

Table S1. Descriptive statistics for seven root traits in 357soybean landraces.

Traits	Range	Mean	SD <sup>a</sup>	CV (%) <sup>b</sup>	Skewness	Kurtosis
DIAM.	0.404 - 0.666	0.537	0.046	8.686	0.111	-0.391
LAD	0.429 - 0.725	0.563	0.052	9.256	0.134	-0.133
LAL	0.109 - 0.379	0.216	0.032	15.120	1.104	2.996
LENGTH	703.330 - 3212.642	1766.263	422.533	23.922	0.281	-0.075
NF	1180.000 - 11941.670	5250.514	1692.208	32.229	0.380	-0.002
NT	622.670 - 3255.000	1777.584	525.085	29.539	0.368	-0.431
SA	124.148 - 491.667	294.381	66.226	22.497	0.184	-0.127

<sup>a</sup> Standard deviation; <sup>b</sup>Coefficient of variation

Table S2. Eigenvalue and proportion of principal components.

Principal Component	Eigenvalue	Variability (%)	Cumulative (%)
1	74.38	34.00	34.20
2	30.64	14.00	48.30
3	21.55	10.00	58.20
4	17.71	8.00	66.40
5	15.67	7.00	73.60
6	15.02	7.00	80.50
7	11.52	5.00	85.80
8	10.73	5.00	90.70
9	10.28	5.00	95.50
10	9.72	4.00	100.00

**Table S3.** List of putative candidate genes associated with significant SNPs from MLM model at the vicinity of (100 Kb either side).

Trait	SNP	Chr	Gene Name	Start	End	Strand	Description
DIAM	AX-90460045	Gm02	<i>Glyma.02g248800</i>	43611197	43611776	+	_
			<i>Glyma.02g249000</i>	43662205	43664226	-	Aspartyl proteases
			<i>Glyma.02g249100</i>	43676217	43678117	-	E3ubiquitin-proteinligasecip8
			<i>Glyma.02g249200</i>	43678739	43679865	-	_
			<i>Glyma.02g249300</i>	43682559	43685068	-	Glycerol-3-phosphateacyltransferase5-related
			<i>Glyma.02g249400</i>	43689781	43693616	-	Proteindnj-23-related
			<i>Glyma.02g249500</i>	43704884	43707125	-	Thaumatococcus family(thaumatin)
			<i>Glyma.02g249600</i>	43713516	43717718	-	Ribulosebis phosphate carboxylase/oxygenase activase, chloroplastic
			<i>Glyma.02g249700</i>	43723333	43724257	+	Lob domain-containing protein33
			<i>Glyma.02g249800</i>	43733046	43736212	-	At-hook motif nuclear localized protein 15
			<i>Glyma.02g249900</i>	43743444	43744190	+	_
			<i>Glyma.02g250000</i>	43747970	43755063	+	Guanyl-nucleotide exchange factor
			<i>Glyma.02g250100</i>	43762133	43762993	+	Transcriptional regulator superman
			<i>Glyma.02g250200</i>	43779470	43781548	+	Protein phosphatase2c3-related
			<i>Glyma.02g250300</i>	43783184	43785004	-	_
			<i>Glyma.02g250400</i>	43786923	43791698	-	Methyltransferase pmt10-related
			<i>Glyma.02g250500</i>	43797931	43798131	-	_
			<i>Glyma.02g250600</i>	43803483	43807640	+	PPR repeat(ppr)/ ppr repeat family (ppr_2)
	AX-90505093	Gm03	<i>Glyma.03g249500</i>	44562673	44568783	-	Proteingyg-1, isoform
	AX-90311611		<i>Glyma.03g248600</i>	44489655	44498277	-	Aldo/keto reductase

	AX-90308307 AX-90385325 AX-90442177 AX-90503377 AX-90345460		<i>Glyma.03g248700</i>	44499588	44502884	-	Aldo/keto reductase
			<i>Glyma.03g248800</i>	44506460	44512186	+	Zein-binding(zein-binding)
			<i>Glyma.03g248900</i>	44513489	44514230	+	_
			<i>Glyma.03g249000</i>	44521820	44526089	+	Grf1-interactingfactor1
			<i>Glyma.03g249100</i>	44529232	44529956	-	Vq motif (vq)
			<i>Glyma.03g249200</i>	44540832	44551676	+	Myosin-11-related
			<i>Glyma.03g249300</i>	44553517	44555047	-	F-box associated ubiquitination effector family protein
			<i>Glyma.03g249400</i>	44557289	44557836	-	_
			<i>Glyma.03g249600</i>	44569709	44572013	-	Profilin(profilin)
			<i>Glyma.03g249700</i>	44581032	44582153	-	C2domain(c2)
			<i>Glyma.03g249800</i>	44588637	44595274	+	Setdomain protein
			<i>Glyma.03g249900</i>	44595527	44597546	-	Caleosin-related family protein-related
			<i>Glyma.03g250000</i>	44599051	44603637	+	Myb family transcription factor-related
			<i>Glyma.03g250100</i>	44604344	44608040	+	Peroxisome assembly protein12
			<i>Glyma.03g250200</i>	44607834	44610091	-	_
			<i>Glyma.03g250300</i>	44611777	44616698	+	Alpha-1,6-fucosyltransferase
			<i>Glyma.03g250400</i>	44616824	44621636	-	Ankyrin repeat-containing protein
			<i>Glyma.03g250500</i>	44625641	44630894	+	Swib/mdm2,plus-3andgyfdomain-containingprotein-related
			<i>Glyma.03g250600</i>	44634084	44635415	+	Myb-like DNA-binding protein
			<i>Glyma.03g250700</i>	44637659	44643389	+	Chloroplastj-likedomain1-containingprotein
			<i>Glyma.03g250900</i>	44660923	44662144	+	Protein of unknown function (duf640)
			<i>Glyma.03g251000</i>	44667735	44668730	+	_
	AX-90385554	Gm03	<i>Glyma.03g253500</i>	44903910	44910278	-	Violaxanthin de-epoxidase, chloroplastic
			<i>Glyma.03g253600</i>	44909846	44913008	+	Non-specific serine/ threonine protein kinase/threonine-specific protein kinase
			<i>Glyma.03g253700</i>	44915061	44916435	+	Domain of unknown function (DUF4228)

	AX-90513850 AX-90502675 AX-90329829 AX-90504776 AX-90434642 AX-90416589 AX-90426968	Gm06	<i>Glyma.06g126000</i>	10293511	10313877	+	RNA recognition motif (rrm_1)/ peptidasefamilym41(peptidase_m41)/ relatedsubfamily)(aaa_5)//rnarecogniti onmotif.(a.k.a.rrm,rbd,ornnpdomain)(r rm_5)
			<i>Glyma.06g126100</i>	10315437	10317265	-	Abscisic acid receptor PY110-related
			<i>Glyma.06g126200</i>	10329274	10330451	+	_
			<i>Glyma.06g126300</i>	10331312	10341252	-	Trehalose-6-phosphate synthase
			<i>Glyma.06g126400</i>	10356650	10362151	-	_
			<i>Glyma.06g126500</i>	10367536	10373426	-	Proteindhs-1
			<i>Glyma.06g126600</i>	10376446	10384391	+	Cyclicnucleotide-gatedionchannel1
			<i>Glyma.06g126700</i>	10384771	10389578	-	Spermine synthase/spermidine amino propyl transferase
			<i>Glyma.06g126800</i>	10400498	10401860	-	F-box domain(f-box)
			<i>Glyma.06g126900</i>	10403126	10408307	-	3-oxoacyl-[acyl-carrier-protein] synthase-like protein
			<i>Glyma.06g127000</i>	10409463	10415886	+	_
			<i>Glyma.06g127100</i>	10419701	10425340	+	Protein of unknown function (duf668)
			<i>Glyma.06g127200</i>	10423873	10430156	-	Phosphomevalonatekinase
			<i>Glyma.06g127300</i>	10432974	10434886	-	Ringfingerdomain (zf-ring_2)/wall- associatedreceptorkinasegalacturonan- binding(gub_wak_bind)//wall- associatedreceptorkinasec- terminal(wak_assoc)
			<i>Glyma.06g127400</i>	10435277	10448595	-	_
			<i>Glyma.06g127500</i>	10462640	10469529	+	Splicing factor3 a subunit 3
			<i>Glyma.06g127600</i>	10474884	10482574	-	_
			<i>Glyma.06g127700</i>	10486250	10492229	+	Plastid-lipid-associated protein14, chloroplastic-related
	AX-90524509 AX-90332250	Gm14	<i>Glyma.14g197300</i>	46239260	46240644	+	Proteinlight- dependentshorthypocotyls5
			<i>Glyma.14g197400</i>	46269392	46271494	-	Apoprotein3, mitochondrial
			<i>Glyma.14g197500</i>	46280214	46282933	+	Ferroxidase/hephaestin

