

Appendix 3: Candidate gene lists within 1Mbp of the most strongly associated markers

Year 1 Chromosome 1 hits

Gene Co-ordinates	Gene Identifier	Annotation
4161011	4161421	ID=PGSC0003DMG400036835;name="Hcr9-OR2C"
4166212	4168753	ID=PGSC0003DMG400010700;name="Hcr9-OR2A"
4191121	4199105	ID=PGSC0003DMG400010706;name="Aluminium-activated citrate transporter"
4236936	4240073	ID=PGSC0003DMG400045844;name="Gene of unknown function"
4252644	4254027	ID=PGSC0003DMG400010705;name="Ubiquitin-protein ligase"
4257240	4264145	ID=PGSC0003DMG400010704;name="Calcium-dependent protein kinase 8"
4271043	4274135	ID=PGSC0003DMG400010699;name="Gene of unknown function"
4276441	4276836	ID=PGSC0003DMG400038570;name="Gene of unknown function"
4276919	4282378	ID=PGSC0003DMG400010698;name="Adrenodoxin"
4283178	4290239	ID=PGSC0003DMG400010703;name="Translocation protein sec62"
4308774	4314022	ID=PGSC0003DMG400010697;name="YA4"
4336045	4342821	ID=PGSC0003DMG400038851;name="Gene of unknown function"
4347860	4349231	ID=PGSC0003DMG400010702;name="Gene of unknown function"
4351682	4352026	ID=PGSC0003DMG400010696;name="Conserved gene of unknown function"
4352942	4355157	ID=PGSC0003DMG400010701;name="Kinase"
4374603	4379187	ID=PGSC0003DMG401031484;name="DNA repair protein XRCC2 homolog"
4383141	4385740	ID=PGSC0003DMG402031484;name="Gene of unknown function"
4386352	4388537	ID=PGSC0003DMG400031486;name="Conserved gene of unknown function"
4389931	4391960	ID=PGSC0003DMG400031485;name="Kinase"
4447476	4449075	ID=PGSC0003DMG400030292;name="Conserved gene of unknown function"
4455518	4460624	ID=PGSC0003DMG400030291;name="Kinase"
4472884	4473759	ID=PGSC0003DMG400010506;name="Gene of unknown function"
4479857	4486139	ID=PGSC0003DMG401010496;name="X-ray repair cross complementing protein 2, xrcc2"
4486955	4487551	ID=PGSC0003DMG402010496;name="Gene of unknown function"
4492632	4493071	ID=PGSC0003DMG400010489;name="Receptor serine/threonine kinase"
4493344	4493679	ID=PGSC0003DMG400010488;name="Conserved gene of unknown function"
4495712	4497631	ID=PGSC0003DMG400010504;name="Conserved gene of unknown function"
4497706	4498598	ID=PGSC0003DMG400010503;name="Ubiquitin-protein ligase"
4502206	4503003	ID=PGSC0003DMG400010499;name="Stress-induced receptor-like kinase"
4504185	4504493	ID=PGSC0003DMG400010502;name="Gene of unknown function"
4526522	4527264	ID=PGSC0003DMG400010501;name="Gene of unknown function"
4534430	4535052	ID=PGSC0003DMG400010498;name="Photosystem II 5 kDa protein, chloroplast"
4536282	4539092	ID=PGSC0003DMG400010497;name="Isoform 2 of DNA repair protein XRCC2 homolog"
4637077	4645541	ID=PGSC0003DMG400010485;name="Poly(P)/ATP NAD kinase"
4650987	4652484	ID=PGSC0003DMG400010484;name="BRASSINOSTEROID INSENSITIVE 1-associated receptor kinase 1"
4653594	4655761	ID=PGSC0003DMG400010495;name="Conserved gene of unknown function"
4658723	4660583	ID=PGSC0003DMG400035453;name="Gene of unknown function"
4666796	4667210	ID=PGSC0003DMG400010494;name="Ulp1 protease family, C-terminal catalytic domain containing protein"
4673152	4676876	ID=PGSC0003DMG400036144;name="ZIP transporter"
4686048	4690262	ID=PGSC0003DMG400010493;name="Nucleic acid binding protein"
4693739	4694199	ID=PGSC0003DMG400043075;name="ZIP transporter"
4702485	4704272	ID=PGSC0003DMG400010483;name="Glucan endo-1,3-beta-glucosidase"
4719871	4720503	ID=PGSC0003DMG400038836;name="Conserved gene of unknown function"
4725859	4735834	ID=PGSC0003DMG401010492;name="Acidic class II 1,3-beta-glucanase"
4734182	4735834	ID=PGSC0003DMG402010492;name="Acidic class II 1,3-beta-glucanase"
4738993	4739994	ID=PGSC0003DMG400010491;name="Glucan endo-1,3-beta-D-glucosidase"
4740340	4741497	ID=PGSC0003DMG400010500;name="Gene of unknown function"
4749188	4750046	ID=PGSC0003DMG400010490;name="Acidic class II 1,3-beta-glucanase"
4808244	4808912	ID=PGSC0003DMG400009812;name="Cytochrome P450"
4817864	4818817	ID=PGSC0003DMG400009814;name="Cytochrome P450"
4821372	4821896	ID=PGSC0003DMG400009811;name="Cytochrome P450"
4841898	4844290	ID=PGSC0003DMG400040715;name="Gene of unknown function"
4847253	4848359	ID=PGSC0003DMG400009810;name="Cytochrome P450 hydroxylase"
4902242	4908267	ID=PGSC0003DMG400004429;name="S2 self-incompatibility locus-linked pollen 3.2 protein"
4908899	4913652	ID=PGSC0003DMG400004430;name="GDP-mannose transporter"
4917375	4924301	ID=PGSC0003DMG400004431;name="Conserved gene of unknown function"
4935283	4941122	ID=PGSC0003DMG400039819;name="Mannan endo-1,4-beta-mannosidase 4"
4942324	4945397	ID=PGSC0003DMG400044667;name="Mannan endo-1,4-beta-mannosidase 4"
4946816	4947868	ID=PGSC0003DMG400004435;name="Ubiquitin-conjugating enzyme variant"
4973592	4975386	ID=PGSC0003DMG400004428;name="Gene of unknown function"
5042612	5046763	ID=PGSC0003DMG400022718;name="Conserved gene of unknown function"
5074743	5079598	ID=PGSC0003DMG400022716;name="Phospholipase A2"
5082576	5088041	ID=PGSC0003DMG400022715;name="Phosphoesterase family protein"
5088261	5094022	ID=PGSC0003DMG400022699;name="Resistance gene"
5094293	5097931	ID=PGSC0003DMG400022698;name="RING finger"
5120127	5126327	ID=PGSC0003DMG400022714;name="Minor histocompatibility antigen H13"
5128661	5136297	ID=PGSC0003DMG400022713;name="L-ascorbate oxidase"
5138586	5146527	ID=PGSC0003DMG400022712;name="Cop9 signalosome complex subunit"
5154274	5159709	ID=PGSC0003DMG400022711;name="CBL-interacting serine/threonine-protein kinase"
5161780	5163387	ID=PGSC0003DMG400045481;name="Protein kinase"
5174856	5176521	ID=PGSC0003DMG400022696;name="Protein kinase APK1A, chloroplast"
5188089	5188679	ID=PGSC0003DMG400047149;name="Ethylene-responsive transcription factor CRF4"
5192491	5196768	ID=PGSC0003DMG400038949;name="AP2 domain class transcription factor"
5257247	5257690	ID=PGSC0003DMG400040856;name="AP2 domain class transcription factor"
5274045	5274464	ID=PGSC0003DMG400034583;name="AP2 domain class transcription factor"
5279120	5279506	ID=PGSC0003DMG400036561;name="Ethylene-responsive transcription factor"
5291571	5298023	ID=PGSC0003DMG400022695;name="Ethylene-responsive transcription factor"
5302321	5309472	ID=PGSC0003DMG400022710;name="Tryptophan synthase alpha subunit"
5317971	5320421	ID=PGSC0003DMG400022709;name="GRAS family transcription factor"
5324395	5324721	ID=PGSC0003DMG401022708;name="Gene of unknown function"
5331296	5333768	ID=PGSC0003DMG402022708;name="NAD dependent epimerase/dehydratase family protein"
5336596	5340656	ID=PGSC0003DMG402022694;name="Phytochromobilin synthase"
5336578	5344274	ID=PGSC0003DMG401022694;name="Phytochromobilin synthase"

