

# Annex 2

Effect of CaMV Infection and Plant  
Transformation on Gene Expression in  
*Arabidopsis thaliana*

Analysis of alteration in gene expression

The analysis of the microarray data obtained in Objective 9 showed that the expression of 358 genes was altered and could be grouped into nine clusters based on the alterations in their gene expression profiles. The nature of each gene, how it was altered (induced or reduced) and to what extent are given below. This is followed by an analysis of the groupings of the genes of known functions by molecular functions (Fig. 1), molecular processes (Fig. 2) and cellular distribution (Fig. 3).

The data presented in the chart below are as follows:

Column 1 shows the Cluster number, in numerical order of 1-9.

Column 2 shows the gene transcript ID.

Column 3 shows the gene title, which indicates a possible function, where known.

Column 4 shows the ratio of gene expression in Arabidopsis plants infected by CaMV (i) vs. that of wildtype plants (w), which were untreated [ratio = iw].

Column 5 shows the ratio of gene expression in Arabidopsis plants [Line 320B] transformed with an empty vector (e) vs. that of non-transformed wildtype plants (w) [ratio = ew].

Column 6 shows the ratio of gene expression in one line of Arabidopsis [Line 316B] transformed with the entire genome of CaMV (6) vs. that of non-transformed wildtype plants (w) [ratio = 6w].

Column 7 shows the ratio of gene expression in one line of Arabidopsis [Line 318-1] transformed with the entire genome of CaMV (8) vs. that of non-transformed wildtype plants (w) [ratio = 8w].

The colour bars show whether the alterations in the level of gene expression were more or less than two-fold. In some cases, there was no significant alteration in gene expression by a particular treatment (yellow).

	No change
	Induction Up to 1.99 fold
	Induction greater than 2 fold
	Expression Reduced to 99-50%
	Expression Reduced less than 50%

Cluster	Transcript ID(AGI)	Gene Title	ratio iw	ratio ew	ratio 6w	ratio 8w
1	At2g26780	expressed protein	1.39	0.54	0.57	0.61
1	At2g41880	guanylate kinase 1 (GK-1)	1.71	0.77	0.77	0.98
1	At2g30510	signal transducer of phototropic response (RPT2)	2.18	0.23	0.26	0.26
1	At2g30530	expressed protein	2.90	0.46	0.45	0.46
1	At2g26300	guanine nucleotide binding protein (G-protein) alpha-1 subunit / GP-alpha-1 (GPA1)	2.41	0.35	0.34	0.36
1	At2g44525	expressed protein	1.96	0.61	0.70	0.67
1	At2g23700	expressed protein	1.07	0.20	0.11	0.13
1	At2g43900	endonuclease/exonuclease/phosphatase family protein	0.99	0.13	0.16	0.19
1	At2g40960	expressed protein	1.28	0.32	0.38	0.29
1	At2g39570	ACT domain-containing protein	8.35	0.36	0.51	0.68
1	At2g26800	hydroxymethylglutaryl-CoA lyase, putative / 3-hydroxy-3-methylglutarate-CoA lyase, putative / HMG-CoA lyase, putative	1.21	0.47	0.41	0.38
1	At2g03270	DNA-binding protein, putative	2.21	0.29	0.23	0.23
1	At2g14910	expressed protein	1.50	0.39	0.37	0.41
1	At2g18110	elongation factor 1-beta, putative / EF-1-beta, putative	2.11	0.92	0.89	0.81
1	At2g03470	myb family transcription factor / ELM2 domain-containing protein	3.31	0.38	0.45	0.44
1	At2g28290	chromatin remodeling protein, putative (SYD)	1.32	0.52	0.48	0.62
1	At2g46560	transducin family protein / WD-40 repeat family protein	1.58	0.26	0.33	0.30

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1	At2g20780	mannitol transporter, putative	4.32	0.70	0.75	0.68
1	At2g22720	expressed protein	3.58	0.54	0.57	0.60
1	At2g17440	leucine-rich repeat family protein	2.87	0.35	0.31	0.33
1	At1g77130	glycogenin glucosyltransferase (glycogenin)-related	1.65	0.36	0.42	0.47
1	At1g04300	mepirin and TRAF homology domain-containing protein / MATH domain-containing protein	2.60	0.94	0.92	1.21
1	At2g07672	hypothetical protein	5.73	0.39	0.52	0.76
1	At2g40140	zinc finger (CCCH-type) family protein	1.38	0.34	0.27	0.34
1	At1g13195	zinc finger (C3HC4-type RING finger) family protein	5.90	0.81	0.72	0.81
1	At1g16260	protein kinase family protein	2.56	0.57	0.62	0.47
1	At1g13960	WRKY family transcription factor	2.20	0.78	0.74	1.00
1	At1g13980	pattern formation protein (EMB30) (GNOM)	2.09	0.33	0.37	0.36
1	At1g34780	protein disulfide isomerase-related	2.33	0.34	0.33	0.36
1	At1g74720	C2 domain-containing protein	1.53	0.53	0.61	0.69
1	At1g35590	---	3.87	0.47	0.65	0.97
1	At1g22610	C2 domain-containing protein	1.95	0.30	0.33	0.34
1	At1g80830	NRAMP metal ion transporter 1 (NRAMP1)	2.07	0.21	0.23	0.31
1	At1g04810	26S proteasome regulatory subunit, putative	1.53	0.44	0.47	0.41
1	At1g21450	scarecrow-like transcription factor 1 (SCL1)	1.17	0.61	0.55	0.70
1	At1g72400	COP1-interacting protein-related	2.09	0.31	0.43	0.32
1	At1g69360	expressed protein	4.65	0.16	0.15	0.19
1	At1g63880	disease resistance protein (TIR-NBS-LRR class), putative	4.24	0.51	0.55	0.61
1	At1g73720	transducin family protein / WD-40 repeat family protein	1.73	0.87	0.98	1.04
1	At1g67960	expressed protein	1.83	0.53	0.41	0.63
1	At1g34370	zinc finger (C2H2 type) family protein	2.51	0.67	0.62	0.72
1	At1g71410	protein kinase family protein	2.96	0.55	0.57	0.55
1	At3g01540	DEAD box RNA helicase (DRH1)	1.65	0.41	0.38	0.45
1	At3g01470	homeobox-leucine zipper protein 5 (HAT5) / HD-ZIP protein 5 / HD-ZIP protein (HB-1)	6.46	0.59	0.58	0.72
1	At3g05530	26S proteasome AAA-ATPase subunit (RPT5a)	1.71	0.76	0.76	0.76
1	At3g07870	F-box family protein	2.64	0.58	0.69	0.86
1	At3g06670	expressed protein	1.63	0.66	0.70	0.81
1	At3g27670	expressed protein	2.40	0.79	0.66	0.74
1	At3g23570	dienelactone hydrolase family protein	1.55	0.65	0.48	0.83
1	At3g25890	AP2 domain-containing transcription factor, putative	1.20	0.32	0.29	0.33
1	At3g18830	mannitol transporter, putative	1.49	0.23	0.19	0.26
1	At3g19720	dynamain family protein	1.35	0.26	0.28	0.28
1	At3g22170	far-red impaired responsive protein, putative	3.71	0.64	0.53	0.59
1	At3g29180	expressed protein	1.52	0.39	0.35	0.29
1	At1g66680	S locus-linked protein, putative	2.95	0.76	0.77	0.70
1	At1g18260	suppressor of lin-12-like protein-related / sel-1 protein-related	1.58	0.42	0.36	0.40
1	At1g58290	glutamyl-tRNA reductase 1 / GluTR (HEMA1)	1.21	0.22	0.24	0.18
1	At4g01850	S-adenosylmethionine synthetase 2 (SAM2)	1.14	0.75	0.75	0.68
1	At4g02880	expressed protein	1.20	0.63	0.56	0.61
1	At4g12340	expressed protein	2.80	0.82	0.86	0.89
1	At4g28760	expressed protein	2.62	0.43	0.45	0.43
1	At4g30200	expressed protein	1.67	0.24	0.25	0.24
1	At4g34370	IBR domain-containing protein	1.58	0.43	0.38	0.48
1	At4g34680	GATA transcription factor 3, putative (GATA-3)	1.27	0.54	0.45	0.54
1	At4g34750	auxin-responsive protein, putative / small auxin up RNA (SAUR_E)	1.40	0.33	0.36	0.36
1	At3g45630	RNA recognition motif (RRM)-containing protein	1.38	0.78	0.59	0.81
1	At3g48000	aldehyde dehydrogenase (ALDH2)	1.43	0.38	0.39	0.45

