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Theobroma cacao L. pathogenesis-related gene tandem array members show diverse expression dynamics in response to pathogen colonization

Andrew S. Fister[1], Luis C. Mejia[2,3], Yufan Zhang[4], Edward Allen Herre[3], Siela N. Maximova[1,5] and Mark J. Guiltinan[1,5*]

Abstract

Background: The pathogenesis-related (PR) group of proteins are operationally defined as polypeptides that increase in concentration in plant tissues upon contact with a pathogen. To date, 17 classes of highly divergent proteins have been described that act through multiple mechanisms of pathogen resistance. Characterizing these families in cacao, an economically important tree crop, and comparing the families to those in other species, is an important step in understanding cacao's immune response.

Results: Using publically available resources, all members of the 17 recognized pathogenesis-related gene families in the genome of *Theobroma cacao* were identified and annotated resulting in a set of ~350 members in both published cacao genomes. Approximately 50 % of these genes are organized in tandem arrays scattered throughout the genome. This feature was observed in five additional plant taxa (three dicots and two monocots), suggesting that tandem duplication has played an important role in the evolution of the PR genes in higher plants. Expression profiling captured the dynamics and complexity of PR genes expression at basal levels and after induction by two cacao pathogens (the oomycete, *Phytophthora palmivora*, and the fungus, *Colletotrichum theobromicola*), identifying specific genes within families that are more responsive to pathogen challenge. Subsequent qRT-PCR validated the induction of several PR-1, PR-3, PR-4, and PR-10 family members, with greater than 1000 fold induction detected for specific genes.

Conclusions: We describe candidate genes that are likely to be involved in cacao's defense against *Phytophthora* and *Colletotrichum* infection and could be potentially useful for marker-assisted selection for breeding of disease resistant cacao varieties. The data presented here, along with existing cacao—omics resources, will enable targeted functional genetic screening of defense genes likely to play critical functions in cacao's defense against its pathogens.

Keywords: Pathogenesis-related, PR genes, PR proteins, Gene duplication, Tandem arrays, Disease resistance, Pathogen, *Phytophthora*, *Colletotrichum*

Background

Plant-microbe interactions leading to pathogenesis or immunity rely on a complex series of interactions between host and microbial molecules. The process begins when plant membrane-bound pattern recognition receptors (PRRs) detect microbial- or pathogen-associated molecular patterns (MAMPs or PAMPs) [1], or intracellular R genes bind secreted microbial effector proteins [2–4]. Recognition of pathogen presence activates multiple signal transduction cascades, including several interacting phytohormone signaling systems [5], which organize local and systemic responses to the infection including the activation of genes encoding antimicrobial proteins and enzymes involved in the synthesis of secondary metabolites with antimicrobial activities [3, 6–9]. Ultimately, the plant's survival hinges on its ability to rapidly produce peptides and chemicals with antimicrobial properties. Understanding this process

* Correspondence: mjg9@psu.edu
[1]The Huck Institutes of the Life Sciences, The Pennsylvania State University, 422 Life Sciences Building, University Park 16802, PA, USA
[5]The Department of Plant Science, The Pennsylvania State University, 422 Life Sciences Building, University Park 16802, PA, USA
Full list of author information is available at the end of the article

is integral to breeding for or engineering more resistant plant cultivars, a dire need for improved global food security and sustainable agriculture.

Pathogenesis-related (PR) proteins, or as they have more recently been called, inducible defense-related proteins, have long been studied with regard to their importance in plant immunity [10, 11]. The 17 families of genes that fall under the broad 'PR' classification encode a group of proteins with various antimicrobial properties and that were originally identified because certain family members show strong induction in response to biotic stress associated with activation of systemic acquired resistance signaling [10]. Table 1 summarizes the roles of the 17 most commonly acknowledged PR families based on extensive work in a variety of species. Overall, the PR families encode a diverse array of proteins involved in pathogen defense though multiple mechanisms.

A better understanding of the defense response in crop plants is integral to increasing the sustainability of food and feed production. Cacao production around the world is severely inhibited by cacao's susceptibility to pathogens, with roughly 40 % of the crop lost annually, accounting for a multi-billion dollar loss of cocoa trade and chocolate industry annually [12]. Two high-quality cacao genome sequences have been acquired, that of the fine-flavor Belizean Criollo genotype [13] and the widely-cultivated Matina genotype [14]. These resources enable new genome-wide strategies for characterizing the cacao defense response. To date, a handful of cacao PR genes have been studied, providing strong evidence that they play important roles in the response of cacao plants to pathogen infection. Application of glycerol to cacao leaves was recently found to promote defense and induce PR genes, likely through a fatty-acid-related signaling pathway [15]. The PR-1 s of cacao were recently identified, with at least one showing induction by *Moniliopthora perniciosa*, the causal agent of cacao's witches broom disease [16]. Specific members of the PR-3 [17, 18],PR-4 [19], and PR-10 [20, 21] families have also been the subject of functional characterization, focusing on enzymatic properties and roles in defense. The results of a recent RNA-seq study measuring induction of genes by witches' broom revealed that PR gene expression was elevated in infected tissues, but their induction (and induction of other known defense-related genes) was not sufficient to halt disease progression [22]. A study by our group used a microarray to measure the effect of salicylic acid treatment on two cacao genotypes [23]. Notably we found that PR gene induction levels differed between two contrasting genotypes, and surprisingly that more PR family members were induced in the more susceptible variety, ICS1, indicating that PR induction is only one piece of a successful defense response. Previously generated EST libraries [24, 25] and focused gene expression measurements [19, 23] have begun to characterize genotype specificity of the defense response in cacao, but much more work is required to characterize defense mechanisms across the described cacao populations [26]. Much more work is required to characterize the tissue specificity, induction, and function of these genes in cacao to understand and harness their potential for combating the diversity of cacao pathogens.

Table 1 Summary of PR gene families and their functions

PR gene class	Common name	Function	References
PR-1	None (CAP/SCP superfamily)	Unknown.	[10, 11, 56]
PR-2	β-1,3-glucanase	Aid in cell wall degradation.	[10, 11, 79]
PR-3	Chitinase–type I, II, IV, V, VI, VII	Aid in cell wall degradation.	[10, 11, 80, 81]
PR-4	Chitinase-Hevein-like	Aid in cell wall degradation. May have RNase and DNase activity.	[10, 11, 19, 80–83]
PR-5	Thaumatin-like	Degrade pathogen membranes.	[10, 11, 42, 84, 85]
PR-6	Proteinase-inhibitor	Inhibit proteolysis by herbivorous insects.	[10, 11, 42, 86]
PR-7	Endoproteinase	Aid in cell wall degradation.	[10, 11, 87]
PR-8	Chitinase-type III	Aid in cell wall degradation. May have lysozymal activity.	[10, 11, 80, 81, 88]
PR-9	Peroxidase	Regulate reactive oxygen species concentration, contribute to cell wall lignification.	[10, 11, 89]
PR-10	Ribonuclease-like	Degrade RNA, may degrade viruses.	[10, 11, 90, 91]
PR-11	Chitinase-type I	Aid in cell wall degradation.	[10, 11, 80, 81]
PR-12	Defensin	Degrade fungal membranes.	[10, 11, 92]
PR-13	Thionin	Directly permeabilize lipid bilayers.	[10, 11, 61]
PR-14	Lipid-transfer Protein	Degrade pathogen membranes, mechanism unclear.	[10, 11, 93]
PR-15	Germin/Oxalate Oxidase	Regulate reactive oxygen species production.	[11, 62, 94]
PR-16	Germin-like/Oxalate Oxidase-like	Regulate reactive oxygen species production, catalyze monosaccharides.	[11, 62, 94]
PR-17	Putative Zinc-metalloproteinase	Proteinase function probable, mechanism unclear.	[11, 95]

With the goal of better understanding the evolution, structure, and expression dynamics of the cacao PR gene families, we carried out a comprehensive annotation and analysis of all PR gene families and characterized their genomic organization and expression in response to pathogens. Using a comparative genomics approach, we found that in cacao and in five other diverse plant species (*Arabidopsis thaliana, Brachypodium distachyon, Oryza sativa, Populus trichocarpa, and Vitis vinifera*), PR gene family sizes are similar and members are often physically clustered in tandem arrays, with more than half of the family members existing in these arrays. Analyzing existing EST databases, we found support for expression of 62 % of the *T. cacao* PR genes and identified many with expression limited to a specific tissues. Using a whole-genome microarray, we also identified PR gene family members induced by two major cacao pathogens, *Phytophthora palmivora* [27, 28] and *Colletotrichum theobromicola* [29], the causal agents of black pod rot and anthracnose, respectively. Comparing our new dataset to existing cacao transcriptomic analyses, we identified several PR genes strongly induced by multiple pathogens and treatments, suggesting potential roles as broad-spectrum defense response genes.

Results

Identification of cacao PR gene families

Using the Criollo cacao genome database (cocoagendb.cirad.fr/) [30], we developed a strategy for PR gene identification using the family type members described in van Loon et al. [11]. This bioinformatics approach resulted in a total of 359 PR genes identified in the Criollo genome (Table 2). Graphic representation of the genomic organization of these genes and the chromosomal positions of each of these loci is included in Fig. 1 and detailed information including gene IDs and chromosomal positions is provided in Additional file 1: Table S2. The process of gene identification was repeated for the Matina cacao genome [31].The Matina PR chromosomal distribution is plotted in Additional file 2: Figure S1 and Matina gene IDs and their positions are listed in Additional file 3: Table S3. Overall, the family sizes and genomic organization of the gene families in the two genomes was similar, however we observed some differences that could be the result of either chromosomal rearrangements or assembly errors. For the subsequent analysis, we focused on the genes identified in the Criollo genome assembly.

In order to determine whether PR family sizes in cacao were similar to those in other species, we next applied the PR gene identification pipeline to the *Arabidopsis thaliana* [32], *Brachypodium distachyon* [33], *Populus trichocarpa* [34], *Oryza sativa* [35], and *Vitis vinifera* [36] genomes. PR genes identified in these species are listed in Additional file 4: Table S4, Additional file 5: Table S5, Additional file 6: Table S6, Additional file 7: Table S7, Additional file 8: Table S8. We found that in these species as in cacao, PR genes typically existed as families rather than as single genes, with a notable exception being that our strategy only identified one PR-4, PR-8, and PR-10 gene in the Arabidopsis genome. The size of

Table 2 Summary of PR gene families in the *Theobroma cacao* Criollo genome

Common name	Conserved domain	Number of loci in family	Best BLASTp hit (E-value)
PR-1 CAP domain protein	SCP (smart00198)	14	3.00E-53
PR-2 β-1,3-glucanase	glyco hydro 17 (pfam00332)	43	7.00E-102
PR-3 Chitinase Class I, II, IV, VII	chitinase glyco hydro 19 (cd00325)	11	3.00E-79
PR-4 Chitinase-Hevein-like	barwin (pfam00967)	8	3.00E-49
PR-5 Thaumatin-like	thaumatin (pfam00314)	30	5.00E-72
PR-6 Proteinase-inhibitor	potato inhibitor family (pfam00280)	8	5.00E-11
PR-7 Endoproteinase	PA subtilisin like (cd02120)	54	0
PR-8 Chitinase Class III	GH18 hevamine XipI class III (cd02877)	14	2.00E-91
PR-9 Peroxidase	secretory peroxidase (cd00693)	81	4.00E-113
PR-10 Ribonuclease-like	Bet v1 (pfam00407)	23	3.00E-48
PR-11 Chitinase class V	GH18 plant chitinase class v (cd02879)	11	3.00E-116
PR-12 Defensin	gamma-thionin (pfam00304)	3	7.00E-10
PR-13 Thionin	thionin (pfam00321)	0	NA
PR-14 Lipid-transfer Protein	nsLTP1 (cd01960)	16	6.00E-19
PR-15 Germin/Oxalate Oxidase	Two cupin 1 (pfam00190) domains	0	NA
PR-16 Germin-like/Oxalate Oxidase-like	Two cupin 1 (pfam00190) domains	38	2.00E-52
PR-17 Unknown	BSP (pfam04450)	5	7.00E-90
	Total	359 loci (38 unassembled)	

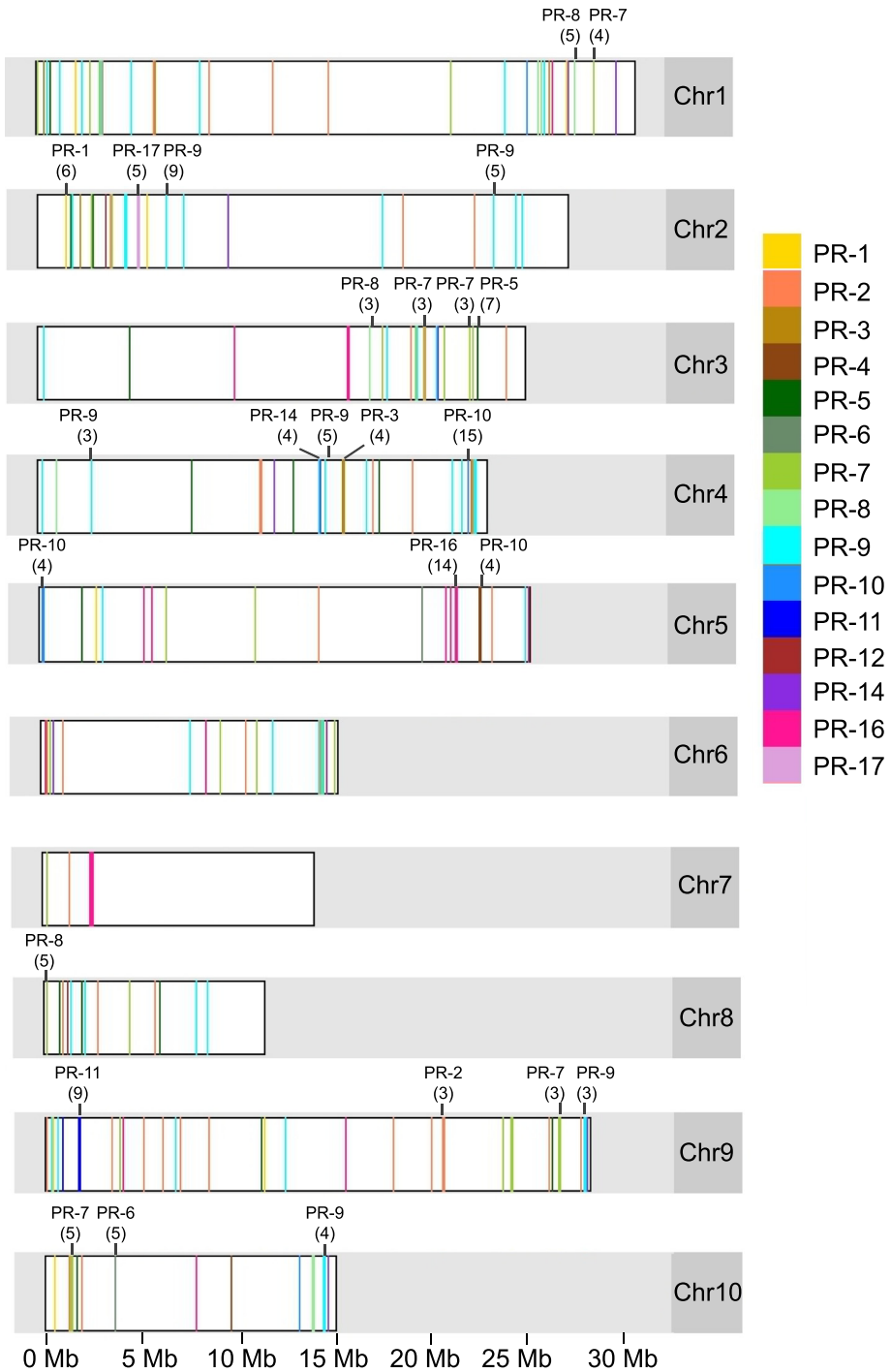

Fig. 1 Karyogram depicting position of PR genes along the length of chromosomes based on the Criollo genome sequence. Tandem arrays are labelled above the chromosomes with gene family and number of genes in the array in parentheses. Length of chromosomes is shown in Mb. Due to resolution of the image lines representing nearby genes partially overlap

gene families in cacao correlated well ($R^2 > .85$, $p < 0.001$) with PR family sizes in the other species (Fig. 2). Family sizes in cacao were typical of those in the other dicots, with no major species-specific family expansions or reductions. We also noticed trends of family conservation across the plant genomes; PR-11 s were not found in the monocots (*Brachypodium distachyon* and *Oryza sativa*) surveyed, PR-12 s were only in Arabidopsis and cacao, and PR-13 s were found only in the monocots and Arabidopsis. The largest size disparity was in the PR-9 s, where

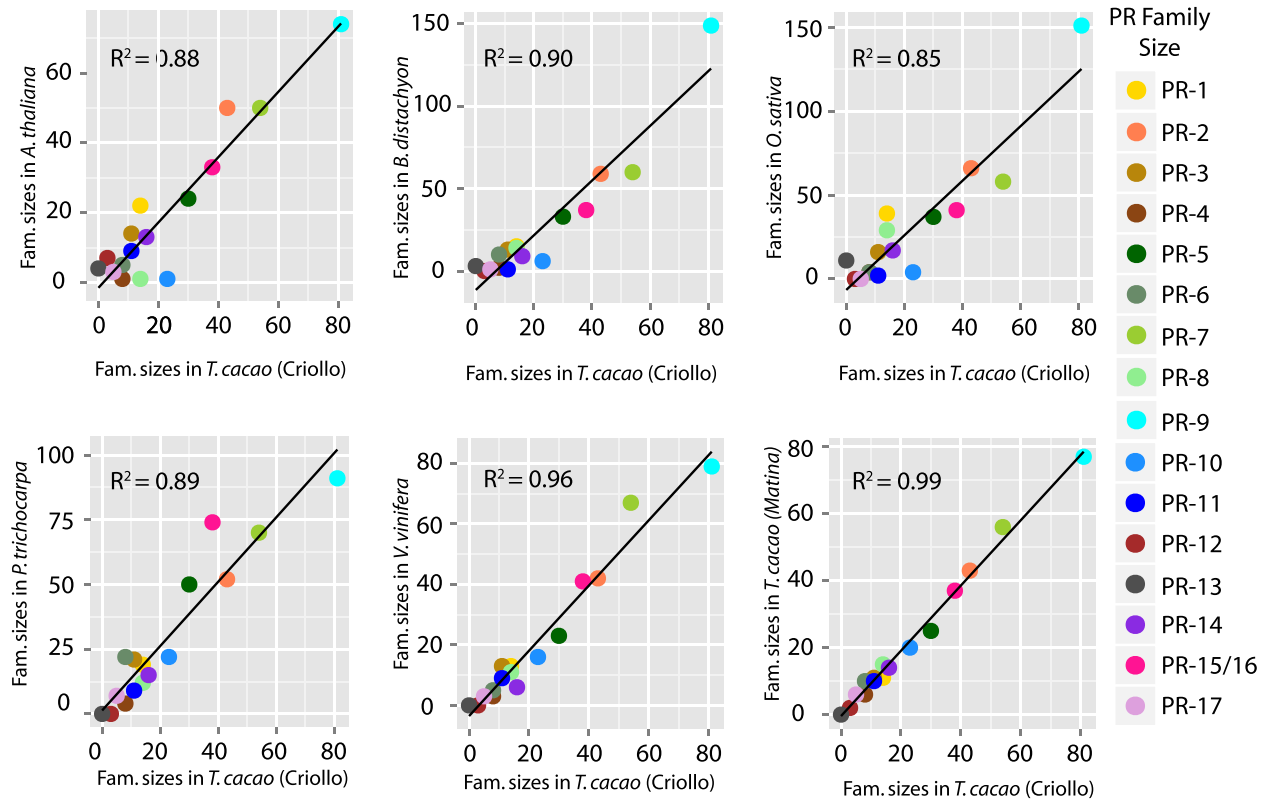

Fig. 2 Scatterplots comparing PR gene family size in the in the Criollo *T. cacao* genome to five plant species and the Matina *T. cacao* genome

the two monocots had ~150 members while the dicots had less than 100 members.

Organization of PR gene families into tandem arrays

Criollo gene IDs indicate their order on chromosomes, where the first gene on chromosome 1 is Tc01_g000010, the second Tc02_g000020, etc. We noticed that many of the cacao PR genes were clustered with other members of the same family. To quantify this phenomenon, we defined a tandem array as any two or more genes of the same family that are located within 10 genes of one another [37, 38]. Using this parameter, we identified 46 PR tandem arrays containing a total 181 genes, distributed across all chromosomes (Fig. 1 and Additional file 1: Table S2). The number of genes within each tandem array ranged from2 to 16 across the families. The largest tandem arrays were a group of PR-10s on chromosome 4 (Chr4PR-10.6, 15 members), a group of PR-16 s on chromosome 5 (Chr5PR-16.3, 14 members), a group of PR-11 s on chromosome 9 (Chr9PR-11.1, 9 members), and a group of PR-9 s on chromosome 2 (Chr2PR-9.5, 9 members). Next, using JBrowse [39] we manually identified tandem arrays for each of the additional five species surveyed. We found that tandem arrays were very common across PR gene families in the diverse plant taxa surveyed (Additional file 9: Table S9), with more than half of the genes for most classes existing in tandem arrays. Proportions of PR family members found in tandem arrays, particularly among dicots, were also similar.

To investigate this phenomenon, we created maximum-likelihood trees for the PR-3 family (Fig. 3), the PR-1 family (Additional file 10: Figure S2, and the PR-4 family (Additional file 11: Figure S3), which include the gene family members from cacao and *Arabidopsis thaliana*. The phylogeny has several well-supported nodes indicating multiple PR-3 family members existed when Arabidopsis and cacao diverged. Further, the support for the tree suggests that there are three clades within the family. Cacao has tandem arrays in both clades B and C. Bootstrap support in clade B, interestingly, suggests that Tc01_g000770 is more closely related to Tc01_g010350 than it is to its tandem array members, Tc01_g000800. This suggests that in this scenario, a duplication led to the formation of an additional chitinase gene at the distal end of chromosome 1 after the tandem array had formed. Clade C contains tandem arrays of cacao and Arabidopsis genes. The branch support suggests that members of the Arabidopsis tandem array have continually expanded and diverged over evolutionary time, with strong support for array members split between three subclades. AT1G56690 presents another likely case of a recent non-local duplication, this one to a different chromosome. A fourth subclade contains the four

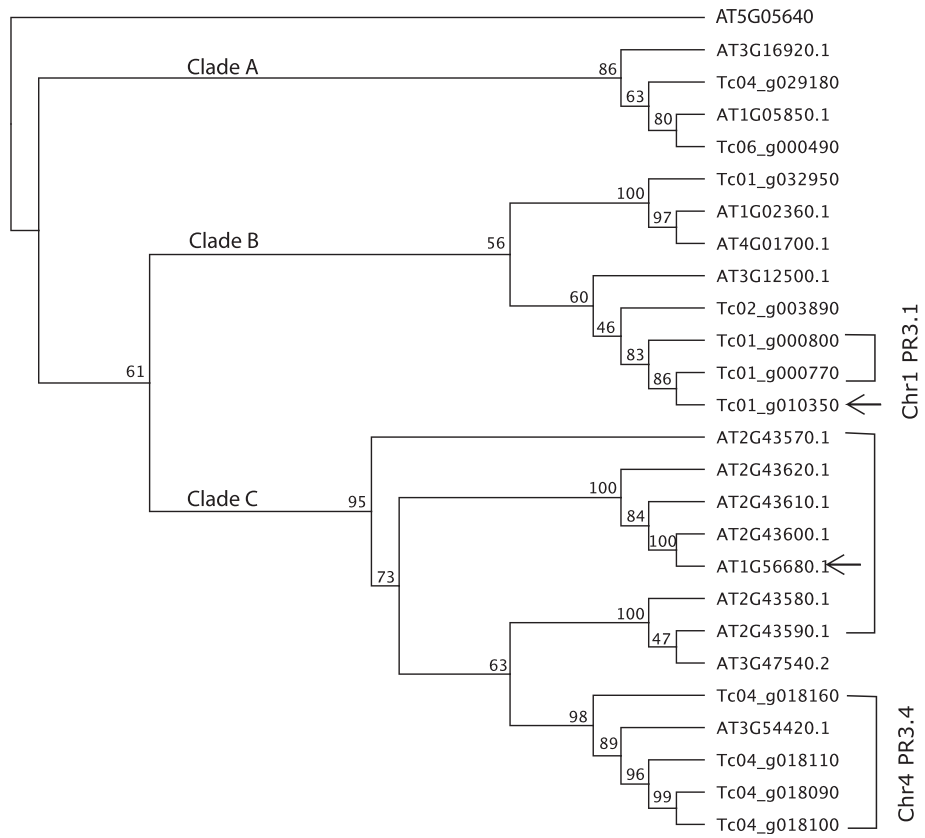

Fig. 3 Maximum-likelihood phylogeny of Criollo and Arabidopsis PR-3 family members. Node labels represent bootstrap support from 100 replicates. Brackets denote members of tandem arrays. Arrows indicate cases where non-tandem array members group most-closely with a tandem array member. Branch lengths represent genetic distance in substitutions per site. AT5G05460, a cytosolic beta-endo-N-acetyglucosaminidase and member of the chitinase superfamily, was included as an outgroup

members of the cacao tandem array on chromosome 4, none of which have been involved in recent duplications to other chromosomes. Examination of the PR-1 and PR-4 phylogenies also show evidence for expansion of gene families over evolutionary time locally, distally on chromosomes, and across chromosomes. Additional file 12: Table S10, Additional file 13: Table S11, Additional file 14: Table S12 include matrices of percentage identity for these three PR families, and further demonstrate that tandem array members are often, but not always, most closely related to one another.

Induction of cacao PR gene expression by pathogen colonization

To further our understanding of PR gene expression in cacao, we measured global gene expression after treating plants with two pathogens, *P. palmivora* and *C. theobromicola*. Figure 4a and b show scatterplots of $\log_2$ normalized expression for *P. palmivora* and *C. theobromicola* treatment, respectively, compared to water treatment for all probes corresponding to PR genes on a whole genome microarray, revealing that normalized expression values detected by the microarray reflect transcript abundance ranging from very low to very high (Additional file 15: Table S13) in all treatments. As expected, a similar trend was noted when analyzing all probes on the microarray (Additional file 16: Figure S4). For both pathogens, the majority of PR gene probes revealed constitutive expression across treatments, a large number of genes being up-regulated in pathogen-treated samples, and only a few examples of PR gene down-regulation. A total of 67 PR genes were induced by *P. palmivora* and 45 were induced by *C. theobromicola* (Benjamini-Hochberg-corrected $p < 0.05$ [40]) (Table 3). Of the two pathogen treatments, *P. palmivora* had a stronger effect in that in generally induced more genes per family and the increase in transcript abundance relative to water-treated samples was greater (Fig. 4c, Additional file 17: Table S14). One exception was the PR-10s; while more of the PR-10 genes were induced by *P. palmivora*, those induced by both pathogens were equally or more strongly induced by *C. theobromicola.* A single PR-10 gene (Tc04_g028940) was strongly induced by *C. theobromicola* ($\log_2$ 3.6- fold increase) but not

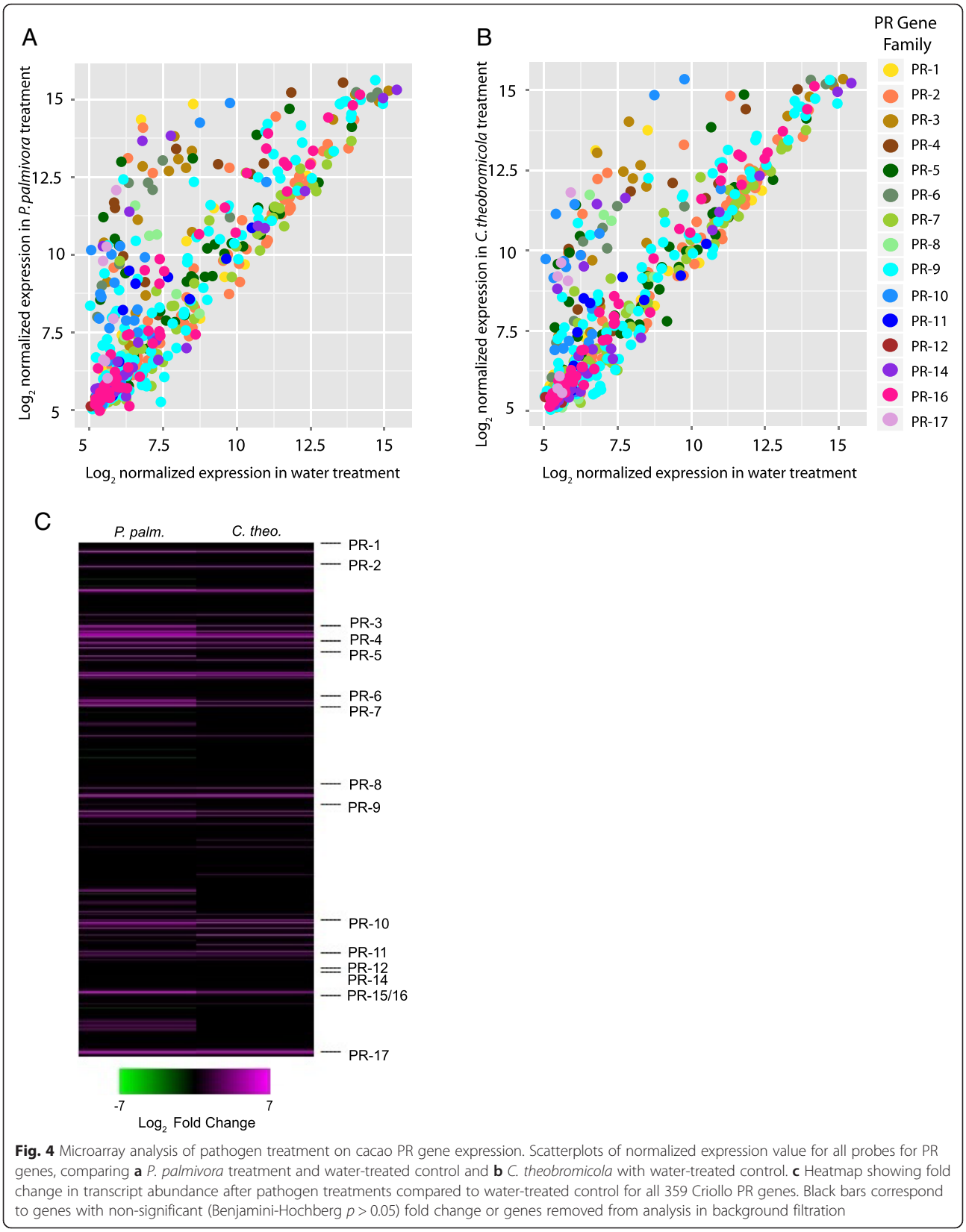

Fig. 4 Microarray analysis of pathogen treatment on cacao PR gene expression. Scatterplots of normalized expression value for all probes for PR genes, comparing **a** *P. palmivora* treatment and water-treated control and **b** *C. theobromicola* with water-treated control. **c** Heatmap showing fold change in transcript abundance after pathogen treatments compared to water-treated control for all 359 Criollo PR genes. Black bars correspond to genes with non-significant (Benjamini-Hochberg $p > 0.05$) fold change or genes removed from analysis in background filtration

Table 3 Regulation of Criollo PR genes as detected by microarray

		P. palmivora		*C. theobromicola*	
	Number removed in background filtration (Average Log_2 Normalized Expression <6)	Up-regulated	Down-regulated	Up-regulated	Down-regulated
PR-1	7/14	1/14	0/14	1/14	0/14
PR-2	11/43	5/43	2/43	4/43	0/43
PR-3	1/11	8/11	0/11	5/11	0/11
PR-4	1/8	3/8	0/8	3/8	0/8
PR-5	6/30	6/30	0/30	5/30	0/30
PR-6	2/8	5/8	0/8	2/8	0/8
PR-7	21/54	2/54	3/54	1/54	0/54
PR-8	9/14	2/14	0/14	2/14	0/14
PR-9	26/81	12/81	1/81	7/81	0/81
PR-10	13/23	8/23	0/23	6/23	0/23
PR-11	5/11	3/11	0/11	3/11	0/11
PR-12	3/3	0/3	0/3	0/3	0/3
PR-14	3/16	2/16	0/16	2/16	0/16
PR-16	16/38	7/38	1/38	1/38	0/38
PR-17	2/5	3/5	0/5	3/5	0/5
Total	126/359	67/359	7/359	45/359	0/359

Counts of up- and down-regulated genes represent the number of genes with Benjamini-Hochberg $p < 0.05$

induced by *P. palmivora*. For both pathogens, statistically significant PR gene down-regulation was rare, as only 7 genes (2 PR-2 s, 3 PR-7 s, 1 PR-9, and 1 PR-16) were repressed by *P. palmivora* and none were by *C. theobromicola*. There was also significant overlap in genes differentially regulated by the two pathogens. Forty two PR genes were affected by both treatments, 32 were uniquely affected by *P. palmivora*, and 3 were unique to *C. theobromicola*. A large set of PR genes (159 in P. palmivora-treated samples and 188 in C. theobromicola-treated samples) were found to be expressed at similar levels in water and in pathogen treated tissues, suggesting that these genes may encode a set of proteins involved in basal defense in cacao, or they could be specifically induced in other tissues.

qRT-PCR validation of microarray results

To support the findings of our microarray analysis, we performed qRT-PCR on select genes from three families. Because family members, and tandem array members in particular, often have high similarity, with this analysis we sought to verify specificity of microarray probes, as well as to confirm induction of genes of interest. Our analysis included 30 genes: 14 PR-1 s, 6 PR-3 s, 7 PR-4 s and 3 PR-10s (Table 4). Primer sequences for qRT-PCR are listed in Additional file 18: Table S15 Generally the qRT-PCR results verified the induction of genes with statistically significant induction detected on the microarray, although the degree of induction was often underestimated by microarray measurement, as is often observed. By designing highly specific qRT-PCR primers, we were able to verify induction of multiple gene family members, and even tandem array members, in the PR-3 and PR-4 families. Members of a single array showed induction ranging from ~8 -fold to 5000-fold. Of the tested PR-10s, all verified the trend of equally strong induction by the two pathogens or greater induction by *C. theobromicola*.