Appendix 3: Candidate gene lists within 1Mbp of the most strongly associated markers

Year 1 Chromosome 1 hits

Gene Co-ordinates	Gene Identifier	Annotation
5347223	5348275	ID=PGSC0003DMG400046726;name="F-box family protein"
5358830	5361994	ID=PGSC0003DMG400022693;name="Calmodulin-5/6/7/8"
5375584	5384247	ID=PGSC0003DMG400022707;name="AGO4-2"
5385376	5389514	ID=PGSC0003DMG400022692;name="RNA-binding protein AKIP1"
5402644	5408639	ID=PGSC0003DMG400022706;name="BZIP domain class transcription factor"
5410904	5418521	ID=PGSC0003DMG400022705;name="Ngg1 interacting factor 3 like 1 binding protein 1 isoform 1"
5420334	5423500	ID=PGSC0003DMG400022704;name="Conserved gene of unknown function"
5424842	5431351	ID=PGSC0003DMG400022703;name="4-diphosphocytidyl-2-C-methyl-D-erythritol kinase, chloroplastic/chromoplastic"
5434053	5434439	ID=PGSC0003DMG400022721;name="Gene of unknown function"
5434685	5436817	ID=PGSC0003DMG400022691;name="Gene of unknown function"
5451593	5455221	ID=PGSC0003DMG403022702;name="Conserved gene of unknown function"
5458667	5463119	ID=PGSC0003DMG402022702;name="Gene of unknown function"
5465649	5468651	ID=PGSC0003DMG401022702;name="Cyclin B1"
5497761	5505712	ID=PGSC0003DMG400022701;name="BTB-POZ and MATH domain protein"
5506259	5513285	ID=PGSC0003DMG400022689;name="GAMYB-like1"
5520592	5523890	ID=PGSC0003DMG400022700;name="Forkhead-associated domain-containing protein"
5556697	5558630	ID=PGSC0003DMG400040864;name="B3 domain-containing protein Os01g0234100"
5767436	5770198	ID=PGSC0003DMG400017141;name="Transposon protein, CACTA, En/Spm sub-class"
5868576	5871026	ID=PGSC0003DMG400045511;name="Bromodomain protein"
5908377	5910799	ID=PGSC0003DMG400044033;name="Bromodomain protein"
5942377	5944051	ID=PGSC0003DMG402005535;name="Conserved gene of unknown function"
5938207	5944077	ID=PGSC0003DMG401005535;name="Histone deacetylase"
5949707	5950174	ID=PGSC0003DMG400005537;name="Gene of unknown function"
6006823	6007158	ID=PGSC0003DMG400041005;name="Gene of unknown function"
6065317	6070441	ID=PGSC0003DMG400008707;name="Conserved gene of unknown function"
6071122	6072219	ID=PGSC0003DMG400008711;name="Avr9/Cf-9 rapidly elicited protein 76"
6142379	6146461	ID=PGSC0003DMG400008712;name="EL2"

Appendix 3: Candidate gene lists within 1Mbp of the most strongly associated markers