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1	At3g48790	serine C-palmitoyltransferase, putative	1.16	0.20	0.22	0.24
1	At3g50910	expressed protein	1.21	0.48	0.40	0.49
1	At3g55410	2-oxoglutarate dehydrogenase E1 component, putative / oxoglutarate decarboxylase, putative / alpha-ketoglutaric dehydrogenase, putative	0.98	0.51	0.56	0.59
1	At3g60860	guanine nucleotide exchange family protein	2.13	0.49	0.49	0.44
1	At3g60600	vesicle-associated membrane protein, putative / VAMP, putative	2.28	0.71	0.72	0.65
1	At5g11460	senescence-associated protein-related	2.50	0.28	0.27	0.24
1	At5g14430	dehydration-responsive protein-related	3.73	0.59	0.62	0.55
1	At5g18140	DNAJ heat shock N-terminal domain-containing protein	3.74	0.60	0.53	0.64
1	At5g18110	novel cap-binding protein (nCBP)	3.15	0.38	0.33	0.34
1	At5g22450	expressed protein	1.93	0.45	0.45	0.47
1	At5g39500	pattern formation protein, putative	1.63	0.33	0.40	0.39
1	At5g46410	NLI interacting factor (NIF) family protein	1.67	0.42	0.49	0.57
1	At5g47540	Mo25 family protein	1.60	0.18	0.27	0.26
1	At5g49480	sodium-inducible calcium-binding protein (ACP1) / sodium-responsive calcium-binding protein (ACP1)	1.54	0.06	0.03	0.08
1	At5g50530	CBS domain-containing protein / octicosapeptide/Phox/Bemp1 (PB1) domain-containing protein	0.89	0.24	0.29	0.23
1	At5g53170	FtsH protease, putative	1.28	0.27	0.34	0.44
1	At5g54390	inositol monophosphatase family protein	1.40	0.41	0.34	0.47
1	At5g59830	expressed protein	1.47	0.68	0.67	0.78
1	At5g60170	RNA recognition motif (RRM)-containing protein	1.35	0.57	0.59	0.63
1	At5g64270	splicing factor, putative	2.05	0.40	0.42	0.42
1	At5g64420	DNA polymerase V family	2.57	0.44	0.48	0.37
1	At5g22000	zinc finger (C3HC4-type RING finger) family protein	1.34	0.61	0.56	0.62
1	At4g14090	UDP-glucuronosyl/UDP-glucosyl transferase family protein	0.60	0.20	0.15	0.15
1	At4g15420	PRLI-interacting factor K	2.79	0.68	0.56	0.55
1	At4g16430	basic helix-loop-helix (bHLH) family protein	1.33	0.72	0.76	0.89
1	At2g40930	ubiquitin-specific protease 5, putative (UBP5)	2.92	0.81	0.71	0.80
1	At2g28680	cupin family protein	0.99	0.19	0.13	0.25
2	At2g26650	potassium channel protein 1 (AKT1)	44.13	1.14	2.10	1.43
2	At2g41900	zinc finger (CCCH-type) family protein	1.49	0.63	0.57	0.57
2	At2g30520	signal transducer of phototropic response (RPT2)	2.37	0.30	0.26	0.29
2	At2g26250	beta-ketoacyl-CoA synthase family (FIDDLEHEAD) (FDH)	2.54	1.07	1.19	0.97
2	At2g45980	expressed protein	2.30	0.55	0.53	0.59
2	At2g02870	kelch repeat-containing F-box family protein	1.55	0.75	0.66	0.67
2	At2g46900	expressed protein	2.50	0.80	0.66	0.91
2	At2g25740	ATP-dependent protease La (LON) domain-containing protein	2.12	0.81	0.69	0.74
2	At2g29670	expressed protein	2.18	0.50	0.39	0.60
2	At2g46020	transcription regulatory protein SNF2, putative	2.37	0.71	0.65	0.67
2	At2g01450	mitogen-activated protein kinase, putative / MAPK, putative (MPK17)	1.88	0.75	0.85	0.79
2	At2g01490	phytanoyl-CoA dioxygenase (PhyH) family protein	2.33	0.89	0.78	0.80
2	At2g01570	gibberellin response modulator (RGA1) / gibberellin-responsive modulator	1.86	0.44	0.47	0.53
2	At2g29180	expressed protein	2.92	0.90	0.92	0.84
2	At2g39000	GCN5-related N-acetyltransferase (GNAT) family protein	2.44	0.53	0.44	0.53
2	At2g02160	zinc finger (CCCH-type) family protein	2.32	0.41	0.42	0.45
2	At2g02090	SNF2 domain-containing protein / helicase domain-containing protein	3.24	0.33	0.29	0.33
2	At2g37850	protein kinase family protein	1.78	0.92	0.81	0.93
2	At2g37330	expressed protein	2.16	0.53	0.53	0.55
2	At2g11140	---	3.80	0.36	0.26	0.23