Discussion

The role of PR genes in mediating resistance to disease has been well studied in a wide variety of model and crop plant species [11, 41–43]. These proteins are grouped together based on their increased accumulation in response to activation of systemic acquired resistance pathways and their roles in plant defense. Our analysis of the PR gene families of *T. cacao* resulted in the identification of multigene families for 15 families of PR proteins. These gene families include about 350 genes that are distributed throughout the genome. About 50 % of the cacao PR genes are found in arrays of tandemly duplicated genes, and many family members, even within tandem arrays, exhibited varying levels of inducibility by pathogen treatment. The structure of the PR gene families of five other plant species shared these features with cacao, suggesting that PR tandem arrays are features highly conserved within most if not all higher plants. The high degree of correlation in family sizes suggests that similar evolutionary forces have likely acted on diverse plant genera, likely indicating that PR family expansions have been beneficial to land plant survival.

Table 4 Validation of PR gene induction by qRT-PCR

		P. palmivora treatment		*C. theobromicola* treatment	
	Gene ID	Microarray fold induction	qRT-PCR fold induction	Microarray fold induction	qRT-PCR fold induction
PR-1 s	Tc01_g003940	N.S.	Transcript not detected	N.S.	Transcript not detected
	Tc01_g034430	N.S.	N.S.	N.S.	N.S.
	Tc02_g002380	N.S.	N.S.	N.S.	N.S.
	Tc02_g002390	N.S.	N.S.	N.S.	N.S.
	Tc02_g002400	N.S.	N.S.	N.S.	8.3 ($p = .001$)
	Tc02_g002410	125.4	763 ($p < .001$)	91.3	55.7 ($p < .001$)
	Tc02_g002420	N.S.	N.S.	N.S.	N.S.
	Tc02_g002430	N.S.	N.S.	N.S.	N.S.
	Tc02_g010380	N.S.	N.S.	N.S.	N.S.
	Tc05_g005530	N.S.	N.S.	N.S.	N.S.
	Tc09_g000720	N.S.	N.S.	N.S.	N.S.
	Tc09_g016580	N.S.	N.S.	N.S.	N.S.
	Tc09_g016590	N.S.	N.S.	N.S.	N.S.
	Tc10_g000980	N.S.	Transcript not detected	N.S.	Transcript not detected
PR-3 s	Tc01_g000770	33.6	70.2 ($p < .001$)	18.8	13.8 ($p = .01$)
	Tc02_g003890	27.1	Transcript not detected	22.31	Transcript not detected
	Tc04_g018100	22.5	5086.0 ($p < .001$)	8.3	36.7 ($p = .019$)
	Tc04_g018110	29.2	763.2 ($p < .000$)	11.5	13.7 ($p = .041$)
	Tc04_g018160	63.6	158.4 ($p = .003$)	73	65.6 ($p = .001$)
	Tc06_g000490	N.S.	3.4 ($p = .016$)	N.S	N.S.
PR-4 s	Tc00_g012980	N.S.	N.S.	N.S.	N.S.
	Tc05_g027210	24.9	1027.7 ($p < .001$)	14.9	22.7 ($p = .01$)
	Tc05_g027220	11.1	258.9 ($p = .001$)	6.7	N.S.
	Tc05_g027230	N.S.	164.1 ($p = .011$)	N.S.	N.S.
	Tc05_g027250	N.S.	N.S.	N.S.	N.S.
	Tc05_g027320	53.4	29.3 ($p = .009$)	17.8	8.9 ($p = .001$)
	Tc10_g011130	N.S.	61.5 ($p < .001$)	N.S.	N.S.
PR-10s	Tc01_g031100	39.7	28.0 ($p = .019$)	57.2	32.3 ($p = .002$)
	Tc04_g028780	25.5	32.9 ($p = .027$)	25.5	41.6 ($p = .004$)
	Tc04_g028860	6.02	24.3 ($p = .038$)	53.4	96.8 ($p = .001$)

Genes shown as induced by microarray had BH *p*-values < 0.05. N.S. indicates *p*-values for fold change were > 0.05. Inductions detected by qRT-PCR were calculated using REST software [96] and represent the average of five pathogen-treated samples compared to five water-treated samples relative to TcTub1 (Tc06_g000360). Transcripts were considered undetected if the average C_t value across all treatments was greater than 35

This body of work provides strong evidence that gene duplication and neo-functionalization, particularly with regard to expression dynamics, have played major roles in shaping the genomics of the plant defense response.

Local duplications arise through various mechanisms including polymerase slippage, unequal crossing over, and transposon movement, and local duplications are known to contribute to eukaryotic evolution by increasing genetic diversity [37, 44]. Organization of PR genes into tandem arrays has been described for several plants and PR families, including PR-7 s in tomato [45], PR-10s in grape [46], PR-12 s in Arabidopsis [47], and PR-1 s in Arabidopsis and rice [11], and PR-16 s in rice [48]. The physical clustering of PR-4 s in cacao was also previously described [19]. Tandem duplications have also been shown to play a key role in evolution of Resistance (R) gene families [49, 50] and they are particularly common in the NBS-LRR class of R genes, as well as in PR-1 s, thaumatins, germins, and major latex proteins in Arabidopsis [51]. Here we demonstrate that this clustering is common across PR families. Correlation analysis of family size indicates that sizes are similar across diverse plant taxa, indicating that expanded family sizes are common and are likely selectively beneficial in higher

plants. Our phylogenetic analysis of the PR-1, PR-3, and PR-4 families suggests that the families have continually expanded both locally and inter-chromosomally over land plant evolution, although further investigation of expansions of certain sub-clades in different species is necessary to explain functional dynamics of family expansion.

Gene family expansions have a complicated interplay with expression dynamics. Employing our microarray analyses, unique expression dynamics within groups of family members with very high percent identity. The data presented here suggest that in some cases single genes within tandem arrays are induced by a given pathogen, while in other tandem arrays two or more genes can be induced by the same stimulus. Large tandem arrays for PR-10s (Chr4PR-10.6, 15 members) and PR-16 s (Chr5PR-16.3, 14 members) have members ranging from constitutive low expression to constitutive high expression, with a few showing inducibility by pathogens. Consequently, evolutionary dynamics of family members after a duplication event remain unclear, but several mechanisms are likely at play in a scenario-specific manner. First, selection could favor greater concentration of antimicrobial peptides produced in a given tissue, leading to multiple family members exhibiting similar protein structure and expression patterns. Our microarray analyses revealed several cases that could support this model; for example four PR-3 s that make up a tandem array were all induced by *P. palmivora*. Alternatively, mutations affecting nearby regulatory machinery or the coding sequence of the gene could result in new tissue specificity or binding/enzymatic activity of a protein. Our microarray dataset found that only one of six PR-1 s in a tandem array was induced by pathogen, suggesting the others have alternative functions, tissue specificities, or are in the process of becoming pseudogenes. Evolutionary studies have revealed that products of small-scale duplications diverge in expression more rapidly than they do in terms of protein structure [52] ,with age of paralogs correlating with their divergence in expression in Arabidopsis [53, 54] and rice [55]. For defense genes, divergence in expression patterns could be beneficial, decreasing metabolic burden associated with mounting a defense response in tissues distal to the site of infection. Further work, particularly RNA-seq experiments across a wide range of tissue types, would allow more comprehensive dissection of functional patterns associated with this gene organization. *In silico* promoter analysis may be a means of identifying a mechanism underlying expression dynamics of tandem arrays.

Teixeira et al. [22] previously reported the induction of more than 67 PR genes after infection of cacao plants with *Moniliophthora perniciosa*, but that the induction did not eliminate pathogen colonization. Similarly, the induction that we see here did not halt infection, but likely slow the pathogens' progress. These transcriptomic experiments identify candidate genes that require functional characterization to better understand roles of PR proteins against the diversity of cacao's pathogens. The infection and microarray analysis we performed with oomycete (*P. palmivora*) and fungal (*C. theobromicola*) pathogens confirms the induction of 67 and 45 PR genes by the respective pathogen treatments. However, the majority of the PR genes had stable expression across treatments under our experimental conditions. Analysis of other tissues may reveal that a subset of those genes have tissue specificity in their basal expression and inducibility. The existence of PR family members with constitutively high expression could suggest that certain family members have evolved to act as a preliminary line of defense. For example, two PR-3 s (Tc06_g000490 and Tc04_g029180) had very high expression in water treated samples. Constitutive high-level expression in leaves may allow the plant to begin degrading chitin of invading pathogens before PAMP or R-gene mediated signal transduction can elevate expression of induced defenses. Knockdown or deletion of these constitutive high-expressors followed by pathogen challenge would demonstrate the role of basal defense components. Broadly, we saw a more dramatic defense response in samples infected with *P. palmivora* than in those infected with *C. theobromicola,* with more genes being up-regulated and their degree of induction being greater. The microarray and qRT-PCR analysis indicated that the PR-10 family deviates from this trend, with members showing equal or more dramatic induction by *C. theobromicola* than by *P. palmivora.* The PR-10 member Tc04_g028860 is particularly noteworthy, showing 96-fold induction by *C. theobromicola* treatment, about four times the induction by *P. palmivora* treatment. While it is possible that these differences reflect pathogen-specific responses, we cannot rule out the possibility they result from different speeds with which the two pathogens colonize the host.

Induction of PR-1 genes is a hallmark of plant defense activation. While they belong to the well-studied Sperm Coating Protein/Tpx-1/Ag5/PR-1/Sc7 (SCP/TAPS) [56], a sub-group of the Cysteine-rich secretory protein superfamily, little is known about their biological function [57]. Our analysis indicates that TcPR1-g (Tc10_g000980) that was previously reported to be induced in tissue infected with witches' broom [16], was not induced under our experimental conditions. This lack of induction by *P. palmivora* and *C. theobromicola* suggests that family member activation may differ for certain pathogens. Another example is the induction of the PR-1 Tc02_g002410, which was not induced by witches' broom, by *P. palmivora* and *C. theobromicola*. Our qRT-PCR experiment validated strong induction of only this gene (>700 fold by P. palmivora and > 50 fold by *C. theobromicola*), and confirmed

low expression of Tc10_g000980 across all samples. The specificity of the reaction is interesting, but even more puzzling as the function of PR-1 s in plants remains unclear.

PR-3 family member expression was also of particular interest because of our prior work with a class I chitinase (Tc02_g003890) [17]. Here we report induction of several other PR-3 s. A tandem array on chromosome four (Chr4PR-3.4) was notable in that multiple members were found to be induced by both pathogens, suggesting that, in this case, proximity may be contributing to their co-expression, and that these proteins may act in a coordinated fashion to defend the plant against both of the tested pathogens. While chitin is significantly less abundant in the cell walls of oomycetes than fungi, and its function in oomycetes is not well understood, recent evidence suggests that chitin synthase enzymes are active in hyphal tips, where chitin may play a role in cell wall structure [58]. Further, inhibition of these chitin synthases with nikkomycin Z led to bursting of hyphal tips and cell death. Accordingly, induction of chitinases in plants by oomycete treatment may reflect an important defense process, inhibition of hyphal tip growth.

Interestingly, our earlier work described that stable overexpression of Tc02_g003890, a class I chitinase, in transgenic cacao plants resulted in an increased resistance of leaves to *Colletotrichum gloeosporioides* [17]. The same gene was also upregulated in the highly disease-susceptible genotype ICS1 by treating leaves with salicylic acid [23], and we found that its transient overexpression in cacao leaves increases resistance to *P. capsici* [18]. The qRT-PCR we performed here did not verify its induction by treatment with *P. palmivora* or *C. theobromicola*, suggesting that this gene may respond to SA but not these two pathogens. This result suggests that the underlying mechanisms of these plant pathogen interactions are complex and that further research is necessary to unravel the specific mechanisms involved. One possibility is that the pathogens are able to suppress the mechanisms of SA induced gene expression via secretion of pathogen effector proteins as has been seen with other systems [59].

Cacao PR-4s were also recently identified [19] Pereira-Menezes et al.'s [19] work built upon an earlier EST database [25] by characterizing genotype specificity in the speed and level of induction of PR-4b (Tc05_g027210), which shows anti-fungal activity dependent on its RNase activity, in a resistant (TSH1188) and a susceptible (Catongo) genotype. Our microarray and qRT-PCR indicates that the gene was also induced by *P. palmivora* (more than 1000-fold and *C. theobromicola* (roughly 20-fold), showing one of the strongest inductions of the genes tested with qRT-PCR. Its induction by a variety of pathogens makes it a critical candidate for further study. Analyses similar to Pereira-Menezes et al.'s work across a broader background of genotypes are required to validate the importance of genes described here. Assaying the effect of over-expression or knockout of this gene would be useful for defining roles of single genes within these families.

We observed a few differences in organization when comparing two different varieties of cacao. The two varieties compared in this study are representatives of distinct genetic clusters that developed over *T. cacao*'s evolution and are thought to have diverged because of the presence of geological barriers [31]. Consequently, it is possible that these two genotypes, having been subjected to different pathogens over their evolutionary history and having unique selective pressures applied by domestication after cultivation of cacao began, have undergone unique duplications or translocations altering gene organization. Indeed, our identification of PR genes in the two genomes may support this hypothesis, as gene counts within families differ for the two genomes, and while the positions of the genes are generally consistent, some chromosomal rearrangement appears to have occurred. It is possible however, that these are differences resulting from genome assembly strategies. Analysis of additional cacao genome sequences from other genetic groups [31] would help resolve these possibilities.

As induction of PR genes is a hallmark of the defense response in many plant species, their identification in cacao is critical to the study of cacao's defense response. Our finding that PR gene family size and organization into tandem arrays is consistent across diverse plant species suggests that the diverse expression patterns seen within families in other species are likely similar to those we have described in cacao. Therefore, this study lays a foundational knowledge of defense gene expression upon which functional molecular genetic approaches can be based. Genes identified here, once functionally verified, will be useful in the breeding cacao cultivars with superior resistance to pathogens.

Conclusions

In this study we identified 359 PR genes in the cacao genome, and found that approximately half of these physically cluster into tandem arrays with other members of the same PR family. Physical clustering of PR genes into tandem arrays was also identified in five diverse plant species. Using a whole genome microarray and qRT-PCR to measure the induction of genes by two cacao pathogens, we identified which PR genes are induced in leaf tissue by pathogens, and we identified differences in basal expression within PR families. This work is critical in improving the understanding of the defense response in cacao, and it provides a list of key candidate defense genes that will be the focus of future molecular characterization.

Methods

Theobroma cacao PR gene identification and filtration

Amino acid sequences for the type members of each PR gene family (Additional file 19: Table S1) were used as queries to search the Criollo genome database using BLASTp (cutoff $E < 1e^{-5}$, BLOSUM62 matrix) [60]. Using this strategy, we identified putative genes in 15 of the 17 known plant PR protein classes. PR-13 s were not identified in the Criollo genome (they are specific to monocots and a subset of dicots [61]), and PR-15 s are also considered to be monocot specific, although the BLASTp search finds them in the Criollo genome because of their homology with PR-16 s [62]. Next, a custom Python (python.org) [63] script (PRAminoacidgetterASF) was used to extract protein IDs from the BLASTp output and use them to extract the peptide sequences available in the Criollo cacao genome database.

The list of amino acid sequences was uploaded to the NCBI Batch Web CD-Search Tool (v3.13) [64] with an e-value cutoff of 0.01. Another script (PRdomainsorterASF) was used to sort the output of the CD-Search with gene IDs and BLASTp E-values of putative PR genes. Polypeptides were manually curated for the presence of domains used in Wanderly-Nogueira et al. [43] to classify each family. For the PR-6 family, we used presence of the "potato-inhibitor family domain" (pfam00280) to screen putative cacao PR genes, as it is the only domain found in the type member sequence. Putative PR genes missing the characteristic domains were removed, and the remaining genes are listed in Additional file 1: Table S2.

This process was repeated for the Matina cacao genome [14]. In order to compare PR gene distribution in the genomes, a third python script was used to retrieve positional information from the Criollo and Matina GFF files (PRstartstopfinderASF). This data was plotted in Fig. 1 (Criollo) and Additional file 2: Figure S1 (Matina) using the R packages ggplot2 [65] and ggbio [66], and gene positional information is also included in Additional file 1: Table S2 (Criollo) and Additional file 3: Table S3 (Matina). All python scripts are available on the Guiltinan-Maximova Lab website (http://plantscience.psu.edu/research/labs/guiltinan/protocols/bioinformatic-scripts).

PR gene identification in other plant species

Using the same type member queries, BLASTp searches were against predicted polypeptide sequences downloaded from Phytozome v10.3 (Goodstein et al., 2012) from the *Arabidopsis thaliana* (TAIR10), *Brachypodium distachyon* (v3.1), *Oryza sativa* (v7.0), *Populus trichocarpa* (v3.0), and *Vitis vinifera* (Genoscope 12×) genomes using the same parameters. The procedure described above was used to curate, use CD-Search, and organize PR genes in order to count the number of genes per class. Tandem arrays were manually identified using JBrowse [39] in Phytozome v10.3 [67]. For all species, the PR-15 and PR-16 lists were largely redundant because of homology of the families, but PR-15 s are monocot specific and should therefore only be present in *Brachypodium distachyon* and *Oryza sativa*. Therefore, for plotting gene family sizes in Fig. 2, these two families were combined. Gene IDs and BLASTp e-values for identified genes for these species are listed in Additional file 4: Table S4, Additional file 5: Table S5, Additional file 6: Table S6, Additional file 7: Table S7, Additional file 8: Table S8.

Building PR-1, PR-3 and PR-4 phylogenies

To construct phylogenies, nucleotide sequences of family members for PR-1, PR-3, and PR-4 from the Criollo genome and primary transcripts from Arabidopsis (TAIR10) [32] were aligned using the MUSCLE [68] translational alignment function in Geneious [69] with eight iterations. Alignments were manually curated. No adjustments were made to the PR-1 or PR-3 families, but Tc05_g027340 was removed from the PR-4 alignment as it appears to have annotation errors in intron prediction. Maximum likelihood trees were generated in Geneious using a RAxML [70] plugin.

Plant growth, infection, and RNA extraction

The seeds used for generating the plants for the experiment were collected under Panamanian Authority of the Environment (ANAM) scientific permit SE/AH-1-11. Seeds from open pollinated *T. cacao* mother trees, accession UF12, were collected from a plantation in Charagre, Bocas del Toro province, Panama. The seeds were surface sterilized by immersing them in 0.5 % sodium hypochlorite for three minutes and rinsed with sterile water before being placed for germination in plastic trays with soil (2:1 mixture of clay rich soil from Barro Colorado Island, Panama and rinsed river sand) and incubated in Percival growth chambers. One-month-old seedlings were transplanted to individual pots (600 ml volume) containing the same soil mixture and kept in the growth chambers. Germination of seeds and seedling growth was done in growth chambers (model I35LL, 115 volts, 1/4 Hp, series: 8503122.16, Percival Scientific, Inc., Perry IA) with 12/12 h light/dark photoperiod and temperatures of 30 °C and 26 °C respectively [71].

Two month old seedlings, with approximately six leaves each, were spray-inoculated with conidia of *Colletotrichum theobromicola* or zoospores of *Phytophthora palmivora*. Conidia of *C. theobromicola* were produced using the same methods as in [71] for production of other species of *Colletotrichum* and zoospores were produced as in [72]. Whole seedlings were sprayed either with pathogen inoculum (*P. palmivora* isolate PTP zoospores at 5×10^4 per ml

or *C. theobromicola* isolate ER08-11 conidia at 2×10^7 per ml) or sterile distilled water (controls) and then placed back into the growing chamber, but only leaves in stage C [73] at the time of inoculation were considered as a target for the experiment. Pathogens *C. theobromicola* and *P. palmivora* were re-isolated from lesions developed in inoculated Samples were harvested from 72 h post-inoculation for RNA extraction, and tissue at this time point was used to re-isolate pathogen, which was considered as a measure of successful inoculation. Leaves sprayed with water remained healthy, did not develop lesions, and no pathogens were re-isolated from them. Representative photographs of infected and control leaves are shown in Additional file 20: Figure S5. Four seedlings received each treatment, and five leaf samples were collected from each group of four seedlings. Each biological replicate consisted of a single individual leaf. Target leaves were cut with scissors from the plant, immediately weighed, and placed in RNAlater solution in borosilicate vials following manufacturer's instructions (Applied Biosystems/Ambion, Austin, TX). Vials containing samples were shipped to PSU on dry ice where RNA extractions were performed using a previously described protocol [74]. Total RNA sample concentration and purity was assessed using a NanoDrop spectrophotometer and RNA quality was determined using an Agilent Bioanalzyer.

Microarray analysis

Transcriptomic analysis was performed using a whole-genome Roche NimbleGen custom oligo expression array (platform GPL18356), which was previously described in [75]. Probe labeling, hybridization, and detection were performed at the Penn State Genomics Core Facility, and the statistical analysis of the microarray data were performed as previously described [75].Briefly, the Bioconductor package [76] was used in R to perform quality control checks and calculate normalized expression values using the RMA procedure. Normalized expression values were plotted to ensure all replicates for a given treatment had similar expression patterns. These data are available on GEO (GSE73804). In calculating fold induction, probes with mean $\log_2$ expression values across all probes less than 6 were removed. The LIMMA package [77, 78] was then used to calculate fold induction on a per-probe basis and to calculate a Bayesian moderated test statistic for each comparison (pathogen-treatments relative to water-treatment). A Benjamini-Hochberg multiple testing correction [40] was then applied. Probes with Benjamini-Hochberg $p < 0.05$ were considered significant. In identifying individual PR genes with statistically significant differential regulation, any gene with multiple probes showing statistically significant change had fold change recalculated by averaging across all significant probes.

CDNA synthesis and qRT-PCR validation of microarray

One microgram of RNA from each of the five samples from each treatment were reverse transcribed by M-MuLV Reverse Transcriptase (New England Biolabs, Ipswich, MA, USA) with oligo-$(dT)_{15}$ primers to obtain cDNA. To create highly specific primers for PR gene family members, nucleotide sequences of for the PR-1, PR-3, PR-4, and PR-10 families were aligned using MUSCLE [72] in Geneious [73]. qRT-PCR primers were designed to target bases that differentiate family members. Primer sequences are listed in Additional file 18: Table S15. qRT-PCR was performed in a total reaction volume of 10 μL containing 4 μL of diluted cDNA (1:8), 5 μL of SYBR Green PCR Master Mix (TaKaRa, Mountain View, CA, USA), 0.2 μL of Rox and 0.4 μL of each 5 μM primer. Each reaction was performed on each of the five samples per treatment in technical duplicate using the Applied Biosystem Step One Plus Realtime PCR System (Nutley, NJ, USA) with the following program: 15 min at 94 °C, 40 cycles of 15 s at 94 °C, 20 s at 60 °C, and 40 s at 72 °C. The specificity of the primer pair was verified by dissociation curve.

Data normalization, a statistical randomization test, and relative pathogen-treated vs. water-treated expression ratios were computed using REST [64]. Fold changes with *p-values* less than 0.05 were considered significant.

Ethics approval

As the study did not include any human or animal participants, no ethics approval was required.

Consent to publish

As no human participants were involved in the study, no consent was required.

Availability of data

Microarray data are available at NCBI (GEO: GSE73804). The Criollo cacao genome is available at http://cocoagendb.cirad.fr/ and the Matina cacao genome, *A. thaliana*, *B. distachyon*, *O. sativa*, *P. trichocarpa*, and *V. vinifera* genomes are accessible through Phytozome.

Additional files

Additional file 1: Table S2. Gene IDs and positions of Criollo PR genes mapped to the ten cacao chromosomes. Those not mapped to the ten chromosomes are appended to the bottom of the list without positional information. (PDF 4169 kb)

Additional file 2: Figure S1. Karyogram depicting the position of PR genes along the length of chromosomes based on the Matina genome sequence. Due to resolution of the image lines representing nearby genes partially overlap. (PDF 4169 kb)

Additional file 3: Table S3. Gene IDs and positions of Matina PR genes mapped to the ten cacao chromosomes. Those not mapped to the ten

chromosomes are appended to the bottom of the list without positional information. (PDF 4169 kb)

Additional file 4: Table S4. Gene IDs and BLASTp E-values for *Arabidopsis thaliana* PR loci. (PDF 4169 kb)

Additional file 5: Table S5. Gene IDs and BLASTp E-values for *Brachypodium distachyon* PR loci. (PDF 4169 kb)

Additional file 6: Table S6. Gene IDs and BLASTp E-values for *Oryza sativa* PR loci. (PDF 4169 kb)

Additional file 7: Table S7. Gene IDs and BLASTp E-values for *Populus trichocarpa* PR loci. (PDF 4169 kb)

Additional file 8: Table S8. Gene IDs and BLASTp E-values for *Vitis vinifera* PR loci. (PDF 4169 kb)

Additional file 9: Table S9. Percentage of PR genes in tandem arrays in the six analyzed plant species. (PDF 4169 kb)

Additional file 10: Figure S2. Maximum-likelihood phylogeny of Criollo and Arabidopsis PR-1 family members. (PDF 4169 kb)

Additional file 11: Figure S3. Maximum-likelihood phylogeny of Criollo and Arabidopsis PR-4 family members. (PDF 4169 kb)

Additional file 12: Table S10. Percent identities for Criollo PR-1 genes, color-coded to show tandem array members. (PDF 4169 kb)

Additional file 13: Table S11. Percent identities for Criollo PR-3 genes, color-coded to show tandem array members (PDF 4169 kb)

Additional file 14: Table S12. Percent identities for Criollo PR-4 genes, color-coded to show tandem array members. (PDF 4169 kb)

Additional file 15: Table S13. Log_2 normalized expression values for all PR genes on microarray, with values averaged across five biological replicates. (PDF 4168 kb)

Additional file 16: Figure S4. Whole genome gene expression profiles in microarray-analyzed leaves. Scatterplots of log_2 normalized expression values for all probes on the microarray, comparing pathogen treatments with water treatment. (PDF 4169 kb)

Additional file 17: Table S14. Log_2 fold change for all significantly regulated (Benjamini-Hochberg $p < 0.05$) PR genes on microarray. (PDF 4169 kb)

Additional file 18: Table S15. Sequences of qRT-PCR primers for validation of PR-1, PR-3, and PR-4 family expression. (PDF 4169 kb)

Additional file 19: Table S1. PR gene gamily type members: GenBank accession numbers for PR type member amino acid sequences used as BLASTp queries (PDF 4169 kb)

Additional file 20: Figure S5. Representative photographs showing leaves 72 h after A) H_2O, B) *C. theobromicola* (with red lines indicating developing lesions), and C) *P. palmivora* treatment. Scale bars represent 1 cm. (PDF 4169 kb)

Abbreviations
PR: pathogenesis-related; qRT-PCR: quantitative real-time polymerase chain reaction.

Competing interests
The authors declare that they have no competing interests.

Authors' contributions
AF wrote Python scripts, curated gene families, analyzed microarray data, generated figures, performed qRT-PCR, and drafted the manuscript. YZ performed initial BLASTp search on the Criollo genome. LM and EH designed and conducted the pathogen infection assays and related microarray experiments. SM and MG participated in designing the experiments and editing the manuscript. MG was responsible for overall project management. All authors contributed to the writing and review of the manuscript.

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Author details
[1]The Huck Institutes of the Life Sciences, The Pennsylvania State University, 422 Life Sciences Building, University Park 16802, PA, USA. [2]Institute for Scientific Research and High Technology Services (INDICASAT-AIP), Panama City, Panama. [3]Smithsonian Tropical Research Institute (STRI), Unit 9100, Box 0948, Balboa, Ancon DPO AA 34002-9998, Panama. [4]Department of Electrical Engineering, Princeton University, Princeton NJ 08544, USA. [5]The Department of Plant Science, The Pennsylvania State University, 422 Life Sciences Building, University Park 16802, PA, USA.