Year 1 Chromosome 4 hits

Gene Co-ordinates	Gene Identifier	Annotation
10154972	10155325	ID=PGSC0003DMG400027278;name="Gene of unknown function"
10221246	10221853	ID=PGSC0003DMG400027306;name="Gene of unknown function"
10224049	10230355	ID=PGSC0003DMG400027250;name="Gene of unknown function"
10288068	10289648	ID=PGSC0003DMG400027281;name="Conserved gene of unknown function"
10300669	10301232	ID=PGSC0003DMG400035793;name="Plant disease resistant protein"
10348636	10351120	ID=PGSC0003DMG400027253;name="Gene of unknown function"
10401010	10401942	ID=PGSC0003DMG400027282;name="Gene of unknown function"
10403553	10406464	ID=PGSC0003DMG400027255;name="Monovalent cation:proton antiporter"
10409271	10411469	ID=PGSC0003DMG400027283;name="AT-HSF3 (Arabidopsis thaliana heat shock transcription factor B3)"
10420879	10428000	ID=PGSC0003DMG401027256;name="Thioredoxin reductase"
10428713	10433543	ID=PGSC0003DMG402027256;name="Thioredoxin reductase"
10434305	10436009	ID=PGSC0003DMG400027284;name="GTP binding protein"
10455903	10456751	ID=PGSC0003DMG400043223;name="Conserved gene of unknown function"
10546656	10555937	ID=PGSC0003DMG400027257;name="Kinesin heavy chain"
10584089	10590591	ID=PGSC0003DMG400038085;name="F-box family protein"
10608641	10616254	ID=PGSC0003DMG400027287;name="F-box family protein"
10618828	10621390	ID=PGSC0003DMG400027288;name="Glycosyltransferase"
10639580	10640159	ID=PGSC0003DMG400027308;name="Gene of unknown function"
10638407	10644589	ID=PGSC0003DMG401027258;name="Glycine-rich RNA-binding protein"
10642638	10644865	ID=PGSC0003DMG402027258;name="Gene of unknown function"
10645186	10647010	ID=PGSC0003DMG400027289;name="Glucosyltransferase"
10654359	10654985	ID=PGSC0003DMG400027290;name="Transposon MuDR mudrA"
10657397	10658048	ID=PGSC0003DMG400035572;name="Gene of unknown function"
10671537	10673485	ID=PGSC0003DMG400027259;name="Glucosyltransferase"
10673943	10675658	ID=PGSC0003DMG400027291;name="Zeatin O-glucosyltransferase"
10681268	10684837	ID=PGSC0003DMG400027293;name="Gene of unknown function"
10706365	10709162	ID=PGSC0003DMG400029225;name="RRM-containing RNA-binding protein"
10741914	10746001	ID=PGSC0003DMG400029229;name="Non-LTR retroelement reverse transcriptase"
10752007	10754542	ID=PGSC0003DMG402029222;name="Na+/H+ antiporter protein"
10757768	10759054	ID=PGSC0003DMG401029222;name="Gene of unknown function"
10763255	10763732	ID=PGSC0003DMG400029228;name="Gene of unknown function"
10767769	10769503	ID=PGSC0003DMG400029226;name="Zeatin O-xylosyltransferase"
10832159	10832692	ID=PGSC0003DMG400026890;name="Zeatin O-xylosyltransferase"
10909207	10909821	ID=PGSC0003DMG400012693;name="Zeatin O-xylosyltransferase"
10910040	10910573	ID=PGSC0003DMG400012707;name="Zeatin O-glucosyltransferase"
10923603	10925510	ID=PGSC0003DMG401012694;name="UDP-glucosyltransferase"
10925330	10927555	ID=PGSC0003DMG400012708;name="Glucosyltransferase"
10925330	10926561	ID=PGSC0003DMG402012694;name="Zeatin O-xylosyltransferase"
10929878	10939528	ID=PGSC0003DMG400012709;name="Nucleoporin interacting component; Protein prenyltransferase"
10941144	10946227	ID=PGSC0003DMG401012695;name="Conserved gene of unknown function"
10942733	10944571	ID=PGSC0003DMG402012695;name="Conserved gene of unknown function"
10961556	10971876	ID=PGSC0003DMG400012696;name="Calcium ATPase"
10972675	10976628	ID=PGSC0003DMG402012710;name="Glucose-6-phosphate/phosphate translocator 1, chloroplast"
10972675	10973275	ID=PGSC0003DMG401012710;name="Gene of unknown function"
10979806	10985075	ID=PGSC0003DMG400012697;name="Gene of unknown function"
10985160	10988892	ID=PGSC0003DMG400012711;name="Conserved gene of unknown function"
10990427	10994692	ID=PGSC0003DMG400012712;name="Glycerol-3-phosphate dehydrogenase"
11009582	11013326	ID=PGSC0003DMG400012698;name="Gene of unknown function"
11015240	11023665	ID=PGSC0003DMG401012699;name="S-formylglutathione hydrolase"
11021304	11023656	ID=PGSC0003DMG402012699;name="Gene of unknown function"
11025588	11028288	ID=PGSC0003DMG400012713;name="Chromatin remodeling complex subunit"
11049219	11054026	ID=PGSC0003DMG400012714;name="Ribosome biogenesis protein brix"
11063886	11064974	ID=PGSC0003DMG400012700;name="50S ribosomal protein L33"
11065161	11070028	ID=PGSC0003DMG400012715;name="Ef-hand calcium binding protein"
11072577	11078094	ID=PGSC0003DMG400012716;name="DNA heat shock N-terminal domain-containing protein"
11095629	11096293	ID=PGSC0003DMG400012717;name="Ulp1 protease family, C-terminal catalytic domain containing protein"
11102735	11109216	ID=PGSC0003DMG400012701;name="Conserved gene of unknown function"
11108702	11111248	ID=PGSC0003DMG400012718;name="Cytokinin oxidase/dehydrogenase 1"
11141445	11146637	ID=PGSC0003DMG400012719;name="Transmembrane protein 14"
11172744	11174236	ID=PGSC0003DMG400012702;name="Glucan endo-1,3-beta-D-glucosidase"
11174528	11178268	ID=PGSC0003DMG400012720;name="Calmodulin binding protein SUN"
11181252	11186390	ID=PGSC0003DMG400012721;name="ATPAP16/PAP16"
11189908	11195283	ID=PGSC0003DMG400012703;name="U4/U6 small nuclear ribonucleoprotein Prp4"
11194075	11200284	ID=PGSC0003DMG400012722;name="UDP-N-acetylglucosamine-dolichyl-phosphate N-acetylglucosaminophosphotransferase"
11202411	11206200	ID=PGSC0003DMG402012723;name="Apurinic endonuclease-redox protein"
11205762	11206156	ID=PGSC0003DMG401012723;name="Gene of unknown function"
11207034	11210351	ID=PGSC0003DMG403012723;name="Apurinic endonuclease-redox protein"
11212883	11217678	ID=PGSC0003DMG404012723;name="Pentatricopeptide repeat-containing protein"
11214202	11217666	ID=PGSC0003DMG405012723;name="Pentatricopeptide repeat-containing protein"
11252614	11257708	ID=PGSC0003DMG400012704;name="Conserved gene of unknown function"
11273147	11274393	ID=PGSC0003DMG400043837;name="Gene of unknown function"
11278119	11278457	ID=PGSC0003DMG400012705;name="Conserved gene of unknown function"
11282393	11289863	ID=PGSC0003DMG400038395;name="Conserved gene of unknown function"
11296966	11302279	ID=PGSC0003DMG400012706;name="G15025"
11302996	11305876	ID=PGSC0003DMG400012725;name="Conserved gene of unknown function"
11306139	11308128	ID=PGSC0003DMG400012726;name="Conserved gene of unknown function"
11311815	11315687	ID=PGSC0003DMG400012727;name="T-complex protein 1 subunit beta"
11319568	11321744	ID=PGSC0003DMG400007622;name="Chaperonin containing t-complex protein 1, beta subunit, tcpb"
11331110	11332797	ID=PGSC0003DMG400007617;name="Mitochondrial carrier protein"
11351277	11353145	ID=PGSC0003DMG400007623;name="Dihydroneopterin aldolase"
11354785	11356912	ID=PGSC0003DMG400007624;name="ERD15"
11363075	11369841	ID=PGSC0003DMG402007625;name="Phosphatidylinositol N-acetylglucosaminyltransferase"
11363075	11363654	ID=PGSC0003DMG401007625;name="Gene of unknown function"
11372156	11373466	ID=PGSC0003DMG400035733;name="Gene of unknown function"
11391067	11392231	ID=PGSC0003DMG400007621;name="GAST1 protein"

Appendix 3: Candidate gene lists within 1Mbp of the most strongly associated markers

Year 1 Chromosome 4 hits

Gene Co-ordinates	Gene Identifier	Annotation
11393645	11394425	ID=PGSC0003DMG400007627;name="Gene of unknown function"
11395602	11397340	ID=PGSC0003DMG400007626;name="Gene of unknown function"
11562103	11567160	ID=PGSC0003DMG400040517;name="Conserved gene of unknown function"
11701700	11702179	ID=PGSC0003DMG400045725;name="Gene of unknown function"
11762331	11767463	ID=PGSC0003DMG400008764;name="Transcription cofactor"
11808359	11811895	ID=PGSC0003DMG400045790;name="Transcription cofactor"
11855305	11858837	ID=PGSC0003DMG400034539;name="Transcription cofactor"
12062353	12062694	ID=PGSC0003DMG400041871;name="Integrase core domain containing protein"
12063747	12065647	ID=PGSC0003DMG400036765;name="Integrase core domain containing protein"
12094021	12099382	ID=PGSC0003DMG400010627;name="Transcription cofactor"
12115057	12116212	ID=PGSC0003DMG400010629;name="Gene of unknown function"
12115582	12116608	ID=PGSC0003DMG401010644;name="U88"
12116702	12117133	ID=PGSC0003DMG400010648;name="Conserved gene of unknown function"
12129947	12133788	ID=PGSC0003DMG400010630;name="Salt overly sensitive 1"
12150074	12151066	ID=PGSC0003DMG400010631;name="Calcium-binding allergen Ole e"
12154997	12156006	ID=PGSC0003DMG400010649;name="RF1"
12185919	12187429	ID=PGSC0003DMG400010632;name="Conserved gene of unknown function"

Appendix 3: Candidate gene lists within 1Mbp of the most strongly associated markers