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2	At2g01620	expressed protein	2.70	0.58	0.43	0.59
2	At2g01650	zinc finger (C2H2 type) family protein	2.27	0.64	0.63	0.68
2	At2g01270	thioredoxin family protein	2.37	0.88	0.81	0.94
2	At2g20725	CAAX amino terminal protease family protein	2.86	0.63	0.68	0.70
2	At2g18280	tubby-like protein 2 (TULP2)	3.12	0.57	0.53	0.60
2	At1g24440	expressed protein	2.76	0.85	0.90	0.95
2	At1g08700	presenilin family protein	2.22	0.88	0.67	0.75
2	At1g69980	expressed protein	2.27	0.62	0.57	0.60
2	At1g10170	NF-X1 type zinc finger family protein	2.23	0.60	0.57	0.57
2	At1g61690	tetratricopeptide repeat (TPR)-containing protein	2.52	0.86	0.71	0.99
2	At1g60160	potassium transporter family protein	1.73	0.40	0.53	0.49
2	At1g79090	expressed protein	1.75	0.97	0.79	0.86
2	At2g24640	ubiquitin carboxyl-terminal hydrolase family protein / zinc finger (MYND type) family protein	2.15	0.49	0.53	0.53
2	At2g04160	subtilisin-like protease (AIR3)	1.87	0.43	0.37	0.34
2	At2g31350	hydroxyacylglutathione hydrolase, putative / glyoxalase II, putative	2.49	0.55	0.49	0.52
2	At2g17500	auxin efflux carrier family protein	3.87	0.77	0.75	0.89
2	At1g79520	cation efflux family protein	1.76	0.48	0.39	0.46
2	At1g14740	expressed protein	1.72	0.64	0.73	0.72
2	At1g47530	ripening-responsive protein, putative	2.04	1.05	0.96	0.84
2	At1g72940	disease resistance protein (TIR-NBS class), putative	6.63	0.60	0.59	0.72
2	At1g64040	serine/threonine protein phosphatase PP1 isozyme 3 (TOPP3) / phosphoprotein phosphatase 1	1.62	0.75	0.65	0.79
2	At1g71010	phosphatidylinositol-4-phosphate 5-kinase family protein	2.16	0.76	0.64	0.49
2	At1g56145	leucine-rich repeat family protein / protein kinase family protein	2.18	0.78	1.04	0.45
2	At1g56180	expressed protein	2.52	0.93	0.96	0.97
2	At1g33690	KH domain-containing protein	2.25	0.67	0.71	0.61
2	At1g80680	nucleoporin family protein	2.27	0.70	0.66	0.74
2	At1g15920	CCR4-NOT transcription complex protein, putative	1.91	0.81	0.76	0.84
2	At1g32740	expressed protein	6.69	0.78	2.08	0.43
2	At1g33050	expressed protein	2.58	0.72	0.60	0.61
2	At1g33110	MATE efflux family protein	2.94	0.35	0.17	0.14
2	At1g20200	26S proteasome regulatory subunit S3, putative (RPN3)	1.55	0.92	0.84	0.80
2	At1g12910	flower pigmentation protein (AN11)	2.17	0.88	0.80	0.76
2	At3g26618	eukaryotic release factor 1 family protein / eRF1 family protein	2.21	0.58	0.59	0.67
2	At1g19680	expressed protein	4.19	0.62	0.41	0.40
2	At1g07530	scarecrow-like transcription factor 14 (SCL14)	1.60	0.64	0.59	0.63
2	At1g06110	F-box family protein	2.88	0.91	0.76	0.73
2	At1g02500	S-adenosylmethionine synthetase 1 (SAM1)	1.75	0.88	0.82	0.80
2	At1g49240	actin 8 (ACT8)	1.56	0.77	0.79	0.70
2	At1g49200	zinc finger (C3HC4-type RING finger) family protein	2.60	0.71	0.56	0.84
2	At1g53310	phosphoenolpyruvate carboxylase, putative / PEP carboxylase, putative (PPC1)	1.17	0.66	0.54	0.55
2	At2g43680	calmodulin-binding family protein	2.51	0.39	0.39	0.38
2	At2g41710	ovule development protein, putative	1.42	0.69	0.57	0.58
2	At1g47270	F-box family protein / tubby family protein	3.41	1.01	0.92	1.04
2	At1g68140	expressed protein	2.08	0.88	0.95	0.78
2	At1g72390	expressed protein	1.57	0.67	0.57	0.62
2	At1g69270	leucine-rich repeat family protein / protein kinase family protein	4.49	0.50	0.40	0.50
2	At1g76400	ribophorin I family protein	1.92	0.65	0.61	0.54
2	At1g29350	expressed protein	1.96	0.91	0.83	0.78
2	At1g77480	nucellin protein, putative	1.96	0.46	0.57	0.49