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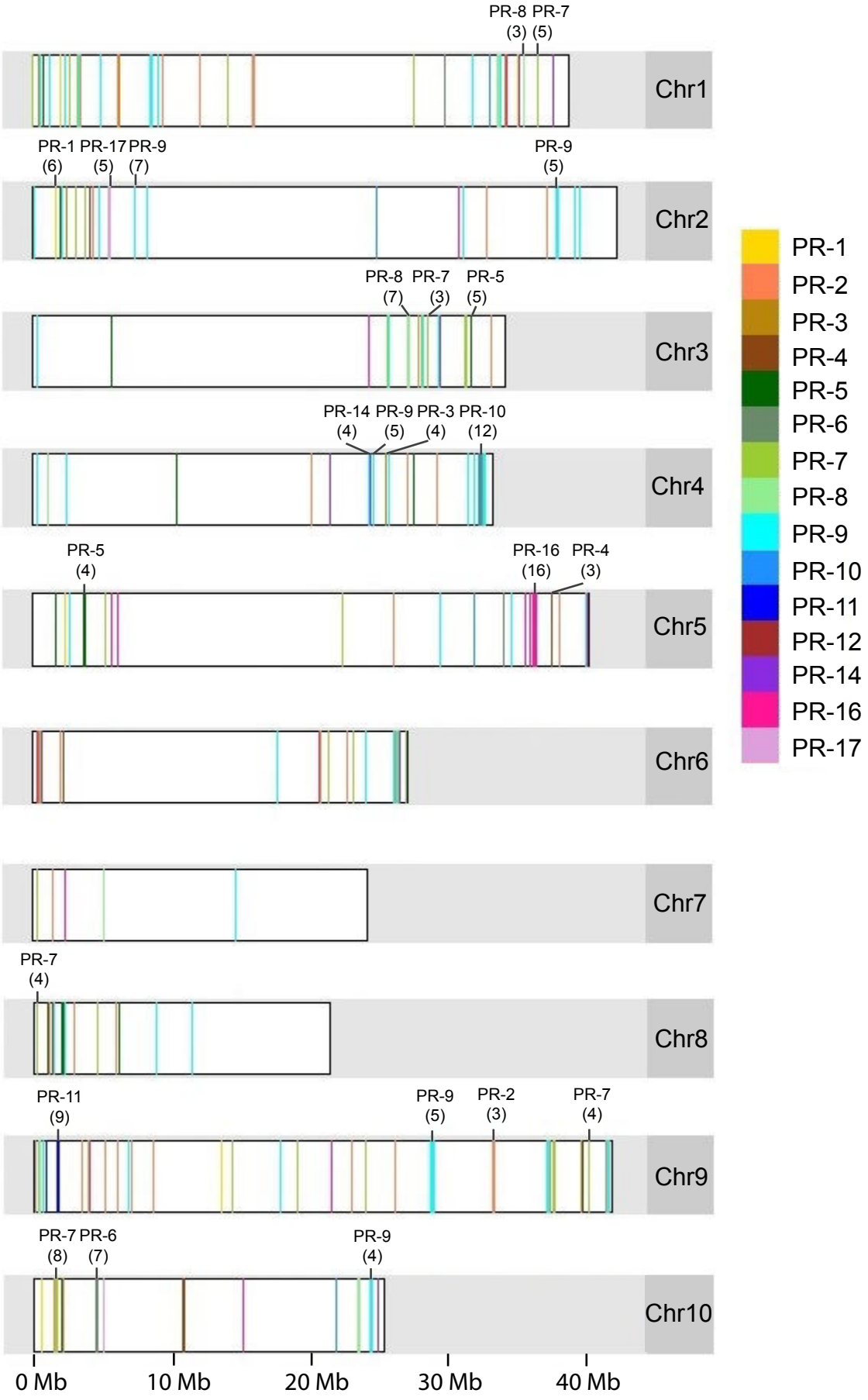
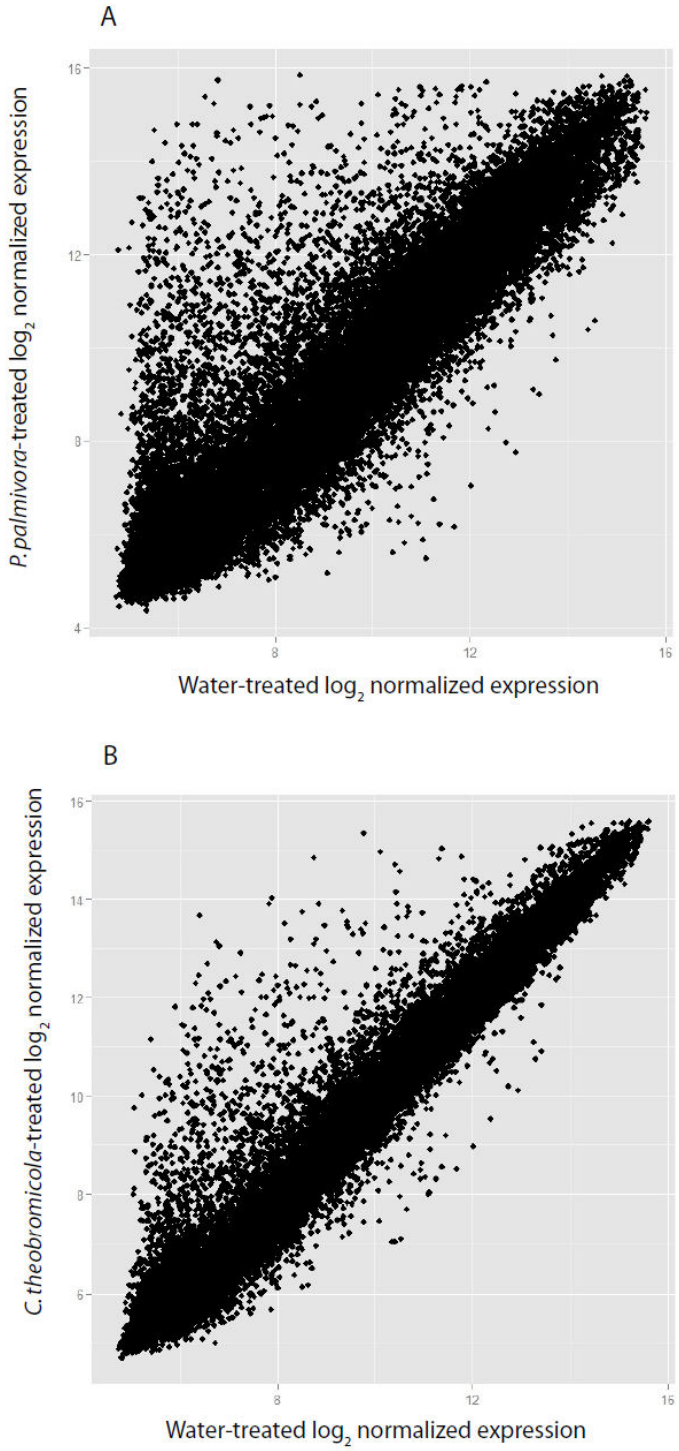
References
1. Macho Alberto P, Zipfel C. Plant PRRs and the activation of innate immune signaling. Mol Cell. 2014;54(2):263–72.
2. Dangl JL, Jones JDG. Plant pathogens and integrated defence responses to infection. Nature. 2001;411(6839):826–33.
3. Jones JDG, Dangl JL. The plant immune system. Nature. 2006;444(7117):323–9.
4. Kliebenstein DJ. Orchestration of plant defense systems: genes to populations. Trends Plant Sci. 2014;19(4):250–5.
5. Yang Y-X, Ahammed GJ, Wu C, Fan S-y, Zhou Y-H. Crosstalk among jasmonate, salicylate and ethylene signaling pathways in plant disease and immune responses. Curr Protein Peptide Sci. 2015;16(5):450–61.
6. Alvarez ME. Salicylic acid in the machinery of hypersensitive cell death and disease resistance. Plant Mol Biol. 2000;44(3):429–42.
7. Durrant WE, Dong X. Systemic acquired resistance. Annu Rev Phytopathol. 2004;42:185–209.
8. Vlot AC, Dempsey DMA, Klessig DF. Salicylic acid, a multifaceted hormone to combat disease. Annu Rev Phytopathol. 2009;47(1):177–206.
9. Fu ZQ, Dong X. Systemic acquired resistance: turning local infection into global defense. Annu Rev Plant Biol. 2013;64(1):839–63.
10. van Loon LC, van Strien EA. The families of pathogenesis-related proteins, their activities, and comparative analysis of PR-1 type proteins. Physiol Mol Plant Pathol. 1999;55(2):85–97.
11. van Loon LC, Rep M, Pieterse CMJ. Significance of inducible defense-related proteins in infected plants. Annu Rev Phytopathol. 2006;44(1):135–62.
12. Guiltinan M, Verica J, Zhang D, Figueira A. Genomics of *theobroma cacao*, "the foods of the gods". In: Moore PM, Ming R, editors. Genomics of tropical crop plants. New York: Springer; 2008.
13. Argout X, Salse J, Aury J-M, Guiltinan MJ, Droc G, Gouzy J, Allegre M, Chaparro C, Legavre T, Maximova SN, et al. The genome of *theobroma cacao*. Nat Genet. 2011;43(2):101–8.
14. Motamayor J, Mockaitis K, Schmutz J, Haiminen N, Livingstone D, Cornejo O, Findley S, Zheng P, Utro F, Royaert S, et al. The genome sequence of the most widely cultivated cacao type and its use to identify candidate genes regulating pod color. Genome Biol. 2013;14(6):R53.
15. Zhang Y, Smith P, Maximova SN, Guiltinan MJ. Application of glycerol as a foliar spray activates the defence response and enhances disease resistance of *theobroma cacao*. Mol Plant Pathol. 2015;16(1):27–37.
16. Teixeira PJPL, Costa GGL, Fiorin GL, Pereira GAG, Mondego JMC. Novel receptor-like kinases in cacao contain PR-1 extracellular domains. Mol Plant Pathol. 2013;14(6):602–9.
17. Maximova S, Marelli J-P, Young A, Pishak S, Verica J, Guiltinan M. Over-expression of a cacao class I chitinase gene in *theobroma cacao L*. Enhances resistance against the pathogen, *colletotrichum gloeosporioides*. Planta. 2006;224(4):740–9.

18. Fister AS, Shi Z, Zhang Y, Helliwell EE, Maximova SN, Guiltinan MJ. Protocol: transient expression system for functional genomics in the tropical tree theobroma cacao L. Plant Methods. 2016;12(1):1–13.
19. Pereira Menezes S, de Andrade SE, Matos Lima E, Oliveira de Sousa A, Silva Andrade B, Santos Lima Lemos L, Peres Gramacho K, da Silva Gesteira A, Pirovani C, Micheli F. The pathogenesis-related protein PR-4b from *theobroma cacao* presents RNase activity, Ca2+ and Mg2+ dependent-DNase activity and antifungal action on *moniliophthora perniciosa*. BMC Plant Biol. 2014;14(1):161.
20. Pungartnik C, da Silva AC, de Melo SA, Gramacho KP, de Mattos Cascardo JC, Brendel M, Micheli F, da Silva Gesteira A. High-affinity copper transport and Snq2 export permease of *saccharomyces cerevisiae* modulate cytotoxicity of PR-10 from *theobroma cacao*. Mol Plant-Microbe Interact. 2008;22(1):39–51.
21. Menezes SP, dos Santos JL, Cardoso THS, Pirovani CP, Micheli F, Noronha FSM, Alves AC, Faria AMC, da Silva Gesteira A. Evaluation of the allergenicity potential of TcPR-10 protein from *theobroma cacao*. PLoS One. 2012;7(6), e37969.
22. Teixeira PJPL, Thomazella DPT, Reis O, do Prado PFV, do Rio MCS, Fiorin GL, José J, Costa GGL, Negri VA, Mondego JMC, et al. High-resolution transcript profiling of the atypical biotrophic interaction between *theobroma cacao* and the fungal pathogen *moniliophthora perniciosa*. Plant Cell. 2014;26:4245–69.
23. Fister AS, O'Neil ST, Shi Z, Zhang Y, Tyler BM, Guiltinan MJ, Maximova SN. Two *theobroma cacao* genotypes with contrasting pathogen tolerance show aberrant transcriptional and ROS responses after salicylic acid treatment. J Exp Bot. 2015;66(20):6245–58.
24. Argout X, Fouet O, Wincker P, Gramacho K, Legavre T, Sabau X, Risterucci AM, Da Silva C, Cascardo J, Allegre M, et al. Towards the understanding of the cocoa transcriptome: production and analysis of an exhaustive dataset of ESTs of *theobroma cacao L.* Generated from various tissues and under various conditions. BMC Genomics. 2008;9:512.
25. Gesteira AS, Micheli F, Carels N, Da Silva AC, Gramacho KP, Schuster I, Macedo JN, Pereira GA, Cascardo JC. Comparative analysis of expressed genes from cacao meristems infected by moniliophthora perniciosa. Ann Bot. 2007;100(1):129–40.
26. Motamayor JC, Lachenaud P, Mota JW SE, Loor R, Kuhn DN, Brown JS. Geographic and genetic population differentiation of the Amazonian chocolate tree (theobroma cacao L.). PLoS ONE. 2008;3(10):e3311.
27. Guest D. Black pod: diverse pathogens with a global impact on cocoa yield. Phytopathology. 2007;97(12):1650–3.
28. Ploetz RC. Cacao diseases: important threats to chocolate production worldwide. Phytopathology. 2007;97(12):1634–9.
29. Rojas EI, Rehner SA, Samuels GJ, Van Bael SA, Herre EA, Cannon P, Chen R, Pang J, Wang R, Zhang Y. *Colletotrichum gloeosporioides sl* associated with *theobroma cacao* and other plants in panama: multilocus phylogenies distinguish host-associated pathogens from asymptomatic endophytes. Mycologia. 2010;102(6):1318–38.
30. Argout X, Salse J, Aury J, Guiltinan M, Droc G, Gouzy J, Allegre M, Chaparro C, Legavre T, Maximova S. The genome of theobroma cacao. Nat Genet. 2011;43(2):101–8.
31. Motamayor JC, Lachenaud P, da Silva e Mota JW, Loor R, Kuhn DN, Brown JS, Schnell RJ. Geographic and genetic population differentiation of the Amazonian chocolate tree (*theobroma cacao L*). PLoS One. 2008;3(10), e3311.
32. Lamesch P, Berardini TZ, Li D, Swarbreck D, Wilks C, Sasidharan R, Muller R, Dreher K, Alexander DL, Garcia-Hernandez M, et al. The Arabidopsis information resource (TAIR): improved gene annotation and new tools. Nucleic Acids Res. 2012;40(Database issue):D1202–10.
33. International Brachypodium Inititative. Genome sequencing and analysis of the model grass *brachypodium distachyon*. Nature. 2010;463(7282):763–8.
34. Tuskan GA, Difazio S, Jansson S, Bohlmann J, Grigoriev I, Hellsten U, Putnam N, Ralph S, Rombauts S, Salamov A, et al. The genome of black cottonwood, *populus trichocarpa* (torr. & gray). Science. 2006;313(5793):1596–604.
35. Yu J, Hu S, Wang J, Wong G, Li S, Liu B, Deng Y, Dai L, Zhou Y, Zhang X, et al. A draft sequence of the rice genome (oryza sativa L. ssp. Indica). Science. 2002;296:79–92.
36. Jaillon O, Aury JM, Noel B, Policriti A, Clepet C, Casagrande A, Choisne N, Aubourg S, Vitulo N, Jubin C, Vezzi, A.The grapevine genome sequence suggests ancestral hexaploidization in major angiosperm phyla. Nature. 2007, 449(7161):463–467.
37. Rizzon C, Ponger L, Gaut BS. Striking similarities in the genomic distribution of tandemly arrayed genes in Arabidopsis and rice. PLoS Comput Biol. 2006;2(9), e115.
38. Lyons E, Freeling M. How to usefully compare homologous plant genes and chromosomes as DNA sequences. Plant J. 2008;53(4):661–73.
39. Skinner ME, Uzilov AV, Stein LD, Mungall CJ, Holmes IH. JBrowse: a next-generation genome browser. Genome Res. 2009;19(9):1630–8.
40. Benjamini Y, Hochberg Y. Controlling the false discovery rate: a practical and powerful approach to multiple testing. J R Stat Soc Ser B Methodol. 1995;57(1):289–300.
41. Campos MA, Rosa DD, Teixeira JÉC, Targon MLPN, Souza AA, Paiva LV, Stach-Machado DR, Machado MA. PR gene families of citrus: their organ specific-biotic and abiotic inducible expression profiles based on ESTs approach. Genet Mol Biol. 2007;30:917–30.
42. Sels J, Mathys J, De Coninck BMA, Cammue BPA, De Bolle MFC. Plant pathogenesis-related (PR) proteins: a focus on PR peptides. Plant Physiol Biochem. 2008;46(11):941–50.
43. Wanderley-Nogueira AC, Belarmino LC, Soares-Cavalcanti NM, Bezerra-Neto JP, Kido EA, Pandolfi V, Abdelnoor RV, Binneck E, Carazzole MF, Benko-Iseppon AM. An overall evaluation of the resistance (R) and pathogenesis-related (PR) superfamilies in soybean, as compared with *medicago* and Arabidopsis. Genet Mol Biol. 2012;35:260–71.
44. Barker M, Baute G, Liu S-L: Duplications and Turnover in Plant Genomes. In: Plant Genome Diversity Volume 1. Edited by Wendel JF, Greilhuber J, Dolezel J, Leitch IJ. Vienna, Austria: Springer Vienna; 2012: 155–169.
45. Jordá L, Coego A, Conejero V, Vera P. A genomic cluster containing four differentially regulated subtilisin-like processing protease genes is in tomato plants. J Biol Chem. 1999;274(4):2360–5.
46. Lebel S, Schellenbaum P, Walter B, Maillot P. Characterisation of the *vitis vinifera* PR10 multigene family. BMC Plant Biol. 2010;10(1):184.
47. Silverstein KAT, Graham MA, Paape TD, Vandenbosch KA. Genome organization of more than 300 defensin-like genes in Arabidopsis. Plant Physiol. 2005;138(2):600–10.
48. Manosalva PM, Davidson RM, Liu B, Zhu X, Hulbert SH, Leung H, Leach JE. A germin-like protein gene family functions as a complex quantitative trait locus conferring broad-spectrum disease resistance in rice. Plant Physiol. 2009;149(1):286–96.
49. Leister D. Tandem and segmental gene duplication and recombination in the evolution of plant disease resistance genes. Trends Genet. 2004;20(3):116–22.
50. Spoel SH, Dong X. How do plants achieve immunity? defence without specialized immune cells. Nat Rev Immunol. 2012;12(2):89–100.
51. Cannon S, Mitra A, Baumgarten A, Young N, May G. The roles of segmental and tandem gene duplication in the evolution of large gene families in *Arabidopsis thaliana*. BMC Plant Biol. 2004;4(1):10.
52. Haberer G, Hindemitt T, Meyers BC, Mayer KFX. Transcriptional similarities, dissimilarities, and conservation of cis-elements in duplicated genes of Arabidopsis. Plant Physiol. 2004;136(2):3009–22.
53. Casneuf T, De Bodt S, Raes J, Maere S, Van de Peer Y. Nonrandom divergence of gene expression following gene and genome duplications in the flowering plant *Arabidopsis thaliana*. Genome Biol. 2006;7(2):R13.
54. Ganko EW, Meyers BC, Vision TJ. Divergence in expression between duplicated genes in Arabidopsis. Mol Biol Evol. 2007;24(10):2298–309.
55. Li Z, Zhang H, Ge S, Gu X, Gao G, Luo J. Expression pattern divergence of duplicated genes in rice. BMC Bioinf. 2009;10 Suppl 6:S8.
56. Cantacessi C, Campbell BE, Visser A, Geldhof P, Nolan MJ, Nisbet AJ, Matthews JB, Loukas A, Hofmann A, Otranto D, et al. A portrait of the "SCP/TAPS" proteins of eukaryotes—developing a framework for fundamental research and biotechnological outcomes. Biotechnol Adv. 2009;27(4):376–88.
57. Chalmers I, Mcardle A, Coulson R, Wagner M, Schmid R, Hirai H, Hoffmann K. Developmentally regulated expression, alternative splicing and distinct sub-groupings in members of the schistosoma mansoni venom allergen-like (SmVAL) gene family. BMC Genomics. 2008;9(1):89.
58. Guerriero G, Avino M, Zhou Q, Fugelstad J, Clergeot P-H, Bulone V. Chitin synthases from *saprolegnia* are involved in tip growth and represent a potential target for anti-oomycete drugs. PLoS Path. 2010;6(8), e1001070.
59. Tanaka S, Han X, Kahmann R. Microbial effectors target multiple steps in the salicylic acid production and signaling pathway. Front Plant Sci. 2015;6:349.
60. Altschul SF, Gish W, Miller W, Myers EW, Lipman DJ. Basic local alignment search tool. J Mol Biol. 1990;215(3):403–10.
61. Stec B. Plant thionins—the structural perspective. Cell Mol Life Sci CMLS. 2006;63(12):1370–85.
62. Dunwell JM, Gibbings JG, Mahmood T, Saqlan Naqvi SM. Germin and germin-like proteins: evolution, structure, and function. Crit Rev Plant Sci. 2008;27(5):342–75.

63. Cock PJA, Antao T, Chang JT, Chapman BA, Cox CJ, Dalke A, Friedberg I, Hamelryck T, Kauff F, Wilczynski B. Biopython: freely available python tools for computational molecular biology and bioinformatics. Bioinformatics. 2009;25(11):1422–3.
64. Marchler-Bauer A, Derbyshire MK, Gonzales NR, Lu S, Chitsaz F, Geer LY, et al. CDD: NCBI's conserved domain database. Nucleic Acids Res. 2015;43(D1):D222–6.
65. Wickham H. ggplot2: elegant graphics for data analysis. New York: Springer; 2009.
66. Yin T, Cook D, Lawrence M. Ggbio: an R package for extending the grammar of graphics for genomic data. Genome Biol. 2012;13(8):R77.
67. Goodstein DM, Shu S, Howson R, Neupane R, Hayes RD, Fazo J, Mitros T, Dirks W, Hellsten U, Putnam N. Phytozome: a comparative platform for green plant genomics. Nucleic Acids Res. 2012;40(D1):D1178–86.
68. Edgar RC. MUSCLE: multiple sequence alignment with high accuracy and high throughput. Nucleic Acids Res. 2004;32(5):1792–7.
69. Drummond A, Ashton B, Buxton S, Cheung M, Cooper A, Duran C, Field M, Heled J, Kearse M, Markowitz S, et al. Geneious v5.6, Available from http://www.geneious.com. 2012.
70. Stamatakis A. RAxML version 8: a tool for phylogenetic analysis and post-analysis of large phylogenies. Bioinformatics. 2014;30(9):1312–3.
71. Mejía LC, Herre EA, Sparks JP, Winter K, García MN, Van Bael SA, Stitt J, Shi Z, Zhang Y, Guiltinan MJ, et al. Pervasive effects of a dominant foliar endophytic fungus on host genetic and phenotypic expression in a tropical tree. Frontiers in Microbiology 2014;5:1–16.
72. Mejía LC, Rojas EI, Maynard Z, Van Bael S, Arnold AE, Hebbar P, Samuels GJ, Robbins N, Herre EA. Endophytic fungi as biocontrol agents of theobroma cacao pathogens. Biol Control. 2008;46(1):4–14.
73. Mejia L, Guiltinan M, Shi Z, Landherr L, Maximova S. Expression of designed antimicrobial peptides in Theobroma cacao L. trees reduces leaf necrosis caused by Phytophthora spp. Small Wonders Pept Dis Control. 2012;1905:379–395.
74. Verica JA, Maximova SN, Strem MD, Carlson JE, Bailey BA, Guiltinan MJ. Isolation of ESTs from cacao (*theobroma cacao L.*) leaves treated with inducers of the defense response. Plant Cell Rep. 2004;23(6):404–13.
75. Maximova S, Florez S, Shen X, Niemenak N, Zhang Y, Curtis W, Guiltinan M. Genome-wide analysis reveals divergent patterns of gene expression during zygotic and somatic embryo maturation of *theobroma cacao L.* the chocolate tree. BMC Plant Biol. 2014;14(1):185.
76. Gentleman R, Carey V, Bates D, Bolstad B, Dettling M, Dudoit S, Ellis B, Gautier L, Ge Y, Gentry J, et al. Bioconductor: open software development for computational biology and bioinformatics. Genome Biol. 2004;5(10):R80.
77. Smyth G: Linear models and empirical bayes methods for assessing differential expression in microarray experiments. Statistical Applications in Genetics and Molecular Biology. 2004. 3.
78. Smyth GK: limma: Linear Models for Microarray Data. In: Bioinformatics and Computational Biology Solutions Using R and Bioconductor. Edited by Gentleman R, Carey V, Huber W, Irizarry R, Dudoit S. Vienna, Austria: Springer New York; 2005. 397–420.
79. Balasubramanian V, Vashisht D, Cletus J, Sakthivel N. Plant β-1,3-glucanases: their biological functions and transgenic expression against phytopathogenic fungi. Biotechnol Lett. 2012;34(11):1983–90.
80. Brunner F, Stintzi A, Fritig B, Legrand M. Substrate specificities of tobacco chitinases. Plant J. 1998;14(2):225–34.
81. Grover A. Plant chitinases: genetic diversity and physiological roles. Crit Rev Plant Sci. 2012;31(1):57–73.
82. Caporale C, Di Berardino I, Leonardi L, Bertini L, Cascone A, Buonocore V, Caruso C. Wheat pathogenesis-related proteins of class 4 have ribonuclease activity. FEBS Lett. 2004;575(1–3):71–6.
83. Lu HC, Lin JH, Chua ACN, Chung TY, Tsai IC, Tzen JTC, Chou WM. Cloning and expression of pathogenesis-related protein 4 from jelly fig (*ficus awkeotsang Makino*) achenes associated with ribonuclease, chitinase and anti-fungal activities. Plant Physiol Biochem. 2012;56:1–13.
84. Liu J-J, Sturrock R, Ekramoddoullah AM. The superfamily of thaumatin-like proteins: its origin, evolution, and expression towards biological function. Plant Cell Rep. 2010;29(5):419–36.
85. Petre B, Major I, Rouhier N, Duplessis S. Genome-wide analysis of eukaryote thaumatin-like proteins (TLPs) with an emphasis on poplar. BMC Plant Biol. 2011;11(1):33.
86. Mithöfer A, Boland W. Plant defense against herbivores: chemical aspects. Annu Rev Plant Biol. 2012;63(1):431–50.
87. Tornero P, Conejero V, Vera P. Primary structure and expression of a pathogen-induced protease (PR-P69) in tomato plants: similarity of functional domains to subtilisin-like endoproteases. Proc Natl Acad Sci U S A. 1996;93(13):6332–7.
88. van Scheltinga AC T, Hennig M, Dijkstra BW. The 1.8 Å resolution structure of hevamine, a plant chitinase/lysozyme, and analysis of the conserved sequence and structure motifs of glycosyl hydrolase family 18. J Mol Biol. 1996;262(2):243–57.
89. Passardi F, Penel C, Dunand C. Performing the paradoxical: how plant peroxidases modify the cell wall. Trends Plant Sci. 2004;9(11):534–40.
90. Park C-J, Kim K-J, Shin R, Park JM, Shin Y-C, Paek K-H. Pathogenesis-related protein 10 isolated from hot pepper functions as a ribonuclease in an antiviral pathway. Plant J. 2004;37(2):186–98.
91. Walter MH, Liu J-W, Wünn J, Hess D. Bean ribonuclease-like pathogenesis-related protein genes (Ypr10) display complex patterns of developmental, dark-induced and exogenous-stimulus-dependent expression. Eur J Biochem. 1996;239(2):281–93.
92. Stotz HU, Thomson JG, Wang Y. Plant defensins: defense, development and application. Plant Signal Behav. 2009;4(11):1010–2.
93. Yeats TH, Rose JKC. The biochemistry and biology of extracellular plant lipid-transfer proteins (LTPs). Protein Sci : Publ Protein Soc. 2008;17(2):191–8.
94. Davidson RM, Reeves PA, Manosalva PM, Leach JE. Germins: a diverse protein family important for crop improvement. Plant Sci. 2009;177(6):499–510.
95. Christensen AB, Cho BHO, Næsby M, Gregersen PL, Brandt J, Madriz-Ordeñana K, Collinge DB, Thordal-Christensen H. The molecular characterization of two barley proteins establishes the novel PR-17 family of pathogenesis-related proteins. Mol Plant Pathol. 2002;3(3):135–44.
96. Pfaffl MW, Horgan GW, Dempfle L. Relative expression software tool (REST©) for group-wise comparison and statistical analysis of relative expression results in real-time PCR. Nucleic Acids Res. 2002;30(9), e36.



Supplemental Fig. S1 – Karyogram depicting the position of PR genes along the length of chromosomes based on the Matina genome sequence. Tandem arrays are labelled above the chromosomes with gene family and number of genes in the array in parentheses. Length of chromosomes is shown in Mb. Due to resolution of the image, lines for physically clustered genes may overlap.



Supplemental Figure S2 – Normalized expression scatterplots for all probes on the array comparing A) *P. palmivora* treatment to water treatment and B) *C. theobromicola* treatment to water treatment.

Supplemental Table S1 - GenBank Accession Numbers for PR Family Type Members

PR Gene	Accession Number
PR-1	CAA31008.1
PR-2	AAA34103.1
PR-3	P17514.1
PR-4	CAA41437.1
PR-5	BAA74546.2
PR-6	AAA34183.1
PR-7	NP_001234257.1
PR-8	AAA33120.1
PR-9	AAA34108.1
PR-10	AAL09033.1
PR-11	CAA54373.1
PR-12	O24332.1
PR-13	AAC41678.1
PR-14	CAA91436.1
PR-15	CAA74595.1
PR-16	CAA63659.1
PR-17	BAA81904.1

Supplemental Table S2 - PR gene positions in Criollo genome, color-coded by PR gene family					
Chromosome	Start	Stop	PR Gene Family	Gene ID	Tandem Array ID
Chr1	46446	50611	PR-7	Tc01_g000090	
Chr1	407076	408180	PR-3	Tc01_g000770	Chr1PR-3.1
Chr1	416020	417055	PR-3	Tc01_g000800	Chr1PR-3.1
Chr1	592960	594207	PR-9	Tc01_g001190	
Chr1	756862	758055	PR-5	Tc01_g001580	Chr1PR-5.2
Chr1	764592	765968	PR-5	Tc01_g001590	Chr1PR-5.2
Chr1	1223958	1225321	PR-9	Tc01_g002490	
Chr1	2046944	2047477	PR-1	Tc01_g003940	
Chr1	2390176	2391738	PR-9	Tc01_g004590	
Chr1	2797614	2800013	PR-7	Tc01_g005210	Chr1PR-7.3
Chr1	2801937	2804204	PR-7	Tc01_g005220	Chr1PR-7.3
Chr1	3352887	3355169	PR-7	Tc01_g006160	
Chr1	3427643	3429296	PR-9	Tc01_g006280	
Chr1	3517917	3519445	PR-2	Tc01_g006420	
Chr1	5006124	5007854	PR-9	Tc01_g008530	
Chr1	6168606	6170228	PR-2	Tc01_g010310	Chr1PR-2.4
Chr1	6172632	6176254	PR-2	Tc01_g010320	Chr1PR-2.4
Chr1	6221240	6222258	PR-3	Tc01_g010350	
Chr1	8521396	8522841	PR-9	Tc01_g013330	
Chr1	9077679	9080866	PR-2	Tc01_g014030	
Chr1	12365543	12367610	PR-2	Tc01_g017650	
Chr1	15266578	15268183	PR-2	Tc01_g021070	
Chr1	21684400	21686697	PR-7	Tc01_g026170	
Chr1	24449757	24451200	PR-9	Tc01_g029350	
Chr1	25614422	25615074	PR-10	Tc01_g031100	
Chr1	26238743	26239660	PR-8	Tc01_g032120	
Chr1	26379168	26379491	PR-8	Tc01_g032260	
Chr1	26567546	26568662	PR-9	Tc01_g032570	
Chr1	26825013	26825938	PR-3	Tc01_g032950	
Chr1	26960822	26961584	PR-16	Tc01_g033170	
Chr1	27725371	27726015	PR-1	Tc01_g034430	
Chr1	27788216	27788682	PR-14	Tc01_g034520	
Chr1	28094750	28095737	PR-8	Tc01_g035050	Chr1PR-8.5
Chr1	28098396	28099445	PR-8	Tc01_g035060	Chr1PR-8.5
Chr1	28136550	28137445	PR-8	Tc01_g035140	Chr1PR-8.5

Chr1	28139089	28139985	PR-8	Tc01_g035150	Chr1PR-8.5
Chr1	28141342	28142244	PR-8	Tc01_g035160	Chr1PR-8.5
Chr1	29089378	29096068	PR-7	Tc01_g037010	Chr1PR-7.6
Chr1	29099230	29102593	PR-7	Tc01_g037020	Chr1PR-7.6
Chr1	29106890	29110006	PR-7	Tc01_g037030	Chr1PR-7.6
Chr1	29115406	29119284	PR-7	Tc01_g037040	Chr1PR-7.6
Chr1	30267844	30268167	PR-14	Tc01_g039190	
Chr2	1453223	1453702	PR-1	Tc02_g002380	Chr2PR-1.1
Chr2	1454367	1454837	PR-1	Tc02_g002390	Chr2PR-1.1
Chr2	1456734	1457219	PR-1	Tc02_g002400	Chr2PR-1.1
Chr2	1460085	1460573	PR-1	Tc02_g002410	Chr2PR-1.1
Chr2	1463710	1464189	PR-1	Tc02_g002420	Chr2PR-1.1
Chr2	1465775	1466269	PR-1	Tc02_g002430	Chr2PR-1.1
Chr2	1782306	1783525	PR-5	Tc02_g003020	
Chr2	1834936	1836914	PR-9	Tc02_g003150	
Chr2	2204825	2205983	PR-3	Tc02_g003890	
Chr2	2838778	2841102	PR-7	Tc02_g005130	
Chr2	2891313	2892972	PR-5	Tc02_g005190	Chr2PR-5.2
Chr2	2900033	2902683	PR-5	Tc02_g005200	Chr2PR-5.2
Chr2	3567043	3567463	PR-12	Tc02_g006630	Chr2PR-12.3
Chr2	3574782	3574952	PR-12	Tc02_g006660	Chr2PR-12.3
Chr2	3791974	3796328	PR-2	Tc02_g007080	
Chr2	3911517	3916523	PR-7	Tc02_g007300	
Chr2	4604542	4606761	PR-9	Tc02_g008380	
Chr2	5265134	5265811	PR-17	Tc02_g009590	Chr2PR-17.4
Chr2	5268266	5269520	PR-17	Tc02_g009600	Chr2PR-17.4
Chr2	5272315	5273019	PR-17	Tc02_g009610	Chr2PR-17.4
Chr2	5280292	5280972	PR-17	Tc02_g009630	Chr2PR-17.4
Chr2	5290110	5290810	PR-17	Tc02_g009650	Chr2PR-17.4
Chr2	5714692	5716563	PR-1	Tc02_g010380	
Chr2	6680377	6681597	PR-9	Tc02_g011920	Chr2PR-9.5
Chr2	6688821	6690092	PR-9	Tc02_g011930	Chr2PR-9.5
Chr2	6692863	6694134	PR-9	Tc02_g011940	Chr2PR-9.5
Chr2	6698094	6699389	PR-9	Tc02_g011950	Chr2PR-9.5
Chr2	6701728	6702974	PR-9	Tc02_g011960	Chr2PR-9.5
Chr2	6713925	6715033	PR-9	Tc02_g011990	Chr2PR-9.5
Chr2	6725602	6726798	PR-9	Tc02_g012000	Chr2PR-9.5
Chr2	6728402	6732943	PR-9	Tc02_g012010	Chr2PR-9.5

Chr2	6733980	6735168	PR-9	Tc02_g012020	Chr2PR-9.5
Chr2	7596477	7598446	PR-9	Tc02_g013360	
Chr2	9964462	9964902	PR-14	Tc02_g016580	
Chr2	17976635	17977630	PR-9	Tc02_g022830	
Chr2	19074797	19075795	PR-2	Tc02_g023780	
Chr2	22789048	22793374	PR-2	Tc02_g028070	
Chr2	23779373	23780685	PR-9	Tc02_g029020	Chr2PR-9.6
Chr2	23812198	23813502	PR-9	Tc02_g029090	Chr2PR-9.6
Chr2	23817409	23818719	PR-9	Tc02_g029110	Chr2PR-9.6
Chr2	23827973	23829773	PR-9	Tc02_g029120	Chr2PR-9.6
Chr2	23839783	23845668	PR-9	Tc02_g029131	Chr2PR-9.6
Chr2	24935435	24936685	PR-9	Tc02_g030420	Chr2PR-9.7
Chr2	24943784	24945334	PR-9	Tc02_g030430	Chr2PR-9.7
Chr2	25295410	25295847	PR-9	Tc02_g030970	Chr2PR-9.8
Chr2	25297462	25298357	PR-9	Tc02_g030980	Chr2PR-9.8
Chr3	320042	321034	PR-9	Tc03_g000530	
Chr3	4837264	4838273	PR-5	Tc03_g005540	
Chr3	10318529	10319194	PR-16	Tc03_g009350	
Chr3	16215818	16223170	PR-16	Tc03_g016120	
Chr3	17331874	17332776	PR-8	Tc03_g017760	Chr3PR-8.1
Chr3	17340582	17341478	PR-8	Tc03_g017780	Chr3PR-8.1
Chr3	17344432	17345325	PR-8	Tc03_g017790	Chr3PR-8.1
Chr3	18014708	18017044	PR-7	Tc03_g018930	
Chr3	18236392	18237551	PR-9	Tc03_g019180	
Chr3	19476132	19478006	PR-2	Tc03_g021200	
Chr3	19763023	19766766	PR-7	Tc03_g021760	
Chr3	19837251	19838667	PR-9	Tc03_g021880	
Chr3	20186386	20189613	PR-7	Tc03_g022570	Chr3PR-7.2
Chr3	20192438	20196672	PR-7	Tc03_g022580	Chr3PR-7.2
Chr3	20198996	20202591	PR-7	Tc03_g022590	Chr3PR-7.2
Chr3	20236328	20237838	PR-2	Tc03_g022650	
Chr3	20812784	20814495	PR-9	Tc03_g023600	
Chr3	20873633	20874124	PR-14	Tc03_g023690	
Chr3	21230293	21255588	PR-7	Tc03_g024170	
Chr3	22569364	22573346	PR-7	Tc03_g026320	Chr3PR-7.3
Chr3	22574911	22577142	PR-7	Tc03_g026330	Chr3PR-7.3
Chr3	22578287	22580454	PR-7	Tc03_g026340	Chr3PR-7.3
Chr3	22705359	22708866	PR-7	Tc03_g026560	Chr3PR-7.4