			<i>Glyma.14g197600</i>	46288254	46290941	+	Cinnamoyl-coareductase-likeprotein
			<i>Glyma.14g197700</i>	46291986	46298337	+	Transcriptioninitiationfactortfiidsubun it15b
			<i>Glyma.14g197800</i>	46303686	46308920	+	_
			<i>Glyma.14g197900</i>	46327072	46328700	+	Cct motif (cct)
			<i>Glyma.14g198000</i>	46334117	46336863	+	Udp-glycosyl transferase 87a2
			<i>Glyma.14g198100</i>	46337677	46340654	+	Glucosyl/glucuronosyl transferases
			<i>Glyma.14g198200</i>	46342657	46344315	-	Exocyst complex protein exo70
			<i>Glyma.14g198300</i>	46345968	46346877	+	Glucosyl/glucuronosyl transferases
			<i>Glyma.14g198400</i>	46347605	46349378	-	Exocyst complex protein exo70
			<i>Glyma.14g198500</i>	46352163	46354775	-	Exocystcomplexproteinexo70
			<i>Glyma.14g198600</i>	46360801	46362778	+	Udp-glycosyltransferase87a1
			<i>Glyma.14g198700</i>	46367820	46374604	+	Serine/threonine protein phosphatase
			<i>Glyma.14g198800</i>	46375963	46379746	-	Mitochondrial carrier protein mrs3/4
			<i>Glyma.14g198900</i>	46404283	46407292	-	Laccase-13-related
			<i>Glyma.14g199000</i>	46413031	46419952	+	Sortingnexin
			<i>Glyma.14g199100</i>	46421954	46422457	+	Exocystcomplexproteinexo70
			<i>Glyma.14g199200</i>	46425482	46428141	+	_
			<i>Glyma.14g199300</i>	46433103	46433444	+	_
			<i>Glyma.14g199400</i>	46435759	46438392	-	Diseaseresistanceproteinrpp13-related
	AX-90367887 AX-90402282 AX-90468047	Gm18	<i>Glyma.18g300200</i>	57789188	57820853	+	Callosesynthase3
			<i>Glyma.18g300300</i>	57823394	57831151	+	Wdsam1protein
			<i>Glyma.18g300400</i>	57831381	57834152	-	Oligo peptide transporter-related
			<i>Glyma.18g300500</i>	57841316	57843280	+	Pirin
			<i>Glyma.18g300600</i>	57844897	57846271	-	Gtpaserab11/ypt3, small g protein super family
			<i>Glyma.18g300700</i>	57852461	57859687	+	Signalpeptidepeptidase-like3-related
			<i>Glyma.18g300800</i>	57860162	57861657	+	_
			<i>Glyma.18g300900</i>	57867768	57869200	-	Auxin responsive protein (auxin_inducible)
			<i>Glyma.18g301000</i>	57890959	57891781	+	Non-specific serine/threonine protein kinase

			<i>Glyma.18g301100</i>	57894037	57895910	-	Bi directional sugar transporter sweet15
			<i>Glyma.18g301200</i>	57903571	57906434	-	Bi directional sugar transporter sweet15
			<i>Glyma.18g301300</i>	57913464	57915469	-	_
			<i>Glyma.18g301400</i>	57915964	57916724	-	_
			<i>Glyma.18g301500</i>	57926526	57928866	+	No apical meristem (nam)protein
			<i>Glyma.18g301600</i>	57939468	57945328	+	BAR domain
			<i>Glyma.18g301700</i>	57945537	57947130	-	Brassino steroid insensitive1-associated receptor kinase1-related
			<i>Glyma.18g301800</i>	57950394	57950985	+	_
			<i>Glyma.18g301900</i>	57953323	57956369	-	Lipopolysaccharide-induced transcription factor regulating tumor necrosis factoralpha
			<i>Glyma.18g302000</i>	57965322	57969597	+	Bomb/kira proteins
			<i>Glyma.18g302100</i>	57988925	57992117	+	Cdp-diacylglycerol--glycerol-3-phosphate3-
			<i>Glyma.18g302200</i>	57998307	58011231	+	Histone-lysine-methyl transferase ASHR3
			<i>Glyma.18g302300</i>	58014611	58017908	+	65-k d microtubule-associated protein 6-related
			<i>Glyma.03g251100</i>	44673965	44702804	-	Exportin-4
<b>LAD</b>	AX-90345460	Gm03	<i>Glyma.03g251200</i>	44703737	44706084	-	PPR repeat family (ppr_2)
			<i>Glyma.03g251300</i>	44708643	44717310	+	Phosphatase 2a regulatory subunit-related
			<i>Glyma.03g251400</i>	44718734	44719931	+	Non-specific serine/ threonine protein kinase/ phosphoenol pyruvate carboxy kinase (atp)
			<i>Glyma.03g251500</i>	44723994	44729654	-	Serine/threonine-protein phosphatase PP1 isozyme 2-related
			<i>Glyma.03g251600</i>	44735415	44736486	-	Peptidyl-prolylcis-trans isomerase cyp18-3-related
			<i>Glyma.03g251700</i>	44736493	44741875	-	Ethylene response sensor 2-related

			<i>Glyma.03g251800</i>	44744746	44751071	-	At hook motif DNA-binding family protein-related
			<i>Glyma.03g251900</i>	44752444	44755159	-	Associate of c-mycamy-1
			<i>Glyma.03g252000</i>	44756482	44767598	-	Suppressor of actin mutations 2/ vacuolar protein sorting 52
			<i>Glyma.03g252100</i>	44768483	44772056	+	Single-stranded DNA-binding protein why2, mitochondrial
			<i>Glyma.03g252200</i>	44773982	44778842	-	Duf 239, (dof4409)
			<i>Glyma.03g252300</i>	44781815	44809556	-	Translational activator gcn1
			<i>Glyma.03g252400</i>	44813173	44813557	+	—
			<i>Glyma.03g252500</i>	44819920	44825163	+	Gdslesterase/lipaselt1
			<i>Glyma.03g252600</i>	44830497	44833487	+	Zincfingerfyvedomaincontainingprotei n
			<i>Glyma.03g252700</i>	44841960	44844706	+	Gdslesterase/lipaselt1
			<i>Glyma.03g252800</i>	44849419	44851672	+	Zinc finger fyve domain containin gprotein
			<i>Glyma.03g252900</i>	44853430	44853922	+	Histidine kinase/proteinkinase(histidine)
			<i>Glyma.03g253000</i>	44856721	44878696	+	P53 inducible protein pir121
			<i>Glyma.03g253100</i>	44880486	44882438	+	Beta catenin-related armadillo repeat-containing
			<i>Glyma.03g253200</i>	44887335	44889341	-	Late embryogenesis abundant3 (lea3) family protein
			<i>Glyma.03g253300</i>	44888518	44892973	+	U1small nuclear ribonucleo protein
			<i>Glyma.03g253400</i>	44899608	44901536	-	—
	AX-90426968	Gm06	<i>Glyma.06g127800</i>	10493847	10506001	-	Histone-lysine-methyl transferase atx4-related
			<i>Glyma.06g127900</i>	10510306	10515402	-	Cct motif family protein
			<i>Glyma.06g128000</i>	10534942	10537640	-	Nuclear migration protein
			<i>Glyma.06g128100</i>	10538914	10540591	+	Oxido reductase, 2og-feii oxygenase family protein
			<i>Glyma.06g128200</i>	10543911	10545747	+	Flavonolsynthase
			<i>Glyma.06g128300</i>	10546528	10547630	+	—



			<i>Glyma.06g128400</i>	10546758	10548460	+	Alpha/beta-hydrolases superfamily protein
			<i>Glyma.06g128500</i>	10564808	10569476	+	Pectin esterase/ pectin esterase inhibitor 34-related
			<i>Glyma.06g128600</i>	10572823	10578723	-	Dipeptidyl-peptidaseiv/ xaa-pro-dipeptidyl amino peptidase
			<i>Glyma.06g128700</i>	10581580	10588773	-	Calcineurinb-likeprotein4
			<i>Glyma.06g128800</i>	10598708	10598973	-	_
			<i>Glyma.06g128900</i>	10600212	10602821	+	Pprrepeat (ppr)/ pprrepeat (ppr_1)/ ppr repeat family (ppr_2)
	AX-90481233	Gm12	<i>Glyma.12g192800</i>	35434955	35439253	-	Multi-copperoxidase
			<i>Glyma.12g192900</i>	35440475	35444708	-	_
			<i>Glyma.12g193000</i>	35450459	35456613	-	Arogenatedehydratase/carboxy cyclo hexadienyl dehydratase
			<i>Glyma.12g193100</i>	35463673	35472010	+	_
			<i>Glyma.12g193200</i>	35473199	35474392	+	_
			<i>Glyma.12g193300</i>	35478288	35482335	+	Myb-like DNA-binding protein
			<i>Glyma.12g193400</i>	35488883	35491610	-	_
			<i>Glyma.12g193500</i>	35498865	35503832	-	Alcohol dehydrogenase related
			<i>Glyma.12g193600</i>	35512904	35517589	-	Beta-1,3-galactosyl transferase 2-related
			<i>Glyma.12g193700</i>	35543782	35544619	-	_
			<i>Glyma.12g193800</i>	35551596	35559129	+	Aconitatehydratase/citrate (isocitrate) hydro-lyase
			<i>Glyma.12g193900</i>	35561363	35561746	-	_
			<i>Glyma.12g194000</i>	35567230	35571578	+	Multidrug resistance protein
			<i>Glyma.12g194100</i>	35577962	35583881	+	Glutamate receptor3.6-related
			<i>Glyma.12g194200</i>	35592309	35598542	+	Glutamate receptor3.4-related
			<i>Glyma.12g194300</i>	35602347	35603796	-	_
			<i>Glyma.12g194400</i>	35606060	35613310	-	Homeo box domain (homeobox)/start domain
		Gm13	<i>Glyma.13g162500</i>	27785225	27788045	-	_
			<i>Glyma.13g162000</i>	27766440	27766796	+	_

	AX-90405818 AX-90405799 AX-90496747		<i>Glyma.13g162100</i>	27767517	27768046	-	_
			<i>Glyma.13g162200</i>	27768047	27772562	-	Translocase of chloroplast 90
			<i>Glyma.13g162300</i>	27773991	27778719	-	_
			<i>Glyma.13g162400</i>	27781636	27783846	-	Sarscorona virus main proteinase/severe acute respiratory syndrome coronavirus mainprotease
			<i>Glyma.13g162600</i>	27790437	27793621	-	Monogalactosyldiacyl glycerolsynthase/uridinediphosphogalactose-1,2-diacylglycerol galactosyl transferase
			<i>Glyma.13g162700</i>	27796825	27800728	-	_
			<i>Glyma.13g162800</i>	27817824	27822630	+	Inorganic diphosphatase/pyrophosphate phosphohydrolase
			<i>Glyma.13g162900</i>	27823310	27833374	+	Anion transporter6, chloroplastic-related
			<i>Glyma.13g163000</i>	27833892	27837459	-	Heparanase-likeprotein3
			<i>Glyma.13g163100</i>	27847463	27849868	-	_
			<i>Glyma.13g163200</i>	27850927	27852651	+	Adenosine triphosphatase/triphosphatase
			<i>Glyma.13g163300</i>	27854463	27856435	-	_
			<i>Glyma.13g163400</i>	27861309	27869162	+	Ankyrin repeat and dhhc-type zn-finger domain containing proteins
			<i>Glyma.13g163500</i>	27876748	27886905	+	Protein phosphatase1, regulatory subunit, and related proteins/ leucine rich repeat proteins, some proteins contain f-box
			<i>Glyma.13g163600</i>	27887744	27892434	-	Tpr repeat containing protein
			<i>Glyma.13g163700</i>	27895777	27898359	-	UPF0051 protein abci8, chloroplastic-related
			<i>Glyma.13g163800</i>	27896301	27896661	+	_
			<i>Glyma.13g163900</i>	27905208	27908859	-	EFH and domain family a1,a2-related
			<i>Glyma.13g164000</i>	27911603	27912972	+	_