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2	At1g63170	zinc finger (C3HC4-type RING finger) family protein	2.29	0.47	0.54	0.45
2	At1g15750	WD-40 repeat family protein	1.65	0.47	0.55	0.57
2	At5g15080	protein kinase, putative	1.90	0.87	0.79	0.89
2	At3g11540	gibberellin signal transduction protein (SPINDLY)	1.91	0.55	0.58	0.63
2	At3g07790	DGCR14-related	2.10	0.86	0.86	0.92
2	At3g01770	DNA-binding bromodomain-containing protein	2.26	0.50	0.46	0.47
2	At3g10630	glycosyl transferase family 1 protein	3.28	0.80	0.82	0.98
2	At3g09840	cell division cycle protein 48 (CDC48A) (CDC48)	1.45	0.83	0.74	0.73
2	At3g04470	expressed protein	2.47	0.76	0.81	0.79
2	At3g04350	expressed protein	2.73	0.51	0.48	0.51
2	At3g06960	expressed protein	3.38	0.88	0.84	0.88
2	At3g17510	CBL-interacting protein kinase 1 (CIPK1)	2.86	0.29	0.25	0.30
2	At3g22680	expressed protein	1.59	0.87	0.85	0.79
2	At3g15880	WD-40 repeat family protein	1.53	0.47	0.39	0.42
2	At3g27700	RNA recognition motif (RRM)-containing protein	1.64	0.76	0.83	0.84
2	At3g17850	protein kinase, putative	1.71	0.87	0.88	0.81
2	At3g27530	vesicle tethering family protein	1.53	0.59	0.68	0.67
2	At3g19910	zinc finger (C3HC4-type RING finger) family protein	1.81	0.96	0.75	0.77
2	At3g27090	expressed protein	1.43	0.63	0.56	0.69
2	At3g13290	transducin family protein / WD-40 repeat family protein	1.27	0.66	0.59	0.62
2	At3g24200	monooxygenase family protein	1.45	0.74	0.71	0.64
2	At3g24315	sec20 family protein	2.10	0.69	0.60	0.59
2	At3g15290	3-hydroxybutyryl-CoA dehydrogenase, putative	2.03	0.99	0.99	1.16
2	At3g19100	calcium-dependent protein kinase, putative / CDPK, putative	2.77	0.70	0.84	0.64
2	At3g19190	expressed protein	1.44	0.56	0.52	0.54
2	At3g14090	exocyst subunit EXO70 family protein	1.91	0.60	0.67	0.65
2	At3g18970	pentatricopeptide (PPR) repeat-containing protein	3.42	0.90	1.13	1.14
2	At3g22150	pentatricopeptide (PPR) repeat-containing protein	2.61	0.83	0.83	0.68
2	At1g33250	fringe-related protein	1.78	0.51	0.56	0.57
2	At1g18160	protein kinase family protein	2.87	0.91	0.78	0.93
2	At2g33630	3-beta hydroxysteroid dehydrogenase/isomerase family protein	1.86	0.58	0.60	0.62
2	At4g00730	anthocyaninless2 (ANL2)	2.90	0.40	0.43	0.48
2	At4g01860	transducin family protein / WD-40 repeat family protein	1.60	0.57	0.42	0.44
2	At4g01810	protein transport protein-related	1.84	0.61	0.54	0.58
2	At4g02470	AAA-type ATPase family protein	1.56	0.76	0.77	0.76
2	At4g11420	eukaryotic translation initiation factor 3 subunit 10 / eIF-3 theta / eIF3a (TIF3A1)	1.71	0.75	0.92	0.79
2	At4g17890	human Rev interacting-like family protein / hRIP family protein	1.64	0.64	0.58	0.48
2	At4g24370	expressed protein	3.96	0.68	0.62	0.55
2	At4g24520	NADPH-cytochrome p450 reductase, putative / NADPH-ferrihemoprotein reductase, putative	1.97	0.89	1.07	0.90
2	At4g26180	mitochondrial substrate carrier family protein	3.75	0.44	0.46	0.44
2	At4g26400	zinc finger (C3HC4-type RING finger) family protein	2.67	0.49	0.44	0.45
2	At4g26650	RNA recognition motif (RRM)-containing protein	2.43	0.51	0.60	0.57
2	At4g27750	expressed protein	2.62	0.60	0.58	0.60
2	At4g27880	seven in absentia (SINA) family protein	1.71	0.67	0.55	0.61
2	At4g32910	expressed protein	2.59	1.16	0.90	1.04
2	At4g34860	beta-fructofuranosidase, putative / invertase, putative / saccharase, putative / beta-fructosidase, putative	3.29	0.80	0.65	0.78
2	At4g38050	xanthine/uracil permease family protein	3.88	0.74	0.72	0.70
2	At4g38680	cold-shock DNA-binding family protein	1.82	1.25	1.83	1.34
2	At4g38800	phosphorylase family protein	1.51	1.07	0.90	0.97

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2	At4g39050	kinesin-related protein (MKRP2)	2.38	0.65	0.68	0.63
2	At3g45830	expressed protein	2.16	0.77	0.52	0.60
2	At3g47610	expressed protein	2.14	0.98	0.72	0.79
2	At3g47730	ABC transporter family protein	1.85	0.59	0.54	0.63
2	At3g48490	expressed protein	6.27	0.91	0.94	0.69
2	At3g60310	expressed protein	2.91	0.68	0.82	0.59
2	At3g60250	casein kinase II beta chain, putative (CKB3)	3.02	0.59	0.61	0.63
2	At3g61580	delta-8 sphingolipid desaturase (SLD1)	2.49	0.82	1.24	0.97
2	At3g62240	zinc finger (C2H2 type) family protein	1.88	0.78	0.69	0.72
2	At5g02500	heat shock cognate 70 kDa protein 1 (HSC70-1) (HSP70-1)	1.17	0.88	0.93	0.74
2	At5g03540	exocyst subunit EXO70 family protein	2.70	0.82	0.88	0.72
2	At5g04910	hypothetical protein	2.89	0.83	0.74	0.70
2	At5g05680	nuclear pore complex protein-related	2.29	0.56	0.52	0.40
2	At5g05750	---	3.52	0.36	0.44	0.41
2	At5g06260	nucleolar protein-related	1.48	0.90	0.79	0.81
2	At5g07940	expressed protein	2.03	0.63	0.71	0.79
2	At5g08550	expressed protein	2.22	0.64	0.54	0.62
2	At5g08560	transducin family protein / WD-40 repeat family protein	1.55	1.01	0.90	1.06
2	At5g11890	expressed protein	2.53	1.34	1.26	1.24
2	At5g13010	RNA helicase, putative	1.76	0.87	0.65	0.84
2	At5g13770	pentatricopeptide (PPR) repeat-containing protein	2.67	0.45	0.41	0.47
2	At5g16320	expressed protein	2.39	0.78	0.75	0.73
2	At5g17290	autophagy protein Apg5 family	2.98	0.36	0.32	0.32
2	At5g40740	expressed protein	2.43	0.54	0.41	0.28
2	At5g45250	disease resistance protein (TIR-NBS-LRR class), putative (RPS4)	2.47	0.54	0.48	0.60
2	At5g46250	RNA recognition motif (RRM)-containing protein	2.25	0.64	0.53	0.71
2	At5g46840	RNA recognition motif (RRM)-containing protein	4.43	0.99	0.72	0.86
2	At5g46850	expressed protein	2.06	0.79	0.85	0.78
2	At5g47040	Lon protease homolog 1, mitochondrial (LON)	2.07	0.52	0.45	0.54
2	At5g47680	expressed protein	3.19	1.00	1.19	1.00
2	At5g53360	seven in absentia (SINA) family protein	3.74	0.71	0.55	0.78
2	At5g53570	RabGAP/TBC domain-containing protein	1.68	0.94	0.91	0.98
2	At5g55540	expressed protein	1.81	0.72	0.72	0.64
2	At5g55850	nitrate-responsive NOI protein, putative	1.70	0.84	0.74	0.87
2	At5g55930	oligopeptide transporter OPT family protein	4.75	0.63	0.48	0.42
2	At5g57610	protein kinase family protein	1.67	0.65	0.49	0.65
2	At5g57870	eukaryotic translation initiation factor 4F, putative / eIF-4F, putative	1.74	0.74	0.85	0.79
2	At5g58410	expressed protein	1.85	0.60	0.59	0.57
2	At5g60450	auxin-responsive factor (ARF4)	1.85	0.54	0.40	0.54
2	At5g65950	expressed protein	1.84	0.75	0.79	0.79
2	At5g67260	cyclin family protein	2.93	0.41	0.36	0.31
2	At5g67330	NRAMP metal ion transporter 4 (NRAMP4)	2.24	0.56	0.57	0.67
2	At5g26210	PHD finger family protein	1.42	0.73	0.68	0.69
2	At5g27670	histone H2A, putative	3.79	1.40	1.53	1.20
2	At5g15460	expressed protein	2.36	1.14	0.94	1.08
2	At5g16880	VHS domain-containing protein / GAT domain-containing protein	1.43	0.64	0.68	0.68
2	At5g20520	expressed protein	3.20	0.73	0.63	0.72
2	At5g08340	riboflavin biosynthesis protein-related	3.27	0.89	1.11	0.91
2	At5g13100	expressed protein	2.07	0.58	0.65	0.48
2	At5g20660	24 kDa vacuolar protein, putative	2.07	1.04	0.93	0.98