Chr3	22710814	22714408	PR-7	Tc03_g026570	Chr3PR-7.4
Chr3	22978758	22979435	PR-5	Tc03_g026960	Chr3PR-5.5
Chr3	22989396	22989923	PR-5	Tc03_g026980	Chr3PR-5.5
Chr3	22995503	22996177	PR-5	Tc03_g026990	Chr3PR-5.5
Chr3	22999218	22999882	PR-5	Tc03_g027000	Chr3PR-5.5
Chr3	23001302	23001976	PR-5	Tc03_g027010	Chr3PR-5.5
Chr3	23003689	23004303	PR-5	Tc03_g027020	Chr3PR-5.5
Chr3	23004849	23005571	PR-5	Tc03_g027030	Chr3PR-5.5
Chr3	24496301	24497326	PR-2	Tc03_g029620	
Chr4	255387	256364	PR-9	Tc04_g000340	
Chr4	1012521	1013740	PR-8	Tc04_g001620	
Chr4	2788623	2790250	PR-9	Tc04_g004350	Chr4PR-9.1
Chr4	2791630	2793436	PR-9	Tc04_g004360	Chr4PR-9.1
Chr4	2794822	2796456	PR-9	Tc04_g004370	Chr4PR-9.1
Chr4	8043355	8044235	PR-5	Tc04_g008530	
Chr4	11658052	11661012	PR-2	Tc04_g012520	
Chr4	12331457	12331935	PR-14	Tc04_g013310	
Chr4	13347034	13347476	PR-5	Tc04_g014480	
Chr4	14722179	14723300	PR-9	Tc04_g016340	
Chr4	14745374	14745865	PR-14	Tc04_g016380	Chr4PR-14.2
Chr4	14765307	14765876	PR-14	Tc04_g016400	Chr4PR-14.2
Chr4	14785146	14786072	PR-14	Tc04_g016440	Chr4PR-14.2
Chr4	14799364	14799929	PR-14	Tc04_g016450	Chr4PR-14.2
Chr4	15012802	15018041	PR-9	Tc04_g016710	Chr4PR-9.3
Chr4	15033309	15034430	PR-9	Tc04_g016740	Chr4PR-9.3
Chr4	15054772	15055892	PR-9	Tc04_g016760	Chr4PR-9.3
Chr4	15937181	15938075	PR-3	Tc04_g018090	Chr4PR-3.4
Chr4	15942222	15943027	PR-3	Tc04_g018100	Chr4PR-3.4
Chr4	15951169	15952222	PR-3	Tc04_g018110	Chr4PR-3.4
Chr4	15995814	15996879	PR-3	Tc04_g018160	Chr4PR-3.4
Chr4	17148238	17151103	PR-9	Tc04_g019840	
Chr4	17484077	17485694	PR-2	Tc04_g020310	
Chr4	17879840	17881090	PR-5	Tc04_g020870	
Chr4	19580508	19585108	PR-2	Tc04_g023620	
Chr4	21631422	21632757	PR-9	Tc04_g027220	Chr4PR-9.5
Chr4	21636062	21637717	PR-9	Tc04_g027230	Chr4PR-9.5
Chr4	22135251	22136317	PR-9	Tc04_g028060	
Chr4	22480311	22480887	PR-10	Tc04_g028740	Chr4PR-10.6

Chr4	22481675	22482230	PR-10	Tc04_g028750	Chr4PR-10.6
Chr4	22483092	22483770	PR-10	Tc04_g028760	Chr4PR-10.6
Chr4	22489740	22490297	PR-10	Tc04_g028780	Chr4PR-10.6
Chr4	22492172	22492742	PR-10	Tc04_g028790	Chr4PR-10.6
Chr4	22494552	22495144	PR-10	Tc04_g028800	Chr4PR-10.6
Chr4	22499557	22500145	PR-10	Tc04_g028830	Chr4PR-10.6
Chr4	22501085	22501677	PR-10	Tc04_g028840	Chr4PR-10.6
Chr4	22504672	22505247	PR-10	Tc04_g028860	Chr4PR-10.6
Chr4	22506913	22507501	PR-10	Tc04_g028870	Chr4PR-10.6
Chr4	22508764	22509336	PR-10	Tc04_g028880	Chr4PR-10.6
Chr4	22511232	22511804	PR-10	Tc04_g028900	Chr4PR-10.6
Chr4	22515773	22516365	PR-10	Tc04_g028920	Chr4PR-10.6
Chr4	22517301	22517886	PR-10	Tc04_g028930	Chr4PR-10.6
Chr4	22518569	22519103	PR-10	Tc04_g028940	Chr4PR-10.6
Chr4	22641991	22643524	PR-3	Tc04_g029180	
Chr4	22709023	22712083	PR-2	Tc04_g029300	
Chr4	22833512	22834743	PR-9	Tc04_g029620	
Chr4	22935290	22936567	PR-9	Tc04_g029820	
Chr5	155638	156316	PR-10	Tc05_g000310	Chr5PR-10.1
Chr5	171073	171753	PR-10	Tc05_g000340	Chr5PR-10.1
Chr5	187696	188376	PR-10	Tc05_g000350	Chr5PR-10.1
Chr5	212396	215208	PR-10	Tc05_g000380	Chr5PR-10.1
Chr5	2252411	2253450	PR-5	Tc05_g004240	
Chr5	2957852	2958562	PR-1	Tc05_g005530	
Chr5	3297559	3300161	PR-9	Tc05_g006120	
Chr5	5445578	5446622	PR-16	Tc05_g008860	
Chr5	5854961	5858791	PR-16	Tc05_g009390	
Chr5	6655743	6659172	PR-7	Tc05_g010230	
Chr5	11319064	11321364	PR-7	Tc05_g013470	
Chr5	14642635	14643881	PR-2	Tc05_g016070	
Chr5	20017774	20018430	PR-6	Tc05_g022770	Chr5PR-6.2
Chr5	20026069	20026725	PR-6	Tc05_g022780	Chr5PR-6.2
Chr5	21264780	21265618	PR-16	Tc05_g024700	
Chr5	21455283	21456757	PR-16	Tc05_g024940	
Chr5	21700051	21700875	PR-16	Tc05_g025310	Chr5PR-16.3
Chr5	21705030	21705781	PR-16	Tc05_g025330	Chr5PR-16.3
Chr5	21713402	21714258	PR-16	Tc05_g025350	Chr5PR-16.3
Chr5	21715594	21718017	PR-16	Tc05_g025360	Chr5PR-16.3

Chr5	21737964	21738819	PR-16	Tc05_g025400	Chr5PR-16.3
Chr5	21740097	21740875	PR-16	Tc05_g025410	Chr5PR-16.3
Chr5	21750659	21751516	PR-16	Tc05_g025420	Chr5PR-16.3
Chr5	21761479	21762326	PR-16	Tc05_g025430	Chr5PR-16.3
Chr5	21771629	21772485	PR-16	Tc05_g025440	Chr5PR-16.3
Chr5	21775301	21776123	PR-16	Tc05_g025450	Chr5PR-16.3
Chr5	21793844	21795080	PR-16	Tc05_g025470	Chr5PR-16.3
Chr5	21796024	21800895	PR-16	Tc05_g025480	Chr5PR-16.3
Chr5	21850086	21852832	PR-16	Tc05_g025520	Chr5PR-16.3
Chr5	21855659	21859290	PR-16	Tc05_g025530	Chr5PR-16.3
Chr5	23011025	23011535	PR-4	Tc05_g027210	Chr5PR-4.4
Chr5	23015545	23016832	PR-4	Tc05_g027220	Chr5PR-4.4
Chr5	23022482	23023859	PR-4	Tc05_g027230	Chr5PR-4.4
Chr5	23030430	23031726	PR-4	Tc05_g027250	Chr5PR-4.4
Chr5	23076382	23077121	PR-4	Tc05_g027320	Chr5PR-4.4
Chr5	23082584	23089537	PR-4	Tc05_g027340	Chr5PR-4.4
Chr5	23647781	23650823	PR-2	Tc05_g028370	
Chr5	25358388	25359598	PR-9	Tc05_g031640	
Chr5	25533413	25534642	PR-16	Tc05_g031880	
Chr6	283670	284572	PR-16	Tc06_g000370	Chr6PR-16.1
Chr6	288415	289525	PR-16	Tc06_g000400	Chr6PR-16.1
Chr6	342951	345342	PR-3	Tc06_g000490	
Chr6	512464	520849	PR-7	Tc06_g000810	
Chr6	627416	627703	PR-14	Tc06_g000990	Chr6PR-14.2
Chr6	628183	628635	PR-14	Tc06_g001000	Chr6PR-14.2
Chr6	1190282	1191669	PR-2	Tc06_g001730	
Chr6	7792149	7794494	PR-9	Tc06_g008540	
Chr6	8665491	8668445	PR-16	Tc06_g009700	
Chr6	9373572	9375890	PR-7	Tc06_g010630	
Chr6	10708214	10709837	PR-2	Tc06_g012580	
Chr6	11247628	11253176	PR-7	Tc06_g013520	
Chr6	12106897	12108599	PR-9	Tc06_g014950	
Chr6	14479691	14481234	PR-9	Tc06_g019150	
Chr6	14587458	14590282	PR-2	Tc06_g019320	
Chr6	14715208	14716459	PR-9	Tc06_g019650	
Chr6	14788011	14791633	PR-7	Tc06_g019800	
Chr6	14899115	14899570	PR-14	Tc06_g020010	Chr6PR-14.3
Chr6	14904636	14905201	PR-14	Tc06_g020030	Chr6PR-14.3

Chr6	15375477	15378303	PR-7	Tc06_g021130	
Chr7	242337	248261	PR-7	Tc07_g000490	
Chr7	1373943	1375917	PR-2	Tc07_g002650	
Chr7	2469342	2470759	PR-16	Tc07_g004510	Chr7PR-16.1
Chr7	2541372	2545366	PR-16	Tc07_g004580	Chr7PR-16.1
Chr7	2656056	2656726	PR-16	Tc07_g004710	
Chr8	136530	138827	PR-7	Tc08_g000230	Chr8PR-7.1
Chr8	140672	142931	PR-7	Tc08_g000240	Chr8PR-7.1
Chr8	144535	148772	PR-7	Tc08_g000250	Chr8PR-7.1
Chr8	157014	159803	PR-7	Tc08_g000260	Chr8PR-7.1
Chr8	162515	164797	PR-7	Tc08_g000270	Chr8PR-7.1
Chr8	861589	862531	PR-5	Tc08_g001670	
Chr8	1035418	1037669	PR-2	Tc08_g001980	
Chr8	1251906	1252272	PR-12	Tc08_g002440	
Chr8	1392341	1393706	PR-9	Tc08_g002680	
Chr8	1982231	1984015	PR-5	Tc08_g003730	Chr8PR-5.2
Chr8	1994947	1996618	PR-5	Tc08_g003740	Chr8PR-5.2
Chr8	2135796	2139162	PR-7	Tc08_g004000	
Chr8	2171236	2172745	PR-9	Tc08_g004060	
Chr8	2812158	2813696	PR-2	Tc08_g005240	
Chr8	4454124	4457212	PR-7	Tc08_g007740	
Chr8	5838275	5839415	PR-2	Tc08_g009900	
Chr8	6072846	6074589	PR-5	Tc08_g010190	
Chr8	7977834	7979127	PR-9	Tc08_g012700	
Chr8	8542455	8545412	PR-9	Tc08_g013300	
Chr9	115915	118110	PR-2	Tc09_g000150	
Chr9	349534	350866	PR-9	Tc09_g000620	
Chr9	392587	393144	PR-1	Tc09_g000720	
Chr9	644365	645956	PR-9	Tc09_g001160	
Chr9	940710	942098	PR-11	Tc09_g001640	
Chr9	1746195	1747442	PR-11	Tc09_g003110	Chr9PR-11.1
Chr9	1748948	1752317	PR-11	Tc09_g003120	Chr9PR-11.1
Chr9	1754274	1755716	PR-11	Tc09_g003130	Chr9PR-11.1
Chr9	1756032	1759736	PR-11	Tc09_g003140	Chr9PR-11.1
Chr9	1761439	1764995	PR-11	Tc09_g003150	Chr9PR-11.1
Chr9	1765831	1767491	PR-11	Tc09_g003160	Chr9PR-11.1

Chr9	1771501	1774951	PR-11	Tc09_g003180	Chr9PR-11.1
Chr9	1784184	1785419	PR-11	Tc09_g003190	Chr9PR-11.1
Chr9	1786169	1787434	PR-11	Tc09_g003200	Chr9PR-11.1
Chr9	3455242	3457297	PR-2	Tc09_g006080	
Chr9	3924740	3927797	PR-7	Tc09_g006830	
Chr9	4056208	4056831	PR-16	Tc09_g007080	
Chr9	5106593	5109921	PR-2	Tc09_g008700	
Chr9	6108778	6111167	PR-2	Tc09_g010240	
Chr9	6842502	6843844	PR-9	Tc09_g011360	
Chr9	7056410	7061303	PR-2	Tc09_g011610	
Chr9	8542813	8545250	PR-2	Tc09_g013490	
Chr9	11250595	11251258	PR-5	Tc09_g016370	
Chr9	11463491	11464078	PR-1	Tc09_g016580	Chr9PR-1.2
Chr9	11465593	11466093	PR-1	Tc09_g016590	Chr9PR-1.2
Chr9	12561121	12565191	PR-9	Tc09_g017500	
Chr9	15718258	15718875	PR-16	Tc09_g019910	Chr9PR-16.3
Chr9	15720067	15720699	PR-16	Tc09_g019920	Chr9PR-16.3
Chr9	18149426	18155830	PR-2	Tc09_g021600	
Chr9	20183483	20184809	PR-2	Tc09_g023540	
Chr9	20776268	20777977	PR-2	Tc09_g024130	Chr9PR-2.4
Chr9	20788910	20789878	PR-2	Tc09_g024140	Chr9PR-2.4
Chr9	20791335	20792780	PR-2	Tc09_g024150	Chr9PR-2.4
Chr9	23914213	23916248	PR-7	Tc09_g028050	
Chr9	24349477	24353936	PR-7	Tc09_g028480	
Chr9	26293694	26295852	PR-2	Tc09_g031660	
Chr9	26452025	26452786	PR-5	Tc09_g031980	
Chr9	26838009	26841044	PR-7	Tc09_g032690	Chr9PR-7.5
Chr9	26843341	26846664	PR-7	Tc09_g032710	Chr9PR-7.5
Chr9	26853874	26856781	PR-7	Tc09_g032720	Chr9PR-7.5
Chr9	27978971	27981575	PR-2	Tc09_g034460	
Chr9	28169930	28171435	PR-9	Tc09_g034910	Chr9PR-9.6
Chr9	28177251	28179090	PR-9	Tc09_g034930	Chr9PR-9.6
Chr9	28180582	28182204	PR-9	Tc09_g034950	Chr9PR-9.6
Chr9	28271459	28271896	PR-14	Tc09_g035150	Chr9PR-14.
Chr9	28273057	28273520	PR-14	Tc09_g035160	Chr9PR-14.
Chr10	535646	537418	PR-1	Tc10_g000980	
Chr10	1257226	1258967	PR-2	Tc10_g002190	
Chr10	1321904	1325507	PR-7	Tc10_g002300	Chr10PR-7.1

Chr10	1326811	1330184	PR-7	Tc10_g002310	Chr10PR-7.1
Chr10	1331539	1343180	PR-7	Tc10_g002320	Chr10PR-7.1
Chr10	1359081	1365372	PR-7	Tc10_g002340	Chr10PR-7.1
Chr10	1374740	1384788	PR-7	Tc10_g002360	Chr10PR-7.1
Chr10	1680770	1681627	PR-5	Tc10_g002890	
Chr10	1889638	1891207	PR-2	Tc10_g003270	
Chr10	3651755	3652072	PR-6	Tc10_g005840	Chr10PR-6.2
Chr10	3660102	3660412	PR-6	Tc10_g005870	Chr10PR-6.2
Chr10	3662441	3662758	PR-6	Tc10_g005880	Chr10PR-6.2
Chr10	3669109	3669426	PR-6	Tc10_g005890	Chr10PR-6.2
Chr10	3678425	3684937	PR-6	Tc10_g005920	Chr10PR-6.2
Chr10	7845864	7846505	PR-16	Tc10_g009710	
Chr10	9700039	9702951	PR-16	Tc10_g011101	
Chr10	9724411	9725695	PR-4	Tc10_g011130	
Chr10	13313715	13314278	PR-10	Tc10_g014440	
Chr10	13971831	13973290	PR-8	Tc10_g015260	Chr10PR-8.3
Chr10	14003058	14003975	PR-8	Tc10_g015330	Chr10PR-8.3
Chr10	14505716	14507362	PR-9	Tc10_g015970	Chr10PR-9.4
Chr10	14567534	14568895	PR-9	Tc10_g016040	Chr10PR-9.4
Chr10	14583432	14584744	PR-9	Tc10_g016070	Chr10PR-9.4
Chr10	14585210	14586406	PR-9	Tc10_g016080	Chr10PR-9.4
Chr10	14753971	14754533	PR-14	Tc10_g016320	
Unmapped			PR-10	Tc00_g031750	
Unmapped			PR-10	Tc00_g071880	
Unmapped			PR-11	Tc00_g043900	
Unmapped			PR-16	Tc00_g013300	
Unmapped			PR-16	Tc00_g037180	
Unmapped			PR-16	Tc00_g054490	
Unmapped			PR-16	Tc00_g054500	
Unmapped			PR-16	Tc00_g076490	
Unmapped			PR-2	Tc00_g034720	
Unmapped			PR-2	Tc00_g054290	
Unmapped			PR-2	Tc00_g083950	
Unmapped			PR-4	Tc00_g012980	
Unmapped			PR-5	Tc00_g056050	
Unmapped			PR-5	Tc00_g056060	
Unmapped			PR-5	Tc00_g056070	
Unmapped			PR-5	Tc00_g056080	

Unmapped			PR-5	Tc00_g056110	
Unmapped			PR-5	Tc00_g060970	
Unmapped			PR-6	Tc00_g053480	
Unmapped			PR-7	Tc00_g001690	
Unmapped			PR-7	Tc00_g007300	
Unmapped			PR-7	Tc00_g013470	
Unmapped			PR-7	Tc00_g017310	
Unmapped			PR-7	Tc00_g032610	
Unmapped			PR-7	Tc00_g038560	
Unmapped			PR-8	Tc00_g024510	
Unmapped			PR-9	Tc00_g014230	
Unmapped			PR-9	Tc00_g020190	
Unmapped			PR-9	Tc00_g040640	
Unmapped			PR-9	Tc00_g044710	
Unmapped			PR-9	Tc00_g045360	
Unmapped			PR-9	Tc00_g045400	
Unmapped			PR-9	Tc00_g045440	
Unmapped			PR-9	Tc00_g045460	
Unmapped			PR-9	Tc00_g045610	
Unmapped			PR-9	Tc00_g045630	
Unmapped			PR-9	Tc00_g045940	
Unmapped			PR-9	Tc00_g054480	

Supplemental Table S3 - PR gene positions in the Matina 1-6 genome, color coded by PR gene family					
Chromosome	**Start**	**Stop**	**Gene Family**	**Gene ID**	**Tandem Array ID**
Chr1	38970	43636	PR-7	Thecc1EG000009	
Chr1	398604	400143	PR-3	Thecc1EG000095	Chr1PR-3.1
Chr1	407766	409127	PR-3	Thecc1EG000096	Chr1PR-3.1
Chr1	581637	583276	PR-9	Thecc1EG000145	
Chr1	747046	754136	PR-5	Thecc1EG000193	Chr1PR-5.2
Chr1	754379	756442	PR-5	Thecc1EG000197	Chr1PR-5.2
Chr1	1211500	1213275	PR-9	Thecc1EG000295	
Chr1	2026978	2027875	PR-1	Thecc1EG000491	
Chr1	2357330	2362741	PR-9	Thecc1EG000564	
Chr1	2748608	2752027	PR-7	Thecc1EG000640	Chr1PR-7.3
Chr1	2752856	2758066	PR-7	Thecc1EG000641	Chr1PR-7.3
Chr1	3307000	3310286	PR-7	Thecc1EG000749	
Chr1	3382352	3384526	PR-9	Thecc1EG000762	
Chr1	3470261	3472558	PR-2	Thecc1EG000782	
Chr1	4992850	4995297	PR-9	Thecc1EG001054	
Chr1	6194523	6196823	PR-2	Thecc1EG001274	Chr1PR-2.4
Chr1	6197493	6202783	PR-2	Thecc1EG001275	Chr1PR-2.4
Chr1	6253057	6261425	PR-3	Thecc1EG001280	
Chr1	8613801	8616925	PR-9	Thecc1EG001664	
Chr1	9131329	9134274	PR-9	Thecc1EG001737	
Chr1	9483225	9487563	PR-2	Thecc1EG001794	
Chr1	12130265	12134160	PR-2	Thecc1EG002168	
Chr1	14155420	14183715	PR-7	Thecc1EG002479	
Chr1	16047163	16060417	PR-2	Thecc1EG002746	
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Chr9	33416912	33419009	PR-2	Thecc1EG040791	Chr9PR-2.5
Chr9	37324293	37326613	PR-16	Thecc1EG041376	Chr9PR-16.6
Chr9	37328816	37330133	PR-16	Thecc1EG041377	Chr9PR-16.6
Chr9	37330732	37332369	PR-9	Thecc1EG041378	
Chr9	37442073	37446700	PR-2	Thecc1EG041403	
Chr9	37711045	37715553	PR-7	Thecc1EG041449	
Chr9	37801525	37807811	PR-7	Thecc1EG041462	Chr9PR-7.7
Chr9	37811034	37827825	PR-7	Thecc1EG041463	Chr9PR-7.7
Chr9	39742134	39745187	PR-2	Thecc1EG041833	
Chr9	39900122	39901490	PR-5	Thecc1EG041871	
Chr9	40283527	40292405	PR-7	Thecc1EG041950	Chr9PR-7.8
Chr9	40287674	40292567	PR-7	Thecc1EG041951	Chr9PR-7.8
Chr9	40292614	40309871	PR-7	Thecc1EG041952	Chr9PR-7.8
Chr9	40299619	40329996	PR-7	Thecc1EG041957	Chr9PR-7.8
Chr9	41528294	41531544	PR-2	Thecc1EG042208	
Chr9	41718285	41727412	PR-9	Thecc1EG042259	Chr9PR-9.9
Chr9	41732924	41738678	PR-9	Thecc1EG042261	Chr9PR-9.9
Chr9	41826527	41827275	PR-14	Thecc1EG042284	Chr9PR-14.10
Chr9	41828203	41828948	PR-14	Thecc1EG042285	Chr9PR-14.10
Chr10	568906	571643	PR-1	Thecc1EG042446	
Chr10	1425026	1428017	PR-2	Thecc1EG042611	
Chr10	1611248	1619758	PR-7	Thecc1EG042652	Chr10PR-7.1
Chr10	1620365	1624378	PR-7	Thecc1EG042653	Chr10PR-7.1
Chr10	1625325	1628768	PR-7	Thecc1EG046952	Chr10PR-7.1
Chr10	1629514	1632741	PR-7	Thecc1EG046953	Chr10PR-7.1
Chr10	1644748	1652068	PR-7	Thecc1EG042656	Chr10PR-7.1
Chr10	1645533	1660966	PR-7	Thecc1EG042657	Chr10PR-7.1
Chr10	1660065	1667653	PR-7	Thecc1EG042659	Chr10PR-7.1
Chr10	1663592	1667693	PR-7	Thecc1EG042660	Chr10PR-7.1
Chr10	1982315	1983905	PR-5	Thecc1EG042726	
Chr10	2192233	2194119	PR-2	Thecc1EG042768	
Chr10	4550730	4551474	PR-6	Thecc1EG043194	Chr10PR-6.2
Chr10	4559293	4559803	PR-6	Thecc1EG043196	Chr10PR-6.2
Chr10	4561388	4562015	PR-6	Thecc1EG046959	Chr10PR-6.2
Chr10	4565525	4580115	PR-6	Thecc1EG043198	Chr10PR-6.2
Chr10	4565536	4566082	PR-6	Thecc1EG046960	Chr10PR-6.2
Chr10	4576505	4577038	PR-6	Thecc1EG043201	Chr10PR-6.2

Chr10	4582260	4582744	PR-6	Thecc1EG043202	Chr10PR-6.2
Chr10	5101255	5110883	PR-17	Thecc1EG043303	
Chr10	10866300	10867951	PR-4	Thecc1EG043895	
Chr10	15211018	15211919	PR-16	Thecc1EG044263	
Chr10	21995785	21996731	PR-10	Thecc1EG045046	
Chr10	23553698	23580519	PR-8	Thecc1EG045276	Chr10PR-8.3
Chr10	23602812	23603970	PR-8	Thecc1EG045283	Chr10PR-8.3
Chr10	24429996	24431594	PR-9	Thecc1EG045424	Chr10PR-9.4
Chr10	24431808	24447232	PR-9	Thecc1EG045425	Chr10PR-9.4
Chr10	24447255	24449409	PR-9	Thecc1EG045429	Chr10PR-9.4
Chr10	24507368	24509439	PR-9	Thecc1EG045437	Chr10PR-9.4
Chr10	25002097	25003389	PR-14	Thecc1EG045525	
Unmapped			PR-10	Thecc1EG046315	
Unmapped			PR-10	Thecc1EG046316	
Unmapped			PR-16	Thecc1EG045749	
Unmapped			PR-5	Thecc1EG046303	

Supplemental Table S4 - Gene IDs and BLASTp E-value for Arabidopsis PR genes		
PR Gene Family	**Gene ID**	**E-value**
PR-1	AT2G14580	1.00E-62
PR-1	AT3G19690	5.00E-61
PR-1	AT4G33720	3.00E-60
PR-1	AT2G14610	3.00E-58
PR-1	AT1G50060	1.00E-55
PR-1	AT5G26130	9.00E-52
PR-1	AT4G33710	9.00E-51
PR-1	AT4G33730	3.00E-50
PR-1	AT4G25790	7.00E-50
PR-1	AT2G19990	4.00E-48
PR-1	AT5G57625	3.00E-47
PR-1	AT1G01310	1.00E-44
PR-1	AT1G50050	1.00E-43
PR-1	AT4G30320	6.00E-43
PR-1	AT4G25780	2.00E-42
PR-1	AT3G09590	2.00E-42
PR-1	AT4G31470	3.00E-40
PR-1	AT5G02730	2.00E-39
PR-1	AT4G07820	4.00E-37
PR-1	AT5G66590	1.00E-29
PR-1	AT2G19970	2.00E-25
PR-1	AT2G19980	2.00E-20
PR-2	AT4G16260	5.00E-116
PR-2	AT3G57260	3.00E-103
PR-2	AT3G57270	6.00E-99
PR-2	AT3G57240	7.00E-97
PR-2	AT5G56590	7.00E-74
PR-2	AT2G26600	8.00E-70
PR-2	AT5G42720	5.00E-69
PR-2	AT4G29360	1.00E-68
PR-2	AT5G20330	5.00E-67
PR-2	AT5G20390	7.00E-67
PR-2	AT1G32860	4.00E-65
PR-2	AT5G20340	4.00E-65
PR-2	AT1G33220	9.00E-65
PR-2	AT3G15800	2.00E-63
PR-2	AT2G05790	3.00E-63
PR-2	AT2G01630	1.00E-62
PR-2	AT2G16230	2.00E-62
PR-2	AT4G26830	3.00E-62
PR-2	AT2G27500	6.00E-62
PR-2	AT5G24318	1.00E-61
PR-2	AT5G55180	2.00E-61
PR-2	AT4G18340	4.00E-61
PR-2	AT1G66250	2.00E-60
PR-2	AT1G30080	1.00E-59
PR-2	AT5G42100	1.00E-59
PR-2	AT4G34480	3.00E-58
PR-2	AT1G77790	5.00E-58
PR-2	AT5G20560	4.00E-57
PR-2	AT1G11820	3.00E-55
PR-2	AT1G77780	2.00E-54
PR-2	AT3G07320	2.00E-54
PR-2	AT4G14080	3.00E-53
PR-2	AT5G58090	2.00E-52
PR-2	AT3G13560	4.00E-52
PR-2	AT3G61810	3.00E-51
PR-2	AT5G18220	4.00E-50
PR-2	AT3G46570	5.00E-50
PR-2	AT3G23770	1.00E-49
PR-2	AT4G31140	9.00E-49
PR-2	AT3G24330	9.00E-49
PR-2	AT3G04010	4.00E-48
PR-2	AT5G58480	1.00E-46
PR-2	AT3G55430	1.00E-44
PR-2	AT1G64760	2.00E-44
PR-2	AT2G19440	2.00E-43
PR-2	AT5G64790	3.00E-43
PR-2	AT2G39640	3.00E-42

PR-2	AT4G17180	3.00E-42
PR-2	AT5G20870	8.00E-39
PR-2	AT3G55780	2.00E-34
PR-3	AT3G12500	3.00E-86
PR-3	AT1G02360	2.00E-64
PR-3	AT4G01700	1.00E-61
PR-3	AT2G43570	2.00E-33
PR-3	AT1G05850	3.00E-32
PR-3	AT2G43590	2.00E-31
PR-3	AT3G54420	1.00E-30
PR-3	AT3G16920	2.00E-30
PR-3	AT2G43610	2.00E-29
PR-3	AT2G43620	1.00E-27
PR-3	AT2G43580	2.00E-27
PR-3	AT1G56680	2.00E-22
PR-3	AT2G43600	4.00E-22
PR-3	AT3G47540	1.00E-19
PR-4	AT3G04720	1.00E-60
PR-5	AT1G75030	7.00E-87
PR-5	AT1G18250	1.00E-86
PR-5	AT1G73620	3.00E-86
PR-5	AT1G75050	6.00E-85
PR-5	AT1G19320	2.00E-83
PR-5	AT4G38660	3.00E-83
PR-5	AT1G75040	5.00E-81
PR-5	AT1G77700	3.00E-78
PR-5	AT1G20030	6.00E-78
PR-5	AT4G36010	3.00E-77
PR-5	AT4G24180	5.00E-77
PR-5	AT1G75800	5.00E-77
PR-5	AT2G17860	5.00E-75
PR-5	AT5G24620	4.00E-71
PR-5	AT5G02140	1.00E-65
PR-5	AT4G38670	9.00E-65
PR-5	AT5G40020	2.00E-63
PR-5	AT5G38280	6.00E-59
PR-5	AT2G28790	1.00E-54
PR-5	AT4G36000	1.00E-51
PR-5	AT4G11650	6.00E-51
PR-5	AT4G18250	1.00E-43
PR-5	AT1G70250	6.00E-42
PR-5	AT2G24810	6.00E-27
PR-6	AT2G38870	5.00E-17
PR-6	AT2G38900	2.00E-14
PR-6	AT5G43580	8.00E-14
PR-6	AT5G43570	6.00E-07
PR-6	AT3G46860	1.00E-06
PR-7	AT5G67360	7.00E-160
PR-7	AT2G05920	3.00E-158
PR-7	AT1G04110	6.00E-158
PR-7	AT4G34980	1.00E-156
PR-7	AT3G14067	2.00E-154
PR-7	AT1G01900	8.00E-149
PR-7	AT3G14240	5.00E-148
PR-7	AT5G51750	1.00E-142
PR-7	AT2G04160	8.00E-140
PR-7	AT5G59810	1.00E-130
PR-7	AT4G00230	3.00E-129
PR-7	AT1G20160	2.00E-124
PR-7	AT5G59120	4.00E-123
PR-7	AT5G45650	8.00E-119
PR-7	AT5G59100	3.00E-116
PR-7	AT5G67090	6.00E-116
PR-7	AT5G59090	2.00E-115
PR-7	AT5G03620	4.00E-114
PR-7	AT5G59190	4.00E-113
PR-7	AT3G46850	3.00E-110
PR-7	AT3G46840	1.00E-108
PR-7	AT4G10520	1.00E-106
PR-7	AT4G10550	2.00E-105
PR-7	AT1G20150	5.00E-105
PR-7	AT4G10540	2.00E-104
PR-7	AT1G32950	5.00E-103
PR-7	AT1G66210	5.00E-103
PR-7	AT5G58830	1.00E-102
PR-7	AT5G59130	2.00E-102
PR-7	AT4G10510	6.00E-102
PR-7	AT1G32960	5.00E-100
PR-7	AT1G32940	8.00E-98
PR-7	AT1G66220	1.00E-97
PR-7	AT5G58820	2.00E-97
PR-7	AT4G26330	2.00E-95