Year 1 Chromosome 6 hits

Gene Co-ordinates	Gene Identifier	Annotation
54194363	54198068	ID=PGSC0003DMG400005950;name="Multicystatin"
54199558	54201712	ID=PGSC0003DMG401005949;name="Aquaporin NIP1;1"
54204271	54209252	ID=PGSC0003DMG402005949;name="Ubiquitin-associated /TS-N domain-containing protein"
54210137	54211387	ID=PGSC0003DMG400005920;name="Acytransferase"
54212669	54213088	ID=PGSC0003DMG400040501;name="Acytransferase"
54214019	54216952	ID=PGSC0003DMG400005948;name="Cyclin B1"
54217175	54219255	ID=PGSC0003DMG400005919;name="Molybdopterin synthase large subunit"
54219908	54226659	ID=PGSC0003DMG400005947;name="Cdc2Msc"
54228199	54235466	ID=PGSC0003DMG400005918;name="GAMYB-like2"
54241344	54243499	ID=PGSC0003DMG400005946;name="F-box and wd40 domain protein"
54257676	54266723	ID=PGSC0003DMG400005917;name="Nucleotide binding protein"
54267593	54270710	ID=PGSC0003DMG400005916;name="LSM 5m family member"
54272483	54274150	ID=PGSC0003DMG400005944;name="Glycosyl hydrolase family 17 protein"
54292149	54295237	ID=PGSC0003DMG400005915;name="EIL1"
54305277	54308543	ID=PGSC0003DMG400005914;name="EIN3"
54325785	54326374	ID=PGSC0003DMG400005913;name="EIN3"
54330416	54335617	ID=PGSC0003DMG400005943;name="Hydrolase, hydrolyzing O-glycosyl compounds"
54337350	54340093	ID=PGSC0003DMG401005942;name="Beta-D-glucan exohydrolase"
54345177	54347242	ID=PGSC0003DMG402005942;name="Beta-D-glucan exohydrolase"
54347343	54354724	ID=PGSC0003DMG400005912;name="Structural maintenance of chromosome"
54381540	54383364	ID=PGSC0003DMG403005911;name="40S ribosomal protein S11"
54389233	54389605	ID=PGSC0003DMG400005941;name="Conserved gene of unknown function"
54390650	54392842	ID=PGSC0003DMG402005911;name="40S ribosomal protein S11"
54394693	54396947	ID=PGSC0003DMG401005911;name="40S ribosomal protein S11"
54397610	54405694	ID=PGSC0003DMG400005910;name="Cellular nucleic acid binding protein"
54433208	54434212	ID=PGSC0003DMG400005909;name="Regulator of gene silencing"
54448367	54457333	ID=PGSC0003DMG400005939;name="Fk506 binding protein"
54457919	54458905	ID=PGSC0003DMG400005908;name="Conserved gene of unknown function"
54460953	54466571	ID=PGSC0003DMG402005938;name="Zinc ion binding protein"
54466947	54470202	ID=PGSC0003DMG400005907;name="DNA-directed RNA polymerase II"
54471131	54476813	ID=PGSC0003DMG401005938;name="Zinc ion binding protein"
54477106	54481045	ID=PGSC0003DMG400005906;name="Conserved gene of unknown function"
54482842	54486200	ID=PGSC0003DMG400005937;name="Strictosidine synthase"
54500291	54507110	ID=PGSC0003DMG400005936;name="YABBY domain class transcription factor"
54538721	54540550	ID=PGSC0003DMG400005904;name="Conserved gene of unknown function"
54562720	54570014	ID=PGSC0003DMG400005935;name="J domain-containing protein spf31"
54567357	54580152	ID=PGSC0003DMG400005903;name="Serine/threonine-protein phosphatase BSL3"
54582346	54585199	ID=PGSC0003DMG400005902;name="Conserved gene of unknown function"
54591001	54594286	ID=PGSC0003DMG400005934;name="Transcriptional factor B3 family protein"
54599758	54600923	ID=PGSC0003DMG400005933;name="Conserved gene of unknown function"
54605426	54607144	ID=PGSC0003DMG400005901;name="Aspartic proteinase nepenthesin-2"
54615550	54621808	ID=PGSC0003DMG402005932;name="Transcription factor"
54624429	54625475	ID=PGSC0003DMG401005932;name="Transcription factor"
54625601	54626921	ID=PGSC0003DMG400005900;name="Conserved gene of unknown function"
54630496	54631625	ID=PGSC0003DMG400005899;name="CCR4-associated factor"
54640861	54641727	ID=PGSC0003DMG400005898;name="Harpin-induced family protein"
54643132	54647357	ID=PGSC0003DMG400005897;name="Harpin-induced protein 1 containing protein"
54653147	54657439	ID=PGSC0003DMG400005896;name="Protein kinase"
54660358	54663473	ID=PGSC0003DMG400005895;name="Histone deacetylase superfamily"
54670203	54676242	ID=PGSC0003DMG400005931;name="Sterol delta-7 reductase DWF5"
54681012	54687520	ID=PGSC0003DMG400005894;name="Helix-loop-helix DNA-binding"
54709882	54713896	ID=PGSC0003DMG400005930;name="BEL5 protein"
54717287	54722948	ID=PGSC0003DMG400005929;name="Conserved gene of unknown function"
54726206	54727547	ID=PGSC0003DMG400005928;name="Spotted leaf protein"
54729047	54730531	ID=PGSC0003DMG401005927;name="Leucine-rich repeat extensin 3"
54730180	54730652	ID=PGSC0003DMG402005927;name="Gene of unknown function"
54731171	54732525	ID=PGSC0003DMG400005893;name="Conserved gene of unknown function"
54733449	54738086	ID=PGSC0003DMG400005892;name="Transcription factor"
54741614	54743471	ID=PGSC0003DMG400005926;name="Cytochrome P450"
54745566	54747382	ID=PGSC0003DMG400005925;name="Cytochrome P450"
54747556	54750834	ID=PGSC0003DMG400005891;name="Conserved gene of unknown function"
54752176	54753353	ID=PGSC0003DMG400005890;name="16kDa membrane protein"
54754196	54762005	ID=PGSC0003DMG400005889;name="mRNA-decapping enzyme"
54763255	54772421	ID=PGSC0003DMG400005888;name="OJ000126_13.12 protein"
54773036	54774143	ID=PGSC0003DMG400005887;name="UPF0497 membrane protein 1"
54774962	54776783	ID=PGSC0003DMG400005886;name="Neoxanthin synthase, chloroplastic"
54778037	54778562	ID=PGSC0003DMG402005885;name="Gene of unknown function"
54778037	54782729	ID=PGSC0003DMG401005885;name="Vesicle-associated membrane protein"
54783996	54785492	ID=PGSC0003DMG400005884;name="Conserved gene of unknown function"
54792727	54794001	ID=PGSC0003DMG400005883;name="Conserved gene of unknown function"
54794847	54796362	ID=PGSC0003DMG400005882;name="Conserved gene of unknown function"
54798157	54799770	ID=PGSC0003DMG400005924;name="Ankyrin repeat protein"
54800228	54802111	ID=PGSC0003DMG402005881;name="Ferredoxin-3, chloroplast"
54802313	54804767	ID=PGSC0003DMG401005881;name="Ribosomal protein L10a"
54807110	54808058	ID=PGSC0003DMG400005923;name="Ubiquinol-cytochrome C reductase"
54808231	54809016	ID=PGSC0003DMG402005880;name="Multispanning membrane protein"
54808225	54815047	ID=PGSC0003DMG401005880;name="Endomembrane protein 70 family protein"
54815636	54816686	ID=PGSC0003DMG400044056;name="Type 2 proly 4-hydroxylase"
54818218	54820640	ID=PGSC0003DMG400040955;name="Gene of unknown function"
54822995	54824661	ID=PGSC0003DMG400005879;name="Type 2 proly 4-hydroxylase"
54887568	54888836	ID=PGSC0003DMG400034493;name="FRIGIDA"
54903296	54909094	ID=PGSC0003DMG400007110;name="BZIP transcription factor"
54914338	54916831	ID=PGSC0003DMG400007142;name="Conserved gene of unknown function"
54943161	54945260	ID=PGSC0003DMG400007111;name="Protein SELF-PRUNING"
54956823	54960104	ID=PGSC0003DMG400007112;name="TRANSPARENT TESTA 1 protein"
54965371	54967097	ID=PGSC0003DMG400007143;name="Sialyltransferase"
54970300	54974058	ID=PGSC0003DMG400007144;name="Conserved gene of unknown function"
54989088	54994044	ID=PGSC0003DMG400007113;name="Fatty acyl-CoA reductase 3"
54994258	55001150	ID=PGSC0003DMG400007145;name="Multidrug resistance pump"
55008319	55016922	ID=PGSC0003DMG400007114;name="Fatty acyl-CoA reductase 3"
55018583	55019596	ID=PGSC0003DMG400038438;name="Glucosyltransferase"
55023169	55025686	ID=PGSC0003DMG400007115;name="Male sterility protein"