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2	At1g45976	expressed protein	1.97	0.62	0.51	0.56
2	At4g17790	expressed protein	3.25	0.46	0.40	0.39
2	At4g17486	expressed protein	2.05	1.10	0.81	0.90
2	At4g16780	homeobox-leucine zipper protein 4 (HAT4) / HD-ZIP protein 4	8.76	0.21	0.24	0.31
2	At2g47420	dimethyladenosine transferase, putative	3.37	0.42	0.40	0.39
2	At2g41630	transcription initiation factor IIB-1 / general transcription factor TFIIB-1 (TFIIB1)	2.18	0.89	0.88	0.92
2	At1g63850	PRLI-interacting factor-related	3.11	0.95	0.96	1.02
2	At1g12340	cornichon family protein	2.03	1.00	0.81	0.90
3	At1g03420	expressed protein	5.92	0.35	2.16	1.70
3	At2g03820	nonsense-mediated mRNA decay NMD3 family protein	1.72	0.59	0.74	0.69
3	At1g64060	respiratory burst oxidase protein F (RbohF) (RbohAp108) / NADPH oxidase	1.39	0.39	0.53	0.53
3	At1g79670	wall-associated kinase, putative	2.84	0.45	0.63	0.56
3	At3g17650	oligopeptide transporter OPT family protein	2.35	0.46	0.81	0.75
3	At1g29900	carbamoyl-phosphate synthase family protein	2.45	0.52	0.69	0.62
3	At4g07410	transducin family protein / WD-40 repeat family protein	2.92	0.30	0.71	0.67
3	At3g54920	pectate lyase, putative / powdery mildew susceptibility protein (PMR6)	1.70	0.44	0.61	0.65
3	At5g53770	nucleotidyltransferase family protein	3.44	0.28	0.80	0.37
3	At4g37190	expressed protein	1.98	0.45	0.69	0.59
4	At2g16010	hypothetical protein	12.45	16.24	14.11	7.11
4	At1g80410	acetyltransferase-related	1.52	1.38	1.40	1.32
4	At4g24050	short-chain dehydrogenase/reductase (SDR) family protein	5.31	5.80	2.08	5.44
4	At5g02560	histone H2A, putative	2.73	4.26	4.29	4.33
5	At1g04630	expressed protein	4.44	4.83	0.69	0.89
5	At1g79630	protein phosphatase 2C family protein / PP2C family protein	2.16	0.99	0.12	0.10
5	At1g68460	adenylate isopentenyltransferase 1 / cytokinin synthase (IPT1)	0.62	1.81	0.17	1.46
5	At4g40090	arabinogalactan-protein (AGP3)	0.93	2.64	0.20	1.80
5	At5g54060	glycosyltransferase family protein	0.71	1.32	0.10	0.21
5	At5g65280	lanthionine synthetase C-like family protein	0.92	1.11	0.40	0.84
5	At2g40830	zinc finger (C3HC4-type RING finger) family protein	0.87	0.82	0.60	0.69
5	At2g40890	cytochrome P450 98A3, putative (CYP98A3)	1.14	0.86	0.66	0.74
6	At5g58750	wound-responsive protein-related	3.79	8.86	3.81	1.12
6	At1g52250	dynein light chain type 1 family protein	1.96	3.79	3.64	0.57
7	At2g44310	calcium-binding EF hand family protein	0.65	1.15	1.17	1.14
7	At2g44870	expressed protein	0.66	1.15	1.18	1.23
7	At2g24020	expressed protein	0.55	1.18	1.56	1.10
7	At2g20890	expressed protein	0.52	1.30	1.33	1.22
7	At2g16740	ubiquitin-conjugating enzyme, putative	0.65	0.90	0.66	1.14
7	At2g43020	amine oxidase family protein	0.51	1.12	0.83	0.97
7	At1g05030	hexose transporter, putative	0.53	1.05	0.84	1.24
7	At1g77090	thylakoid lumenal 29.8 kDa protein	0.43	1.11	1.14	1.27
7	At1g70330	equilibrative nucleoside transporter family protein	0.68	1.13	1.05	1.05
7	At1g54520	expressed protein	0.58	0.94	0.98	1.07
7	At1g68570	proton-dependent oligopeptide transport (POT) family protein	0.31	0.51	0.49	0.65
7	At1g52590	expressed protein	0.36	0.88	0.69	1.00
7	At1g02475	expressed protein	0.53	1.10	0.93	1.06
7	At1g70740	protein kinase family protein	0.41	0.82	0.85	0.93
7	At1g36390	co-chaperone grpE family protein	0.75	1.36	1.47	1.33
7	At3g05350	aminopeptidase P, cytosolic, putative	0.59	1.16	1.04	1.10
7	At3g10350	anion-transporting ATPase family protein	0.61	0.87	1.02	1.05