			<i>Glyma.13g164100</i>	27913120	27916690	-	Major facilitator super family protein
			<i>Glyma.13g164200</i>	27922878	27924801	-	Bi functional arginine demethylase and lysyl-hydroxylasejmd6
			<i>Glyma.13g164300</i>	27934139	27936052	-	_
			<i>Glyma.13g164400</i>	27940695	27943408	+	_
			<i>Glyma.13g164500</i>	27944852	27945076	+	_
			<i>Glyma.13g164600</i>	27952816	27953422	-	_
			<i>Glyma.13g164700</i>	27958127	27961278	-	_
	AX-90521967	Gm13	<i>Glyma.13g164800</i>	27967025	27969167	-	Platz transcription factor family protein
			<i>Glyma.13g164900</i>	27975423	27977287	+	Domain of unknown function (duf1817)
			<i>Glyma.13g165000</i>	27987286	27988809	+	_
			<i>Glyma.13g165100</i>	27991996	27994467	+	Glutamate receptor3.4-related
			<i>Glyma.13g165200</i>	27997373	27999343	+	40sribosomal proteins 11 family member
	AX-90336511	Gm13	<i>Glyma.13g165300</i>	28011615	28015224	+	Protein phosphatase2c
			<i>Glyma.13g165400</i>	28016508	28021594	-	116kdau 5 small nuclear ribonucleo protein component
			<i>Glyma.13g165500</i>	28030788	28034710	+	Ring finger domain-containing
			<i>Glyma.13g165600</i>	28035507	28038063	-	_
			<i>Glyma.16g173700</i>	33430875	33438490	+	Aaaatpase
	AX-90502945	Gm16	<i>Glyma.16g173800</i>	33431688	33431888	-	_
			<i>Glyma.16g173900</i>	33439127	33447439	-	Leucine richr epeat (lrr_1)/ (lrrnt_2)/ (lrr_8)
			<i>Glyma.16g174000</i>	33452980	33456674	-	lrr_1/llr_8
			<i>Glyma.16g174100</i>	33475023	33478604	-	lrrnt_2/ lrr_8
			<i>Glyma.16g174200</i>	33491255	33494665	+	Micro tubule-severing ATPase/ katanin
			<i>Glyma.16g174300</i>	33493635	33496282	-	Histone deacetylase/hdac
			<i>Glyma.16g174400</i>	33529239	33531183	+	lrr_1
			<i>Glyma.16g174500</i>	33532929	33535530	+	lrr_1/llr_8
			<i>Glyma.16g174600</i>	33541866	33550018	+	lrr_1/ llr_2/llr_8

			<i>Glyma.16g174700</i>	33568260	33573288	+	lrr_1/ llr_2/llr_8
			<i>Glyma.16g174800</i>	33588132	33591504	+	lrr_1/llr_8
			<i>Glyma.16g174900</i>	33595320	33596393	-	Aaaatpase
			<i>Glyma.16g175000</i>	33606851	33614825	+	lrr_1/ llr_2/llr_8
			<i>Glyma.16g175100</i>	33620772	33629405	+	lrr_1/ llr_2/llr_8
	AX-90422071	Gm18	<i>Glyma.18g107000</i>	12028945	12032564	-	Ribose-phosphate pyrophospho kinase4
			<i>Glyma.18g107100</i>	12047167	12050021	+	Ancient ubiquitous protein1
			<i>Glyma.18g107200</i>	12059922	12060860	-	Peptidase of plants and bacteria (bsp)
			<i>Glyma.18g107300</i>	12091200	12095291	-	Carbohydrate-binding x8 domain-containing protein
			<i>Glyma.18g107400</i>	12099175	12100330	-	_
			<i>Glyma.18g107500</i>	12116972	12118952	+	Mitochondrial transcription termination factor family protein-related
			<i>Glyma.18g107600</i>	12164801	12170095	-	Protein kinase family protein
			<i>Glyma.18g107700</i>	12207661	12208644	-	Gag-polypeptide of ltrcopia-type (ubn2_3)
			<i>Glyma.18g107800</i>	12208710	12212011	-	_
			<i>Glyma.18g107900</i>	12220182	12260477	+	Callose synthase7-related
			<i>Glyma.18g108000</i>	12221736	12225257	-	Dnahelicasepif1/rrm3
LAL	AX-90523253	Gm02	<i>Glyma.02g237600</i>	42597212	42600960	-	Metal tolerance protein c3-related
			<i>Glyma.02g237400</i>	42580305	42582359	+	Leucine-rich repeat-containing protein
			<i>Glyma.02g237500</i>	42582609	42591402	-	B3DNA binding domain (b3)
			<i>Glyma.02g237700</i>	42602537	42604779	-	Protein of unknown function (duf2741)
			<i>Glyma.02g237800</i>	42607230	42611324	-	RNA binding protein related
			<i>Glyma.02g237900</i>	42615776	42617153	-	Protein of unknown function (duf1191)
			<i>Glyma.02g238000</i>	42627584	42631716	+	_
			<i>Glyma.02g238100</i>	42635741	42643194	-	Nicotinate-nucleotide diphosphorylase (carboxylating)/quinolinate phosphoribosyl transferase (decarboxylating)

			<i>Glyma.02g238200</i>	42645706	42649807	-	UDPglucuronate:xylnalalpha-glucuronosyl transferase3-related
			<i>Glyma.02g238300</i>	42672255	42689914	-	ATP-binding cassette sub-family Bmember6, mitochondrial
			<i>Glyma.02g238400</i>	42692884	42703545	-	Cohesin loading factor (cohesin_load)
			<i>Glyma.02g238500</i>	42709015	42712333	-	Uncharacterized conserved protein
			<i>Glyma.02g238600</i>	42714308	42718195	-	CT120 protein
			<i>Glyma.02g238700</i>	42722617	42726326	-	Inosine-5-monophosphate dehydrogenase related
			<i>Glyma.02g238800</i>	42735396	42738350	+	Oxalyl-coadecarboxylase/oxalyl-coacaroxy-lyase
			<i>Glyma.02g238900</i>	42742465	42743004	-	_
			<i>Glyma.02g239000</i>	42747173	42750040	+	_
			<i>Glyma.02g239100</i>	42754798	42755899	+	Late embryogenesis abundant (lea) hydroxyproline-rich glycol protein-related
	AX-90367890 AX-90407903 AX-90372917	Gm02	<i>Glyma.02g239200</i>	42757315	42763576	-	Nibrin-related
			<i>Glyma.02g239300</i>	42777266	42779243	-	Acyl-activating enzyme5, peroxisomal-related
			<i>Glyma.02g239400</i>	42784584	42786251	-	Acyl-activating enzyme5, peroxisomal-related
			<i>Glyma.02g239500</i>	42799982	42802509	-	Acyl-activating enzyme5, peroxisomal-related
			<i>Glyma.02g239600</i>	42813400	42824492	-	Auxin response factor8
			<i>Glyma.02g239700</i>	42839384	42841491	-	40sribosomal proteins26
			<i>Glyma.02g239800</i>	42848299	42849703	+	_
			<i>Glyma.02g239900</i>	42853091	42855600	+	CPG binding protein
	AX-90456562	Gm05	<i>Glyma.05g224900</i>	40366096	40370669	-	_
			<i>Glyma.05g223000</i>	40248224	40250093	+	1-aminocyclopropane-1-carboxylate synthase7
			<i>Glyma.05g223100</i>	40259388	40262641	+	Mitochondrial ATP synthaseg subunit (ATP-synt_g)

			<i>Glyma.05g223200</i>	40264775	40268360	+	Regulator of vps4 activity protein-related
			<i>Glyma.05g223300</i>	40270196	40271323	+	O-methyl transferase-related
			<i>Glyma.05g223400</i>	40273312	40274992	+	Caffeoyl-coao-methyl transferase/ trans-caffeoyl-coa3-o-methyl transferase
			<i>Glyma.05g223500</i>	40275557	40278080	-	40sribosomal proteins15a-2-related
			<i>Glyma.05g223600</i>	40277423	40279367	+	_
			<i>Glyma.05g223700</i>	40283806	40293124	+	Insulinase (peptidasefamilym16) protein
			<i>Glyma.05g223800</i>	40294131	40295090	+	60sribosomal protein l31
			<i>Glyma.05g223900</i>	40297233	40299773	+	_
			<i>Glyma.05g224000</i>	40300268	40303288	-	Asparagine-trnaligase, mitochondrial- related
			<i>Glyma.05g224100</i>	40304087	40305165	+	_
			<i>Glyma.05g224200</i>	40307329	40312025	+	SNF7-related
			<i>Glyma.05g224300</i>	40316985	40318520	-	Myb-like DNA binding protein
			<i>Glyma.05g224400</i>	40325845	40327778	-	Zinc fingerc-x8-c-x5-c-x3-htype (andsimilar) (zf-ccch)
			<i>Glyma.05g224500</i>	40342583	40345336	+	Inositolxygenase/myo- inositolxygenase
			<i>Glyma.05g224600</i>	40345642	40345824	+	_
			<i>Glyma.05g224700</i>	40351005	40361888	+	Glycine-rich protein
			<i>Glyma.05g224800</i>	40362481	40363717	-	Clathrin coatassembly protein
			<i>Glyma.05g225000</i>	40376407	40381768	+	Mitochondrial processing peptidase/processing enhancing peptidase
			<i>Glyma.05g225100</i>	40387813	40393404	+	Nac domain containing protein75- related
			<i>Glyma.05g225200</i>	40398178	40400609	-	Protein-serine/threonine phosphatase/serine/threonine specific protein phosphatase//protein-tyrosine- phosphatase/ptpase