Appendix 3: Candidate gene lists within 1Mbp of the most strongly associated markers

Year 1 Chromosome 6 hits

Gene Co-ordinates	Gene Identifier	Annotation
55034517	55037937	ID=PGSC0003DMG400007116;name="Oxidoreductase"
55045647	55047116	ID=PGSC0003DMG400007118;name="Cytochrome P450"
55055968	55057818	ID=PGSC0003DMG400007119;name="60s acidic ribosomal protein"
55060699	55063041	ID=PGSC0003DMG400044295;name="Protein FRIGIDA"
55066406	55067850	ID=PGSC0003DMG400007146;name="Shrunken seed protein (SSE1)"
55070269	55072360	ID=PGSC0003DMG400007120;name="Gene of unknown function"
55078266	55083644	ID=PGSC0003DMG400007121;name="Serine/threonine protein kinase"
55083830	55086501	ID=PGSC0003DMG400007147;name="Conserved gene of unknown function"
55088837	55090274	ID=PGSC0003DMG400007148;name="Conserved gene of unknown function"
55096366	55102143	ID=PGSC0003DMG400007149;name="Phosphoglycerate mutase"
55116164	55117713	ID=PGSC0003DMG400007122;name="Arogenate dehydratase"
55127974	55129109	ID=PGSC0003DMG400007123;name="Phytosulfokine peptide"
55139371	55140420	ID=PGSC0003DMG400007124;name="Conserved gene of unknown function"
55146029	55147166	ID=PGSC0003DMG400007125;name="Conserved gene of unknown function"
55160135	55165113	ID=PGSC0003DMG400007150;name="UPA15"
55175748	55182922	ID=PGSC0003DMG400007126;name="DNA binding protein"
55203294	55207584	ID=PGSC0003DMG400007152;name="UDP-apiose/xylose synthase"
55210825	55217821	ID=PGSC0003DMG400007127;name="Phosphatidylcholine-sterol acyltransferase"
55214188	55223305	ID=PGSC0003DMG400007153;name="Conserved gene of unknown function"
55224744	55229630	ID=PGSC0003DMG400007154;name="Serine/arginine (SR) protein kinase protein"
55234777	55236185	ID=PGSC0003DMG400007155;name="Anthranilate N-benzoyltransferase protein"
55249433	55253566	ID=PGSC0003DMG400007128;name="RNA binding protein"
55271437	55278238	ID=PGSC0003DMG400007129;name="Eukaryotic translation initiation factor 2c"
55292329	55292960	ID=PGSC0003DMG400007130;name="Gene of unknown function"
55296930	55302114	ID=PGSC0003DMG400007131;name="Histone H2B"
55302754	55306281	ID=PGSC0003DMG400007157;name="Conserved gene of unknown function"
55322402	55325582	ID=PGSC0003DMG400007132;name="Ubiquitin-protein ligase"
55326564	55327185	ID=PGSC0003DMG400007158;name="Histone H2B"
55330264	55330933	ID=PGSC0003DMG400007159;name="Histone H2B.1"
55343486	55344730	ID=PGSC0003DMG400007160;name="DNA-binding protein"
55353047	55360079	ID=PGSC0003DMG400007133;name="Conserved gene of unknown function"
55372054	55374660	ID=PGSC0003DMG400007134;name="Tonoplast intrinsic protein"
55378967	55380495	ID=PGSC0003DMG400007135;name="Mucin"
55382263	55383646	ID=PGSC0003DMG400007168;name="Gene of unknown function"
55389742	55395069	ID=PGSC0003DMG400007136;name="SNF7 family protein"
55398761	55402081	ID=PGSC0003DMG400007137;name="Serine carboxypeptidase III"
55409069	55411555	ID=PGSC0003DMG400007161;name="T-complex protein 1 beta subunit (TCP-1-beta)"
55413105	55415849	ID=PGSC0003DMG401007138;name="Conserved gene of unknown function"
55417034	55421895	ID=PGSC0003DMG402007138;name="Conserved gene of unknown function"
55464451	55465720	ID=PGSC0003DMG400007140;name="Metal ion binding protein"
55467078	55471123	ID=PGSC0003DMG400007141;name="ABC transporter family protein"
55477008	55477373	ID=PGSC0003DMG400007162;name="SAUR family protein"
55483319	55490898	ID=PGSC0003DMG400007163;name="Transmembrane protein"
55498157	55498736	ID=PGSC0003DMG400012004;name="Gene of unknown function"
55502947	55512202	ID=PGSC0003DMG400011999;name="ATP-binding cassette transporter"
55515655	55521858	ID=PGSC0003DMG400012003;name="Cell division control protein"
55526924	55528285	ID=PGSC0003DMG402011998;name="High-affinity nitrate transporter"
55535257	55537119	ID=PGSC0003DMG401011998;name="High-affinity nitrate transporter"
55567139	55568588	ID=PGSC0003DMG400012002;name="Oxidoreductase"
55568679	55573501	ID=PGSC0003DMG400011997;name="CPN60A"
55574774	55583712	ID=PGSC0003DMG400012001;name="White-brown-complex ABC transporter family"
55585793	55587782	ID=PGSC0003DMG400012000;name="ATP binding protein"
55647414	55648407	ID=PGSC0003DMG402008795;name="Gene of unknown function"
55648286	55649098	ID=PGSC0003DMG401008795;name="Gene of unknown function"
55652701	55654197	ID=PGSC0003DMG400008794;name="Major latex"
55730289	55736311	ID=PGSC0003DMG400024315;name="Nectarin-2"
55743306	55748450	ID=PGSC0003DMG400024321;name="Mutt/nudix hydrolase"
55777231	55784144	ID=PGSC0003DMG400024317;name="Storage protein"
55788699	55796265	ID=PGSC0003DMG400024318;name="Pleckstrin homology (PH) domain-containing protein / lipid-binding START domain-containing protein"
55797189	55801725	ID=PGSC0003DMG400024319;name="GATA-1 zinc finger protein"
55805067	55808251	ID=PGSC0003DMG400024320;name="Auxin response factor 16"
55810550	55814998	ID=PGSC0003DMG400024322;name="SIT4 phosphatase-associated family protein"
55827546	55828389	ID=PGSC0003DMG400024323;name="Conserved gene of unknown function"
55830386	55830798	ID=PGSC0003DMG400003375;name="NADH-ubiquinone oxidoreductase chain 2"
55837541	55838284	ID=PGSC0003DMG400003368;name="60s ribosomal protein L12"
55841050	55841615	ID=PGSC0003DMG400003376;name="Gene of unknown function"
55844498	55845146	ID=PGSC0003DMG400003369;name="Conserved gene of unknown function"
55851346	55854976	ID=PGSC0003DMG400003370;name="Protein disulfide isomerase"
55856610	55857687	ID=PGSC0003DMG400003371;name="Arabinogalactan protein 2"
55860945	55863589	ID=PGSC0003DMG400003372;name="Nucleic acid binding protein"
55871016	55872751	ID=PGSC0003DMG402003373;name="TRNA-splicing endonuclease subunit Sen2-2"
55871779	55872507	ID=PGSC0003DMG401003373;name="TRNA-splicing endonuclease subunit Sen2-2"
55873841	55875211	ID=PGSC0003DMG400003374;name="Vicilin"
55877736	55879480	ID=PGSC0003DMG402007500;name="Vicilin"
55882134	55883989	ID=PGSC0003DMG400007501;name="Vicilin"
55885543	55887421	ID=PGSC0003DMG400007502;name="Vicilin"
55887840	55890547	ID=PGSC0003DMG400007496;name="Adenylate kinase isoenzyme 6"
55889622	55891351	ID=PGSC0003DMG401007500;name="Vicilin"
55897437	55900185	ID=PGSC0003DMG400007503;name="LOB domain-containing protein"
55904773	55910691	ID=PGSC0003DMG400007504;name="Carbamoyl phosphate synthase large subunit"
55920368	55924144	ID=PGSC0003DMG400007497;name="TRNA-splicing endonuclease subunit Sen2-2"
55922946	55926333	ID=PGSC0003DMG400007505;name="Senescence-associated protein"
55935605	55937762	ID=PGSC0003DMG400007506;name="DOF domain class transcription factor"
55944618	55951403	ID=PGSC0003DMG400007507;name="3'-5'-exoribonuclease/RNA binding"
55952230	55961384	ID=PGSC0003DMG400007498;name="Vacuolar proton atpase"
55962206	55969054	ID=PGSC0003DMG400007499;name="Conserved gene of unknown function"
55969710	55970603	ID=PGSC0003DMG400038815;name="Gene of unknown function"
55971792	55976592	ID=PGSC0003DMG400007508;name="Major Facilitator Superfamily protein"
55984006	55986374	ID=PGSC0003DMG400007509;name="Peptide transporter"
55995187	55997140	ID=PGSC0003DMG400007510;name="Peptide transporter"
56003194	56006176	ID=PGSC0003DMG400007511;name="Peptide transporter"
56007197	56008144	ID=PGSC0003DMG400007512;name="Nitrate excretion transporter 2"