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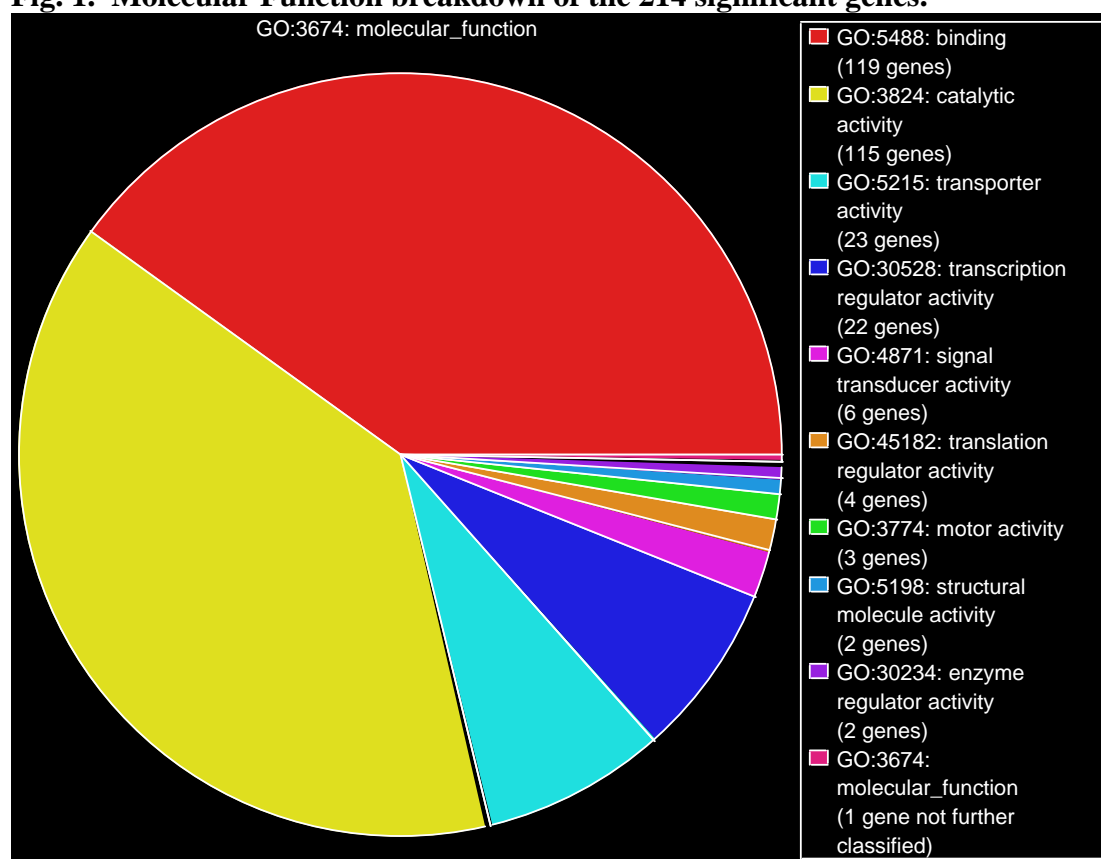
7	At3g05490	rapid alkalization factor (RALF) family protein	0.61	1.24	1.62	1.52
7	At3g09250	expressed protein	0.65	1.01	0.93	1.08
7	At3g08550	elongation defective 1 protein / ELD1 protein	0.61	0.98	1.30	1.02
7	At3g23400	plastid-lipid associated protein PAP / fibrillin family protein	0.31	0.90	0.80	0.96
7	At3g19480	D-3-phosphoglycerate dehydrogenase, putative / 3-PGDH, putative	0.27	0.94	1.05	0.97
7	At3g27540	glycosyl transferase family 17 protein	0.31	0.82	0.96	0.98
7	At3g25540	longevity-assurance (LAG1) family protein	0.68	1.29	1.18	1.15
7	At3g24160	expressed protein	0.74	1.18	1.36	1.29
7	At3g27890	NADPH-dependent FMN reductase family protein	0.52	0.83	0.67	0.70
7	At1g66130	oxidoreductase N-terminal domain-containing protein	0.53	0.85	1.02	1.25
7	At1g33340	epsin N-terminal homology (ENTH) domain-containing protein / clathrin assembly protein-related	0.26	1.34	1.06	1.24
7	At4g18240	starch synthase-related protein	0.59	0.98	1.08	1.15
7	At4g23420	short-chain dehydrogenase/reductase (SDR) family protein	0.48	1.01	0.87	1.33
7	At4g29120	---	0.57	1.04	0.90	1.06
7	At4g33530	potassium transporter family protein	0.66	1.11	1.32	1.06
7	At4g38100	expressed protein	0.71	1.23	1.64	1.24
7	At3g50060	myb family transcription factor	0.16	0.20	0.21	0.20
7	At3g50830	stress-responsive protein, putative	0.63	1.31	1.33	1.39
7	At5g03120	expressed protein	0.42	1.03	1.67	1.40
7	At5g03900	expressed protein	0.53	1.08	0.99	1.10
7	At5g11840	expressed protein	0.47	1.15	0.92	1.18
7	At5g18520	expressed protein	0.91	1.26	1.36	1.29
7	At5g22830	magnesium transporter CorA-like family protein	0.65	0.94	1.04	1.00
7	At5g23440	ferredoxin-thioredoxin reductase, putative	0.51	1.26	0.93	1.07
7	At5g23920	expressed protein	0.53	0.93	1.08	1.04
7	At5g38350	disease resistance protein (NBS-LRR class), putative	0.63	1.69	1.74	1.69
7	At5g41210	glutathione S-transferase (GST10)	0.67	0.91	0.93	1.01
7	At5g42980	thioredoxin H-type 3 (TRX-H-3) (GIF1)	0.55	0.98	0.79	1.04
7	At5g45390	ATP-dependent Clp protease proteolytic subunit (ClpP4)	0.66	1.20	1.17	1.11
7	At5g52030	TraB protein-related	0.45	0.94	0.92	1.08
7	At5g54660	heat shock protein-related	0.43	0.70	0.58	0.84
7	At5g56280	COP9 signalosome subunit 6 / CSN subunit 6 (CSN6A)	0.82	1.32	1.22	1.18
7	At5g59890	actin-depolymerizing factor 4 (ADF4)	0.57	0.94	0.89	0.96
7	At5g65990	amino acid transporter family protein	0.68	1.08	1.19	1.32
7	At5g14970	expressed protein	0.49	1.11	1.12	1.33
7	At5g19370	rhodanese-like domain-containing protein / PPIC-type PPIASE domain-containing protein	0.62	0.97	0.97	0.95
7	At1g32200	glycerol-3-phosphate acyltransferase, chloroplast (ATS1)	0.55	1.16	1.25	1.15
7	At4g14910	imidazoleglycerol-phosphate dehydratase, putative	0.61	1.40	1.45	1.47
7	clpP	---	0.92	1.65	1.63	1.50
8	At2g31170	tRNA synthetase class I (C) family protein	0.75	0.89	1.47	1.18
8	At2g16280	very-long-chain fatty acid condensing enzyme, putative	0.98	1.00	1.70	1.30
9	At1g34300	lectin protein kinase family protein	1.09	0.11	0.11	0.10
9	At4g34450	coatamer gamma-2 subunit, putative / gamma-2 coat protein, putative / gamma-2 COP, putative	1.41	0.45	0.46	0.37
9	At4g35600	protein kinase family protein	1.83	0.16	0.15	0.15
9	At5g42950	GYF domain-containing protein	1.82	0.17	0.17	0.18
9	At5g51430	conserved oligomeric Golgi complex component-related / COG complex component-related	1.13	0.14	0.12	0.12
9	At5g54310	ARF GAP-like zinc finger-containing protein ZIGA3 (ZIGA3)	1.27	0.30	0.29	0.33