			<i>Glyma.05g225300</i>	40408912	40410821	+	Extensin-likeprotein-related
			<i>Glyma.05g225400</i>	40412601	40415905	-	Protein of unknown function(duf1005)
			<i>Glyma.05g225500</i>	40422630	40426560	+	Der1-likeprotein, derlin
			<i>Glyma.05g225600</i>	40427955	40429788	+	Profilin
			<i>Glyma.05g225700</i>	40432149	40439631	+	Profilin
			<i>Glyma.05g225800</i>	40441668	40445293	-	Glucanendo-1,3-beta-glucosidase12-related
	AX-90365252	Gm07	<i>Glyma.07g077700</i>	7078817	7101299	+	Leucine-rich repeat-containing protein
			<i>Glyma.07g077800</i>	7101306	7102021	+	—
			<i>Glyma.07g077900</i>	7116774	7117750	+	—
			<i>Glyma.07g078000</i>	7121636	7126695	+	Leucine-rich repeat-containing protein
			<i>Glyma.07g078100</i>	7126750	7135963	+	Leucine rich repeat proteins, some proteins contain f-box
			<i>Glyma.07g078200</i>	7144509	7148052	-	Armadillo/beta-catenin repeat-containing protein-related
			<i>Glyma.07g078300</i>	7150800	7154478	-	Alternative splicing factor srp55/b52/srp75 (rrm superfamily)
			<i>Glyma.07g078400</i>	7152903	7153630	+	—
			<i>Glyma.07g078500</i>	7152959	7153210	-	Subtilisin-like serineproteas
			<i>Glyma.07g078600</i>	7158821	7160401	-	Shnshine, DNA binding/transcription
			<i>Glyma.07g078700</i>	7175548	7177380	+	Xyloglucan:xyloglucosyl transferase/xyloglucanendo transglycosylase
			<i>Glyma.07g078800</i>	7182128	7184201	+	Ring finger domain-containing
			<i>Glyma.07g078900</i>	7187362	7192149	+	Protein-ribulosamine3-kinase/ribulosamine/erythrul osamine3-kinase
			<i>Glyma.07g079000</i>	7193037	7202151	-	Response regulator of two-compon
			<i>Glyma.07g079100</i>	7199099	7205256	-	—
			<i>Glyma.07g079200</i>	7200488	7201018	+	—
			<i>Glyma.07g079300</i>	7201131	7201427	+	—
			<i>Glyma.07g079400</i>	7204711	7206782	+	—
			<i>Glyma.07g079500</i>	7214161	7217333	+	—

			<i>Glyma.07g079600</i>	7237783	7238601	+	Lysm domain (lysm)
			<i>Glyma.07g079700</i>	7248737	7256522	+	Arsenite-transporting ATPase/arsenite-translocating ATPase
			<i>Glyma.07g079800</i>	7259786	7263265	+	_
			<i>Glyma.07g079900</i>	7266622	7267156	-	Pthr 22811//pthr22811:sf68-trans membrane emp24 domain
	AX-90477018	Gm07	<i>Glyma.07g080400</i>	7312327	7319873	-	Phospholipased beta1-related
			<i>Glyma.07g080500</i>	7328383	7331416	-	Subtilisin-like serine protease-related
			<i>Glyma.07g080600</i>	7336252	7339584	+	Disease resistance family protein/ lrr family
			<i>Glyma.07g080700</i>	7341451	7345688	-	Protein kinase domain (pkinase)/s-locusglycop
			<i>Glyma.07g080800</i>	7358782	7367281	+	Acyltransferase(acyltransferase)/ef
			<i>Glyma.07g080900</i>	7381339	7405785	+	Mads-box protein soc1
			<i>Glyma.07g081000</i>	7423408	7424268	-	ABC transporter transmembrane region
			<i>Glyma.07g081100</i>	7424545	7425990	-	Cyclin-a2-1-related
			<i>Glyma.07g081200</i>	7427658	7428245	-	Maintenance of killer16 mak16 protein-related
			<i>Glyma.07g081300</i>	7442510	7449341	-	Agamous-like MADS-box protein agl13-related
			<i>Glyma.07g081400</i>	7465769	7471829	+	Protein y45f10a.7, isoforma
			<i>Glyma.07g081500</i>	7472362	7475246	+	Sap18
			<i>Glyma.07g081600</i>	7479732	7487620	+	Polygalacturonate4-alpha-galacturonosyltra
	AX-90491184	Gm11	<i>Glyma.11g093700</i>	7111708	7115757	+	Set1/ash2 histone methyl transferase complex sub unit
			<i>Glyma.11g093800</i>	7116433	7123292	-	ATP-binding cassette transporter
			<i>Glyma.11g095000</i>	7206492	7209711	-	Glucanendo-1,3-beta-d-glucosidase/laminarinase
			<i>Glyma.11g093900</i>	7130214	7137304	-	Sf247-ATP-binding cassette transporter
			<i>Glyma.11g094000</i>	7140746	7145587	-	_
			<i>Glyma.11g094100</i>	7144509	7145178	+	_



			<i>Glyma.11g094200</i>	7147965	7152190	+	Biotin synthase
			<i>Glyma.11g094300</i>	7153148	7168980	-	Isoleucine-tRNA ligase/iso leucyl-trna synthetase
			<i>Glyma.11g094400</i>	7170437	7174192	-	28s ribosomal proteins9, mitochondrial
			<i>Glyma.11g094500</i>	7176300	7183060	-	_
			<i>Glyma.11g094600</i>	7187192	7190048	-	_
			<i>Glyma.11g094700</i>	7190632	7195838	-	Hydroxymethyl bi lanesynthase /uroporphyrinogen synthetase
			<i>Glyma.11g094800</i>	7199274	7201137	+	_
			<i>Glyma.11g094900</i>	7202266	7203515	-	Glucanendo-1,3-beta-d-glucosidase/laminarinase
			<i>Glyma.11g095100</i>	7212438	7214276	-	Glucanendo-1,3-beta-d-glucosidase/laminarinase
			<i>Glyma.11g095200</i>	7218860	7221194	-	Glucanendo-1,3-beta-d-glucosidase/laminarinase
			<i>Glyma.11g095300</i>	7222140	7235534	+	DNA jhomolog sub family c member
			<i>Glyma.11g095400</i>	7236082	7240527	-	Saccharo pinedehydrogenase NADP binding domain
			<i>Glyma.11g095500</i>	7242440	7249074	-	Adaptinc-terminal domain (alpha_adaptinc2)
			<i>Glyma.11g095600</i>	7249880	7254364	-	Hexokinase-3-related
			<i>Glyma.11g095700</i>	7263413	7265368	-	Ubiquitin-conjugating enzyme E2
			<i>Glyma.11g095800</i>	7267458	7279596	-	Nucleosome-remodeling factor subunit BPTF
			<i>Glyma.11g095900</i>	7287276	7288134	+	Probable lipid transfer (ltp_2)
			<i>Glyma.11g096000</i>	7294150	7296623	-	Gras domain family(gras)
			<i>Glyma.11g096100</i>	7299741	7307551	-	Proteins-acyl transferase 19-related
	AX-90348822 AX-90337775 AX-90498877	Gm11	<i>Glyma.11g096200</i>	7315127	7325455	+	4-amino butyrate--2-oxoglutarate transaminase/gamma-amino-n-butyra
			<i>Glyma.11g096300</i>	7325956	7326700	-	_
	AX-90443985 AX-90340335	Gm11	<i>Glyma.11g209100</i>	30057154	30061089	+	Monodehydro ascorbate reductase, cytoplasm
			<i>Glyma.11g209200</i>	30063770	30065301	-	60s acidic ribosomal proteinp2

			<i>Glyma.11g209300</i>	30097729	30105137	+	6-dioxo-6-phenylhexa-3-enoatehydrolase/ hohpdahydrolase
			<i>Glyma.11g209400</i>	30105649	30106749	-	Germin-like protein sub family 3 member
			<i>Glyma.11g209500</i>	30131080	30134126	+	Protein terminal flower1
			<i>Glyma.11g209600</i>	30147295	30159083	+	Protease u48 caaxprenyl protease rce1
			<i>Glyma.11g209700</i>	30163931	30165878	-	Protein little zipper3
			<i>Glyma.11g209800</i>	30180779	30182096	+	Purple acid phosphatase 21-related
			<i>Glyma.11g209900</i>	30188618	30192948	-	Zinc finger five domain containin GP
			<i>Glyma.11g210000</i>	30206429	30207913	-	An1-type zinc finger protein
			<i>Glyma.11g210100</i>	30223531	30231651	+	Transcription initiation factort FIID subunit12
			<i>Glyma.11g210200</i>	30234588	30237609	+	Lysm domain (lysm)
			<i>Glyma.11g210300</i>	30238668	30248611	-	Tri hydroxy ptero carpandi methyl allyl transferase/glyceollin synthase
	AX-90362827 AX-90513611 AX-90396575	Gm18	<i>Glyma.18g104500</i>	11526580	11531654	-	Plant mobile domain (pmd)
			<i>Glyma.18g104600</i>	11541115	11551882	-	Serine/threonine-protein phosphatase 5
			<i>Glyma.18g105000</i>	11665406	11665918	+	_
			<i>Glyma.18g104700</i>	11598036	11603174	+	Helicase (herpes_helicase)/ pif1-like helicase
			<i>Glyma.18g104800</i>	11608502	11608894	-	_
			<i>Glyma.18g104900</i>	11656641	11665405	+	_
			<i>Glyma.18g105100</i>	11680805	11684730	+	Leucine-rich repeat- containing protein
			<i>Glyma.18g105200</i>	11694516	11696250	+	Leucine-rich repeat-containing protetein
			<i>Glyma.18g105300</i>	11696911	11697669	+	Leucine-richrepeat-containing protein
			<i>Glyma.18g105400</i>	11702349	11704712	-	Hva22-like prote
			<i>Glyma.18g105500</i>	11705137	11710003	-	Protein huellenlos
			<i>Glyma.18g105600</i>	11715984	11723202	+	Bed finger-related
			<i>Glyma.18g105700</i>	11731323	11732124	+	Endonuclease/ exonuclease/ phosphatase family
<b>TRL</b>	AX-90431861	Gm06	<i>Glyma.06g040900</i>	3084559	3086167	-	Heat stress transcription factorb-4