Appendix 3: Candidate gene lists within 1Mbp of the most strongly associated markers

Year 1 Chromosome 6 hits

Gene Co-ordinates	Gene Identifier	Annotation
56070891	56071277	ID=PGSC0003DMG400006608;name="Peptide transporter"
56072074	56075069	ID=PGSC0003DMG400006607;name="Peptide transporter"
56077002	56080118	ID=PGSC0003DMG400006606;name="Peptide transporter"
56084617	56088096	ID=PGSC0003DMG400006605;name="RNA 3' terminal phosphate cyclase"
56089078	56092424	ID=PGSC0003DMG400006604;name="Apetala 2"
56122985	56123732	ID=PGSC0003DMG403006611;name="Gene of unknown function"
56124422	56129994	ID=PGSC0003DMG402006611;name="Hydrolase"
56129376	56129994	ID=PGSC0003DMG401006611;name="Gene of unknown function"
56133650	56137775	ID=PGSC0003DMG400006610;name="Receptor serine-threonine protein kinase"
56138222	56140469	ID=PGSC0003DMG400006603;name="Transferase, transferring glycosyl groups"
56166080	56166412	ID=PGSC0003DMG400006609;name="Narrow sheath protein"

Appendix 3: Candidate gene lists within 1Mbp of the most strongly associated markers

Year 2 Chromosome 11 hits

Gene co-ordinates	Gene Identifier	Annotation
39770272	39772793	ID=PGSC0003DMG400026535;name="Phytosulfokine peptide"
39785964	39787265	ID=PGSC0003DMG400026536;name="Arogenate dehydratase 3"
39793887	39802875	ID=PGSC0003DMG400026537;name="Nucleobase ascorbate transporter"
39806824	39811401	ID=PGSC0003DMG400026526;name="Syntxin"
39812385	39814133	ID=PGSC0003DMG4000405090;name="Pentatricopeptide repeat-containing protein"
39828272	39829825	ID=PGSC0003DMG400026538;name="Conserved gene of unknown function"
39830374	39830760	ID=PGSC0003DMG401026539;name="Gene of unknown function"
39830374	39831328	ID=PGSC0003DMG402026539;name="Conserved gene of unknown function"
39834361	39835701	ID=PGSC0003DMG400026540;name="Conserved gene of unknown function"
39837581	39844817	ID=PGSC0003DMG400026541;name="tRNA isopentenylpyrophosphatase"
39846186	39848590	ID=PGSC0003DMG400026542;name="Conserved gene of unknown function"
39858296	39864153	ID=PGSC0003DMG400026527;name="Conserved gene of unknown function"
39864565	39873867	ID=PGSC0003DMG400026543;name="Pleiotropic drug resistance protein 2"
39875726	39880446	ID=PGSC0003DMG400026544;name="G10"
39881629	39884528	ID=PGSC0003DMG400026528;name="Conserved gene of unknown function"
39885466	39898078	ID=PGSC0003DMG400026529;name="Histone deacetylase"
39897302	39905224	ID=PGSC0003DMG400026545;name="Raspberry3"
39907597	39913829	ID=PGSC0003DMG400026530;name="Neutral invertase"
39913939	39919599	ID=PGSC0003DMG400026546;name="Low molecular weight protein-tyrosine-phosphatase"
39920383	39925587	ID=PGSC0003DMG400026547;name="Serine/threonine protein kinase"
39933974	39940511	ID=PGSC0003DMG400026531;name="Protein kinase"
39947475	39956055	ID=PGSC0003DMG400007418;name="WD-repeat protein"
39956264	39958957	ID=PGSC0003DMG400007410;name="60s acidic ribosomal protein"
40001890	40005642	ID=PGSC0003DMG400007409;name="Conserved gene of unknown function"
40010844	40015167	ID=PGSC0003DMG400007408;name="Aldo-keto reductase"
40019784	40020706	ID=PGSC0003DMG400007416;name="Gene of unknown function"
40025123	40025641	ID=PGSC0003DMG400044576;name="Type I MADS box transcription factor"
40030230	40030998	ID=PGSC0003DMG400039544;name="Gene of unknown function"
40055479	40059913	ID=PGSC0003DMG403007406;name="Male sterility protein"
40067010	40070386	ID=PGSC0003DMG402007406;name="Male sterility protein"
40082011	40086694	ID=PGSC0003DMG401007406;name="Fatty acyl-CoA reductase 1"
40111212	40116752	ID=PGSC0003DMG400007405;name="Acyl CoA reductase"
40134030	40142889	ID=PGSC0003DMG400007404;name="Protein HIRA"
40144677	40148054	ID=PGSC0003DMG400007415;name="Pentatricopeptide repeat-containing protein"
40149174	40152019	ID=PGSC0003DMG402007403;name="Vacuolar protein sorting-associated protein VPS4"
40154922	40156291	ID=PGSC0003DMG403007403;name="Vacuolar protein sorting-associated protein VPS4"
40157350	40164223	ID=PGSC0003DMG401007403;name="Vacuolar protein sorting-associated protein VPS4"
40165599	40170871	ID=PGSC0003DMG400007402;name="Poly [ADP-ribose] polymerase"
40180555	40188913	ID=PGSC0003DMG402007414;name="Esterase/lipase/thioesterase family protein"
40187896	40188913	ID=PGSC0003DMG401007414;name="Esterase/lipase superfamily protein"
40193337	40193777	ID=PGSC0003DMG400007413;name="Acetyltransferase"
40193858	40200209	ID=PGSC0003DMG400007401;name="MYB-CC type transactor"
40222130	40223413	ID=PGSC0003DMG400007400;name="Acyltransferase"
40225813	40235522	ID=PGSC0003DMG400007412;name="ABC transporter B family member 21"
40240421	40248719	ID=PGSC0003DMG400007399;name="P-glycoprotein 21"
40261461	40262456	ID=PGSC0003DMG400007411;name="Acyl-transferase"
40322469	40323464	ID=PGSC0003DMG401026367;name="Acyl-transferase"
40325732	40326466	ID=PGSC0003DMG400039919;name="Flavonol 3-sulfotransferase"
40328915	40330216	ID=PGSC0003DMG400026366;name="Acyltransferase"
40335568	40337018	ID=PGSC0003DMG400026365;name="Gene of unknown function"
40345169	40354460	ID=PGSC0003DMG400026364;name="BZip protein AtbZip21"
40357238	40358240	ID=PGSC0003DMG400026363;name="Conserved gene of unknown function"
40359482	40360207	ID=PGSC0003DMG400026362;name="Conserved gene of unknown function"
40364294	40368749	ID=PGSC0003DMG400026342;name="Cytochrome b-c1 complex subunit 9"
40372257	40375524	ID=PGSC0003DMG400026361;name="Ribosomal protein"
40377260	40381382	ID=PGSC0003DMG400026360;name="Ferredoxin-3, chloroplast"
40395336	40400616	ID=PGSC0003DMG400026359;name="Glucan endo-1,3-beta-glucosidase"
40402248	40404838	ID=PGSC0003DMG400026358;name="Conserved gene of unknown function"
40405320	40408958	ID=PGSC0003DMG400026341;name="Ef-hand calcium binding protein"
40410665	40413163	ID=PGSC0003DMG400026340;name="Tetratricopeptide-like helical"
40416114	40420266	ID=PGSC0003DMG400026357;name="DNA polymerase epsilon P17 subunit"