Of the 358 genes altered in their expression, 144 are unknown with respect to their putative molecular function, while 179 are unknown with respect to a specific putative biological process. Of the remaining 214 genes for which a putative molecular function can be ascribed [See Fig. 1 below], 119 encode binding proteins and 115 encode some sort of catalytic activity (there is overlap between these groupings), while 23 genes encode proteins with transporter activity, 22 genes encode proteins with transcription regulatory activity, six genes encode proteins with signal transducer activity, four genes encode proteins with translational regulatory activity, three genes encode proteins with motor activity, two genes encode proteins with structural molecular and enzyme regulator activities, and two genes each encode proteins with structural molecular and enzyme regulator activities.

Of the 179 genes involved in various biological processes [see Fig. 2 below], 162 are involved in physiological processes, 152 are involved in cellular processes (again, there is overlap between these groupings) and 14 are specifically involved in plant development.

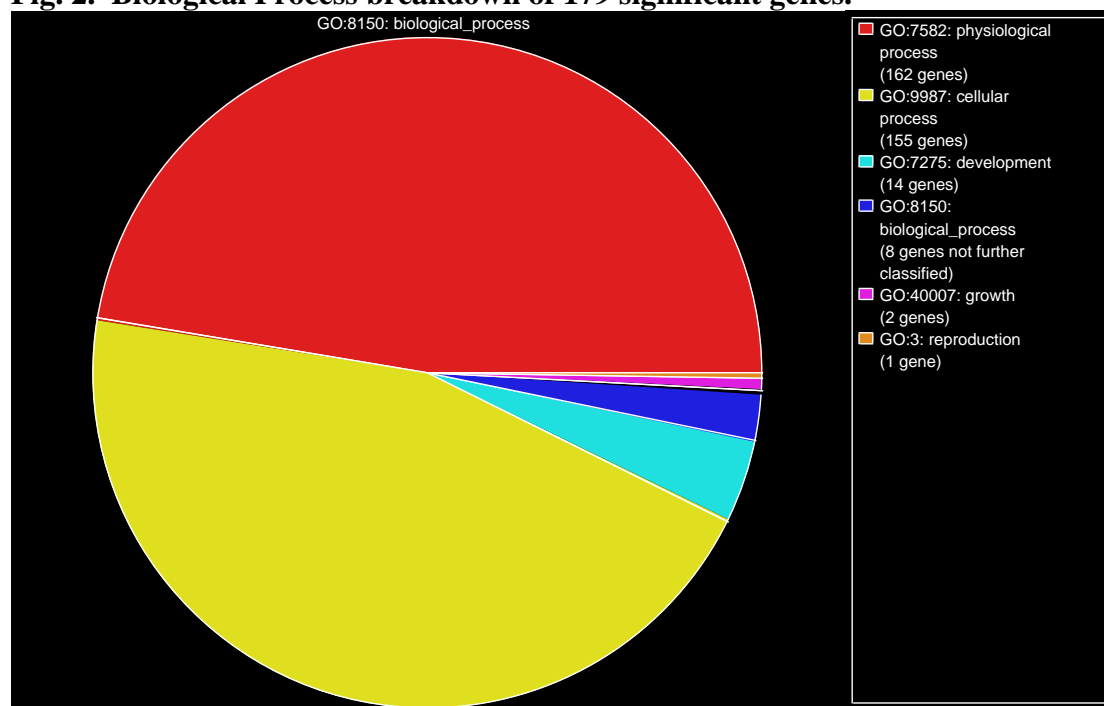
Of the 185 genes grouped by cellular distribution [see Fig. 3 below], only two are extracellular and the remainder are cellular. Thirty-five genes encode factors associated with the nucleus while 110 genes encode factors that are cytoplasmic. Of these, the largest number are associated with the plastids (62) and the mitochondria (32). Overall, 56 gene products are associated with membranes.