			<i>Glyma.06g041000</i>	3104225	3111827	-	Ring finger domain-containing
			<i>Glyma.06g041100</i>	3118193	3119768	-	_
			<i>Glyma.06g041200</i>	3121756	3122364	-	Transferase family (transferase)
			<i>Glyma.06g041300</i>	3122900	3124901	-	Transferase family (transferase)
			<i>Glyma.06g041400</i>	3132564	3136289	-	Transferase family (transferase)
			<i>Glyma.06g041500</i>	3139829	3144620	+	Atp-dependent protease cereblon
			<i>Glyma.06g041600</i>	3145139	3145351	-	_
			<i>Glyma.06g041700</i>	3147768	3152655	-	RNA recognition motif
			<i>Glyma.06g041800</i>	3161791	3163327	-	Wuschel-related homeo box4
			<i>Glyma.06g041900</i>	3169816	3171166	-	_
			<i>Glyma.06g042000</i>	3178447	3178644	-	_
			<i>Glyma.06g042100</i>	3179113	3180503	-	Ethylene-responsive transcription factored f008
			<i>Glyma.06g042200</i>	3180855	3181761	+	_
			<i>Glyma.06g042300</i>	3194307	3197140	+	Ranbinding protein 9-related
			<i>Glyma.06g042400</i>	3212730	3225119	+	Kinesin-like protein-related
			<i>Glyma.06g042500</i>	3226378	3229165	-	Serine/threonine protein kinase/tgf-beta stimulated factor
			<i>Glyma.06g042600</i>	3233956	3236966	+	Cysteine protease component of protease
			<i>Glyma.06g042700</i>	3240841	3243050	-	Serine/threonine-protein kinase wnk
			<i>Glyma.06g042800</i>	3246839	3248053	-	F-box protein skip2
			<i>Glyma.06g042900</i>	3264037	3266176	+	Cyclin
	AX-90446460 AX-90414551 AX-90472866	Gm11	<i>Glyma.11g055600</i>	4200285	4203022	-	Remorin, c-terminal region (remorin_c)
			<i>Glyma.11g055700</i>	4207710	4216150	+	Zeaxanthine oxidase, chloroplastic
			<i>Glyma.11g055800</i>	4220955	4221185	-	_
			<i>Glyma.11g055900</i>	4221420	4223125	-	_
			<i>Glyma.11g056000</i>	4234567	4239763	-	Swap mRNA splicing regulator
			<i>Glyma.11g056100</i>	4246705	4248880	+	Protein of unknown function (duf1685)
			<i>Glyma.11g056200</i>	4254959	4257382	+	Heat stress transcription factor B-1
			<i>Glyma.11g056300</i>	4255281	4255406	+	_
			<i>Glyma.11g056400</i>	4259181	4260890	+	RNA helicase

			<i>Glyma.11g056500</i>	4265079	4266558	+	Ef hand(ef-hand_1)/ ef hand(ef-hand_5)
			<i>Glyma.11g056600</i>	4272400	4273766	+	Emb
			<i>Glyma.11g056700</i>	4282555	4284383	-	Cyclin-dependent kinase inhibitor 6
			<i>Glyma.11g056800</i>	4296965	4298290	+	Methionine amino peptidase1d, mitochondrial
			<i>Glyma.11g056900</i>	4298795	4300993	-	Ca2+-independent phosphor lipasea2
			<i>Glyma.11g057000</i>	4304933	4309655	+	Sulfo transferase domain (sulfotransfer_1)
			<i>Glyma.11g057100</i>	4313411	4314027	+	_
			<i>Glyma.11g057200</i>	4320409	4321206	+	_
			<i>Glyma.11g057300</i>	4326263	4326902	+	_
			<i>Glyma.11g057400</i>	4332503	4333352	+	_
			<i>Glyma.11g057500</i>	4341698	4347460	+	Uncharacterized conserved protein
			<i>Glyma.11g057600</i>	4352469	4357731	+	Protein of unknown function, duf547 /leucine-zip
			<i>Glyma.11g057700</i>	4358078	4359945	-	Transducin/wd40 domain-containing protein
			<i>Glyma.11g057800</i>	4361981	4364146	+	17-beta-estradiol17-dehydrogenase/estrogen17-oxidoreductase
			<i>Glyma.11g057900</i>	4367145	4369966	-	Sf2-sap domain-containing protein
			<i>Glyma.11g058000</i>	4370574	4376076	-	Serine/threonine-protein kinase
			<i>Glyma.11g058100</i>	4384247	4386065	-	Peroxidase/lactoperoxidase
			<i>Glyma.11g058200</i>	4390109	4390700	-	_
			<i>Glyma.11g058300</i>	4392607	4397689	-	Mitogen-activated kinase kinasekinas
			<i>Glyma.11g058400</i>	4409851	4413688	+	Protein of unknown function duf260
			<i>Glyma.11g058500</i>	4417029	4423791	-	Tubulin-relatedprotein
			<i>Glyma.11g058600</i>	4425323	4427642	-	Myb family transcription factor
NF	AX-90428520 AX-90467878 AX-90468823 AX-90412442	Gm08	<i>Glyma.08g081500</i>	6152552	6161571	-	Histidin oldehydrogenase hdh
			<i>Glyma.08g080000</i>	6076298	6077881	+	Berberine bridge enzyme-like protein-related
			<i>Glyma.08g080100</i>	6079968	6081557	-	Berberine bridge enzyme-related

			<i>Glyma.08g080200</i>	6084010	6085893	+	Tetrahydro berberine oxidase/ thboxidase
			<i>Glyma.08g080300</i>	6086733	6088550	+	Ppr repeat (ppr)/ dyw family of nucleic acid deaminases
			<i>Glyma.08g080400</i>	6092714	6096079	+	Sf34-f22m8.11protein-related
			<i>Glyma.08g080500</i>	6097769	6099931	+	Sf34-f22m8.11protein-related
			<i>Glyma.08g080600</i>	6115848	6117996	+	Berberine bridge enzyme-related
			<i>Glyma.08g080700</i>	6119523	6122290	+	Berberine bridge enzyme-related
			<i>Glyma.08g080800</i>	6123319	6124310	-	_
			<i>Glyma.08g080900</i>	6127342	6129511	+	Berberine bridge enzyme-related
			<i>Glyma.08g081000</i>	6133267	6136646	-	Fatty acid hydroxylase
			<i>Glyma.08g081100</i>	6137956	6140938	-	Tubulinbeta-4chain-related
			<i>Glyma.08g081200</i>	6142155	6143076	+	Cupin domain (cupin_2)
			<i>Glyma.08g081300</i>	6145003	6149493	-	N-acetyl glucosaminyl phosphatidyl inositoldeacetylase/ n-acetylglucosa
			<i>Glyma.08g081400</i>	6152131	6155753	+	Protein phosphatase 2c28-related
			<i>Glyma.08g081600</i>	6162265	6170670	-	Hen1
			<i>Glyma.08g081700</i>	6174443	6177152	-	Stressup-regulated nod19 (surnod19)
			<i>Glyma.08g081800</i>	6178646	6180153	-	Stressup-regulated nod19 (surnod19)
			<i>Glyma.08g081900</i>	6182127	6185682	-	Protein pmt-1,isoformb
			<i>Glyma.08g082000</i>	6188267	6192585	-	26s proteasomenon-ATPase regulatory subunit8
			<i>Glyma.08g082100</i>	6196059	6199325	+	Programmed cell death protein5
			<i>Glyma.08g082200</i>	6202794	6210874	+	Potassium inward rectifier (kir)-like channe l3
			<i>Glyma.08g082300</i>	6206872	6207344	+	_
			<i>Glyma.08g082400</i>	6229164	6231818	+	Wrky transcription factor 28-related
			<i>Glyma.08g082500</i>	6244916	6252372	+	O-acetyl transferase cas1p-like protein- related
			<i>Glyma.08g082600</i>	6256587	6266032	+	Putative dynamitin
			<i>Glyma.08g082700</i>	6266414	6268400	-	U6s nrna-associated protein
		Gm08	<i>Glyma.08g093300</i>	7072042	7076041	-	Tartrate-resistant acid phosphatase type5

	AX-90493535 AX-90455156 AX-90331992		<i>Glyma.08g093400</i>	7084753	7087202	+	Hetero dimeric geranyl geranyl pyro phosphates
			<i>Glyma.08g093500</i>	7088454	7092027	+	Tartrate-resistant acid phosphatase type5
			<i>Glyma.08g093600</i>	7092593	7098413	+	Tartrate-resistant acid phosphatase type5
			<i>Glyma.08g093700</i>	7097206	7101441	-	Procollagen-proline3-dioxygenase/ prolyl3-hydroxylase
			<i>Glyma.08g093800</i>	7102857	7109102	-	Hydroxyproline-rich glycoprotein-like protein
			<i>Glyma.08g093900</i>	7120394	7123346	-	Xylo glucanendo transglucosylase
			<i>Glyma.08g094000</i>	7139990	7141988	+	Transmembrane ascorbate ferri reductase3-rel
			<i>Glyma.08g094100</i>	7145070	7149534	-	Proteinoberon3
			<i>Glyma.08g094200</i>	7157662	7163180	-	Early growth response protein-related
			<i>Glyma.08g094300</i>	7160799	7160957	+	_
			<i>Glyma.08g094400</i>	7174551	7178950	-	Protein kinase domain (pkinase)/wall-associated
			<i>Glyma.08g094500</i>	7184460	7192472	+	Protein of unknown function (duf789)
			<i>Glyma.08g094600</i>	7195107	7198806	-	Enolase superfamily, mandel ateracemase
			<i>Glyma.08g094700</i>	7205721	7208341	-	Mitochondrial 28s ribosomal proteins28
			<i>Glyma.08g094800</i>	7209255	7213386	-	Non-specific serine/ threonine protein kinase
			<i>Glyma.08g094900</i>	7218371	7222854	-	IFA-binding protein
			<i>Glyma.08g095000</i>	7230311	7239978	-	Clathrin assembly protein
			<i>Glyma.08g095100</i>	7242895	7244309	+	NADH dehydrogenase trans membrane subunit
			<i>Glyma.08g095200</i>	7245023	7250047	-	Uncharacterized conserved protein
			<i>Glyma.08g095300</i>	7258432	7260587	-	Proteinagamous-like82
			<i>Glyma.08g095400</i>	7267235	7270875	+	Iso amylacetate-hydrolyzin gesterase and related enzymes