PR-7	AT4G21650	4.00E-95
PR-7	AT4G21630	6.00E-95
PR-7	AT5G45640	1.00E-92
PR-7	AT4G10530	2.00E-92
PR-7	AT5G11940	2.00E-91
PR-7	AT4G21323	1.00E-89
PR-7	AT4G15040	3.00E-89
PR-7	AT4G21326	1.00E-83
PR-7	AT1G32970	5.00E-79
PR-7	AT4G30020	1.00E-77
PR-7	AT2G19170	3.00E-77
PR-7	AT4G20430	7.00E-71
PR-7	AT5G44530	7.00E-71
PR-7	AT1G30600	5.00E-70
PR-7	AT1G62340	2.00E-63
PR-8	AT5G24090	3.00E-100
PR-9	AT5G06720	8.00E-147
PR-9	AT5G06730	4.00E-145
PR-9	AT5G19880	2.00E-123
PR-9	AT3G32980	8.00E-106
PR-9	AT2G38380	8.00E-105
PR-9	AT3G49120	2.00E-104
PR-9	AT3G49110	2.00E-104
PR-9	AT2G18150	7.00E-104
PR-9	AT2G18140	2.00E-103
PR-9	AT5G19890	5.00E-103
PR-9	AT4G08770	6.00E-103
PR-9	AT4G08780	1.00E-101
PR-9	AT3G50990	1.00E-101
PR-9	AT4G36430	5.00E-101
PR-9	AT2G38390	9.00E-101
PR-9	AT5G66390	8.00E-98
PR-9	AT5G05340	2.00E-93
PR-9	AT1G44970	2.00E-88
PR-9	AT1G14550	4.00E-87
PR-9	AT1G49570	1.00E-86
PR-9	AT5G58400	2.00E-85
PR-9	AT1G14540	1.00E-84
PR-9	AT5G58390	2.00E-83
PR-9	AT4G16270	1.00E-82
PR-9	AT4G11290	3.00E-81

PR-9	AT2G35380	2.00E-80
PR-9	AT2G41480	5.00E-80
PR-9	AT1G68850	3.00E-79
PR-9	AT5G64120	3.00E-78
PR-9	AT3G01190	8.00E-78
PR-9	AT3G03670	1.00E-77
PR-9	AT5G39580	1.00E-77
PR-9	AT2G22420	5.00E-77
PR-9	AT5G17820	5.00E-77
PR-9	AT1G05260	1.00E-76
PR-9	AT5G15180	1.00E-76
PR-9	AT5G42180	2.00E-75
PR-9	AT3G21770	5.00E-75
PR-9	AT5G51890	1.00E-73
PR-9	AT4G33420	4.00E-73
PR-9	AT5G14130	2.00E-72
PR-9	AT2G18980	3.00E-70
PR-9	AT4G25980	5.00E-70
PR-9	AT1G30870	7.00E-70
PR-9	AT1G05250	3.00E-69
PR-9	AT1G05240	3.00E-69
PR-9	AT4G30170	2.00E-68
PR-9	AT1G71695	9.00E-68
PR-9	AT4G37530	2.00E-67
PR-9	AT5G67400	2.00E-67
PR-9	AT3G49960	3.00E-67
PR-9	AT5G24070	3.00E-67
PR-9	AT2G43480	6.00E-67
PR-9	AT1G77100	6.00E-66
PR-9	AT5G64110	6.00E-65
PR-9	AT2G34060	1.00E-64
PR-9	AT5G64100	3.00E-64
PR-9	AT2G39040	4.00E-64
PR-9	AT4G37520	4.00E-64
PR-9	AT4G17690	2.00E-63
PR-9	AT5G40150	4.00E-63
PR-9	AT2G24800	1.00E-61
PR-9	AT3G28200	1.00E-61
PR-9	AT4G33870	4.00E-61
PR-9	AT5G47000	2.00E-59
PR-9	AT4G26010	6.00E-59

PR-9	AT4G31760	3.00E-56
PR-9	AT1G24110	3.00E-56
PR-9	AT2G37130	5.00E-54
PR-9	AT1G34510	5.00E-53
PR-9	AT4G21960	4.00E-52
PR-9	AT5G22410	8.00E-52
PR-9	AT3G17070	3.00E-51
PR-9	AT3G42570	2.00E-14
PR-10	AT1G24020	2.00E-07
PR-11	AT4G19810	7.00E-154
PR-11	AT4G19800	5.00E-120
PR-11	AT4G19820	1.00E-118
PR-11	AT4G19760	1.00E-108
PR-11	AT4G19720	9.00E-107
PR-11	AT4G19750	2.00E-105
PR-11	AT4G19730	2.00E-85
PR-11	AT4G19770	3.00E-76
PR-11	AT4G19740	6.00E-45
PR-12	AT2G26020	3.00E-34
PR-12	AT5G44420	7.00E-34
PR-12	AT2G26010	2.00E-33
PR-12	AT5G44430	3.00E-33
PR-12	AT1G75830	1.00E-32
PR-12	AT1G19610	2.00E-15
PR-12	AT1G55010	5.00E-13
PR-13	AT1G72260	2.00E-85
PR-13	AT1G66100	4.00E-35
PR-13	AT5G36910	5.00E-35
PR-13	AT2G15010	9.00E-22
PR-14	AT5G59310	5.00E-24
PR-14	AT5G59320	3.00E-19
PR-14	AT2G38540	3.00E-18
PR-14	AT2G18370	2.00E-16
PR-14	AT3G51590	4.00E-15
PR-14	AT3G08770	6.00E-15
PR-14	AT5G01870	8.00E-15
PR-14	AT3G51600	3.00E-14
PR-14	AT2G38530	4.00E-14
PR-14	AT2G15050	4.00E-13
PR-14	AT4G33355	8.00E-12
PR-14	AT5G59330	8.00E-08
PR-14	AT2G15325	1.00E-06
PR-16	AT1G18980	5.00E-69
PR-16	AT1G18970	2.00E-68
PR-16	AT3G05950	7.00E-61
PR-16	AT3G04200	1.00E-60
PR-16	AT4G14630	7.00E-59
PR-16	AT5G39160	1.00E-57
PR-16	AT5G39130	2.00E-57
PR-16	AT5G39150	2.00E-57
PR-16	AT5G39190	2.00E-57
PR-16	AT5G39120	3.00E-57
PR-16	AT5G39110	4.00E-57
PR-16	AT5G39180	1.00E-56
PR-16	AT3G62020	4.00E-56
PR-16	AT5G38960	4.00E-56
PR-16	AT1G02335	2.00E-54
PR-16	AT1G09560	1.00E-53
PR-16	AT3G04190	3.00E-52
PR-16	AT5G38940	6.00E-52
PR-16	AT3G04170	8.00E-52
PR-16	AT3G05930	4.00E-51
PR-16	AT5G38930	7.00E-51
PR-16	AT3G04180	8.00E-50
PR-16	AT3G04150	6.00E-49
PR-16	AT5G26700	6.00E-46
PR-16	AT5G38910	1.00E-45
PR-16	AT1G74820	1.00E-43
PR-16	AT3G10080	4.00E-42
PR-16	AT1G10460	1.00E-39
PR-16	AT5G39100	1.00E-36
PR-16	AT1G72610	3.00E-36
PR-16	AT5G20630	2.00E-33
PR-16	AT5G61750	3.00E-30
PR-16	AT5G38950	2.00E-13
PR-17	AT2G15220	2.00E-101
PR-17	AT2G15130	9.00E-89
PR-17	AT2G15170	7.00E-12

Supplemental Table S5 - Gene IDs and BLASTp E-value for *Brachypodium distachyon* PR genes		
PR Gene Family	**Gene ID**	**E-value**
PR-1	Bradi1g57580	6.00E-43
PR-1	Bradi1g57540	1.00E-39
PR-1	Bradi3g53630	2.00E-36
PR-1	Bradi1g12360	1.00E-35
PR-1	Bradi4g00865	5.00E-34
PR-1	Bradi1g57590	9.00E-34
PR-1	Bradi2g14240	7.00E-32
PR-1	Bradi3g53637	2.00E-27
PR-1	Bradi4g38910	4.00E-25
PR-1	Bradi3g60230	2.00E-23
PR-1	Bradi3g60260	4.00E-23
PR-1	Bradi1g09637	4.00E-22
PR-1	Bradi3g53681	7.00E-20
PR-1	Bradi1g57575	4.00E-19
PR-1	Bradi2g14255	3.00E-09
PR-2	Bradi2g43056	3.00E-77
PR-2	Bradi2g60536	1.00E-74
PR-2	Bradi2g60490	4.00E-73
PR-2	Bradi2g60441	1.00E-71
PR-2	Bradi2g27140	2.00E-69
PR-2	Bradi2g22222	1.00E-66
PR-2	Bradi2g60497	1.00E-66
PR-2	Bradi1g15295	1.00E-66
PR-2	Bradi2g60542	2.00E-66
PR-2	Bradi2g52566	2.00E-65
PR-2	Bradi2g60557	7.00E-65
PR-2	Bradi2g22226	1.00E-64
PR-2	Bradi2g21142	1.00E-63
PR-2	Bradi2g49330	2.00E-61
PR-2	Bradi2g22224	5.00E-60
PR-2	Bradi1g38755	6.00E-55
PR-2	Bradi1g68450	6.00E-55
PR-2	Bradi5g09327	1.00E-54
PR-2	Bradi2g60534	3.00E-54
PR-2	Bradi3g44910	5.00E-54
PR-2	Bradi1g69610	9.00E-54
PR-2	Bradi4g36190	1.00E-53
PR-2	Bradi3g20770	4.00E-53
PR-2	Bradi1g12810	6.00E-52
PR-2	Bradi3g57610	8.00E-52
PR-2	Bradi2g60541	5.00E-51
PR-2	Bradi2g55690	6.00E-51
PR-2	Bradi3g07385	1.00E-50
PR-2	Bradi1g50080	2.00E-50
PR-2	Bradi2g23940	7.00E-50
PR-2	Bradi1g69020	9.00E-49
PR-2	Bradi1g25530	2.00E-48
PR-2	Bradi3g18220	3.00E-47
PR-2	Bradi1g10347	8.00E-47
PR-2	Bradi2g22228	1.00E-46
PR-2	Bradi1g36460	2.00E-46
PR-2	Bradi1g23640	2.00E-44
PR-2	Bradi1g53590	3.00E-44
PR-2	Bradi1g13232	7.00E-44
PR-2	Bradi1g56270	1.00E-42
PR-2	Bradi1g06050	1.00E-42
PR-2	Bradi4g09230	3.00E-42
PR-2	Bradi5g12137	5.00E-42
PR-2	Bradi4g34390	9.00E-42
PR-2	Bradi3g03520	1.00E-41
PR-2	Bradi1g25517	2.00E-41
PR-2	Bradi2g18420	4.00E-41
PR-2	Bradi4g15460	4.00E-41
PR-2	Bradi1g37160	2.00E-40
PR-2	Bradi3g40907	8.00E-39
PR-2	Bradi1g60410	2.00E-38
PR-2	Bradi2g18700	2.00E-37
PR-2	Bradi1g65197	2.00E-37

PR-2	Bradi1g26510	2.00E-34
PR-2	Bradi3g33254	3.00E-34
PR-2	Bradi3g33277	3.00E-34
PR-2	Bradi5g26467	7.00E-33
PR-2	Bradi1g55203	1.00E-32
PR-2	Bradi1g61320	8.00E-10
PR-3	Bradi3g32340	4.00E-78
PR-3	Bradi2g47210	4.00E-70
PR-3	Bradi1g29887	3.00E-69
PR-3	Bradi1g29880	6.00E-67
PR-3	Bradi2g47191	7.00E-63
PR-3	Bradi2g26000	5.00E-57
PR-3	Bradi1g76217	8.00E-50
PR-3	Bradi2g11140	3.00E-48
PR-3	Bradi2g36780	6.00E-40
PR-3	Bradi3g40320	6.00E-32
PR-3	Bradi5g14430	2.00E-27
PR-3	Bradi4g34040	1.00E-26
PR-3	Bradi3g48230	2.00E-26
PR-3	Bradi2g26017	9.00E-23
PR-4	Bradi4g14930	2.00E-42
PR-4	Bradi4g14920	1.00E-41
PR-5	Bradi1g33540	2.00E-67
PR-5	Bradi4g34180	4.00E-62
PR-5	Bradi3g04330	2.00E-60
PR-5	Bradi3g42380	1.00E-59
PR-5	Bradi3g40596	4.00E-57
PR-5	Bradi1g68330	1.00E-56
PR-5	Bradi4g36410	3.00E-56
PR-5	Bradi1g69277	3.00E-55
PR-5	Bradi1g68340	5.00E-55
PR-5	Bradi4g36400	2.00E-54
PR-5	Bradi4g09130	3.00E-53
PR-5	Bradi4g03290	7.00E-52
PR-5	Bradi4g05430	1.00E-51
PR-5	Bradi1g30117	3.00E-51
PR-5	Bradi3g21100	2.00E-50
PR-5	Bradi5g27280	4.00E-49
PR-5	Bradi5g00550	1.00E-47
PR-5	Bradi4g05440	2.00E-44
PR-5	Bradi1g13060	8.00E-43

PR-5	Bradi2g54560	2.00E-41
PR-5	Bradi1g13070	6.00E-41
PR-5	Bradi2g01200	4.00E-40
PR-5	Bradi3g26630	2.00E-38
PR-5	Bradi2g01217	2.00E-37
PR-5	Bradi2g01227	1.00E-27
PR-5	Bradi3g07960	2.00E-22
PR-5	Bradi4g09220	3.00E-22
PR-5	Bradi4g04160	2.00E-15
PR-5	Bradi4g04150	4.00E-15
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PR-5	Bradi4g04180	2.00E-13
PR-5	Bradi4g03285	3.00E-09
PR-5	Bradi4g09370	1.00E-08
PR-6	Bradi2g35500	3.00E-09
PR-6	Bradi1g09487	5.00E-09
PR-6	Bradi1g46410	6.00E-09
PR-6	Bradi2g39290	5.00E-08
PR-6	Bradi3g36050	7.00E-08
PR-6	Bradi2g35540	1.00E-07
PR-6	Bradi4g40616	4.00E-07
PR-6	Bradi2g39271	5.00E-07
PR-6	Bradi2g39260	2.00E-06
PR-6	Bradi2g39280	2.00E-06
PR-7	Bradi5g18110	4.00E-163
PR-7	Bradi5g18117	6.00E-158
PR-7	Bradi5g24780	8.00E-157
PR-7	Bradi3g31690	1.00E-154
PR-7	Bradi1g77260	2.00E-154
PR-7	Bradi5g18130	1.00E-151
PR-7	Bradi5g24500	4.00E-151
PR-7	Bradi3g51070	4.00E-149
PR-7	Bradi3g19300	8.00E-146
PR-7	Bradi2g27640	2.00E-139
PR-7	Bradi1g75550	3.00E-138
PR-7	Bradi2g07730	4.00E-137
PR-7	Bradi3g19320	6.00E-137
PR-7	Bradi5g18100	1.00E-134
PR-7	Bradi4g11640	5.00E-132
PR-7	Bradi1g17320	1.00E-130
PR-7	Bradi1g07840	4.00E-130

PR-7	Bradi1g68270	5.00E-128
PR-7	Bradi5g18910	1.00E-126
PR-7	Bradi3g37457	7.00E-125
PR-7	Bradi1g14860	2.00E-124
PR-7	Bradi1g17330	6.00E-122
PR-7	Bradi4g31360	2.00E-120
PR-7	Bradi2g33990	2.00E-119
PR-7	Bradi5g00840	3.00E-119
PR-7	Bradi1g17350	2.00E-118
PR-7	Bradi4g33237	2.00E-117
PR-7	Bradi3g57140	9.00E-117
PR-7	Bradi4g41420	1.00E-116
PR-7	Bradi3g57130	2.00E-115
PR-7	Bradi2g24220	6.00E-115
PR-7	Bradi5g10210	8.00E-114
PR-7	Bradi2g48740	2.00E-113
PR-7	Bradi3g20580	7.00E-113
PR-7	Bradi4g24790	5.00E-112
PR-7	Bradi1g36242	8.00E-112
PR-7	Bradi3g07280	4.00E-109
PR-7	Bradi1g07700	7.00E-109
PR-7	Bradi2g56180	4.00E-107
PR-7	Bradi2g51440	1.00E-106
PR-7	Bradi4g36000	5.00E-104
PR-7	Bradi1g53630	2.00E-101
PR-7	Bradi1g54830	9.00E-97
PR-7	Bradi1g08451	1.00E-95
PR-7	Bradi3g04690	2.00E-91
PR-7	Bradi2g10727	1.00E-88
PR-7	Bradi3g10037	8.00E-87
PR-7	Bradi1g08670	1.00E-86
PR-7	Bradi1g74547	7.00E-85
PR-7	Bradi5g03190	1.00E-84
PR-7	Bradi5g03790	3.00E-82
PR-7	Bradi3g10058	1.00E-80
PR-7	Bradi5g23480	9.00E-79
PR-7	Bradi3g10030	1.00E-75
PR-7	Bradi2g51130	4.00E-73
PR-7	Bradi1g34087	7.00E-71
PR-7	Bradi5g03780	7.00E-67
PR-7	Bradi5g17320	1.00E-63
PR-7	Bradi3g04674	1.00E-41
PR-7	Bradi3g10044	4.00E-35
PR-8	Bradi1g52625	1.00E-83
PR-8	Bradi2g55630	7.00E-83
PR-8	Bradi2g55620	6.00E-81
PR-8	Bradi2g55610	9.00E-81
PR-8	Bradi2g45610	1.00E-71
PR-8	Bradi2g47067	7.00E-70
PR-8	Bradi2g47171	4.00E-67
PR-8	Bradi2g43755	7.00E-66
PR-8	Bradi4g40120	4.00E-38
PR-8	Bradi4g40110	5.00E-37
PR-8	Bradi2g47196	4.00E-34
PR-8	Bradi4g09417	7.00E-32
PR-8	Bradi4g09430	9.00E-30
PR-8	Bradi4g07560	8.00E-23
PR-9	Bradi1g68900	7.00E-87
PR-9	Bradi1g27920	1.00E-81
PR-9	Bradi2g40590	4.00E-81
PR-9	Bradi5g10070	8.00E-81
PR-9	Bradi1g68927	2.00E-80
PR-9	Bradi4g25660	5.00E-80
PR-9	Bradi1g68887	1.00E-79
PR-9	Bradi2g09660	9.00E-77
PR-9	Bradi2g09690	1.00E-76
PR-9	Bradi4g05230	1.00E-76
PR-9	Bradi4g44530	2.00E-76
PR-9	Bradi3g09080	2.00E-75
PR-9	Bradi1g38297	4.00E-75
PR-9	Bradi1g57247	6.00E-75
PR-9	Bradi1g38290	7.00E-75
PR-9	Bradi2g09680	1.00E-74
PR-9	Bradi1g38310	4.00E-74
PR-9	Bradi3g09087	8.00E-74
PR-9	Bradi2g09650	3.00E-73
PR-9	Bradi1g17860	3.00E-73
PR-9	Bradi1g63060	5.00E-73
PR-9	Bradi1g27910	1.00E-72
PR-9	Bradi1g17877	6.00E-72
PR-9	Bradi4g05190	1.00E-71
PR-9	Bradi3g09140	3.00E-71

PR-9	Bradi1g17870	4.00E-71
PR-9	Bradi5g24200	7.00E-71
PR-9	Bradi1g43680	5.00E-70
PR-9	Bradi3g09120	6.00E-70
PR-9	Bradi3g09100	1.00E-69
PR-9	Bradi4g44510	2.00E-69
PR-9	Bradi1g41115	5.00E-69
PR-9	Bradi1g38350	6.00E-68
PR-9	Bradi4g32800	6.00E-68
PR-9	Bradi3g09130	6.00E-68
PR-9	Bradi3g20130	8.00E-68
PR-9	Bradi1g39190	6.00E-67
PR-9	Bradi1g17840	5.00E-66
PR-9	Bradi1g17790	2.00E-65
PR-9	Bradi4g32810	2.00E-65
PR-9	Bradi2g04490	6.00E-65
PR-9	Bradi5g19857	1.00E-64
PR-9	Bradi1g63067	2.00E-64
PR-9	Bradi1g42900	2.00E-64
PR-9	Bradi2g20830	3.00E-64
PR-9	Bradi2g20850	7.00E-64
PR-9	Bradi2g06497	2.00E-63
PR-9	Bradi2g20840	4.00E-63
PR-9	Bradi2g12228	1.00E-62
PR-9	Bradi2g34717	5.00E-62
PR-9	Bradi1g17850	9.00E-62
PR-9	Bradi3g33940	7.00E-61
PR-9	Bradi1g77140	2.00E-59
PR-9	Bradi3g41340	2.00E-59
PR-9	Bradi2g37010	3.00E-59
PR-9	Bradi2g37020	5.00E-59
PR-9	Bradi4g27680	5.00E-59
PR-9	Bradi2g13190	6.00E-59
PR-9	Bradi1g15600	6.00E-59
PR-9	Bradi3g13590	7.00E-59
PR-9	Bradi2g46050	2.00E-58
PR-9	Bradi2g09600	2.00E-58
PR-9	Bradi3g60880	2.00E-58
PR-9	Bradi3g59660	3.00E-58
PR-9	Bradi1g59537	2.00E-57
PR-9	Bradi1g44800	5.00E-57

PR-9	Bradi3g32130	1.00E-56
PR-9	Bradi2g11307	5.00E-56
PR-9	Bradi5g27687	5.00E-56
PR-9	Bradi1g44790	6.00E-56
PR-9	Bradi1g07790	1.00E-54
PR-9	Bradi1g59550	2.00E-54
PR-9	Bradi2g52077	3.00E-54
PR-9	Bradi3g04717	6.00E-54
PR-9	Bradi2g12180	8.00E-54
PR-9	Bradi2g10150	8.00E-54
PR-9	Bradi2g12192	1.00E-53
PR-9	Bradi2g48050	1.00E-53
PR-9	Bradi2g12204	1.00E-53
PR-9	Bradi1g59520	1.00E-53
PR-9	Bradi5g27130	1.00E-53
PR-9	Bradi2g12170	2.00E-53
PR-9	Bradi5g14650	2.00E-53
PR-9	Bradi5g22650	1.00E-52
PR-9	Bradi3g33780	4.00E-52
PR-9	Bradi2g37000	5.00E-52
PR-9	Bradi5g12710	5.00E-52
PR-9	Bradi5g24650	7.00E-52
PR-9	Bradi1g77130	9.00E-52
PR-9	Bradi2g12216	5.00E-51
PR-9	Bradi1g58997	9.00E-51
PR-9	Bradi3g32110	1.00E-50
PR-9	Bradi2g20820	2.00E-50
PR-9	Bradi1g32870	2.00E-50
PR-9	Bradi1g33740	7.00E-50
PR-9	Bradi2g11300	1.00E-49
PR-9	Bradi5g27170	4.00E-49
PR-9	Bradi1g07780	1.00E-48
PR-9	Bradi1g74882	5.00E-48
PR-9	Bradi3g55850	7.00E-48
PR-9	Bradi1g26870	1.00E-47
PR-9	Bradi1g61550	1.00E-47
PR-9	Bradi5g27200	2.00E-47
PR-9	Bradi4g22660	3.00E-47
PR-9	Bradi4g40680	6.00E-47
PR-9	Bradi2g37040	9.00E-47
PR-9	Bradi2g11295	2.00E-46

PR-9	Bradi1g61540	4.00E-46
PR-9	Bradi5g27150	3.00E-45
PR-9	Bradi4g05980	1.00E-44
PR-9	Bradi1g61530	2.00E-44
PR-9	Bradi2g17120	3.00E-44
PR-9	Bradi5g27160	3.00E-44
PR-9	Bradi1g20000	5.00E-44
PR-9	Bradi3g10470	5.00E-44
PR-9	Bradi1g41900	8.00E-44
PR-9	Bradi4g40190	3.00E-43
PR-9	Bradi1g20005	6.00E-43
PR-9	Bradi5g00690	8.00E-43
PR-9	Bradi3g10460	9.00E-43
PR-9	Bradi1g33730	1.00E-42
PR-9	Bradi3g29500	2.00E-42
PR-9	Bradi5g27220	3.00E-42
PR-9	Bradi5g27210	7.00E-42
PR-9	Bradi1g20020	2.00E-41
PR-9	Bradi2g38660	4.00E-41
PR-9	Bradi2g11320	6.00E-41
PR-9	Bradi1g19980	3.00E-40
PR-9	Bradi1g20026	9.00E-38
PR-9	Bradi1g20010	9.00E-37
PR-9	Bradi1g20032	3.00E-35
PR-9	Bradi1g19990	3.00E-34
PR-9	Bradi2g37060	3.00E-32
PR-9	Bradi2g37067	2.00E-30
PR-9	Bradi2g37047	2.00E-29
PR-9	Bradi2g38690	1.00E-24
PR-9	Bradi2g38670	1.00E-24
PR-9	Bradi2g37080	1.00E-21
PR-9	Bradi2g38680	2.00E-21
PR-9	Bradi1g26215	2.00E-21
PR-9	Bradi2g38685	3.00E-20
PR-9	Bradi2g38720	1.00E-19
PR-9	Bradi2g37090	1.00E-19
PR-9	Bradi2g38700	1.00E-18
PR-9	Bradi3g45700	7.00E-14
PR-9	Bradi4g41180	2.00E-12
PR-9	Bradi5g10490	4.00E-12
PR-9	Bradi3g40330	1.00E-11

PR-9	Bradi4g25650	2.00E-10
PR-10	Bradi1g64920	5.00E-16
PR-10	Bradi1g64910	1.00E-15
PR-10	Bradi1g64890	2.00E-09
PR-10	Bradi3g48400	1.00E-08
PR-10	Bradi1g64880	2.00E-07
PR-10	Bradi4g05040	4.00E-06
PR-11	Bradi5g07230	2.00E-31
PR-13	Bradi1g57337	2.00E-08
PR-13	Bradi1g57302	1.00E-06
PR-13	Bradi1g57400	2.00E-06
PR-14	Bradi4g44410	5.00E-20
PR-14	Bradi1g21870	1.00E-17
PR-14	Bradi4g25750	2.00E-17
PR-14	Bradi4g44400	1.00E-15
PR-14	Bradi1g39120	4.00E-14
PR-14	Bradi2g53570	1.00E-11
PR-14	Bradi2g22284	8.00E-11
PR-14	Bradi2g07140	5.00E-10
PR-14	Bradi2g22278	8.00E-08
PR-15/16	Bradi1g11920	1.00E-113
PR-15/16	Bradi1g11930	1.00E-111
PR-15/16	Bradi2g47680	2.00E-51
PR-15/16	Bradi2g47690	1.00E-50
PR-15/16	Bradi2g11050	7.00E-50
PR-15/16	Bradi2g08790	1.00E-47
PR-15/16	Bradi1g04907	2.00E-47
PR-15/16	Bradi3g43650	2.00E-47
PR-15/16	Bradi2g21010	4.00E-46
PR-15/16	Bradi4g06080	4.00E-46
PR-15/16	Bradi2g60870	1.00E-45
PR-15/16	Bradi3g43660	7.00E-45
PR-15/16	Bradi3g17330	2.00E-44
PR-15/16	Bradi3g43490	5.00E-44
PR-15/16	Bradi3g15220	1.00E-43
PR-15/16	Bradi3g15210	4.00E-43
PR-15/16	Bradi3g15250	4.00E-43
PR-15/16	Bradi3g15200	5.00E-43
PR-15/16	Bradi3g15190	8.00E-43
PR-15/16	Bradi3g17316	1.00E-42
PR-15/16	Bradi5g21910	2.00E-42

PR-15/16	Bradi3g15240	2.00E-42
PR-15/16	Bradi3g15230	9.00E-42
PR-15/16	Bradi2g60860	4.00E-40
PR-15/16	Bradi3g15260	1.00E-39
PR-15/16	Bradi3g17308	8.00E-39
PR-15/16	Bradi2g33160	7.00E-35
PR-15/16	Bradi3g44880	3.00E-34
PR-15/16	Bradi3g37670	1.00E-28
PR-15/16	Bradi3g37680	5.00E-28

PR-15/16	Bradi4g38550	5.00E-24
PR-15/16	Bradi4g38570	2.00E-23
PR-15/16	Bradi3g44300	3.00E-23
PR-15/16	Bradi4g38560	2.00E-20
PR-15/16	Bradi4g38575	7.00E-20
PR-15/16	Bradi2g00792	9.00E-20
PR-15/16	Bradi4g17030	1.00E-08
PR-17	Bradi3g29710	6.00E-74

Supplemental Table S6 - Gene IDs and BLASTp E-value for *Oryza sativa* PR genes		
PR Gene Class	**Gene ID**	**E-value**
PR-1	LOC_Os07g03730	9.00E-45
PR-1	LOC_Os07g03710	1.00E-43
PR-1	LOC_Os10g11500	3.00E-43
PR-1	LOC_Os01g28450	3.00E-42
PR-1	LOC_Os01g28500	2.00E-40
PR-1	LOC_Os06g24290	1.00E-39
PR-1	LOC_Os02g27310	8.00E-37
PR-1	LOC_Os02g54540	1.00E-34
PR-1	LOC_Os07g03740	2.00E-34
PR-1	LOC_Os12g43700	1.00E-33
PR-1	LOC_Os07g03279	2.00E-33
PR-1	LOC_Os07g03319	2.00E-33
PR-1	LOC_Os07g03368	2.00E-33
PR-1	LOC_Os07g03409	2.00E-33
PR-1	LOC_Os07g03458	2.00E-33
PR-1	LOC_Os07g03499	2.00E-33
PR-1	LOC_Os07g03288	7.00E-32
PR-1	LOC_Os07g03377	7.00E-32
PR-1	LOC_Os07g03467	7.00E-32
PR-1	LOC_Os07g03590	7.00E-32
PR-1	LOC_Os05g51680	1.00E-31
PR-1	LOC_Os07g03690	2.00E-31
PR-1	LOC_Os07g03750	1.00E-30
PR-1	LOC_Os07g03580	2.00E-29
PR-1	LOC_Os07g03600	4.00E-28
PR-1	LOC_Os02g54530	2.00E-27
PR-1	LOC_Os07g03680	4.00E-27
PR-1	LOC_Os02g54560	1.00E-26
PR-1	LOC_Os07g14030	1.00E-26
PR-1	LOC_Os07g14070	1.00E-26
PR-1	LOC_Os02g27300	4.00E-26
PR-1	LOC_Os07g03610	2.00E-25
PR-1	LOC_Os04g22230	5.00E-25
PR-1	LOC_Os07g03620	1.00E-24
PR-1	LOC_Os04g22220	2.00E-24
PR-1	LOC_Os04g22210	3.00E-24
PR-1	LOC_Os02g54570	2.00E-22
PR-1	LOC_Os05g51660	2.00E-21
PR-1	LOC_Os04g22330	5.00E-10
PR-2	LOC_Os01g71340	2.00E-82
PR-2	LOC_Os01g71810	2.00E-81
PR-2	LOC_Os01g71820	2.00E-80
PR-2	LOC_Os01g71830	5.00E-80
PR-2	LOC_Os01g71400	4.00E-78
PR-2	LOC_Os01g71930	6.00E-77
PR-2	LOC_Os01g71670	7.00E-75
PR-2	LOC_Os01g71680	2.00E-74
PR-2	LOC_Os01g71860	2.00E-73
PR-2	LOC_Os01g71690	1.00E-72
PR-2	LOC_Os01g71410	1.00E-71
PR-2	LOC_Os01g71380	3.00E-71
PR-2	LOC_Os05g31140	6.00E-71
PR-2	LOC_Os05g41610	1.00E-69
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PR-2	LOC_Os01g71350	2.00E-69
PR-2	LOC_Os01g51570	1.00E-64
PR-2	LOC_Os01g53750	5.00E-61
PR-2	LOC_Os01g71474	5.00E-59
PR-2	LOC_Os03g14210	3.00E-58
PR-2	LOC_Os04g33640	3.00E-58
PR-2	LOC_Os09g36280	5.00E-58
PR-2	LOC_Os03g12140	6.00E-54
PR-2	LOC_Os06g34020	4.00E-53
PR-2	LOC_Os02g33000	5.00E-53
PR-2	LOC_Os03g12620	3.00E-52
PR-2	LOC_Os01g64170	4.00E-52
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PR-2	LOC_Os02g53200	5.00E-52
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PR-3	LOC_Os04g41680	7.00E-26
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PR-4	LOC_Os11g37940	6.00E-39
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PR-7	LOC_Os02g44590	6.00E-144
PR-7	LOC_Os03g04950	3.00E-142
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PR-15/16	LOC_Os01g14670	1.00E-45
PR-15/16	LOC_Os08g08990	1.00E-45
PR-15/16	LOC_Os03g59010	2.00E-45
PR-15/16	LOC_Os12g05860	3.00E-45
PR-15/16	LOC_Os12g05840	5.00E-45
PR-15/16	LOC_Os12g05870	1.00E-44
PR-15/16	LOC_Os08g09000	9.00E-44
PR-15/16	LOC_Os08g09060	2.00E-43
PR-15/16	LOC_Os08g09020	5.00E-43
PR-15/16	LOC_Os08g09010	9.00E-43
PR-15/16	LOC_Os08g09040	3.00E-42
PR-15/16	LOC_Os01g72300	1.00E-41
PR-15/16	LOC_Os12g05880	8.00E-37
PR-15/16	LOC_Os02g32980	2.00E-35
PR-15/16	LOC_Os08g35750	2.00E-33
PR-15/16	LOC_Os03g08150	5.00E-32
PR-15/16	LOC_Os08g35760	1.00E-30
PR-15/16	LOC_Os09g39530	4.00E-25
PR-15/16	LOC_Os11g33110	9.00E-25
PR-15/16	LOC_Os09g39520	3.00E-24
PR-15/16	LOC_Os09g39510	5.00E-24
PR-15/16	LOC_Os03g58990	2.00E-20
PR-15/16	LOC_Os03g21790	3.00E-06