**Fig. 1. Molecular Function breakdown of the 214 significant genes.**



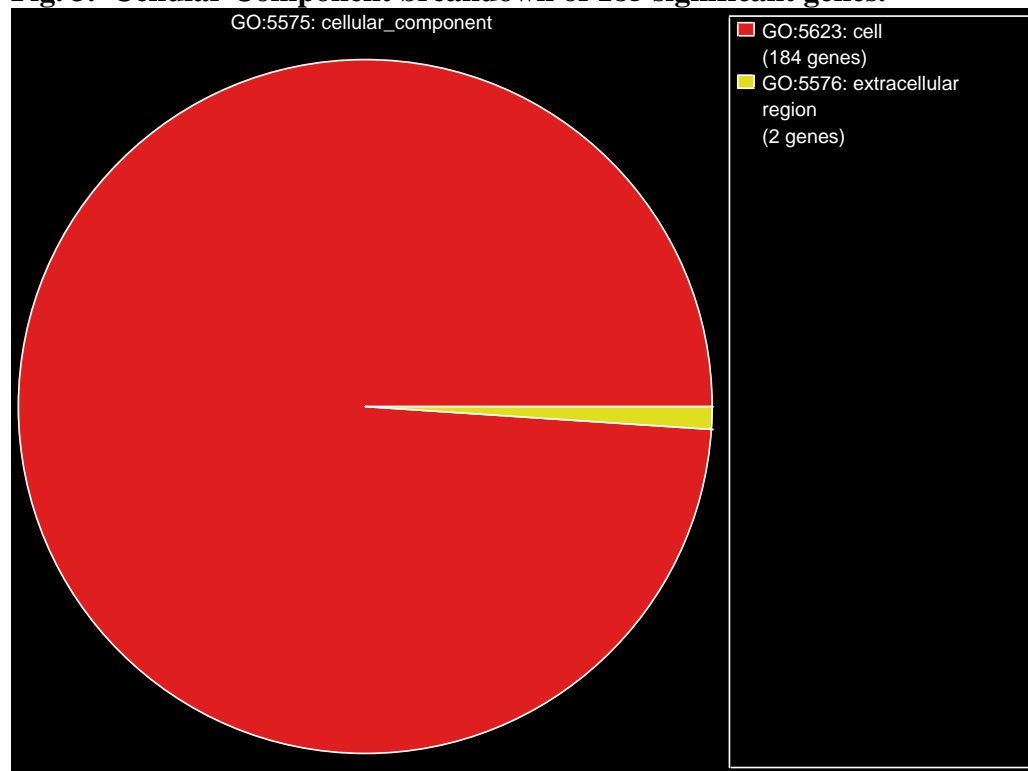
Category	Genes in Category	% of Genes in Category	Genes in List in Category	% of Genes in List in Category
GO:3674: molecular_function not classed further	12276	100	1	100
GO:3774: motor activity	85	0.692	3	1.402
GO:3824: catalytic activity	6738	54.89	115	53.74
→GO:16740: transferase activity	2265	18.45	40	18.69
→GO:16787: hydrolase activity	2195	17.88	32	14.95
GO:4871: signal transducer activity	303	2.468	6	2.804
→GO:4872: receptor activity	161	1.312	2	0.935
GO:5198: structural molecule activity	404	3.291	2	0.935
GO:5215: transporter activity	1281	10.43	23	10.75
GO:5488: binding	6190	50.42	119	55.61
→GO:166: nucleotide binding	1676	13.65	35	16.36
→GO:3676: nucleic acid binding	2563	20.88	49	22.9
→→GO:3677: DNA binding	1820	14.83	31	14.49
→→→GO:3700: transcription factor activity	1356	11.05	20	9.346
→→GO:3723: RNA binding	385	3.136	8	3.738
→→GO:8135: translation factor activity, nucleic acid binding	101	0.823	4	1.869
→GO:5515: protein binding	1207	9.832	30	14.02
→GO:30246: carbohydrate binding	84	0.684	1	0.467
GO:30234: enzyme regulator activity	191	1.556	2	0.935
GO:30528: transcription regulator activity	1478	12.04	22	10.28
GO:45182: translation regulator activity	101	0.823	4	1.869

**Fig. 2. Biological Process breakdown of 179 significant genes.**



Category	Genes in Category	% of Genes in Category	Genes in List in Category	% of Genes in List in Category
GO:8150: biological_process	10203	99.99	179	100
GO:3: reproduction	103	1.009	1	0.559
GO:7275: development	436	4.273	14	7.821
→GO:9653: morphogenesis	142	1.392	6	3.352
→GO:9791: post-embryonic development	83	0.813	3	1.676
→→GO:9908: flower development	43	0.421	1	0.559
→GO:30154: cell differentiation	41	0.402	1	0.559
GO:7582: physiological process	9350	91.63	162	90.5
→GO:8152: metabolism	7456	73.07	128	71.51
→→GO:9056: catabolism	409	4.008	13	7.263
→→GO:9058: biosynthesis	1388	13.6	23	12.85
→→GO:19748: secondary metabolism	227	2.225	5	2.793
→GO:15979: photosynthesis	58	0.568	2	1.117
→GO:16265: death	224	2.195	3	1.676
→→GO:8219: cell death	176	1.725	3	1.676
GO:9987: cellular process	8584	84.12	155	86.59
→GO:7154: cell communication	681	6.674	11	6.145
→→GO:7165: signal transduction	615	6.027	10	5.587
→→GO:7267: cell-cell signaling	12	0.118	1	0.559
GO:40007: growth	78	0.764	2	1.117
→GO:16049: cell growth	59	0.578	2	1.117

**Fig. 3. Cellular Component breakdown of 185 significant genes.**



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Category	Genes in Category	% of Genes in Category	Genes in List in Category	% of Genes in List in Category
GO:5575: cellular_component	12760	99.95	185	100
GO:5576: extracellular region	93	0.728	2	1.081
GO:5623: cell	12694	99.44	184	99.46
→GO:5622: intracellular	8294	64.97	145	78.38
→→GO:5634: nucleus	1577	12.35	35	18.92
→→→GO:5654: nucleoplasm	57	0.446	2	1.081
→→→GO:5730: nucleolus	58	0.454	2	1.081
→→GO:5737: cytoplasm	6551	51.32	110	59.46
→→→GO:5739: mitochondrion	2673	20.94	32	17.3
→→→GO:5773: vacuole	31	0.243	1	0.541
→→→GO:5783: endoplasmic reticulum	79	0.619	3	1.622
→→→GO:5794: Golgi apparatus	51	0.399	1	0.541
→→→GO:5829: cytosol	133	1.042	1	0.541
→→→GO:9536: plastid	3209	25.14	62	33.51
→→GO:5856: cytoskeleton	129	1.01	3	1.622
→→GO:9579: thylakoid	115	0.901	3	1.622
→GO:16020: membrane	5214	40.84	56	30.27
→→GO:5886: plasma membrane	172	1.347	7	3.784
→GO:30312: external encapsulating structure	81	0.634	1	0.541
→→GO:5618: cell wall	79	0.619	1	0.541