	AX-90365804	Gm09	<i>Glyma.09g051100</i>	4454515	4461881	+	Cellulose synthase acatalytic subunit7
			<i>Glyma.09g050200</i>	4367844	4370056	+	Cationic amino acid transporter5
			<i>Glyma.09g050300</i>	4373865	4377763	+	Protein kinase domain (pkinase)
			<i>Glyma.09g050400</i>	4379081	4379851	-	_
			<i>Glyma.09g050500</i>	4380780	4383807	-	PPR repeat (ppr)/ppr repeat family (ppr_2)
			<i>Glyma.09g050600</i>	4384885	4387181	-	Cationic amino acid transporter 5
			<i>Glyma.09g050700</i>	4401152	4405156	-	Halo acid dehalogenase-like hydrolas
			<i>Glyma.09g050800</i>	4413615	4418223	-	All antoate deiminase
			<i>Glyma.09g050900</i>	4447546	4450090	+	Poly galacturonase QRT3
			<i>Glyma.09g051000</i>	4452259	4453424	+	_
			<i>Glyma.09g051200</i>	4464563	4473730	-	Choline-phosphatecytidyltransferase/phosphorylcholinetransferase
			<i>Glyma.09g051300</i>	4470781	4470999	+	_
			<i>Glyma.09g051400</i>	4480786	4483499	-	S-adenosyl-l-methionine-dependentmethyltrans
			<i>Glyma.09g051500</i>	4488096	4493102	-	Protein trigalactosyl di acylglycerol 4
			<i>Glyma.09g051600</i>	4494692	4498211	-	Calicylin binding protein
			<i>Glyma.09g051700</i>	4494923	4495081	+	_
			<i>Glyma.09g051800</i>	4499012	4503649	-	Eukaryotic mitochondrial regulator protein (bot1p)
			<i>Glyma.09g051900</i>	4508892	4509626	-	Vqmotif(vq)
			<i>Glyma.09g052000</i>	4519979	4527492	-	E1-e2atpase(e1-e2_atpase)/ heavy-metal-
			<i>Glyma.09g052100</i>	4536612	4538089	+	60s ribosomal protein l27
			<i>Glyma.09g052200</i>	4540284	4557984	+	Set domain (set)/gyf domain (gyf)
			<i>Glyma.09g052300</i>	4557593	4557820	+	_
	AX-90495283 AX-90449059 AX-90520390 AX-90434197 AX-90498061	Gm09	<i>Glyma.09g073400</i>	7732397	7733253	-	Auxin responsive protein (auxin_inducible)
			<i>Glyma.09g072600</i>	7590260	7593045	+	40s ribosomal proteins 3a
			<i>Glyma.09g072700</i>	7619132	7620402	-	Pectin esterase/pectin methyl esterase
			<i>Glyma.09g072800</i>	7633793	7634182	-	_

	AX-90419697 AX-90492156 AX-90493039		<i>Glyma.09g072900</i>	7645379	7646352	+	Myb/sant-likedna-binding domain (myb_dna-bind_3)
			<i>Glyma.09g073000</i>	7650927	7651406	-	_
			<i>Glyma.09g073100</i>	7654381	7657822	-	Predicted transposase
			<i>Glyma.09g073200</i>	7697529	7708882	-	Respiratory burst oxidase homolog protein
			<i>Glyma.09g073300</i>	7723202	7726373	+	Auxin-responsive protein-like protein-related
			<i>Glyma.09g073500</i>	7756930	7758261	+	Vacuolar sorting protein35
			<i>Glyma.09g073600</i>	7809852	7816248	-	Sucrose synthase1-related
NT	AX-90522644 AX-90466067 AX-90467825	Gm01	<i>Glyma.01g219800</i>	54913356	54934465	-	Lysine-specificdemethylaselid
			<i>Glyma.01g218100</i>	54819025	54824457	+	Myosin heavy chain-related protein
			<i>Glyma.01g218200</i>	54828960	54830170	-	Lurp-one-related (lor)
			<i>Glyma.01g218300</i>	54838494	54842120	+	Deoxy nucleotidyl transferase terminal
			<i>Glyma.01g218400</i>	54842601	54846844	+	Kdellys-asp-glu-leucontaining-rela
			<i>Glyma.01g218500</i>	54847794	54848478	-	Expressedprotein
			<i>Glyma.01g218600</i>	54849376	54854956	-	Expressedprotein
			<i>Glyma.01g218700</i>	54857259	54858579	-	_
			<i>Glyma.01g218800</i>	54860809	54866642	+	Protein tyrosine kinase (pkinase_tyr)/ leucine rich repeat
			<i>Glyma.01g218900</i>	54866798	54868389	-	Actin-depolymerizingfactor10-related
			<i>Glyma.01g219000</i>	54870113	54875022	+	E1-e2atpase(e1-e2_atpase)/ heavy-metal-associated
			<i>Glyma.01g219100</i>	54880250	54888021	+	E1-e2atpase(e1-e2_atpase)/heavy-metal-
			<i>Glyma.01g219200</i>	54889915	54895017	+	C2calcium/lipid-binding plant phosphoribosylt
			<i>Glyma.01g219300</i>	54895767	54897277	+	Exo stosin family protein-related
			<i>Glyma.01g219400</i>	54898589	54899940	+	Glutathione peroxidase
			<i>Glyma.01g219500</i>	54901381	54901854	+	Glutathione peroxidase8-related
			<i>Glyma.01g219600</i>	54903061	54907533	-	At hook motif DNA-binding family protein



			<i>Glyma.01g219700</i>	54908697	54911774	-	Poly nucleotidyl transferase/ ribonuclease H-lik
			<i>Glyma.01g219900</i>	54935370	54941060	+	Glutamate – cysteine ligase
			<i>Glyma.01g220000</i>	54942535	54944623	+	RNAse prpr2/ rpp21/ snm1 subunit domain(rpr2)
			<i>Glyma.01g220100</i>	54947015	54948375	+	Bromo-adjacent homology (bah) domain-containing
			<i>Glyma.01g220200</i>	54950379	54954980	+	Bromo-adjacent homology (bah) domain-containing
			<i>Glyma.01g220300</i>	54959627	54963856	+	duf3527
			<i>Glyma.01g220400</i>	54964945	54971202	+	Signalpeptidepeptidase-like4
			<i>Glyma.01g220500</i>	54969086	54969580	+	_
			<i>Glyma.01g220600</i>	54974523	54976556	+	Aquaporinpip1-4-related
			<i>Glyma.01g220700</i>	54977695	54985676	-	Mitogen-activated kinase kinase
			<i>Glyma.01g220800</i>	54988418	54991271	-	_
			<i>Glyma.01g220900</i>	55000110	55006202	+	Tir domain (tir_2)
			<i>Glyma.01g221000</i>	55007371	55009590	-	Ring finger containing protein
			<i>Glyma.01g221100</i>	55018468	55020621	-	Sf20-cctmotiffamilyprotein
			<i>Glyma.01g221200</i>	55022862	55025351	+	Plac8family(plac8)
			<i>Glyma.01g221300</i>	55027025	55028244	-	Anaphase-promoting complex(apc), subunit11
	AX-90430136 AX-90419830 AX-90317331	Gm09	<i>Glyma.09g073700</i>	7863209	7879959	-	Inositol5-phosphatase
	AX-90313864		<i>Glyma.09g073800</i>	7897323	7901496	-	Zinc finger five domain containin gpr
	AX-90431604 AX-90382601 AX-90312113 AX-90455909 AX-90306078	Gm09	<i>Glyma.09g073900</i>	7920912	7922111	-	Expressed protein
			<i>Glyma.09g074000</i>	7924556	7927259	-	Zinc finger five domain containin gpr
			<i>Glyma.09g074100</i>	7943646	7949050	+	Red protein IK factor cytokine
	AX-90325580 AX-90370286 AX-90457815	Gm13	<i>Glyma.13g263800</i>	36698350	36700879	-	Oxidoreductase, 2og-feiioxygenasef
			<i>Glyma.13g261800</i>	36568871	36570396	+	11-oxo-beta-amyrin30- oxidase/cyp72a154

AX-90452276 AX-90480597 AX-90305162 AX-90433497 AX-90383650			<i>Glyma.13g261700</i>	36553556	36556696	-	11-oxo-beta-amyirin30-oxidase/cyp72a154
			<i>Glyma.13g261900</i>	36571819	36576038	+	Protease family S26 mitochondrialinn
			<i>Glyma.13g262000</i>	36579260	36585256	-	11-oxo-beta-amyirin30-oxidase/cyp72a154
			<i>Glyma.13g262100</i>	36586108	36589827	-	11-oxo-beta-amyirin30-oxidase/cyp72a154
			<i>Glyma.13g262200</i>	36591312	36595829	-	Hepta prenyl diphosphate synthase
			<i>Glyma.13g262300</i>	36592394	36593638	+	_
			<i>Glyma.13g262400</i>	36600186	36601991	-	Carbohydrate-binding x8 domain-containing protein
			<i>Glyma.13g262500</i>	36603843	36608523	+	Chalcone isomerase
			<i>Glyma.13g262600</i>	36612366	36614107	-	Purinepermease11-related
			<i>Glyma.13g262700</i>	36617625	36621135	+	Emb
			<i>Glyma.13g262800</i>	36625422	36628081	+	Emb
			<i>Glyma.13g262900</i>	36635322	36637117	+	Emb
			<i>Glyma.13g263000</i>	36643870	36645875	+	Fbd( fbd)
			<i>Glyma.13g263100</i>	36651160	36653640	+	Fbd (fbd)
			<i>Glyma.13g263200</i>	36652023	36663332	-	O-methyltransferase
			<i>Glyma.13g263300</i>	36664541	36668259	+	Ribokinase
			<i>Glyma.13g263400</i>	36671175	36675044	+	Ribokinase
			<i>Glyma.13g263500</i>	36676213	36676962	+	_
			<i>Glyma.13g263700</i>	36687392	36688292	-	_
			<i>Glyma.13g263600</i>	36687392	36692071	+	Mitogen-activated protein kinase18-related
			<i>Glyma.13g263900</i>	36705555	36706942	-	Oxidoreductase, 2og-feii oxygenase
			<i>Glyma.13g264000</i>	36707745	36709746	-	Codeine3-o-demethylase/code in eo-demethylase
			<i>Glyma.13g264100</i>	36711934	36719667	-	Nucleo porin auto peptidase
			<i>Glyma.13g264200</i>	36723747	36728882	-	Aceto acetatede carboxylase
			<i>Glyma.13g264300</i>	36734670	36739644	-	Sodium/bile acid co transporter 4
			<i>Glyma.13g264400</i>	36740782	36744087	-	Rag1-activating protein1