Supplemental Table S7 - Gene IDs and BLASTp E-value for *Populus trichocarpa* PR genes		
PR Gene Family	**Gene ID**	**E-value**
PR-1	Potri.009G083300.1	1.00E-66
PR-1	Potri.009G083100.1	2.00E-66
PR-1	Potri.009G083600.1	4.00E-64
PR-1	Potri.009G083000.1	5.00E-63
PR-1	Potri.T131500.1	8.00E-60
PR-1	Potri.009G082900.1	4.00E-57
PR-1	Potri.001G288600.1	2.00E-56
PR-1	Potri.009G082800.1	9.00E-53
PR-1	Potri.T131400.1	2.00E-52
PR-1	Potri.001G288400.1	2.00E-52
PR-1	Potri.T093500.1	3.00E-48
PR-1	Potri.006G171300.1	5.00E-46
PR-1	Potri.T093600.1	8.00E-43
PR-1	Potri.018G007000.1	9.00E-41
PR-1	Potri.016G082000.1	2.00E-30
PR-1	Potri.006G215600.1	8.00E-30
PR-1	Potri.005G130100.1	1.00E-29
PR-1	Potri.007G033200.1	4.00E-28
PR-1	Potri.009G083400.1	8.00E-14
PR-2	Potri.001G255100.1	1.00E-125
PR-2	Potri.010G142800.1	4.00E-113
PR-2	Potri.T167100.1	1.00E-110
PR-2	Potri.016G057400.1	2.00E-104
PR-2	Potri.009G050300.1	3.00E-103
PR-2	Potri.016G057600.1	8.00E-100
PR-2	Potri.006G046100.1	2.00E-99
PR-2	Potri.006G048100.1	3.00E-98
PR-2	Potri.002G089200.1	2.00E-70
PR-2	Potri.009G050400.1	2.00E-69
PR-2	Potri.005G172000.1	1.00E-68
PR-2	Potri.014G158400.1	1.00E-67
PR-2	Potri.018G068600.1	2.00E-67
PR-2	Potri.006G067500.1	3.00E-66
PR-2	Potri.004G202400.1	1.00E-65
PR-2	Potri.003G032600.1	1.00E-64
PR-2	Potri.011G084900.1	3.00E-64
PR-2	Potri.018G129500.1	4.00E-64
PR-2	Potri.002G224600.1	5.00E-63
PR-2	Potri.004G153800.1	8.00E-63
PR-2	Potri.004G097400.1	8.00E-63
PR-2	Potri.004G132700.1	2.00E-62
PR-2	Potri.001G192200.1	2.00E-62
PR-2	Potri.011G094400.1	4.00E-62
PR-2	Potri.014G182800.1	6.00E-62
PR-2	Potri.014G185100.1	1.00E-61
PR-2	Potri.002G261800.1	2.00E-61
PR-2	Potri.014G184300.1	2.00E-61
PR-2	Potri.009G163700.1	3.00E-61
PR-2	Potri.014G183800.1	4.00E-61
PR-2	Potri.011G152400.1	7.00E-61
PR-2	Potri.014G184100.1	7.00E-61
PR-2	Potri.001G449100.1	1.00E-60
PR-2	Potri.014G182500.1	2.00E-60
PR-2	Potri.012G017800.1	9.00E-60
PR-2	Potri.009G115400.1	1.00E-59
PR-2	Potri.010G108500.1	9.00E-59
PR-2	Potri.004G086400.1	1.00E-58
PR-2	Potri.014G184900.1	7.00E-58
PR-2	Potri.014G182000.1	3.00E-57
PR-2	Potri.010G203800.1	2.00E-56
PR-2	Potri.017G130200.1	2.00E-56
PR-2	Potri.008G055900.1	5.00E-56
PR-2	Potri.002G007300.1	1.00E-55
PR-2	Potri.008G056000.1	1.00E-55
PR-2	Potri.008G133200.1	1.00E-55
PR-2	Potri.001G006500.1	1.00E-55
PR-2	Potri.014G184600.1	2.00E-55
PR-2	Potri.015G010100.1	3.00E-55
PR-2	Potri.004G010500.1	2.00E-54

PR-2	Potri.006G080600.1	4.00E-54
PR-2	Potri.001G240000.1	6.00E-54
PR-3	Potri.004G182000.1	5.00E-95
PR-3	Potri.009G141700.1	5.00E-92
PR-3	Potri.T175200.1	8.00E-80
PR-3	Potri.009G142300.1	2.00E-74
PR-3	Potri.009G142000.1	1.00E-71
PR-3	Potri.T175300.1	8.00E-71
PR-3	Potri.009G142200.1	1.00E-70
PR-3	Potri.009G142100.1	8.00E-70
PR-3	Potri.009G141800.1	3.00E-69
PR-3	Potri.004G182100.1	1.00E-66
PR-3	Potri.014G111800.1	4.00E-65
PR-3	Potri.002G186500.1	2.00E-64
PR-3	Potri.010G141600.1	1.00E-33
PR-3	Potri.019G094000.1	6.00E-33
PR-3	Potri.019G093800.1	7.00E-33
PR-3	Potri.019G094100.1	1.00E-31
PR-3	Potri.013G125000.1	3.00E-31
PR-3	Potri.013G125100.1	3.00E-31
PR-3	Potri.019G093900.1	2.00E-30
PR-3	Potri.014G146600.1	7.00E-30
PR-3	Potri.019G093700.1	7.00E-29
PR-4	Potri.013G041600.1	2.00E-57
PR-4	Potri.013G041700.1	7.00E-56
PR-4	Potri.005G054000.1	9.00E-56
PR-4	Potri.013G041900.1	7.00E-55
PR-5	Potri.012G047800.1	8.00E-89
PR-5	Potri.004G173200.1	8.00E-88
PR-5	Potri.005G112600.1	1.00E-87
PR-5	Potri.015G039200.1	8.00E-87
PR-5	Potri.009G132500.1	9.00E-87
PR-5	Potri.001G221400.1	6.00E-85
PR-5	Potri.014G040700.1	9.00E-84
PR-5	Potri.001G221700.1	7.00E-83
PR-5	Potri.001G222100.1	7.00E-83
PR-5	Potri.001G221100.1	1.00E-82
PR-5	Potri.001G221900.1	1.00E-82
PR-5	Potri.001G221800.1	2.00E-81
PR-5	Potri.001G221500.1	2.00E-81
PR-5	Potri.002G020500.1	1.00E-80
PR-5	Potri.005G240900.1	1.00E-80
PR-5	Potri.001G221200.1	2.00E-80
PR-5	Potri.005G241000.1	5.00E-79
PR-5	Potri.005G112700.1	2.00E-78
PR-5	Potri.002G020400.1	4.00E-78
PR-5	Potri.001G220900.1	2.00E-76
PR-5	Potri.015G000800.1	2.00E-75
PR-5	Potri.005G173900.1	1.00E-73
PR-5	Potri.002G087100.1	6.00E-73
PR-5	Potri.012G004800.1	6.00E-73
PR-5	Potri.006G088100.1	9.00E-73
PR-5	Potri.001G210400.1	3.00E-69
PR-5	Potri.010G200800.1	3.00E-66
PR-5	Potri.003G020100.1	8.00E-66
PR-5	Potri.009G132200.1	2.00E-65
PR-5	Potri.017G075500.1	1.00E-63
PR-5	Potri.004G014700.1	2.00E-62
PR-5	Potri.T091200.1	1.00E-59
PR-5	Potri.011G003900.1	1.00E-56
PR-5	Potri.004G014400.1	3.00E-56
PR-5	Potri.009G028800.1	1.00E-52
PR-5	Potri.001G107600.1	2.00E-52
PR-5	Potri.T091600.1	2.00E-51
PR-5	Potri.T094100.1	4.00E-50
PR-5	Potri.001G102400.1	4.00E-50
PR-5	Potri.001G237600.1	5.00E-49
PR-5	Potri.T091300.1	1.00E-46
PR-5	Potri.001G221300.1	8.00E-42
PR-5	Potri.001G107800.1	4.00E-41
PR-5	Potri.002G133200.1	4.00E-37
PR-5	Potri.004G014200.1	9.00E-32
PR-5	Potri.001G222000.1	1.00E-30
PR-5	Potri.T094200.1	8.00E-24
PR-5	Potri.001G221600.1	1.00E-23
PR-5	Potri.011G004000.1	4.00E-19
PR-5	Potri.001G107700.1	2.00E-17
PR-6	Potri.010G075400.1	2.00E-13
PR-6	Potri.011G110100.1	6.00E-13
PR-6	Potri.010G075600.1	7.00E-13
PR-6	Potri.011G110400.1	7.00E-13
PR-6	Potri.016G078900.1	4.00E-12

PR-6	Potri.010G075800.1	6.00E-12
PR-6	Potri.005G221000.1	3.00E-11
PR-6	Potri.010G075200.1	5.00E-11
PR-6	Potri.016G079100.1	7.00E-11
PR-6	Potri.009G028300.1	1.00E-10
PR-6	Potri.016G079000.1	1.00E-10
PR-6	Potri.006G212200.1	2.00E-10
PR-6	Potri.010G075500.1	4.00E-10
PR-6	Potri.010G075300.1	4.00E-10
PR-6	Potri.010G075700.1	5.00E-10
PR-6	Potri.006G212000.1	6.00E-10
PR-6	Potri.016G078800.1	9.00E-10
PR-6	Potri.002G042300.1	3.00E-07
PR-6	Potri.T083400.1	2.00E-06
PR-6	Potri.006G088700.1	3.00E-06
PR-6	Potri.T082800.1	4.00E-06
PR-6	Potri.006G088500.1	4.00E-06
PR-7	Potri.T004700.1	0
PR-7	Potri.003G118800.1	0
PR-7	Potri.003G118700.1	0
PR-7	Potri.003G118500.1	0
PR-7	Potri.001G113700.1	0
PR-7	Potri.014G074600.1	2.00E-173
PR-7	Potri.009G133400.1	4.00E-166
PR-7	Potri.004G173900.1	7.00E-165
PR-7	Potri.002G256300.1	3.00E-161
PR-7	Potri.003G067000.1	9.00E-157
PR-7	Potri.005G145300.1	3.00E-156
PR-7	Potri.001G167300.1	3.00E-153
PR-7	Potri.014G018900.1	6.00E-148
PR-7	Potri.002G120400.1	1.00E-147
PR-7	Potri.014G171600.1	2.00E-147
PR-7	Potri.011G165900.1	3.00E-146
PR-7	Potri.012G131500.1	1.00E-144
PR-7	Potri.001G163600.1	2.00E-143
PR-7	Potri.001G469000.1	3.00E-141
PR-7	Potri.001G468800.1	7.00E-139
PR-7	Potri.015G133800.1	2.00E-136
PR-7	Potri.007G102100.1	1.00E-135
PR-7	Potri.005G067200.1	2.00E-133
PR-7	Potri.011G050000.1	1.00E-132

PR-7	Potri.007G102200.1	3.00E-132
PR-7	Potri.007G102300.1	9.00E-132
PR-7	Potri.001G455800.1	1.00E-131
PR-7	Potri.001G450600.1	6.00E-131
PR-7	Potri.010G196700.1	4.00E-130
PR-7	Potri.001G468900.1	1.00E-129
PR-7	Potri.007G045100.1	7.00E-129
PR-7	Potri.011G146300.1	5.00E-127
PR-7	Potri.011G076700.1	6.00E-127
PR-7	Potri.011G050100.1	1.00E-126
PR-7	Potri.011G150900.1	5.00E-126
PR-7	Potri.010G196800.1	3.00E-125
PR-7	Potri.006G001600.1	3.00E-125
PR-7	Potri.004G161400.1	5.00E-125
PR-7	Potri.009G100500.1	1.00E-124
PR-7	Potri.006G114500.1	1.00E-124
PR-7	Potri.011G151200.1	2.00E-122
PR-7	Potri.002G124500.1	2.00E-122
PR-7	Potri.011G050300.1	3.00E-122
PR-7	Potri.005G243000.1	2.00E-120
PR-7	Potri.014G026600.1	2.00E-120
PR-7	Potri.011G050200.1	3.00E-120
PR-7	Potri.002G018600.1	2.00E-119
PR-7	Potri.014G026700.1	3.00E-119
PR-7	Potri.009G038000.1	1.00E-117
PR-7	Potri.010G196600.1	2.00E-116
PR-7	Potri.012G133200.1	3.00E-116
PR-7	Potri.010G196900.1	1.00E-115
PR-7	Potri.014G026500.1	3.00E-115
PR-7	Potri.003G120100.1	2.00E-114
PR-7	Potri.014G074500.1	2.00E-113
PR-7	Potri.018G094400.1	2.00E-111
PR-7	Potri.003G189200.1	7.00E-111
PR-7	Potri.009G037900.1	1.00E-105
PR-7	Potri.002G151900.1	1.00E-104
PR-7	Potri.006G141200.1	3.00E-100
PR-7	Potri.009G144500.1	3.00E-99
PR-7	Potri.001G002200.1	1.00E-85
PR-7	Potri.006G076200.1	5.00E-78
PR-7	Potri.004G184600.1	1.00E-77
PR-7	Potri.001G440300.1	6.00E-77

PR-7	Potri.001G151100.1	2.00E-76
PR-7	Potri.011G155400.1	6.00E-75
PR-7	Potri.014G193200.1	1.00E-74
PR-7	Potri.018G143400.1	4.00E-74
PR-7	Potri.002G152000.1	4.00E-65
PR-8	Potri.015G024100.1	1.00E-131
PR-8	Potri.015G024000.1	3.00E-131
PR-8	Potri.015G023900.1	2.00E-128
PR-8	Potri.002G165700.1	5.00E-110
PR-8	Potri.014G091700.1	1.00E-109
PR-8	Potri.015G024200.1	1.00E-105
PR-8	Potri.002G242000.1	3.00E-105
PR-8	Potri.012G033900.1	7.00E-103
PR-8	Potri.014G091600.1	8.00E-103
PR-8	Potri.014G092800.1	2.00E-88
PR-8	Potri.014G092900.1	1.00E-82
PR-8	Potri.014G093000.1	2.00E-22
PR-9	Potri.001G011500.1	9.00E-142
PR-9	Potri.003G214800.1	4.00E-139
PR-9	Potri.003G214700.1	5.00E-139
PR-9	Potri.016G058200.1	4.00E-130
PR-9	Potri.001G011200.1	1.00E-122
PR-9	Potri.001G011300.1	7.00E-122
PR-9	Potri.003G214900.1	1.00E-121
PR-9	Potri.001G013000.1	1.00E-121
PR-9	Potri.001G011000.1	1.00E-121
PR-9	Potri.003G214500.1	2.00E-107
PR-9	Potri.003G215000.1	8.00E-102
PR-9	Potri.007G019300.1	6.00E-100
PR-9	Potri.005G118700.1	7.00E-99
PR-9	Potri.013G083600.1	3.00E-97
PR-9	Potri.013G154400.1	1.00E-96
PR-9	Potri.014G143200.1	2.00E-96
PR-9	Potri.T160000.1	2.00E-96
PR-9	Potri.008G022700.1	4.00E-96
PR-9	Potri.008G022600.1	2.00E-95
PR-9	Potri.T160100.1	4.00E-95
PR-9	Potri.T163200.1	7.00E-95
PR-9	Potri.001G458900.1	4.00E-92
PR-9	Potri.016G132700.1	1.00E-91
PR-9	Potri.010G236900.1	6.00E-91

PR-9	Potri.001G458700.1	1.00E-90
PR-9	Potri.T163000.1	3.00E-90
PR-9	Potri.005G135300.1	3.00E-90
PR-9	Potri.002G031200.1	4.00E-90
PR-9	Potri.T163100.1	8.00E-89
PR-9	Potri.013G156800.1	2.00E-88
PR-9	Potri.008G103200.1	1.00E-87
PR-9	Potri.013G156400.1	1.00E-85
PR-9	Potri.011G027300.1	3.00E-85
PR-9	Potri.004G144600.1	1.00E-84
PR-9	Potri.004G023200.1	1.00E-84
PR-9	Potri.013G156500.1	3.00E-84
PR-9	Potri.009G106400.1	4.00E-84
PR-9	Potri.010G134500.1	1.00E-83
PR-9	Potri.T099300.1	1.00E-83
PR-9	Potri.016G132900.1	2.00E-83
PR-9	Potri.019G063200.1	3.00E-83
PR-9	Potri.008G110600.1	4.00E-83
PR-9	Potri.006G069600.1	8.00E-83
PR-9	Potri.004G023100.1	2.00E-82
PR-9	Potri.016G132800.1	2.00E-82
PR-9	Potri.018G131600.1	4.00E-81
PR-9	Potri.001G145800.1	6.00E-81
PR-9	Potri.006G107000.1	2.00E-80
PR-9	Potri.005G072800.1	2.00E-80
PR-9	Potri.017G038100.1	4.00E-80
PR-9	Potri.005G108900.1	1.00E-79
PR-9	Potri.007G122100.1	9.00E-79
PR-9	Potri.002G065300.1	1.00E-78
PR-9	Potri.007G096200.1	2.00E-78
PR-9	Potri.017G037900.1	3.00E-77
PR-9	Potri.005G195600.1	4.00E-76
PR-9	Potri.012G042800.1	4.00E-76
PR-9	Potri.016G058800.1	6.00E-76
PR-9	Potri.016G125000.1	2.00E-73
PR-9	Potri.010G175100.1	4.00E-73
PR-9	Potri.005G195700.1	2.00E-72
PR-9	Potri.001G182400.1	2.00E-72
PR-9	Potri.004G134800.1	7.00E-72
PR-9	Potri.003G156100.1	8.00E-71
PR-9	Potri.002G018000.1	9.00E-71

PR-9	Potri.007G122200.1	1.00E-70
PR-9	Potri.017G064100.1	4.00E-70
PR-9	Potri.007G122300.1	7.00E-69
PR-9	Potri.018G089900.1	2.00E-68
PR-9	Potri.007G074700.1	7.00E-68
PR-9	Potri.010G036100.1	1.00E-67
PR-9	Potri.T045500.1	3.00E-67
PR-9	Potri.015G003500.1	3.00E-67
PR-9	Potri.015G003600.1	3.00E-66
PR-9	Potri.007G053400.1	2.00E-65
PR-9	Potri.004G052100.1	4.00E-65
PR-9	Potri.011G062300.1	5.00E-65
PR-9	Potri.001G329200.1	6.00E-65
PR-9	Potri.001G351000.1	1.00E-64
PR-9	Potri.007G132800.1	1.00E-63
PR-9	Potri.015G110200.1	1.00E-61
PR-9	Potri.T089600.1	1.00E-61
PR-9	Potri.018G136900.1	1.00E-60
PR-9	Potri.018G015500.1	2.00E-60
PR-9	Potri.012G076500.1	3.00E-60
PR-9	Potri.013G066800.1	5.00E-60
PR-9	Potri.006G267400.1	2.00E-59
PR-9	Potri.007G067200.1	3.00E-58
PR-9	Potri.001G218600.1	1.00E-55
PR-9	Potri.001G218500.1	2.00E-55
PR-9	Potri.006G129900.1	8.00E-54
PR-10	Potri.010G000600.1	6.00E-45
PR-10	Potri.011G026000.1	9.00E-44
PR-10	Potri.008G212100.1	3.00E-43
PR-10	Potri.011G025900.1	9.00E-43
PR-10	Potri.011G026100.1	1.00E-42
PR-10	Potri.011G026200.1	5.00E-42
PR-10	Potri.008G212500.1	1.00E-41
PR-10	Potri.014G152800.1	2.00E-41
PR-10	Potri.008G212400.1	8.00E-41
PR-10	Potri.004G021100.1	9.00E-41
PR-10	Potri.010G000400.1	1.00E-40
PR-10	Potri.T111200.1	2.00E-40
PR-10	Potri.010G000200.1	2.00E-39
PR-10	Potri.016G046500.1	3.00E-39
PR-10	Potri.008G213100.1	7.00E-39

PR-10	Potri.008G212700.1	8.00E-38
PR-10	Potri.008G212600.1	4.00E-35
PR-10	Potri.010G000500.1	4.00E-32
PR-10	Potri.008G212300.1	2.00E-29
PR-10	Potri.008G212800.1	2.00E-26
PR-10	Potri.004G032900.1	4.00E-20
PR-10	Potri.004G033000.1	1.00E-19
PR-11	Potri.006G188300.1	1.00E-146
PR-11	Potri.006G188400.1	4.00E-138
PR-11	Potri.018G111600.1	1.00E-98
PR-11	Potri.018G111900.1	8.00E-95
PR-11	Potri.018G112000.1	3.00E-90
PR-11	Potri.018G112100.1	1.00E-88
PR-11	Potri.018G111700.1	9.00E-86
PR-11	Potri.006G261800.1	1.00E-85
PR-11	Potri.018G111800.1	1.00E-58
PR-14	Potri.001G232900.1	1.00E-21
PR-14	Potri.001G232700.1	4.00E-21
PR-14	Potri.004G086600.1	8.00E-20
PR-14	Potri.004G086500.1	8.00E-19
PR-14	Potri.009G025200.1	6.00E-17
PR-14	Potri.T132400.1	6.00E-17
PR-14	Potri.016G136000.1	6.00E-17
PR-14	Potri.016G135400.1	9.00E-17
PR-14	Potri.016G135800.1	5.00E-16
PR-14	Potri.014G046500.1	5.00E-15
PR-14	Potri.016G135700.1	2.00E-14
PR-14	Potri.006G108100.1	6.00E-14
PR-14	Potri.016G135500.1	2.00E-13
PR-14	Potri.014G098000.1	8.00E-11
PR-14	Potri.011G021900.1	6.00E-09
PR-16	Potri.015G068200.1	8.00E-65
PR-16	Potri.005G001300.1	1.00E-59
PR-16	Potri.011G163300.1	9.00E-59
PR-16	Potri.013G052300.1	2.00E-58
PR-16	Potri.T151800.1	3.00E-58
PR-16	Potri.013G052100.1	6.00E-58
PR-16	Potri.013G052000.1	7.00E-58
PR-16	Potri.013G051700.1	2.00E-57
PR-16	Potri.011G163800.1	3.00E-57
PR-16	Potri.013G051600.1	4.00E-57

PR-16	Potri.011G163200.1	8.00E-57
PR-16	Potri.001G465100.1	9.00E-57
PR-16	Potri.011G162200.1	1.00E-56
PR-16	Potri.014G110400.1	2.00E-55
PR-16	Potri.013G064100.1	1.00E-54
PR-16	Potri.013G000500.1	1.00E-54
PR-16	Potri.002G184900.1	1.00E-54
PR-16	Potri.013G063000.1	2.00E-54
PR-16	Potri.013G063800.1	2.00E-54
PR-16	Potri.013G063600.1	2.00E-54
PR-16	Potri.013G063700.1	2.00E-54
PR-16	Potri.013G063900.1	2.00E-54
PR-16	Potri.013G063500.1	2.00E-54
PR-16	Potri.013G064000.1	2.00E-54
PR-16	Potri.013G063200.1	2.00E-54
PR-16	Potri.013G063100.1	6.00E-54
PR-16	Potri.T151900.1	9.00E-54
PR-16	Potri.019G026400.1	3.00E-53
PR-16	Potri.013G063300.1	6.00E-53
PR-16	Potri.019G026700.1	1.00E-52
PR-16	Potri.019G026000.1	1.00E-52
PR-16	Potri.019G025800.1	1.00E-52
PR-16	Potri.019G025900.1	1.00E-52
PR-16	Potri.T056300.1	2.00E-52
PR-16	Potri.019G026200.1	3.00E-52
PR-16	Potri.019G026500.1	4.00E-52
PR-16	Potri.013G051900.1	3.00E-51
PR-16	Potri.001G464000.1	4.00E-51
PR-16	Potri.001G464100.1	8.00E-51
PR-16	Potri.011G162600.1	1.00E-49
PR-16	Potri.013G051800.1	1.00E-48
PR-16	Potri.009G140400.1	2.00E-48
PR-16	Potri.004G180100.1	2.00E-48
PR-16	Potri.004G179800.1	2.00E-48
PR-16	Potri.004G179900.1	2.00E-48
PR-16	Potri.013G063400.1	1.00E-47
PR-16	Potri.004G180000.1	2.00E-46
PR-16	Potri.004G180200.1	2.00E-46
PR-16	Potri.001G464500.1	2.00E-46
PR-16	Potri.008G020800.1	5.00E-44
PR-16	Potri.010G038200.1	9.00E-40
PR-16	Potri.013G141900.1	4.00E-35
PR-16	Potri.003G065300.1	4.00E-35
PR-16	Potri.012G111500.1	1.00E-34
PR-16	Potri.010G238100.1	2.00E-34
PR-16	Potri.010G238200.1	2.00E-34
PR-16	Potri.001G169000.1	2.00E-34
PR-16	Potri.006G142600.1	3.00E-33
PR-16	Potri.015G109600.1	7.00E-33
PR-16	Potri.019G026100.1	9.00E-31
PR-16	Potri.T055000.1	4.00E-29
PR-16	Potri.019G029300.1	2.00E-28
PR-16	Potri.008G016700.1	8.00E-28
PR-16	Potri.004G194600.1	1.00E-26
PR-16	Potri.010G240700.1	4.00E-26
PR-16	Potri.008G084300.1	6.00E-26
PR-16	Potri.010G240500.1	2.00E-24
PR-16	Potri.009G157100.1	2.00E-24
PR-16	Potri.010G240600.1	5.00E-24
PR-16	Potri.019G026800.1	2.00E-23
PR-16	Potri.008G016500.1	6.00E-14
PR-16	Potri.013G116500.1	2.00E-12
PR-16	Potri.008G016600.1	7.00E-07
PR-16	Potri.001G464600.1	1.00E-05
PR-17	Potri.009G094600.1	3.00E-111
PR-17	Potri.001G299500.1	3.00E-111
PR-17	Potri.001G299400.1	3.00E-107
PR-17	Potri.001G299600.1	1.00E-103
PR-17	Potri.009G094500.1	2.00E-93
PR-17	Potri.009G094700.1	7.00E-87
PR-17	Potri.005G202300.1	8.00E-09

Supplemental Table S8 - Gene IDs and BLASTp E-value for *Vitis vinifera* PR genes		
PR Gene Class	**Gene ID**	**E-value**
PR-1	GSVIVT01037000001	4.00E-53
PR-1	GSVIVT01037005001	1.00E-51
PR-1	GSVIVT01036997001	1.00E-49
PR-1	GSVIVT01037008001	1.00E-49
PR-1	GSVIVT01038540001	2.00E-49
PR-1	GSVIVT01037015001	1.00E-43
PR-1	GSVIVT01036993001	1.00E-40
PR-1	GSVIVT01037011001	1.00E-40
PR-1	GSVIVT01029124001	6.00E-40
PR-1	GSVIVT01025577001	8.00E-40
PR-1	GSVIVT01003762001	3.00E-28
PR-1	GSVIVT01037014001	6.00E-19
PR-1	GSVIVT01003765001	2.00E-06
PR-2	GSVIVT01031542001	1.00E-77
PR-2	GSVIVT01033545001	5.00E-76
PR-2	GSVIVT01033542001	6.00E-75
PR-2	GSVIVT01013131001	6.00E-67
PR-2	GSVIVT01015282001	2.00E-61
PR-2	GSVIVT01033536001	4.00E-60
PR-2	GSVIVT01017331001	1.00E-55
PR-2	GSVIVT01037711001	4.00E-54
PR-2	GSVIVT01031959001	7.00E-54
PR-2	GSVIVT01021499001	8.00E-54
PR-2	GSVIVT01035013001	5.00E-53
PR-2	GSVIVT01033538001	7.00E-53
PR-2	GSVIVT01038583001	1.00E-52
PR-2	GSVIVT01011682001	3.00E-52
PR-2	GSVIVT01030716001	9.00E-52
PR-2	GSVIVT01036124001	1.00E-51
PR-2	GSVIVT01009700001	1.00E-50
PR-2	GSVIVT01024956001	5.00E-50
PR-2	GSVIVT01012711001	3.00E-48
PR-2	GSVIVT01022253001	4.00E-48
PR-2	GSVIVT01013401001	1.00E-46
PR-2	GSVIVT01031698001	1.00E-46
PR-2	GSVIVT01034245001	3.00E-46
PR-2	GSVIVT01033384001	4.00E-44
PR-2	GSVIVT01015563001	1.00E-42
PR-2	GSVIVT01031544001	2.00E-41
PR-2	GSVIVT01030073001	3.00E-40
PR-2	GSVIVT01016553001	6.00E-40
PR-2	GSVIVT01019678001	4.00E-39
PR-2	GSVIVT01016379001	9.00E-39
PR-2	GSVIVT01033540001	2.00E-36
PR-2	GSVIVT01015435001	7.00E-36
PR-2	GSVIVT01014995001	4.00E-35
PR-2	GSVIVT01031543001	3.00E-30
PR-2	GSVIVT01030503001	6.00E-30
PR-2	GSVIVT01002584001	8.00E-30
PR-2	GSVIVT01033543001	6.00E-27
PR-2	GSVIVT01031619001	3.00E-25
PR-2	GSVIVT01015616001	1.00E-11
PR-2	GSVIVT01025431001	3.00E-11
PR-2	GSVIVT01000128001	3.00E-08
PR-2	GSVIVT01017294001	3.00E-06
PR-3	GSVIVT01007190001	1.00E-69
PR-3	GSVIVT01038126001	8.00E-30
PR-3	GSVIVT01038114001	1.00E-29
PR-3	GSVIVT01028243001	3.00E-28
PR-3	GSVIVT01038125001	8.00E-28
PR-3	GSVIVT01038113001	1.00E-27
PR-3	GSVIVT01038117001	1.00E-27
PR-3	GSVIVT01038111001	2.00E-27
PR-3	GSVIVT01038116001	4.00E-27
PR-3	GSVIVT01038120001	1.00E-25
PR-3	GSVIVT01038108001	6.00E-25

