6:8047040 / -8050146		Yes
Ha6g003800	Unkown	Ha6:8061471 / -8062619		Yes
Ha6g003810	Unkown	Ha6:8068760 / -8068837		No
Ha6g003820	Unkown	Ha6:8074436 / -8074741		No
Ha6g003830	Unkown	Ha6:8078047 / -8078538		Yes
Ha6g003840 ^c	Enolase	Ha6:8083694 / -8088034	Ha6_808916 2	Yes
Ha6g003850	Unkown	Ha6:8091926 / -8092405		No

Ha6g003860	Unkown	Ha6:8135400 / -8137227		No
Ha6g003870	Acetyl-CoA carboxylase carboxyl transferase	Ha6:8139099 / -8140957		Yes
Ha6g003880	Ribosomal protein L5	Ha6:8141216 / -8141779		Yes
Ha6g003890	Photosystem I PsaA/PsaB	Ha6:8142142 / -8143603		Yes
Ha6g003900	Unkown	Ha6:8223255 / -8223570		Yes
Ha6g003910 ^c	Zinc finger, C2H2	Ha6:8268763 / -8269614	Ha6_827058 8	No
Ha6g003920	Development/cell death domain	Ha6:8377094 / -8377558		Yes
Ha6g003930	Development/cell death domain	Ha6:8384024 / -8384286		No
Ha6g003940	Dynamin superfamily	Ha6:8387984 / -8392081		No
Ha6g003950	Unkown	Ha6:8413015 / -8413090		No
Ha6g003960	Unkown	Ha6:8413653 / -8418543		Yes
Ha6g003970	Unkown	Ha6:8419398 / -8421241		No
Ha6g003980	Unkown	Ha6:8421342 / -8421453		No
Ha6g003990	Unkown	Ha6:8421545 / -8421686		No
Ha6g004000	Unkown	Ha6:8421871 / -8421946		No
Ha6g004010	Alpha/beta hydrolase	Ha6:8432832 / -8437182		Yes
Ha6g004020	Unkown	Ha6:8463900 / -8466198		Yes

Ha6g004030	Unkown	Ha6:8466757 / -8468402	Yes
Ha6g004040	Translation elongation/initiation factor	Ha6:8504151 / -8506066	Yes
Ha6g004050	Sucrose synthase	Ha6:8557832 / -8563651	Yes
Ha6g004060	Citrate synthase-like	Ha6:8568546 / -8571401	Yes

^a The expression data obtained from RNAseq is available at <https://www.heliagene.org>.

^b The genes on chromosome 5 showed significant association with CGT density in the validation population.

^c The genes on chromosome 6 showed significant association with CGT density in the validation population.

/ Represents missing data.