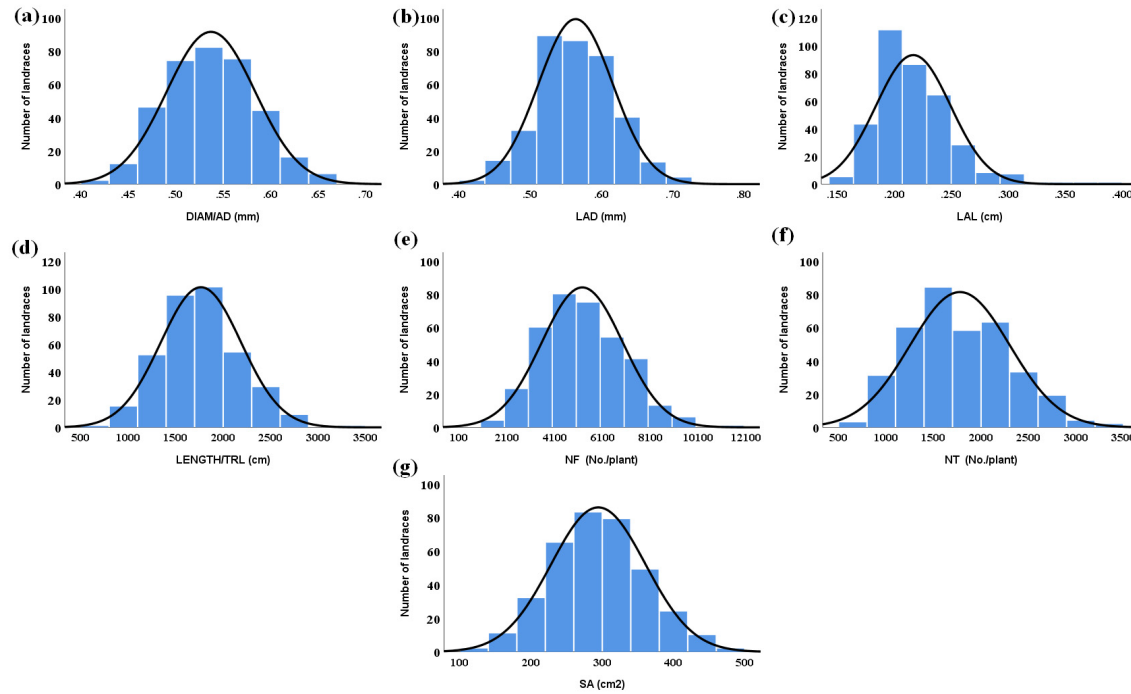
			<i>Glyma.13g264500</i>	36755174	36759150	+	Rhamnose biosynthetic enzyme1-related
			<i>Glyma.13g264600</i>	36759779	36772020	-	—

**Table S4.** List of Genes showed higher expression in root organ/tissue.

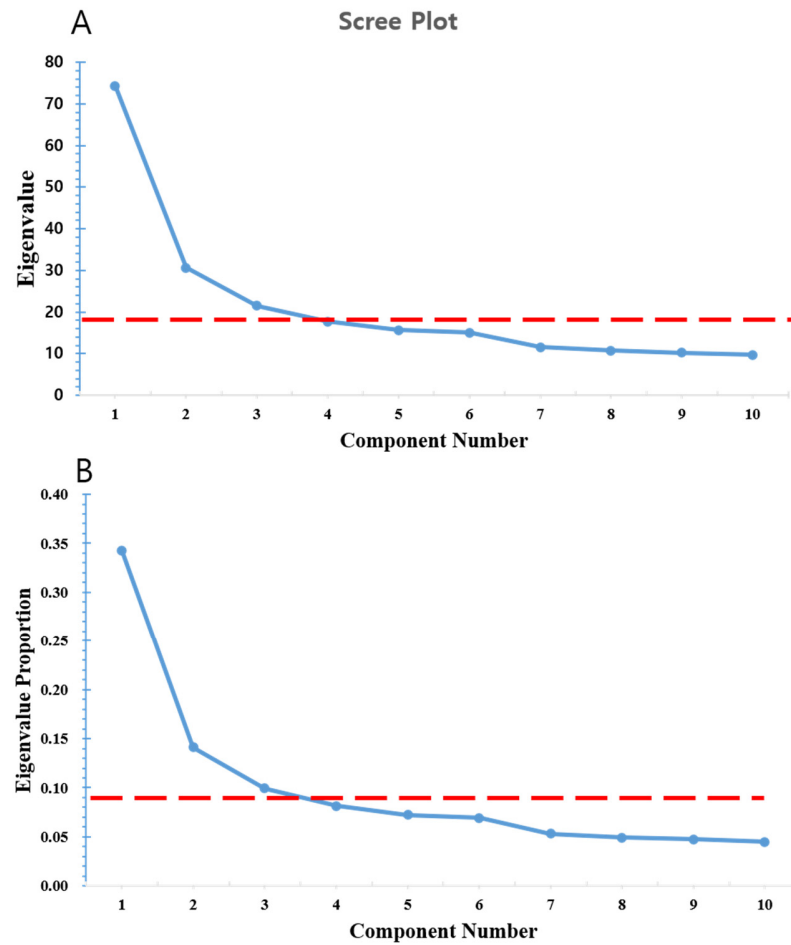
<i>Gene Name</i>	<b>Start</b>	<b>End</b>	<b>Strand</b>	<b>Description</b>
<i>Glyma.02g250200</i>	43779470	43781548	+	Protein phosphatase 2c3-related
<i>Glyma.02g250400</i>	43786923	43791698	-	Methyl transferase pmt10-related
<i>Glyma.06g126100</i>	10315437	10317265	-	Abscisicacid receptor pyl10-related
<i>Glyma.06g127500</i>	10462640	10469529	+	Splicing factor 3a subunit3
<i>Glyma.06g127700</i>	10486250	10492229	+	Plastid-lipid-associated protein 14,chloroplastic-related
<i>Glyma.14g199400</i>	46435759	46438392	-	Disease resistance protein rpp13-related
<i>Glyma.18g300500</i>	57841316	57843280	+	Pirin
<i>Glyma.18g301700</i>	57945537	57947130	-	Brassinosteroid insensitive1-associated receptor kinase1-related
<i>Glyma.18g302100</i>	57988925	57992117	+	Cdp-diacylglycerol--glycerol-3-phosphate3-phosphatidyltransferase/phosphatidylglycerophosphatesynthase
<i>Glyma.03g251500</i>	44723994	44729654	-	Serine/threonine-protein phosphatase pp1isozyme2-related
<i>Glyma.03g251600</i>	44735415	44736486	-	Peptidyl-prolylcis-transisomerase cyp18-3-related
<i>Glyma.03g253100</i>	44880486	44882438	+	Beta catenin-related armadillo repeat-containing
<i>Glyma.06g127800</i>	10493847	10506001	-	Histone-lysine n-methyl transferase atx4-related
<i>Glyma.12g193500</i>	35498865	35503832	-	Alcohol dehydrogenase related
<i>Glyma.13g162200</i>	27768047	27772562	-	Translocase of chloroplast90, chloroplastic
<i>Glyma.13g163000</i>	27833892	27837459	-	Heparanase-like protein3
<i>Glyma.13g163500</i>	27876748	27886905	+	Protein phosphatase1, regulatory subunit, and related proteins//leucine rich repeat proteins, some proteins contain f-box
<i>Glyma.13g163700</i>	27895777	27898359	-	UPF0051protein abci8, chloroplastic-related
<i>Glyma.02g237800</i>	42607230	42611324	-	RNA-binding protein-related
<i>Glyma.02g239100</i>	42754798	42755899	+	Late embryogenesis abundant(lea) hydroxyproline-richglycoprotein-related
<i>Glyma.05g223500</i>	40275557	40278080	-	40s ribosomal proteins 15a-2-related
<i>Glyma.05g224500</i>	40342583	40345336	+	Inositol oxygenase/myo-inositol oxygenase
<i>Glyma.05g225300</i>	40408912	40410821	+	Extensin-like protein-related
<i>Glyma.05g225700</i>	40432149	40439631	+	Profilin
<i>Glyma.07g078200</i>	7144509	7148052	-	Armadillo/beta-catenin repeat-containing protein-related
<i>Glyma.07g079900</i>	7266622	7267156	-	Pthr22811/pthr22811:sf68-transmembrane emp24domain-containi
<i>Glyma.07g080500</i>	7328383	7331416	-	Subtilisin-like serine protease-related
<i>Glyma.07g080600</i>	7336252	7339584	+	Disease resistance family protein/lrr family protein