Appendix 3: Candidate gene lists within 1Mbp of the most strongly associated markers

Year 2 Chromosome 11 hits

Gene co-ordinates	Gene Identifier	Annotation
40421025	40423417	ID=PGSC0003DMG400026339;name="Conserved gene of unknown function"
40424411	40435802	ID=PGSC0003DMG400026338;name="Sec23/sec24 transport family protein"
40437232	40442765	ID=PGSC0003DMG400026356;name="F1F0-ATPase inhibitor protein"
40443069	40443915	ID=PGSC0003DMG400026337;name="Gene of unknown function"
40448190	40442528	ID=PGSC0003DMG400026355;name="RhoGAP1"
40455628	40457217	ID=PGSC0003DMG400026354;name="Conserved gene of unknown function"
40459411	40468128	ID=PGSC0003DMG400026336;name="N-carbamoylputrescine amidase"
40470397	40470720	ID=PGSC0003DMG400026335;name="Conserved gene of unknown function"
40473577	40475195	ID=PGSC0003DMG400026334;name="RNase Ph3"
40477347	40479544	ID=PGSC0003DMG400026333;name="Rhicadhesin receptor"
40480217	40480828	ID=PGSC0003DMG400026353;name="Nectarin-1"
40481535	40482146	ID=PGSC0003DMG400041571;name="Nectarin-1"
40482716	40483336	ID=PGSC0003DMG400026352;name="Rhicadhesin receptor"
40484563	40492546	ID=PGSC0003DMG400026351;name="ARP2/3 complex 34 kDa subunit"
40495790	40498320	ID=PGSC0003DMG400026332;name="NAC domain protein"
40527499	40529771	ID=PGSC0003DMG400026349;name="Conserved gene of unknown function"
40532348	40539825	ID=PGSC0003DMG400026348;name="Cysteine-type peptidase"
40562311	40568147	ID=PGSC0003DMG400026347;name="Protein phosphatase 1 regulatory subunit SDS22"
40583298	40584441	ID=PGSC0003DMG400026346;name="F-box family protein"
40605458	40609684	ID=PGSC0003DMG400026345;name="Conserved gene of unknown function"
40616871	40621984	ID=PGSC0003DMG400026329;name="Bifunctional nitrilase/nitrile hydratase NIT4B"
40624811	40628915	ID=PGSC0003DMG400026344;name="DNA binding protein"
40632465	40633955	ID=PGSC0003DMG400026343;name="DNA binding protein"
40644948	40646323	ID=PGSC0003DMG400044882;name="DNA binding protein"
40647653	40653226	ID=PGSC0003DMG400019615;name="NAC domain protein"
40670138	40670611	ID=PGSC0003DMG400019617;name="Conserved gene of unknown function"
40676832	40678129	ID=PGSC0003DMG400019618;name="CCR4-associated factor"
40682903	40683552	ID=PGSC0003DMG400019628;name="ATOP6/OP6"
40687401	40689769	ID=PGSC0003DMG400019619;name="OJB91214_12.13 protein"
40689908	40695350	ID=PGSC0003DMG400019629;name="Transcription factor"
40695993	40699816	ID=PGSC0003DMG400019630;name="Conserved gene of unknown function"
40700415	40703335	ID=PGSC0003DMG400019631;name="50S ribosomal protein L27, chloroplastic"
40710500	40716696	ID=PGSC0003DMG400019620;name="UMP synthase"
40717820	40721867	ID=PGSC0003DMG400019621;name="Coiled-coil domain-containing protein"
40723034	40724830	ID=PGSC0003DMG400019622;name="Aspartic proteinase nepenthesin-2"
40730281	40731090	ID=PGSC0003DMG400019639;name="Harpin-induced family protein"
40734373	40739266	ID=PGSC0003DMG400019632;name="Conserved gene of unknown function"
40741466	40745140	ID=PGSC0003DMG400019633;name="Methyl binding domain protein MBD109"
40755600	40756908	ID=PGSC0003DMG400019623;name="U box"
40758920	40764299	ID=PGSC0003DMG400019634;name="Autophagy protein"
40771945	40778427	ID=PGSC0003DMG400019635;name="BEL5 protein"
40810794	40818184	ID=PGSC0003DMG400019624;name="Helix-loop-helix DNA-binding"
40828519	40832534	ID=PGSC0003DMG400019625;name="Conserved gene of unknown function"
40843222	40843656	ID=PGSC0003DMG4001019636;name="Gene of unknown function"
40843222	40846507	ID=PGSC0003DMG402019636;name="Mitochondrial import inner membrane translocase subunit tim22"
40848125	40852988	ID=PGSC0003DMG400019626;name="Conserved gene of unknown function"
40853135	40859951	ID=PGSC0003DMG400019637;name="Chaperonin containing t-complex protein 1, beta subunit, tcpb"
40865482	40869965	ID=PGSC0003DMG400019638;name="Alpha-l-fucosidase"
40871863	40875854	ID=PGSC0003DMG400019627;name="Disease resistance protein Gpa2"
40944871	40946417	ID=PGSC0003DMG400008123;name="Blind"
40953367	40960776	ID=PGSC0003DMG400008074;name="Lactoylglutathione lyase"
40963142	40969307	ID=PGSC0003DMG400008122;name="AMP dependent CoA ligase"
40970752	40973007	ID=PGSC0003DMG400008073;name="Gene of unknown function"
40981619	40982854	ID=PGSC0003DMG400008121;name="Metal ion binding protein"
40987375	40990668	ID=PGSC0003DMG400008120;name="Metal ion binding protein"
40999696	41001350	ID=PGSC0003DMG400008072;name="Conserved gene of unknown function"
41001372	41001758	ID=PGSC0003DMG400008071;name="Conserved gene of unknown function"
41005853	41009769	ID=PGSC0003DMG400008119;name="ABC transporter family protein"
41013763	41014716	ID=PGSC0003DMG400008070;name="SAUR family protein"
41033058	41035062	ID=PGSC0003DMG400008118;name="Conserved gene of unknown function"
41039367	41042374	ID=PGSC0003DMG400008117;name="Elongation factor 1-alpha"
41043504	41044539	ID=PGSC0003DMG400008069;name="Conserved gene of unknown function"
41047198	41048310	ID=PGSC0003DMG400008116;name="F-box protein"
41051214	41055813	ID=PGSC0003DMG400008068;name="F-box protein"
41056618	41061071	ID=PGSC0003DMG400008067;name="Proteasome subunit beta type"
41077233	41084356	ID=PGSC0003DMG400008114;name="Sumo ligase"
41086131	41091656	ID=PGSC0003DMG400008066;name="Conserved gene of unknown function"
41104262	41111799	ID=PGSC0003DMG400008113;name="Isovaleryl-CoA dehydrogenase 2, mitochondrial"
41112924	41122092	ID=PGSC0003DMG400008065;name="Auxin response factor 4"
41140852	41143097	ID=PGSC0003DMG400008064;name="Conserved gene of unknown function"