PR-3	GSVIVT01035029001	2.00E-23
PR-3	GSVIVT01031685001	1.00E-22
PR-4	GSVIVT01036278001	1.00E-48
PR-4	GSVIVT01036279001	7.00E-48
PR-4	GSVIVT01036281001	7.00E-16
PR-5	GSVIVT01008423001	7.00E-73
PR-5	GSVIVT01032051001	4.00E-70
PR-5	GSVIVT01018767001	1.00E-69
PR-5	GSVIVT01009930001	1.00E-67
PR-5	GSVIVT01024050001	2.00E-67
PR-5	GSVIVT01027712001	1.00E-65
PR-5	GSVIVT01018769001	2.00E-65
PR-5	GSVIVT01009928001	2.00E-64
PR-5	GSVIVT01038679001	6.00E-64
PR-5	GSVIVT01024052001	1.00E-61
PR-5	GSVIVT01033694001	4.00E-60
PR-5	GSVIVT01016504001	5.00E-58
PR-5	GSVIVT01034131001	2.00E-56
PR-5	GSVIVT01008918001	4.00E-55
PR-5	GSVIVT01022993001	3.00E-54
PR-5	GSVIVT01009646001	2.00E-38
PR-5	GSVIVT01032560001	1.00E-34
PR-5	GSVIVT01019840001	4.00E-27
PR-5	GSVIVT01019849001	7.00E-21
PR-5	GSVIVT01019835001	4.00E-14
PR-5	GSVIVT01019848001	8.00E-10
PR-5	GSVIVT01019838001	2.00E-06
PR-5	GSVIVT01019836001	7.00E-06
PR-6	GSVIVT01018137001	3.00E-13
PR-6	GSVIVT01018139001	8.00E-13
PR-6	GSVIVT01018142001	2.00E-10
PR-6	GSVIVT01018141001	4.00E-09
PR-6	GSVIVT01032743001	1.00E-08
PR-7	GSVIVT01028435001	7.00E-138
PR-7	GSVIVT01024042001	2.00E-134
PR-7	GSVIVT01028051001	2.00E-126
PR-7	GSVIVT01006970001	3.00E-122
PR-7	GSVIVT01030138001	4.00E-122
PR-7	GSVIVT01014788001	2.00E-119
PR-7	GSVIVT01019901001	3.00E-119
PR-7	GSVIVT01015069001	4.00E-118
PR-7	GSVIVT01006972001	2.00E-117
PR-7	GSVIVT01016448001	1.00E-114
PR-7	GSVIVT01019687001	2.00E-114
PR-7	GSVIVT01009471001	3.00E-114
PR-7	GSVIVT01006968001	4.00E-114
PR-7	GSVIVT01009968001	3.00E-112
PR-7	GSVIVT01016449001	5.00E-112
PR-7	GSVIVT01026420001	9.00E-112
PR-7	GSVIVT01016446001	1.00E-111
PR-7	GSVIVT01016452001	1.00E-111
PR-7	GSVIVT01016456001	7.00E-111
PR-7	GSVIVT01016447001	4.00E-110
PR-7	GSVIVT01016439001	3.00E-109
PR-7	GSVIVT01027586001	4.00E-109
PR-7	GSVIVT01019877001	7.00E-109
PR-7	GSVIVT01019919001	3.00E-108
PR-7	GSVIVT01016455001	4.00E-107
PR-7	GSVIVT01027368001	1.00E-106
PR-7	GSVIVT01033810001	5.00E-106
PR-7	GSVIVT01016451001	7.00E-106
PR-7	GSVIVT01027583001	3.00E-105
PR-7	GSVIVT01038642001	7.00E-105
PR-7	GSVIVT01038641001	1.00E-104
PR-7	GSVIVT01016443001	5.00E-104
PR-7	GSVIVT01010670001	1.00E-103
PR-7	GSVIVT01024856001	3.00E-103
PR-7	GSVIVT01038620001	2.00E-102
PR-7	GSVIVT01010668001	3.00E-102
PR-7	GSVIVT01036167001	9.00E-102
PR-7	GSVIVT01018437001	1.00E-101
PR-7	GSVIVT01016682001	1.00E-100
PR-7	GSVIVT01021320001	1.00E-100
PR-7	GSVIVT01018442001	2.00E-100
PR-7	GSVIVT01024195001	4.00E-100
PR-7	GSVIVT01019686001	6.00E-99
PR-7	GSVIVT01024859001	2.00E-98
PR-7	GSVIVT01037483001	3.00E-98
PR-7	GSVIVT01024948001	3.00E-96
PR-7	GSVIVT01024857001	6.00E-96
PR-7	GSVIVT01018438001	4.00E-93
PR-7	GSVIVT01016735001	6.00E-93

PR-7	GSVIVT01025493001	6.00E-93
PR-7	GSVIVT01016445001	4.00E-92
PR-7	GSVIVT01037485001	1.00E-90
PR-7	GSVIVT01002783001	3.00E-89
PR-7	GSVIVT01016442001	2.00E-88
PR-7	GSVIVT01031724001	1.00E-87
PR-7	GSVIVT01031725001	1.00E-83
PR-7	GSVIVT01006973001	1.00E-81
PR-7	GSVIVT01019899001	3.00E-81
PR-7	GSVIVT01000156001	6.00E-81
PR-7	GSVIVT01031723001	2.00E-76
PR-7	GSVIVT01010871001	3.00E-73
PR-7	GSVIVT01037948001	3.00E-70
PR-7	GSVIVT01009472001	4.00E-70
PR-7	GSVIVT01029534001	1.00E-67
PR-7	GSVIVT01004808001	9.00E-65
PR-7	GSVIVT01006971001	1.00E-50
PR-7	GSVIVT01024858001	1.00E-26
PR-8	GSVIVT01027027001	1.00E-85
PR-8	GSVIVT01032411001	5.00E-81
PR-8	GSVIVT01027012001	9.00E-77
PR-8	GSVIVT01028750001	8.00E-73
PR-8	GSVIVT01028752001	7.00E-71
PR-8	GSVIVT01027026001	1.00E-67
PR-8	GSVIVT01027014001	2.00E-64
PR-8	GSVIVT01027013001	5.00E-63
PR-8	GSVIVT01027022001	3.00E-49
PR-8	GSVIVT01027016001	3.00E-35
PR-8	GSVIVT01028753001	6.00E-31
PR-9	GSVIVT01025373001	9.00E-114
PR-9	GSVIVT01033484001	4.00E-105
PR-9	GSVIVT01020737001	5.00E-79
PR-9	GSVIVT01024596001	1.00E-75
PR-9	GSVIVT01010271001	3.00E-75
PR-9	GSVIVT01031801001	5.00E-74
PR-9	GSVIVT01030221001	8.00E-74
PR-9	GSVIVT01010269001	4.00E-72
PR-9	GSVIVT01024600001	5.00E-71
PR-9	GSVIVT01009106001	2.00E-70
PR-9	GSVIVT01013238001	4.00E-70
PR-9	GSVIVT01015533001	6.00E-70

PR-9	GSVIVT01010168001	1.00E-69
PR-9	GSVIVT01010272001	5.00E-67
PR-9	GSVIVT01010267001	2.00E-66
PR-9	GSVIVT01003417001	3.00E-66
PR-9	GSVIVT01010270001	3.00E-66
PR-9	GSVIVT01034967001	3.00E-66
PR-9	GSVIVT01015537001	4.00E-66
PR-9	GSVIVT01030219001	2.00E-65
PR-9	GSVIVT01009107001	7.00E-65
PR-9	GSVIVT01010268001	3.00E-64
PR-9	GSVIVT01010664001	3.00E-64
PR-9	GSVIVT01018436001	3.00E-64
PR-9	GSVIVT01011017001	1.00E-63
PR-9	GSVIVT01026134001	1.00E-63
PR-9	GSVIVT01000248001	2.00E-61
PR-9	GSVIVT01017830001	7.00E-61
PR-9	GSVIVT01008763001	1.00E-60
PR-9	GSVIVT01031311001	1.00E-60
PR-9	GSVIVT01021152001	2.00E-60
PR-9	GSVIVT01030615001	5.00E-60
PR-9	GSVIVT01030616001	8.00E-60
PR-9	GSVIVT01010080001	1.00E-59
PR-9	GSVIVT01031312001	1.00E-59
PR-9	GSVIVT01004097001	3.00E-59
PR-9	GSVIVT01029748001	7.00E-58
PR-9	GSVIVT01009109001	1.00E-57
PR-9	GSVIVT01004088001	7.00E-57
PR-9	GSVIVT01005386001	8.00E-57
PR-9	GSVIVT01029241001	2.00E-56
PR-9	GSVIVT01007448001	4.00E-55
PR-9	GSVIVT01017084001	4.00E-55
PR-9	GSVIVT01028197001	3.00E-54
PR-9	GSVIVT01010266001	4.00E-54
PR-9	GSVIVT01018865001	3.00E-53
PR-9	GSVIVT01010156001	2.00E-52
PR-9	GSVIVT01009108001	5.00E-52
PR-9	GSVIVT01012624001	1.00E-51
PR-9	GSVIVT01038659001	2.00E-51
PR-9	GSVIVT01029771001	2.00E-50
PR-9	GSVIVT01036100001	8.00E-49
PR-9	GSVIVT01025365001	1.00E-48

PR-9	GSVIVT01033081001	4.00E-48
PR-9	GSVIVT01034984001	1.00E-46
PR-9	GSVIVT01025650001	9.00E-45
PR-9	GSVIVT01032715001	1.00E-44
PR-9	GSVIVT01024599001	4.00E-43
PR-9	GSVIVT01025374001	4.00E-41
PR-9	GSVIVT01009777001	6.00E-39
PR-9	GSVIVT01029774001	3.00E-36
PR-9	GSVIVT01020738001	9.00E-36
PR-9	GSVIVT01029776001	9.00E-36
PR-9	GSVIVT01036009001	1.00E-35
PR-9	GSVIVT01000144001	3.00E-35
PR-9	GSVIVT01029773001	3.00E-35
PR-9	GSVIVT01029775001	3.00E-35
PR-9	GSVIVT01010261001	1.00E-32
PR-9	GSVIVT01007225001	5.00E-32
PR-9	GSVIVT01034574001	2.00E-31
PR-9	GSVIVT01017829001	4.00E-28
PR-9	GSVIVT01012727001	1.00E-26
PR-9	GSVIVT01029778001	4.00E-21
PR-9	GSVIVT01015536001	9.00E-17
PR-9	GSVIVT01035858001	5.00E-14
PR-9	GSVIVT01033080001	4.00E-12
PR-9	GSVIVT01008846001	4.00E-10
PR-9	GSVIVT01025104001	4.00E-10
PR-9	GSVIVT01024035001	4.00E-09
PR-10	GSVIVT01035071001	1.00E-44
PR-10	GSVIVT01035072001	2.00E-42
PR-10	GSVIVT01035062001	8.00E-35
PR-10	GSVIVT01035055001	3.00E-34
PR-10	GSVIVT01035074001	3.00E-34
PR-10	GSVIVT01035076001	1.00E-33
PR-10	GSVIVT01035061001	2.00E-33
PR-10	GSVIVT01035060001	5.00E-33
PR-10	GSVIVT01035054001	6.00E-33
PR-10	GSVIVT01035059001	2.00E-32
PR-10	GSVIVT01035066001	3.00E-28
PR-10	GSVIVT01035069001	3.00E-28
PR-10	GSVIVT01035075001	9.00E-23
PR-10	GSVIVT01028061001	7.00E-22
PR-10	GSVIVT01028060001	4.00E-14
PR-10	GSVIVT01035068001	2.00E-12
PR-11	GSVIVT01003718001	1.00E-119
PR-11	GSVIVT01001068001	3.00E-118
PR-11	GSVIVT01001074001	1.00E-101
PR-11	GSVIVT01001059001	3.00E-81
PR-11	GSVIVT01001064001	5.00E-81
PR-11	GSVIVT01007371001	3.00E-78
PR-11	GSVIVT01001058001	3.00E-76
PR-11	GSVIVT01001061001	1.00E-42
PR-11	GSVIVT01007373001	6.00E-23
PR-14	GSVIVT01030190001	9.00E-15
PR-14	GSVIVT01024563001	3.00E-14
PR-14	GSVIVT01006001001	1.00E-10
PR-14	GSVIVT01032682001	9.00E-10
PR-14	GSVIVT01021772001	4.00E-09
PR-14	GSVIVT01027088001	7.00E-06
PR-16	GSVIVT01030965001	5.00E-68
PR-16	GSVIVT01030968001	1.00E-67
PR-16	GSVIVT01030967001	3.00E-67
PR-16	GSVIVT01031079001	3.00E-67
PR-16	GSVIVT01000101001	4.00E-67
PR-16	GSVIVT01000102001	1.00E-66
PR-16	GSVIVT01000095001	2.00E-66
PR-16	GSVIVT01000098001	3.00E-66
PR-16	GSVIVT01000103001	2.00E-65
PR-16	GSVIVT01000097001	5.00E-65
PR-16	GSVIVT01000100001	5.00E-65
PR-16	GSVIVT01021705001	9.00E-65
PR-16	GSVIVT01013822001	1.00E-63
PR-16	GSVIVT01031080001	1.00E-63
PR-16	GSVIVT01031082001	3.00E-63
PR-16	GSVIVT01031085001	3.00E-63
PR-16	GSVIVT01000067001	8.00E-62
PR-16	GSVIVT01000070001	9.00E-62
PR-16	GSVIVT01000071001	9.00E-62
PR-16	GSVIVT01000063001	2.00E-61
PR-16	GSVIVT01021699001	2.00E-61
PR-16	GSVIVT01000068001	1.00E-60
PR-16	GSVIVT01000058001	1.00E-58
PR-16	GSVIVT01000060001	5.00E-57
PR-16	GSVIVT01000066001	2.00E-55

PR-16	GSVIVT01021700001	5.00E-55
PR-16	GSVIVT01000062001	7.00E-55
PR-16	GSVIVT01031351001	3.00E-46
PR-16	GSVIVT01028222001	4.00E-44
PR-16	GSVIVT01028220001	1.00E-40
PR-16	GSVIVT01020142001	4.00E-35
PR-16	GSVIVT01008094001	3.00E-34
PR-16	GSVIVT01000069001	8.00E-31
PR-16	GSVIVT01016761001	1.00E-25
PR-16	GSVIVT01036097001	1.00E-25
PR-16	GSVIVT01038545001	1.00E-25
PR-16	GSVIVT01000065001	6.00E-25
PR-16	GSVIVT01028588001	3.00E-23
PR-16	GSVIVT01028594001	3.00E-23
PR-16	GSVIVT01036098001	1.00E-22
PR-16	GSVIVT01025139001	7.00E-06
PR-17	GSVIVT01037910001	2.00E-89
PR-17	GSVIVT01037911001	8.00E-49
PR-17	GSVIVT01020876001	2.00E-09

Supplemental Table S9 - Percentage of PR family members in tandem arrays.						
	T. cacao	***B. distachyon***	***O. Sativa***	***A. thaliana***	***V. vinifera***	***P. trichocarpa***
PR-1	57.1	73.3	92.3	54.5	61.5	47.4
PR-2	11.6	23.7	28.8	14.0	21.4	28.8
PR-3	54.5	46.2	56.3	42.9	69.2	71.4
PR-4	75.0	100.0	100.0	0**	100.0	75.0
PR-5	50.0	57.6	51.4	29.2	52.2	56.0
PR-6	87.5	60.0	0.0	80.0	100.0	77.3
PR-7	50.0	28.3	39.7	56.0	53.7	42.9
PR-8	71.4	71.4	69.0	0**	90.9	75.0
PR-9	40.7	67.8	68.2	35.1	50.6	37.4
PR-10	82.6	66.7	50.0	0**	100.0	81.8
PR-11	81.8	0**	0.0	100.0	66.7	88.9
PR-12	66.7	NA*	NA*	57.1	NA*	NA*
PR-13	NA*	100.0	90.9	0*	NA*	NA*
PR-14	62.5	44.4	52.9	53.8	0.0	60.0
PR-15/16	52.6	56.8***	70.7***	66.7	80.5	70.3
PR-17	100.0	0**	NA	100.0	66.7	85.7
* No members of this family were identified in this species.						
** There is only one member of the family for this species, so no tandem arrays can exist						
*** Monocots have both PR-15s and PR-16s, which are distantly phylogenetically related. This percentage groups the two families together.						

	Supplemental Table S10 - EST Dataset 1: Classification of libraries described in Argout et al. into broad tissue categories.			
	Genotype	**Library**	**Library description**	**Tissue Class**
1	Jaca	CERATOJ_KZ0ACI	stem tissues inoculated by Ceratocystis fimbriata	Shoots
2	Scavina6	CHERELS_KZ0AAC	cherels from 1 week to 1 month stage of development	Pods
3	Scavina6	COPHAS_KZ0AAL	pod tissue inoculated by Phytophthora palmivora	Pods
4	Scavina6	CORTEXS_KZ0AAT	cortex tissue, external part	Pods
5	Scavina6	CORTINS_KZ0AAV	cortex tissue internal part with lignified chanels	Pods
6	ICS1	COSSHPPI_KZ0AA	SSH library from tissues inoculated/non inoculated by Phytophthora palmivora	Misc
7	Scavina6	COSSHPPS_KZ0AA	SSH library from tissues inoculated/non inoculated by Phytophthora palmivora	Misc
8	ICS1	COTYLEI_KZ0ABB	cotyledons from germinated seeds (1 to 3 weeks)	Misc
9	B97 C-C-2	CUSHIONC_KZ0ACAC	young cushions	Misc
10	Scavina6	DROUGHTLS_KZ0ACAF	leaves submited to drought stresses	Shoots
11	Scavina6	DROUGHTRS_KZ0ACAE	roots submited to drought stresses	Roots
12	ICS1AF	EMBR1WI_KZ0ABA	epicotyle and hypocotyle from 1 week germinated seeds	Misc
13	ICS1AF	EPIC23I_KZ0AAS	epicotyle from 2–3 week germinated seeds	Misc
14	Scavina6	FLOWERS_KZ0AAD	flowers at different stages of development	Misc

15	Scavina6	FLPOLSSH_KZ0ABL_M	SSH library from ovaries submitted to compatible/incompatible pollinations	Misc
16	ICS1AF	HYPO23I_KZ0AAP	hypocotyle from 2–3 week germinated seeds	Misc
17	Scavina6	LEAVES_KZ0ABE	young and adult leaves at different stages of development	Shoots
18	GU255V	LEAVPAGU_KZ0ACQ	leaves inoculated by Phytophthora palmivora	Shoots
19	PNG seedlings	LEPAPNGR_KZ0ACP	leaves inoculated by Phytophthora palmivora	Shoots
20	PNG seedlings	LESSHMEPNGa_KZ0ACAP	SSH library from leaves inoculated by Phytophthora megakarya from susceptible-resistant PNG seedlings	Shoots
21	PNG seedlings	LESSHMEPNGb_KZ0ACV	SSH library from leaves inoculated by Phytophthora megakarya from resistant – susceptible PNG seedlings	Shoots
22	PNG seedlings	LESSHPNGRSb_KZ0ABP	SSH library from leaves inoculated by Phytophthora palmivora from resistant – susceptible PNG seedlings	Shoots
23	UF676	MIRIDUFS_KZ0ACAD	young shoot tissues attacked by Sahlbergella singularis (mirids)	Shoots
24	P7	MONILIOP_KZ0AB	pod tissues inoculated by Moniliophthora roreri	Pods
25	UF273	MONILIOU_KZ0ABV	pod tissues inoculated by Monilia roreri	Pods
26	IMC47	OVUL1_7M_KZ0ACAK	ovaries from 1 to 7 days after pollinations	Misc
27	ICS1	OVULEI_KZ0AAB	ovules collected 2 to 3 months after pollination	Misc
28	UPA134	PODMEUPA_KZ0ACAB	pod tissues inoculated by Phytophthora megakarya	Pods
29	Scavina6	PODSSHWB1Sb_KZ0ACD	SSH library from pod tissues inoculated-non inoculated by Moniliophthora perniciosa less than 60 days after inoculation	Pods

30	Scavina6	PODSSHWB2Sb_KZ0ACF	SSH library from pod tissues inoculated-non inoculated by Moniliophthora perniciosa between 60 to 120 days after inoculation	Pods
31	Scavina6	PODWB1S_KZ0ACM	pod tissues inoculated by Moniliophthora perniciosa less than 60 days after inoculation	Pods
32	Scavina6	PODWB2S_KZ0ACN	pod tissues inoculated by Moniliophthora perniciosa between 60 to 120 days after inoculation	Pods
33	PNG seedlings	RESSHMEPNGb_KZ0AC	SSH library from leaves of resistant seedlings inoculated-non inoculated by Phytophthora megakarya	Shoots
34	Scavina6	ROOTS_KZ0ABF	roots	Roots
35	PNG seedlings	RPPSSHPNGa_KZ0ACAL	SSH library from leaves of resistant seedlings non inoculated- inoculated by Phytophthora palmivora	Shoots
36	PNG seedlings	RPPSSHPNGb_KZ0ACR	SSH library from leaves of resistant seedlings inoculated-non inoculated by Phytophthora palmivora	Shoots
37	ICS1	SEED34I_KZ0AAH	seeds 3 to 3,5 months after pollinations	Pods
38	ICS1	SEED45I_KZ0AAE_F	seeds 4 to 5 months after pollinations	Pods
39	33–49	SEEDFERB_KZ0ACAG	Cotyledons from seeds fermented between 6 H and 4 days	Misc
40	ICS1	SEEDMAI_KZ0AAG	seeds from mature pods 5,5 to 6 months after pollinations	Pods
41	BE240	SEEDNAB_KZ0ABH	seeds 2 to 5 months after pollinations	Pods
42	ICS1	SEFERMI_A_KZ0AAR	fermented seeds during 6 to 26 H	Pods
43	ICS1	SEFERMI_B_KZ0AAM	fermented seeds during 32 to 40 H	Pods
44	Jaca	SSHCERATOJb_KZ0ACS	SSH library from stems inoculated-non inoculated by Ceratocystis fimbriata	Shoots

45	Jaca	SSHCERATOJa_KZ0ACAM	SSH library from stems non inoculated-inoculated by Ceratocystis fimbriata	Shoots
46	UF676	SSHMIRUFa_KZ0ACAN	SSH library from young shoots non attacked-attacked by Sahlbergella singularis	Shoots
47	UF676	SSHMIRUFb_KZ0ACT	SSH library from young shoots attacked-non attacked by Sahlbergella singularis	Shoots
48	Scavina6	STEMS_KZ0AAA	complete disc of stems 1 cm diameter	Shoots
49	Scavina6	STSSHWB1S_KZ0ABI_K	SSH library from (and reverse sens) shoot tissues inoculated/non inoculated by Moniliophthora perniciosa less than 18 days after inoculation	Shoots
50	Scavina6	STSSHWB2Sb_KZ0ACB	SSH library from shoot tissues inoculated-non inoculated by Moniliophthora perniciosa between 18 to 120 days after inoculation	Shoots
51	33–49	TEGFERB_KZ0ACAH	testa from seeds fermented between 6 H and 4 days	Pods
52	ICS1	TEGPULI_KZ0AAI_K	testa with pulp from mature seeds	Pods
53	Scavina6	TISCIVS_KZ0AAQ	embryogenic and non embryogenic callus in vitro culture	Misc
54	ICS1	TPFERMI_A_KZ0AAN	fermented testa during 6 to 40 H	Pods
55	P7	WILTP_KZ0ACL	young wilted cherels 7 to 10 days after pollination	Pods
56	Scavina6	WOODS_KZ0ACAA	bark and cambium part of wood	Shoots
	*Genotype, Library, and Library Description columns are from Argout *et al*., 2008			

Supplemental Table S11 - Normalized expression values of probes for PR genes, averaged across replicates					
TcID	**Class**	**Probe**	***P. palmivora*-treated mean log2 normalized expression**	***C. theobromicola*-treated mean log2 normalized expression**	**Water-treated mean log2 normalized expression**
TC02G002380	PR-1	TC02G002380:1-480	5.53	6.13	5.32
TC02G002400	PR-1	TC02G002400:1-486	6.24	6.08	5.46
TC02G002410	PR-1	TC02G002410_3UTR0:1-186	14.35	13.12	6.75
TC02G002410	PR-1	TC02G002410:1-489	14.86	13.75	8.52
TC02G002420	PR-1	TC02G002420:1-480	5.75	5.54	5.85
TC02G010380	PR-1	TC02G010380:1-1872	5.99	6.21	6.03
TC02G002390	PR-1	TC02G002390:1-471	7.41	6.70	6.10
TC01G034430	PR-1	TC01G034430_3UTR0:1-1150	5.90	5.87	5.75
TC01G034430	PR-1	TC01G034430:1-645	5.31	5.79	5.20
TC02G002430	PR-1	TC02G002430_3UTR1:1-263	10.43	8.47	8.29
TC02G002430	PR-1	TC02G002430:1-495	11.50	9.36	9.22
TC05G005530	PR-1	TC05G005530:1-711	5.58	5.42	5.56
TC09G016590	PR-1	TC09G016590_3UTR0:1-599	5.86	6.35	6.24
TC09G016590	PR-1	TC09G016590	9.28	9.50	9.59

		:1-501			
TC09G016580	PR-1	TC09G016580 _3UTR0:1-613	12.23	11.57	12.05
TC09G016580	PR-1	TC09G016580 :1-588	12.54	11.87	12.39
TC09G000720	PR-1	TC09G000720 :1-558	5.30	5.34	5.36
TC01G003940	PR-1	TC01G003940 _3UTR0:1-213	9.68	9.62	10.27
TC01G003940	PR-1	TC01G003940 :1-534	7.94	8.28	8.76
TC10G000980	PR-1	TC10G000980 :1-1716	6.97	7.30	6.40
TC09G024130	PR-2	TC09G024130 _3UTR0:1-180	14.45	14.82	11.32
TC09G024130	PR-2	TC09G024130 :1-1038	12.80	13.30	9.75
TC04G029300	PR-2	TC04G029300 _3UTR0:1-151	13.11	11.14	6.31
TC04G029300	PR-2	TC04G029300 :1-1113	14.09	12.23	6.82
TC09G024150	PR-2	TC09G024150 :1-1044	5.79	5.56	5.61
TC09G024140	PR-2	TC09G024140 :1-969	6.19	5.76	5.77
TC09G023540	PR-2	TC09G023540 :1-1119	6.01	6.05	5.80
TC00G083950	PR-2	TC00G083950 :1-1044	12.63	12.42	7.15
TC05G016070	PR-2	TC05G016070 _3UTR0:1-231	9.58	9.93	5.83
TC05G016070	PR-2	TC05G016070 :1-1035	9.45	9.85	6.26
TC03G029620	PR-2	TC03G029620 :1-1026	5.47	5.70	5.28
TC02G023780	PR-2	TC02G023780 :1-999	5.46	5.64	5.30
TC09G008700	PR-2	TC09G008700 _3UTR0:1-469	11.31	11.11	11.52
TC09G008700	PR-2	TC09G008700 _3UTR1:1-287	5.76	6.12	6.34
TC09G008700	PR-2	TC09G008700 :1-1518	10.46	10.36	11.05
TC09G011610	PR-2	TC09G011610 _3UTR0:1-203	12.03	12.21	11.71
TC09G011610	PR-2	TC09G011610 :1-1173	11.52	11.58	11.35

TC08G009900	PR-2	TC08G009900:1-1014	5.07	5.51	5.40
TC06G001730	PR-2	TC06G001730:1-1251	6.44	6.72	6.64
TC00G054290	PR-2	TC00G054290_3UTR0:1-88	12.18	12.49	12.10
TC00G054290	PR-2	TC00G054290_3UTR1:1-328	12.32	12.56	11.97
TC00G054290	PR-2	TC00G054290:1-1104	11.85	12.10	11.79
TC04G012520	PR-2	TC04G012520_3UTR0:1-283	9.12	9.58	10.10
TC04G012520	PR-2	TC04G012520:1-1497	8.73	9.23	9.74
TC01G017650	PR-2	TC01G017650_3UTR0:1-499	6.12	6.66	6.48
TC01G017650	PR-2	TC01G017650:1-1422	9.80	9.21	9.54
TC02G007080	PR-2	TC02G007080_3UTR0:1-336	13.34	13.46	12.92
TC02G007080	PR-2	TC02G007080:1-1380	14.34	14.38	13.98
TC08G001980	PR-2	TC08G001980_3UTR0:1-390	11.93	11.95	12.17
TC08G001980	PR-2	TC08G001980:1-1395	11.54	11.43	11.82
TC03G022650	PR-2	TC03G022650_3UTR0:1-174	7.65	7.73	8.49
TC03G022650	PR-2	TC03G022650:1-1227	13.43	13.55	13.78
TC03G021200	PR-2	TC03G021200_3UTR0:1-287	7.40	6.96	7.26
TC03G021200	PR-2	TC03G021200:1-1455	7.08	6.87	7.16
TC09G031660	PR-2	TC09G031660_3UTR0:1-338	9.55	9.32	8.54
TC09G031660	PR-2	TC09G031660:1-1494	11.11	10.90	10.18
TC07G002650	PR-2	TC07G002650_3UTR0:1-261	10.18	10.40	10.33
TC07G002650	PR-2	TC07G002650:1-1401	10.83	10.95	10.79
TC06G012580	PR-2	TC06G012580:1-1209	6.61	6.49	6.63
TC02G028070	PR-2	TC02G028070_3UTR0:1-359	7.37	7.57	8.38
TC02G028070	PR-2	TC02G028070	7.76	7.36	8.22

		:1-1566			
TC06G019320	PR-2	TC06G019320_3UTR0:1-385	8.63	8.29	8.30
TC06G019320	PR-2	TC06G019320:1-1575	11.77	11.87	11.62
TC01G021070	PR-2	TC01G021070_3UTR0:1-418	13.56	13.29	13.08
TC01G021070	PR-2	TC01G021070:1-1386	12.95	12.64	12.51
TC09G013490	PR-2	TC09G013490_3UTR0:1-2851	12.40	12.47	12.44
TC09G013490	PR-2	TC09G013490:1-1341	12.23	12.15	12.23
TC10G003270	PR-2	TC10G003270:1-1371	6.41	5.59	5.75
TC08G005240	PR-2	TC08G005240_3UTR0:1-498	6.04	5.54	6.24
TC08G005240	PR-2	TC08G005240:1-1386	7.15	6.56	7.40
TC01G010310	PR-2	TC01G010310:1-1425	5.75	6.04	5.53
TC00G034720	PR-2	TC00G034720_3UTR0:1-208	11.42	11.46	11.77
TC00G034720	PR-2	TC00G034720:1-1479	9.71	10.03	10.08
TC04G020310	PR-2	TC04G020310_3UTR0:1-220	6.17	6.29	6.16
TC04G020310	PR-2	TC04G020310:1-1473	6.70	6.48	6.64
TC05G028370	PR-2	TC05G028370:1-1440	11.83	11.94	11.77
TC09G021600	PR-2	TC09G021600_3UTR0:1-364	10.00	10.10	9.69
TC09G021600	PR-2	TC09G021600:1-1491	8.29	8.58	8.58
TC09G010240	PR-2	TC09G010240:1-1569	5.80	5.84	5.91
TC04G023620	PR-2	TC04G023620_3UTR0:1-131	5.54	6.00	5.65
TC04G023620	PR-2	TC04G023620:1-3063	8.03	7.62	8.11
TC09G034460	PR-2	TC09G034460:1-1545	6.59	6.64	6.98
TC01G014030	PR-2	TC01G014030_3UTR0:1-215	11.30	11.41	11.19
TC01G014030	PR-2	TC01G014030	12.53	12.43	12.12

		:1-1470			
TC01G010320	PR-2	TC01G010320 :1-1614	5.41	5.46	5.50
TC09G000150	PR-2	TC09G000150 _3UTR0:1-94	10.37	10.52	11.00
TC09G000150	PR-2	TC09G000150 :1-1461	11.50	11.63	11.82
TC09G006080	PR-2	TC09G006080 _3UTR0:1-124	7.86	7.81	6.98
TC09G006080	PR-2	TC09G006080 :1-1473	6.83	7.03	6.49
TC10G002190	PR-2	TC10G002190 :1-1254	5.61	5.47	5.29
TC01G006420	PR-2	TC01G006420 _3UTR0:1-247	6.15	6.94	6.81
TC01G006420	PR-2	TC01G006420 :1-1293	6.17	5.88	6.27
TC01G000770	PR-3	TC01G000770 :1-936	13.08	12.25	8.02
TC02G003890	PR-3	TC02G003890 _3UTR0:1-144	12.70	12.46	7.70
TC02G003890	PR-3	TC02G003890 :1-957	12.80	12.66	8.28
TC01G000800	PR-3	TC01G000800 _3UTR0:1-236	9.12	5.71	5.60
TC01G000800	PR-3	TC01G000800 :1-792	10.39	7.33	5.49
TC01G032950	PR-3	TC01G032950 _3UTR0:1-160	8.69	8.25	6.91
TC01G032950	PR-3	TC01G032950 :1-825	8.12	7.46	6.57
TC01G010350	PR-3	TC01G010350 :1-717	5.75	5.84	5.48
TC04G018160	PR-3	TC04G018160 _3UTR0:1-251	13.81	14.02	7.88
TC04G018160	PR-3	TC04G018160 :1-819	12.85	13.05	6.81
TC06G000490	PR-3	TC06G000490 _3UTR0:1-341	15.28	15.35	15.14
TC06G000490	PR-3	TC06G000490 :1-969	14.94	15.14	14.82
TC04G029180	PR-3	TC04G029180 _3UTR0:1-286	14.36	14.19	13.26
TC04G029180	PR-3	TC04G029180 :1-948	15.16	14.80	14.02
TC04G018090	PR-3	TC04G018090 :1-807	10.73	10.24	8.48

TC04G018100	PR-3	TC04G018100_3UTR0:1-113	7.07	6.29	6.36
TC04G018100	PR-3	TC04G018100:1-675	11.13	9.70	6.64
TC04G018110	PR-3	TC04G018110:1-816	13.34	12.00	8.48
TC05G027210	PR-4	TC05G027210_3UTR0:1-254	9.95	8.16	6.15
TC05G027210	PR-4	TC05G027210:1-429	13.41	11.85	7.94
TC00G012980	PR-4	TC00G012980_3UTR0:1-2087	5.41	5.64	5.21
TC00G012980	PR-4	TC00G012980:1-582	9.11	8.42	6.89
TC05G027320	PR-4	TC05G027320_3UTR0:1-110	11.68	10.05	5.84
TC05G027320	PR-4	TC05G027320:1-624	11.51	9.96	5.87
TC05G027220	PR-4	TC05G027220_3UTR0:1-247	12.92	12.11	9.37
TC05G027220	PR-4	TC05G027220:1-816	15.23	14.41	11.84
TC10G011130	PR-4	TC10G011130_3UTR0:1-422	8.05	7.50	7.33
TC10G011130	PR-4	TC10G011130:1-819	12.94	12.09	10.92
TC05G027230	PR-4	TC05G027230:1-915	12.60	11.63	10.48
TC05G027250	PR-4	TC05G027250_3UTR0:1-1004	6.20	5.77	6.20
TC05G027250	PR-4	TC05G027250:1-834	15.55	15.03	13.60
TC05G027340	PR-4	TC05G027340:1-3459	5.84	5.61	5.85
TC03G005540	PR-5	TC03G005540_3UTR0:1-213	10.36	9.98	9.83
TC03G005540	PR-5	TC03G005540:1-750	10.03	9.49	9.58
TC01G001580	PR-5	TC01G001580:1-954	12.32	12.21	12.77
TC08G003730	PR-5	TC08G003730_3UTR0:1-1467	6.07	6.13	5.98
TC08G003730	PR-5	TC08G003730:1-963	14.12	14.12	13.90