<i>Glyma.07g081600</i>	7479732	7487620	+	Polygalacturonate4-alpha-galacturonosyl related
<i>Glyma.11g095600</i>	7249880	7254364	-	Hexokinase-3-related
<i>Glyma.11g095700</i>	7263413	7265368	-	Ubiquitin-conjugating enzyme E2
<i>Glyma.11g095800</i>	7267458	7279596	-	Nucleosome-remodeling factor subunit BPTF
<i>Glyma.11g209100</i>	30057154	30061089	+	Mono dehydro ascorbate reductase, cytoplasm
<i>Glyma.11g209200</i>	30063770	30065301	-	60s acidic ribosomal protein P2
<i>Glyma.11g209400</i>	30105649	30106749	-	Germin-like protein subfamily 3 member 2
<i>Glyma.11g209600</i>	30147295	30159083	+	Protease u48caaxprenyl protease RCE1
<i>Glyma.08g082000</i>	6188267	6192585	-	26s proteasome non-atpase regulatory subunit 8
<i>Glyma.08g082100</i>	6196059	6199325	+	Programmedcelldeathprotein5
<i>Glyma.08g082200</i>	6202794	6210874	+	Potassium inward rectifier (kir)-like channel 3
<i>Glyma.08g082500</i>	6244916	6252372	+	O-acetyl transferase CAS1p-like protein-related
<i>Glyma.08g093400</i>	7084753	7087202	+	Hetero dimeric geranyl pyrophosphates
<i>Glyma.08g093900</i>	7120394	7123346	-	Xylo glucan endo trans glucosylase/hydrolase
<i>Glyma.08g095400</i>	7267235	7270875	+	Isoamyl acetate-hydrolyzing esterase and related enzymes
<i>Glyma.09g051100</i>	4454515	4461881	+	Cellulose synthase a catalytic subunit7 [udp-fo
<i>Glyma.09g051900</i>	4508892	4509626	-	Vqmotif (vq)
<i>Glyma.09g052000</i>	4519979	4527492	-	E1-e2atpase (e1-e2_atpase)
<i>Glyma.09g073300</i>	7723202	7726373	+	Auxin-responsive protein-like protein-related
<i>Glyma.01g218100</i>	54819025	54824457	+	Myosin heavy chain-related protein
<i>Glyma.01g218300</i>	54838494	54842120	+	De oxynucleotidyl transferase terminal-intera
<i>Glyma.01g218400</i>	54842601	54846844	+	Kdellys-asp-glu-leu containing-related
<i>Glyma.01g220600</i>	54974523	54976556	+	Aqua porin PIP1-4-related
<i>Glyma.13g261700</i>	36553556	36556696	-	11-oxo-beta-amyrin30-oxidase/cyp72a154
<i>Glyma.13g261900</i>	36571819	36576038	+	Protease family S26 mitochondrial
<i>Glyma.13g262000</i>	36579260	36585256	-	11-oxo-beta-amyrin30-oxidase/cyp72a154
<i>Glyma.13g263600</i>	36687392	36692071	+	Mitogen-activated protein kinase18-related

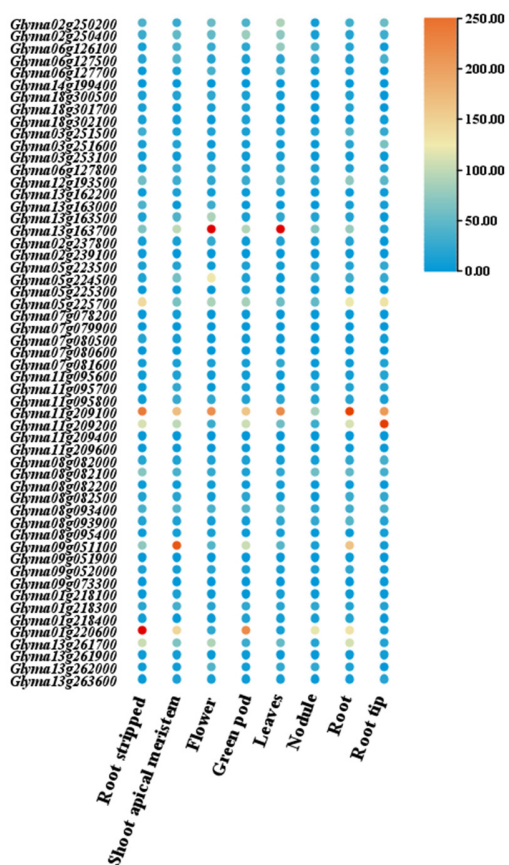
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**Figure S1.** Frequency distribution of root traits among 357 soybean landraces. (a) Average diameter (DIAM), (b) Link average diameter (LAD), (c) Link average length (LAL), (d) Total root length (LENGTH), (e) Number of forks (NF), (f) Number of tips (NT), and (g) Surface area (SA).

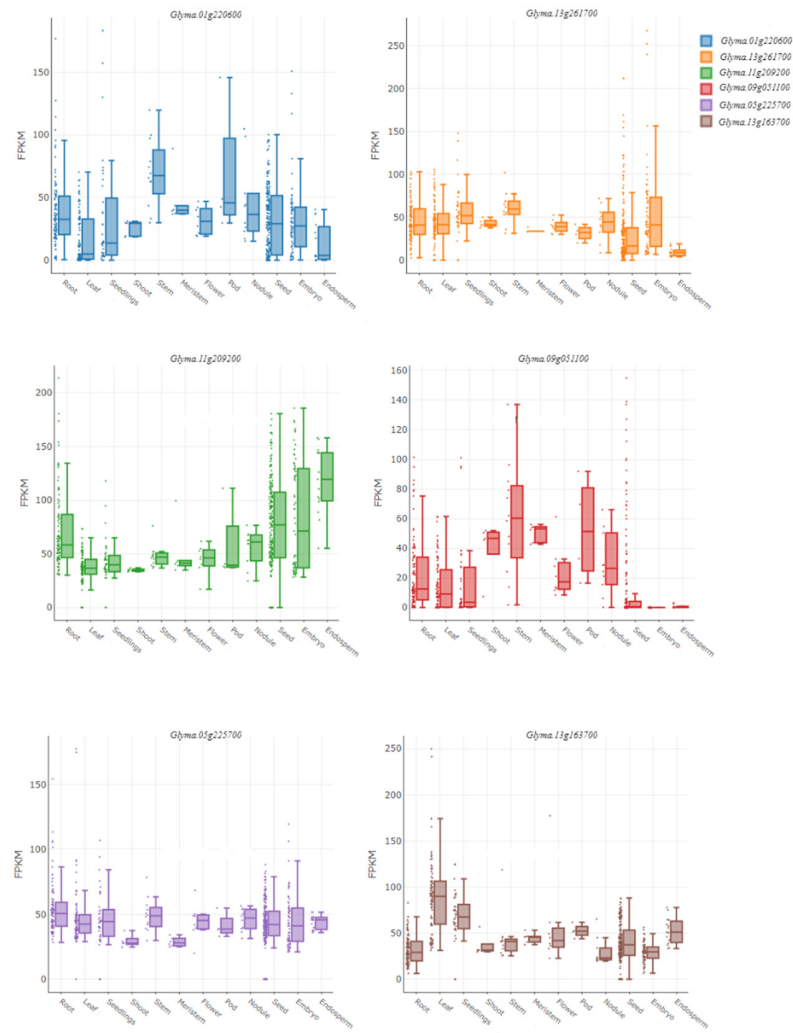


**Figure S2.** Representation of scree plot of principal component analysis. (A) The number of principal components (PCs) is on the x-axis and the associated eigenvalues are on the y-axis. (B) The number of principal components (PCs) is on the x-axis and the associated eigenvalue proportion is on the y-axis. The optimal number of principal components to explain the variation found in the genotype is found by visually determining the largest point of inflection or "elbow" of the non-linear red trend line.

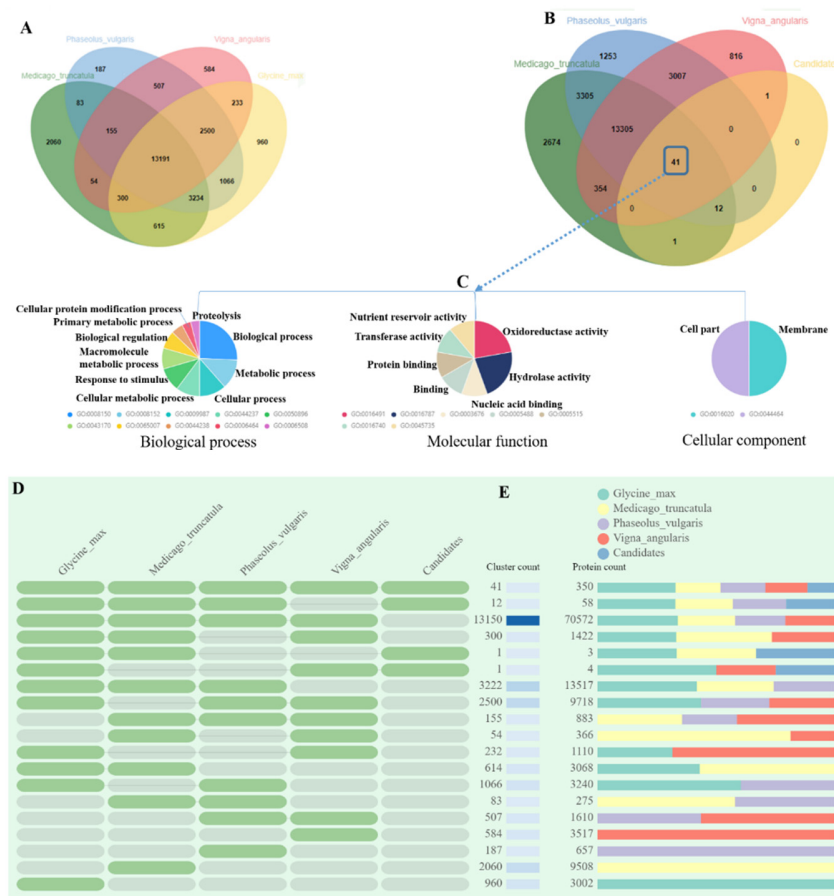


Supplemental Figure S3. Heatmap representing the expression of 55 candidate genes in various soybean plant tissue types. Data were accessed from [ePlant \(https://bar.utoronto.ca/eplant\\_soybean/\)](https://bar.utoronto.ca/eplant_soybean/) database. The level of expression showed differential patterns for selected genes.





**Figure S4. Candidate genes expression levels across 12 different tissues.**



**Figure S5. Comparative genome analysis of 55 candidate genes expressed in root tissue (A). Venn diagram representing the core orthologs and specific genes cluster for *Glycine max*, *Medicago truncatula*, *Phaseolus vulgaris* and *Vigna angularis*. (B). Venn diagram representing the core orthologs and specific genes cluster for candidate genes of candidate genes, *Medicago truncatula*, *Phaseolus vulgaris* and *Vigna angularis*. (C). Gene ontology term enrichment analysis of core candidate genes (D). Shared gene clusters of orthologous groups categories. (E). Protein families count shared between *Glycine max*, *Medicago truncatula*, *Phaseolus vulgaris* and *Vigna angularis*, and candidate genes.**