Appendix 3: Candidate gene lists within 1Mbp of the most strongly associated markers

Year 2 Chromosome 11 hits

Gene co-ordinates	Gene Identifier	Annotation
41153254	41154810	ID=PGSC0003DMG400008112;name="MLO1"
41159070	41162712	ID=PGSC0003DMG400008111;name="Syntxin-71"
41172131	41175486	ID=PGSC0003DMG400008110;name="Nucleic acid binding protein"
41180320	41182265	ID=PGSC0003DMG400008063;name="Fasciclin-like AGP 13"
41185524	41189696	ID=PGSC0003DMG400008062;name="ABC transporter I family member 10, chloroplastic"
41197787	41206297	ID=PGSC0003DMG400008109;name="Beta-galactosidase"
41204469	41206297	ID=PGSC0003DMG400008061;name="Structural constituent of cell wall"
41209522	41215524	ID=PGSC0003DMG400008060;name="Pyridoxine biosynthesis protein"
41220521	41228124	ID=PGSC0003DMG400008108;name="Calcium/calmodulin-dependent protein kinase kinase"
41233608	41236076	ID=PGSC0003DMG400008107;name="Ubiquitin-protein ligase"
41239579	41241870	ID=PGSC0003DMG400008059;name="Conserved gene of unknown function"
41254141	41254671	ID=PGSC0003DMG400040825;name="Whole genome shotgun sequence assembly, scaffold 17"
41289125	41293394	ID=PGSC0003DMG400008105;name="Zinc finger family protein"
41294197	41299352	ID=PGSC0003DMG400008104;name="Protein SUA5"
41300535	41306660	ID=PGSC0003DMG400008103;name="DNA helicase"
41321245	41324503	ID=PGSC0003DMG400008101;name="KITH-2"
41326718	41327530	ID=PGSC0003DMG400008100;name="KITH-2"
41330628	41333718	ID=PGSC0003DMG400008099;name="KITH-2"
41337544	41338406	ID=PGSC0003DMG400008098;name="KITH-2"
41342343	41343183	ID=PGSC0003DMG400008097;name="KITH-2"
41346167	41346805	ID=PGSC0003DMG400008096;name="KITH-2"
41349654	41353775	ID=PGSC0003DMG400008057;name="Bel1 homeotic protein"
41375287	41376376	ID=PGSC0003DMG400008056;name="Gene of unknown function"
41378591	41383759	ID=PGSC0003DMG400008095;name="DNA-directed RNA polymerase II 13.6 kD polypeptide"
41394815	41397399	ID=PGSC0003DMG400008094;name="Carbonic anhydrase"
41411928	41413583	ID=PGSC0003DMG400008093;name="LysM type receptor kinase"
41444163	41450026	ID=PGSC0003DMG400008091;name="Conserved gene of unknown function"
41455926	41459934	ID=PGSC0003DMG400008090;name="Kinase"
41469896	41474338	ID=PGSC0003DMG400008089;name="Cyclic nucleotide-gated ion channel 15"
41500908	41505845	ID=PGSC0003DMG400008088;name="Carboxy-lyase"
41516615	41520289	ID=PGSC0003DMG400008087;name="Glycosyl transferase family 2 protein"
41521980	41529591	ID=PGSC0003DMG400008086;name="Storage protein"
41532137	41538044	ID=PGSC0003DMG400008085;name="UDP-glucuronic acid/UDP-N-acetylgalactosamine transporter"
41558602	41568349	ID=PGSC0003DMG400008083;name="Protein-tyrosine sulfotransferase"
41566186	41566540	ID=PGSC0003DMG400008126;name="Conserved gene of unknown function"
41570144	41575331	ID=PGSC0003DMG400008082;name="GATA-1 zinc finger protein"
41583939	41588667	ID=PGSC0003DMG400008081;name="Auxin response factor"
41591576	41593613	ID=PGSC0003DMG401008055;name="SIT4 phosphatase-associated family protein"
41595320	41603448	ID=PGSC0003DMG402008055;name="SIT4 phosphatase-associated family protein"
41609684	41614152	ID=PGSC0003DMG400008080;name="UPF0497 membrane protein"
41615124	41622072	ID=PGSC0003DMG401008054;name="DNA binding protein"
41615128	41615989	ID=PGSC0003DMG402008054;name="REV HD-ZipIII"
41636813	41643864	ID=PGSC0003DMG400008053;name="DsRNA-binding protein 2"
41665214	41666046	ID=PGSC0003DMG400008052;name="Conserved gene of unknown function"
41674052	41674820	ID=PGSC0003DMG400008079;name="60S ribosomal protein L12"
41686169	41688602	ID=PGSC0003DMG400008078;name="Major intrinsic protein 2"
41695981	41697143	ID=PGSC0003DMG400008077;name="Conserved gene of unknown function"
41697269	41702543	ID=PGSC0003DMG400008051;name="Conserved gene of unknown function"
41704072	41710383	ID=PGSC0003DMG400008076;name="Protein disulfide isomerase"
41711230	41711843	ID=PGSC0003DMG400008124;name="Structural constituent of cell wall"
41712113	41719809	ID=PGSC0003DMG400008050;name="GceF"
41721857	41726381	ID=PGSC0003DMG400008049;name="Glutaredoxin-C4"
41727337	41732481	ID=PGSC0003DMG400008048;name="Conserved gene of unknown function"
41733444	41738659	ID=PGSC0003DMG400008047;name="Electron transporter"
41741046	41748722	ID=PGSC0003DMG400008075;name="Arsenic pump-driving atpase"
41767865	41768500	ID=PGSC0003DMG400043978;name="Mads box protein"