TC02G005190	PR-5	TC02G005190_3UTR0:1-418	10.27	10.03	10.21
TC02G005190	PR-5	TC02G005190:1-1086	11.51	11.04	11.26
TC08G001670	PR-5	TC08G001670_3UTR0:1-185	9.30	9.06	8.46
TC08G001670	PR-5	TC08G001670:1-744	9.23	8.94	8.54
TC01G001590	PR-5	TC01G001590_3UTR0:1-596	9.29	8.79	8.92
TC01G001590	PR-5	TC01G001590:1-870	9.13	8.25	8.30
TC00G056050	PR-5	TC00G056050_3UTR0:1-2172	5.49	5.46	5.36
TC00G056050	PR-5	TC00G056050:1-726	6.04	6.73	6.26
TC00G056070	PR-5	TC00G056070_3UTR0:1-338	10.31	5.97	6.00
TC00G056070	PR-5	TC00G056070:1-732	13.10	9.21	8.51
TC08G010190	PR-5	TC08G010190:1-852	6.33	6.08	6.35
TC00G056060	PR-5	TC00G056060_3UTR0:1-605	5.68	5.37	5.67
TC00G056060	PR-5	TC00G056060:1-729	5.30	5.33	5.38
TC04G020870	PR-5	TC04G020870_3UTR0:1-317	5.78	6.25	6.33
TC04G020870	PR-5	TC04G020870:1-882	6.08	6.22	5.81
TC02G005200	PR-5	TC02G005200_3UTR0:1-689	6.74	6.17	6.50
TC02G005200	PR-5	TC02G005200:1-945	10.75	10.49	10.82
TC05G004240	PR-5	TC05G004240_3UTR0:1-292	7.88	7.42	7.60
TC05G004240	PR-5	TC05G004240:1-954	6.03	5.82	5.91
TC08G003740	PR-5	TC08G003740:1-942	10.20	9.48	9.00
TC10G002890	PR-5	TC10G002890_3UTR0:1-248	9.31	7.80	9.17
TC10G002890	PR-5	TC10G002890:1-747	8.05	7.69	8.23
TC02G003020	PR-5	TC02G003020:1-1017	7.83	7.72	7.90

TC04G008530	PR-5	TC04G008530_3UTR0:1-572	8.18	7.97	7.40
TC04G008530	PR-5	TC04G008530:1-765	10.33	10.12	9.25
TC03G027030	PR-5	TC03G027030_3UTR0:1-305	14.70	14.86	11.79
TC03G027030	PR-5	TC03G027030:1-723	13.86	13.85	10.67
TC09G031980	PR-5	TC09G031980_3UTR0:1-557	6.97	7.39	6.98
TC09G031980	PR-5	TC09G031980:1-762	11.51	11.15	10.72
TC03G026960	PR-5	TC03G026960_3UTR0:1-133	11.32	11.97	11.46
TC03G026960	PR-5	TC03G026960:1-678	10.65	11.19	10.81
TC00G060970	PR-5	TC00G060970:1-675	9.40	10.45	6.22
TC03G027010	PR-5	TC03G027010_3UTR0:1-241	11.21	9.58	5.47
TC03G027010	PR-5	TC03G027010:1-675	12.99	11.43	6.08
TC03G026990	PR-5	TC03G026990_3UTR0:1-173	8.55	7.61	5.37
TC03G026990	PR-5	TC03G026990:1-675	10.51	9.94	5.86
TC00G056110	PR-5	TC00G056110:1-756	5.98	6.28	5.66
TC03G027000	PR-5	TC03G027000_3UTR0:1-134	6.32	7.32	6.14
TC03G027000	PR-5	TC03G027000:1-585	8.04	8.40	5.85
TC03G026980	PR-5	TC03G026980:1-528	5.93	5.88	5.97
TC09G016370	PR-5	TC09G016370:1-456	5.67	5.66	5.81
TC04G014480	PR-5	TC04G014480:1-375	5.95	5.88	5.85
TC03G027020	PR-5	TC03G027020_3UTR0:1-291	5.53	5.50	5.49
TC03G027020	PR-5	TC03G027020:1-327	5.38	5.84	5.76
TC10G005920	PR-6	TC10G005920_3UTR0:1-182	12.31	10.29	6.33
TC10G005920	PR-6	TC10G005920:1-594	12.32	10.71	6.99
TC10G005840	PR-6	TC10G005840	7.99	6.05	5.27

		_3UTR0:1-975			
TC10G005840	PR-6	TC10G005840 :1-216	12.09	10.07	7.15
TC10G005870	PR-6	TC10G005870 _3UTR0:1-179	9.00	7.14	5.42
TC10G005870	PR-6	TC10G005870 :1-216	13.04	11.39	7.49
TC10G005890	PR-6	TC10G005890 :1-216	9.70	7.81	6.02
TC05G022770	PR-6	TC05G022770 _3UTR0:1-398	11.20	11.38	9.76
TC05G022770	PR-6	TC05G022770 :1-483	15.23	15.32	14.05
TC05G022780	PR-6	TC05G022780 _3UTR0:1-641	15.07	15.19	14.56
TC05G022780	PR-6	TC05G022780 :1-483	15.22	15.27	14.77
TC03G026330	PR-7	TC03G026330 _3UTR0:1-609	5.77	5.81	5.97
TC03G026330	PR-7	TC03G026330 :1-2232	5.40	5.40	5.37
TC03G026340	PR-7	TC03G026340 :1-1887	5.48	5.53	5.77
TC01G037030	PR-7	TC01G037030 :1-2307	12.64	12.29	10.31
TC01G026170	PR-7	TC01G026170 _3UTR1:1-332	5.72	5.93	5.94
TC01G026170	PR-7	TC01G026170 :1-2298	5.48	5.90	5.54
TC01G037020	PR-7	TC01G037020 _3UTR0:1-134	11.10	11.17	9.07
TC01G037020	PR-7	TC01G037020 :1-2418	8.83	9.13	7.27
TC02G005130	PR-7	TC02G005130 _3UTR0:1-432	11.49	11.38	11.46
TC02G005130	PR-7	TC02G005130 :1-2325	13.66	13.76	13.89
TC01G006160	PR-7	TC01G006160 _3UTR0:1-274	13.25	13.33	13.13
TC01G006160	PR-7	TC01G006160 :1-2283	13.31	13.24	13.24
TC01G037010	PR-7	TC01G037010 :1-4701	11.55	11.89	11.28
TC09G006830	PR-7	TC09G006830 _3UTR0:1-454	8.34	8.05	7.79
TC09G006830	PR-7	TC09G006830 :1-2280	8.35	8.28	7.87

TC00G013470	PR-7	TC00G013470_3UTR0:1-282	11.96	11.92	11.84
TC00G013470	PR-7	TC00G013470:1-2304	10.67	10.75	10.70
TC08G007740	PR-7	TC08G007740_3UTR0:1-266	5.73	5.49	5.77
TC08G007740	PR-7	TC08G007740:1-2631	11.91	11.44	11.50
TC03G018930	PR-7	TC03G018930_3UTR0:1-238	12.91	13.16	13.05
TC03G018930	PR-7	TC03G018930:1-2337	12.24	12.58	12.59
TC06G010630	PR-7	TC06G010630_3UTR0:1-351	12.17	12.04	12.10
TC06G010630	PR-7	TC06G010630:1-2319	11.19	11.04	11.22
TC08G000270	PR-7	TC08G000270_3UTR0:1-188	12.77	12.45	12.15
TC08G000270	PR-7	TC08G000270:1-2283	10.28	9.99	9.97
TC07G000490	PR-7	TC07G000490_3UTR0:1-134	6.54	6.27	7.49
TC07G000490	PR-7	TC07G000490:1-2313	6.79	6.50	7.30
TC03G022570	PR-7	TC03G022570_3UTR0:1-130	10.26	10.33	9.98
TC03G022570	PR-7	TC03G022570:1-2331	10.77	10.88	10.83
TC06G013520	PR-7	TC06G013520:1-2415	9.28	9.74	9.83
TC00G032610	PR-7	TC00G032610:1-2469	12.05	12.47	12.69
TC10G002320	PR-7	TC10G002320:1-6357	5.44	5.80	5.59
TC08G000240	PR-7	TC08G000240:1-2205	5.30	6.00	5.52
TC08G000230	PR-7	TC08G000230:1-2298	5.76	6.59	7.10
TC01G000090	PR-7	TC01G000090:1-2286	7.93	8.15	8.56
TC10G002300	PR-7	TC10G002300:1-2304	5.56	5.48	5.59
TC05G013470	PR-7	TC05G013470_3UTR0:1-2305	5.27	5.35	5.25
TC05G013470	PR-7	TC05G013470:1-2301	5.48	5.21	5.42

TC03G026560	PR-7	TC03G026560:1-2325	5.59	5.60	5.47
TC01G005210	PR-7	TC01G005210_3UTR0:1-96	5.76	5.56	5.71
TC01G005210	PR-7	TC01G005210_3UTR1:1-173	7.42	6.42	6.62
TC01G005210	PR-7	TC01G005210:1-2400	5.56	5.53	5.31
TC08G004000	PR-7	TC08G004000:1-2343	7.16	7.52	7.13
TC03G026570	PR-7	TC03G026570:1-2328	5.52	5.92	5.50
TC08G000260	PR-7	TC08G000260:1-2382	11.09	10.85	11.09
TC03G022590	PR-7	TC03G022590:1-2358	7.25	7.74	6.15
TC01G005220	PR-7	TC01G005220_3UTR0:1-72	6.33	6.86	7.12
TC01G005220	PR-7	TC01G005220:1-2268	5.73	5.53	5.84
TC10G002310	PR-7	TC10G002310_3UTR0:1-80	5.96	6.13	5.97
TC10G002310	PR-7	TC10G002310:1-2136	5.81	6.24	5.72
TC09G028480	PR-7	TC09G028480:1-2679	5.35	5.11	5.41
TC03G021760	PR-7	TC03G021760:1-2358	5.87	5.67	5.80
TC09G032690	PR-7	TC09G032690:1-2178	5.66	5.65	5.64
TC09G032720	PR-7	TC09G032720:1-2139	5.40	5.46	5.57
TC00G001690	PR-7	TC00G001690:1-2262	8.39	8.38	8.52
TC09G032710	PR-7	TC09G032710:1-2235	5.25	5.54	5.64
TC01G037040	PR-7	TC01G037040_3UTR0:1-176	7.59	7.62	7.95
TC01G037040	PR-7	TC01G037040:1-2316	8.47	8.37	8.41
TC05G010230	PR-7	TC05G010230:1-2331	5.30	5.54	5.89
TC00G007300	PR-7	TC00G007300_3UTR0:1-340	6.48	6.54	6.01
TC00G007300	PR-7	TC00G007300:1-2352	6.88	6.56	6.51
TC02G007300	PR-7	TC02G007300	7.17	7.61	7.16

		_3UTR0:1-199			
TC02G007300	PR-7	TC02G007300 :1-2406	6.97	6.94	6.78
TC03G022580	PR-7	TC03G022580 :1-2367	9.80	8.73	6.03
TC10G002340	PR-7	TC10G002340 :1-2625	9.08	9.19	8.56
TC08G000250	PR-7	TC08G000250 :1-2172	5.33	5.26	6.24
TC00G038560	PR-7	TC00G038560 _3UTR0:1-285	9.85	9.39	9.58
TC00G038560	PR-7	TC00G038560 :1-2457	11.95	11.60	11.67
TC06G000810	PR-7	TC06G000810 _3UTR0:1-213	10.13	10.20	10.78
TC06G000810	PR-7	TC06G000810 :1-2568	10.92	11.07	11.61
TC00G017310	PR-7	TC00G017310 :1-1416	5.39	5.50	5.33
TC03G026320	PR-7	TC03G026320 :1-2226	6.09	5.99	6.27
TC09G028050	PR-7	TC09G028050 :1-1155	5.69	5.48	5.49
TC06G019800	PR-7	TC06G019800 :1-2439	5.39	5.74	5.30
TC03G024170	PR-7	TC03G024170 :1-7845	5.26	5.70	5.60
TC06G021130	PR-7	TC06G021130 :1-1620	5.43	5.72	5.53
TC01G035050	PR-8	TC01G035050 _3UTR0:1-227	10.61	11.11	7.03
TC01G035050	PR-8	TC01G035050 :1-891	10.65	10.93	7.29
TC01G035150	PR-8	TC01G035150 :1-897	5.59	5.82	5.57
TC00G024510	PR-8	TC00G024510 :1-897	5.41	5.46	5.61
TC03G017760	PR-8	TC03G017760 :1-903	11.58	11.74	6.55
TC01G035160	PR-8	TC01G035160 :1-903	5.31	5.11	5.61
TC03G017780	PR-8	TC03G017780 _3UTR0:1-198	6.16	5.25	5.67
TC03G017780	PR-8	TC03G017780 :1-897	6.01	5.56	5.75
TC10G015260	PR-8	TC10G015260 :1-930	5.83	5.79	5.98

TC10G015330	PR-8	TC10G015330_3UTR0:1-307	6.78	6.85	6.18
TC10G015330	PR-8	TC10G015330:1-918	7.37	7.48	6.19
TC01G032120	PR-8	TC01G032120:1-918	8.73	8.19	7.95
TC03G017790	PR-8	TC03G017790:1-894	5.71	5.90	5.73
TC01G035140	PR-8	TC01G035140:1-846	8.10	9.18	8.73
TC04G001620	PR-8	TC04G001620:1-828	5.30	5.45	5.57
TC01G035060	PR-8	TC01G035060:1-918	5.63	5.38	6.17
TC01G032260	PR-8	TC01G032260_3UTR0:1-737	5.38	5.32	5.44
TC01G032260	PR-8	TC01G032260:1-324	5.52	5.64	5.65
TC00G045940	PR-9	TC00G045940_3UTR0:1-233	10.36	10.50	9.92
TC00G045940	PR-9	TC00G045940:1-996	10.62	10.39	10.17
TC00G045400	PR-9	TC00G045400_3UTR0:1-164	10.30	8.55	5.62
TC00G045400	PR-9	TC00G045400:1-960	12.43	10.86	6.15
TC00G045440	PR-9	TC00G045440:1-969	5.52	6.49	5.49
TC00G014230	PR-9	TC00G014230_3UTR0:1-464	15.63	15.32	14.69
TC00G014230	PR-9	TC00G014230:1-1041	14.86	14.28	13.49
TC00G045610	PR-9	TC00G045610_3UTR0:1-117	10.44	10.49	6.57
TC00G045610	PR-9	TC00G045610:1-969	12.35	12.26	8.54
TC00G045360	PR-9	TC00G045360:1-1077	5.02	5.63	5.10
TC01G002490	PR-9	TC01G002490_3UTR0:1-247	5.90	5.46	5.68
TC01G002490	PR-9	TC01G002490:1-1002	8.12	7.44	7.12
TC02G008380	PR-9	TC02G008380:1-1005	6.11	5.76	5.56
TC10G016040	PR-9	TC10G016040_3UTR0:1-276	11.43	9.87	10.70
TC10G016040	PR-9	TC10G016040	12.67	11.26	11.39

		:1-954			
TC00G040640	PR-9	TC00G040640 :1-963	7.27	7.38	5.60
TC09G034910	PR-9	TC09G034910 :1-963	7.08	5.59	5.45
TC01G004590	PR-9	TC01G004590 _3UTR0:1-109	11.58	11.74	9.72
TC01G004590	PR-9	TC01G004590 :1-984	11.49	11.67	9.69
TC10G016080	PR-9	TC10G016080 _3UTR0:1-179	13.61	13.58	12.22
TC10G016080	PR-9	TC10G016080 :1-1002	14.85	14.67	13.50
TC09G034930	PR-9	TC09G034930 _3UTR0:1-307	14.21	12.76	11.04
TC09G034930	PR-9	TC09G034930 :1-981	13.97	12.73	10.97
TC10G015970	PR-9	TC10G015970 _3UTR0:1-230	13.24	13.14	11.24
TC10G015970	PR-9	TC10G015970 :1-966	12.49	12.41	10.72
TC02G029020	PR-9	TC02G029020 :1-990	5.25	6.28	7.42
TC08G002680	PR-9	TC08G002680 _3UTR0:1-133	5.29	5.74	5.45
TC08G002680	PR-9	TC08G002680 :1-1047	6.00	5.99	5.72
TC02G029090	PR-9	TC02G029090 :1-984	6.69	5.35	5.23
TC04G029820	PR-9	TC04G029820 :1-999	6.10	6.02	6.28
TC09G034950	PR-9	TC09G034950 _3UTR0:1-621	5.92	5.73	5.82
TC09G034950	PR-9	TC09G034950 :1-978	6.60	6.08	6.53
TC02G029120	PR-9	TC02G029120 :1-993	5.36	5.44	5.74
TC02G029110	PR-9	TC02G029110 :1-993	5.18	5.04	5.23
TC03G023600	PR-9	TC03G023600 _3UTR0:1-1225	5.51	5.40	5.41
TC03G023600	PR-9	TC03G023600 :1-996	5.73	5.59	5.76
TC00G045630	PR-9	TC00G045630 :1-954	8.10	5.77	5.88
TC04G016340	PR-9	TC04G016340	7.64	6.00	6.19

		:1-951			
TC04G016740	PR-9	TC04G016740 :1-951	7.97	5.44	5.77
TC04G027220	PR-9	TC04G027220 _3UTR0:1-159	6.73	6.58	6.06
TC04G027220	PR-9	TC04G027220 :1-1005	5.31	5.40	5.51
TC02G030420	PR-9	TC02G030420 _3UTR1:1-271	10.75	10.26	9.04
TC02G030420	PR-9	TC02G030420 :1-981	9.76	9.48	8.32
TC08G013300	PR-9	TC08G013300 _3UTR0:1-3841	5.54	5.52	5.68
TC08G013300	PR-9	TC08G013300 _3UTR1:1-660	5.49	5.51	5.32
TC08G013300	PR-9	TC08G013300 :1-1068	14.16	13.45	12.17
TC04G027230	PR-9	TC04G027230 :1-984	5.48	5.34	5.37
TC04G016760	PR-9	TC04G016760 :1-906	8.18	5.93	5.92
TC01G008530	PR-9	TC01G008530 _3UTR0:1-219	7.78	7.42	7.82
TC01G008530	PR-9	TC01G008530 :1-972	6.88	7.02	7.09
TC03G019180	PR-9	TC03G019180 _3UTR0:1-85	6.41	6.05	5.94
TC03G019180	PR-9	TC03G019180 :1-975	5.77	5.53	6.10
TC02G012000	PR-9	TC02G012000 _3UTR0:1-380	11.60	10.89	9.11
TC02G012000	PR-9	TC02G012000 :1-981	10.57	10.05	8.63
TC02G012020	PR-9	TC02G012020 :1-978	6.96	7.60	5.69
TC02G011960	PR-9	TC02G011960 _3UTR0:1-236	5.95	5.89	5.89
TC02G011960	PR-9	TC02G011960 :1-981	6.35	6.28	6.40
TC02G030430	PR-9	TC02G030430 _3UTR0:1-247	6.55	6.63	7.16
TC02G030430	PR-9	TC02G030430 :1-987	6.99	7.06	7.95
TC01G013330	PR-9	TC01G013330 _3UTR0:1-96	10.50	9.86	9.42
TC01G013330	PR-9	TC01G013330	8.30	7.66	7.38

		:1-951			
TC08G004060	PR-9	TC08G004060_3UTR0:1-216	14.99	14.74	14.20
TC08G004060	PR-9	TC08G004060:1-951	14.94	14.49	13.71
TC01G001190	PR-9	TC01G001190_3UTR0:1-263	13.05	12.47	11.99
TC01G001190	PR-9	TC01G001190:1-951	12.46	11.76	11.47
TC02G011940	PR-9	TC02G011940:1-987	5.54	6.11	6.18
TC02G011950	PR-9	TC02G011950_3UTR0:1-208	5.99	7.25	5.47
TC02G011950	PR-9	TC02G011950:1-975	6.65	7.70	6.32
TC05G031640	PR-9	TC05G031640_3UTR0:1-220	8.35	5.46	5.03
TC05G031640	PR-9	TC05G031640:1-990	9.40	6.26	5.51
TC04G004360	PR-9	TC04G004360_3UTR0:1-119	5.31	5.13	5.48
TC04G004360	PR-9	TC04G004360:1-972	5.54	5.14	5.47
TC02G011920	PR-9	TC02G011920_3UTR0:1-114	5.80	5.58	6.78
TC02G011920	PR-9	TC02G011920:1-987	6.11	5.52	6.67
TC02G011930	PR-9	TC02G011930_3UTR0:1-164	6.27	6.12	6.20
TC02G011930	PR-9	TC02G011930_3UTR1:1-525	5.71	5.96	5.67
TC02G011930	PR-9	TC02G011930:1-978	5.37	5.28	5.67
TC04G004370	PR-9	TC04G004370_3UTR0:1-200	7.58	8.43	6.80
TC04G004370	PR-9	TC04G004370:1-975	7.38	8.63	6.84
TC04G004350	PR-9	TC04G004350:1-972	5.38	5.49	5.64
TC02G003150	PR-9	TC02G003150_3UTR0:1-314	10.94	10.91	10.91
TC02G003150	PR-9	TC02G003150:1-957	12.46	12.67	12.54
TC04G028060	PR-9	TC04G028060:1-984	5.19	5.38	5.50
TC04G019840	PR-9	TC04G019840:1-1098	5.68	5.38	5.57

TC00G045460	PR-9	TC00G045460_3UTR0:1-280	14.93	14.50	13.63
TC00G045460	PR-9	TC00G045460:1-861	9.89	9.14	8.33
TC00G054480	PR-9	TC00G054480:1-1005	5.70	5.86	5.51
TC09G000620	PR-9	TC09G000620:1-975	6.42	6.30	6.45
TC02G022830	PR-9	TC02G022830:1-996	5.56	5.57	5.69
TC00G020190	PR-9	TC00G020190:1-978	8.54	9.44	9.00
TC03G021880	PR-9	TC03G021880_3UTR0:1-116	13.33	13.45	13.29
TC03G021880	PR-9	TC03G021880:1-993	12.06	12.29	12.04
TC09G001160	PR-9	TC09G001160_3UTR0:1-228	5.44	5.62	6.15
TC09G001160	PR-9	TC09G001160:1-996	5.76	5.67	6.94
TC08G012700	PR-9	TC08G012700_3UTR0:1-1188	5.53	5.45	5.59
TC08G012700	PR-9	TC08G012700:1-1008	11.16	10.06	10.74
TC01G006280	PR-9	TC01G006280_3UTR0:1-358	14.40	14.21	13.87
TC01G006280	PR-9	TC01G006280:1-993	14.54	14.43	13.89
TC03G000530	PR-9	TC03G000530_3UTR0:1-121	8.52	8.64	8.44
TC03G000530	PR-9	TC03G000530:1-993	5.88	6.40	6.89
TC09G017500	PR-9	TC09G017500:1-1446	5.47	5.26	5.35
TC06G008540	PR-9	TC06G008540:1-1335	6.16	6.11	6.79
TC04G000340	PR-9	TC04G000340:1-978	11.09	11.08	11.18
TC06G019650	PR-9	TC06G019650:1-993	5.73	5.87	5.76
TC01G032570	PR-9	TC01G032570:1-975	6.74	7.65	7.66
TC05G006120	PR-9	TC05G006120_3UTR0:1-145	8.86	6.90	6.01
TC05G006120	PR-9	TC05G006120:1-987	9.22	7.95	6.64

TC02G013360	PR-9	TC02G013360:1-930	5.43	5.58	5.84
TC01G029350	PR-9	TC01G029350:1-1158	5.29	5.45	5.33
TC04G029620	PR-9	TC04G029620:1-972	5.52	5.62	5.82
TC09G011360	PR-9	TC09G011360:1-885	6.34	5.78	6.91
TC06G019150	PR-9	TC06G019150_3UTR0:1-704	9.86	9.91	10.05
TC06G019150	PR-9	TC06G019150:1-990	14.86	14.59	14.95
TC00G044710	PR-9	TC00G044710:1-2598	6.16	6.28	6.08
TC02G030980	PR-9	TC02G030980:1-618	6.50	7.00	7.16
TC06G014950	PR-9	TC06G014950_3UTR0:1-294	6.06	6.62	7.54
TC06G014950	PR-9	TC06G014950:1-1323	5.62	5.99	6.35
TC04G016710	PR-9	TC04G016710:1-2412	8.93	9.16	8.86
TC10G016070	PR-9	TC10G016070:1-708	8.15	7.41	8.21
TC02G030970	PR-9	TC02G030970_3UTR0:1-208	8.07	8.11	8.20
TC02G030970	PR-9	TC02G030970:1-438	7.56	7.54	8.27
TC02G011990	PR-9	TC02G011990:1-657	5.52	5.63	5.55
TC04G028780	PR-10	TC04G028780_3UTR0:1-285	10.15	9.74	5.06
TC04G028780	PR-10	TC04G028780:1-477	10.01	9.49	5.75
TC04G028860	PR-10	TC04G028860_3UTR0:1-133	8.63	11.14	5.41
TC04G028860	PR-10	TC04G028860:1-477	7.63	9.67	5.68
TC04G028790	PR-10	TC04G028790:1-480	5.48	5.37	5.24
TC04G028880	PR-10	TC04G028880:1-483	8.23	8.19	6.63
TC04G028900	PR-10	TC04G028900_3UTR0:1-186	7.88	7.14	6.52
TC04G028900	PR-10	TC04G028900:1-483	7.49	7.40	6.64
TC04G028760	PR-10	TC04G028760	5.87	5.60	6.07

		:1-594			
TC01G031100	PR-10	TC01G031100 _3UTR0:1-305	14.89	15.34	9.77
TC01G031100	PR-10	TC01G031100 :1-480	14.26	14.85	8.75
TC05G000380	PR-10	TC05G000380 :1-843	5.17	5.52	5.44
TC04G028740	PR-10	TC04G028740 _3UTR0:1-96	8.74	6.90	5.37
TC04G028740	PR-10	TC04G028740 :1-483	9.10	7.19	5.85
TC04G028750	PR-10	TC04G028750 _3UTR0:1-188	7.33	7.22	7.14
TC04G028750	PR-10	TC04G028750 :1-483	12.34	11.92	11.00
TC00G031750	PR-10	TC00G031750 _3UTR0:1-3533	5.09	5.15	5.23
TC00G031750	PR-10	TC00G031750 :1-360	7.94	9.15	5.33
TC10G014440	PR-10	TC10G014440 _3UTR1:1-96	9.91	10.54	6.88
TC10G014440	PR-10	TC10G014440 :1-366	10.28	11.45	6.04
TC04G028940	PR-10	TC04G028940 _3UTR0:1-71	6.57	6.95	5.66
TC04G028940	PR-10	TC04G028940 :1-351	7.88	9.86	6.25
TC09G003110	PR-11	TC09G003110 _3UTR0:1-158	9.48	8.51	6.35
TC09G003110	PR-11	TC09G003110 :1-1107	8.21	7.46	6.14
TC09G003140	PR-11	TC09G003140 :1-2145	9.28	9.18	7.67
TC09G003120	PR-11	TC09G003120 :1-2400	6.00	5.54	5.78
TC09G003150	PR-11	TC09G003150 :1-2313	8.57	8.46	8.40
TC09G003130	PR-11	TC09G003130 :1-1281	6.55	6.41	6.01
TC09G003180	PR-11	TC09G003180 :1-2250	5.45	5.88	5.79
TC09G003190	PR-11	TC09G003190 _3UTR0:1-122	9.87	9.22	9.64
TC09G003190	PR-11	TC09G003190 :1-1140	10.87	10.21	10.51
TC09G001640	PR-11	TC09G001640	9.06	8.37	6.57

		:1-1389			
TC09G003200	PR-11	TC09G003200 :1-1266	5.45	5.42	5.38
TC09G003160	PR-11	TC09G003160 :1-978	5.70	5.44	5.65
TC00G043900	PR-11	TC00G043900 _3UTR0:1-965	5.63	5.55	5.61
TC00G043900	PR-11	TC00G043900 :1-351	5.68	5.65	5.97
TC02G006630	PR-12	TC02G006630 :1-285	5.11	5.43	5.05
TC02G006660	PR-12	TC02G006660 :1-171	5.48	5.26	5.61
TC08G002440	PR-12	TC08G002440 :1-249	5.60	5.45	5.39
TC04G016400	PR-14	TC04G016400 _3UTR0:1-139	15.31	15.22	15.42
TC04G016400	PR-14	TC04G016400 _3UTR1:1-141	10.93	10.64	10.72
TC04G016400	PR-14	TC04G016400 :1-420	15.05	14.95	14.96
TC04G016380	PR-14	TC04G016380 _3UTR0:1-326	5.39	5.74	5.66
TC04G016380	PR-14	TC04G016380 :1-390	6.61	6.62	7.34
TC04G016440	PR-14	TC04G016440 _3UTR1:1-1271	5.65	5.68	5.92
TC04G016440	PR-14	TC04G016440 :1-369	6.21	6.27	6.30
TC09G035160	PR-14	TC09G035160 _3UTR0:1-269	13.67	11.45	6.80
TC09G035160	PR-14	TC09G035160 :1-360	13.83	11.64	7.76
TC04G016450	PR-14	TC04G016450 _3UTR0:1-4065	5.74	5.65	5.68
TC04G016450	PR-14	TC04G016450 :1-459	10.85	11.20	10.95
TC09G035150	PR-14	TC09G035150 _3UTR0:1-165	10.28	8.81	5.46
TC09G035150	PR-14	TC09G035150 :1-351	11.39	9.51	6.35
TC06G001000	PR-14	TC06G001000 _3UTR0:1-222	7.17	6.92	6.65
TC06G001000	PR-14	TC06G001000 :1-348	5.67	5.14	5.21

TC01G034520	PR-14	TC01G034520_3UTR0:1-152	5.87	5.55	5.59
TC01G034520	PR-14	TC01G034520:1-393	5.46	5.33	5.50
TC01G039190	PR-14	TC01G039190:1-324	6.37	6.17	6.47
TC03G023690	PR-14	TC03G023690:1-360	12.05	12.33	12.31
TC04G013310	PR-14	TC04G013310_3UTR0:1-167	6.12	6.72	6.18
TC04G013310	PR-14	TC04G013310:1-369	5.30	5.20	5.38
TC10G016320	PR-14	TC10G016320_3UTR0:1-314	5.43	5.61	6.24
TC10G016320	PR-14	TC10G016320:1-375	6.99	7.28	8.29
TC02G016580	PR-14	TC02G016580:1-348	5.70	5.53	5.30
TC06G020010	PR-14	TC06G020010_3UTR0:1-770	5.57	5.42	5.85
TC06G020010	PR-14	TC06G020010:1-348	7.24	6.94	7.28
TC06G020030	PR-14	TC06G020030:1-492	5.56	5.52	5.80
TC06G000990	PR-14	TC06G000990_3UTR1:1-229	6.55	5.83	5.96
TC06G000990	PR-14	TC06G000990:1-288	5.48	5.35	5.45
TC03G009350	PR-16	TC03G009350_3UTR0:1-197	12.98	12.99	11.60
TC03G009350	PR-16	TC03G009350:1-666	12.87	12.93	11.70
TC05G025530	PR-16	TC05G025530:1-867	6.78	5.79	5.72
TC05G025440	PR-16	TC05G025440_3UTR0:1-311	7.40	6.89	6.28
TC05G025440	PR-16	TC05G025440:1-672	13.42	12.18	11.00
TC05G025420	PR-16	TC05G025420_3UTR0:1-328	9.47	8.34	7.54
TC05G025420	PR-16	TC05G025420:1-675	13.91	12.57	11.06
TC05G025400	PR-16	TC05G025400_3UTR0:1-125	6.34	5.55	5.29
TC05G025400	PR-16	TC05G025400:1-678	5.81	5.74	5.53
TC05G025410	PR-16	TC05G025410	5.63	5.94	5.49

		_3UTR0:1-1027			
TC05G025410	PR-16	TC05G025410_3UTR1:1-537	5.12	5.81	6.36
TC05G025410	PR-16	TC05G025410:1-678	9.06	7.95	7.38
TC05G025330	PR-16	TC05G025330_3UTR0:1-127	5.23	5.31	5.29
TC05G025330	PR-16	TC05G025330:1-666	4.97	5.31	5.35
TC05G031880	PR-16	TC05G031880_3UTR0:1-275	12.04	12.05	11.70
TC05G031880	PR-16	TC05G031880:1-654	12.91	12.87	12.49
TC05G024700	PR-16	TC05G024700_3UTR1:1-131	5.35	5.41	5.21
TC05G024700	PR-16	TC05G024700:1-663	6.01	6.02	5.92
TC05G025450	PR-16	TC05G025450_3UTR0:1-167	7.43	6.91	6.35
TC05G025450	PR-16	TC05G025450:1-681	9.50	8.08	6.88
TC05G025350	PR-16	TC05G025350:1-681	5.75	6.27	5.92
TC05G025310	PR-16	TC05G025310_3UTR0:1-175	7.53	7.72	7.37
TC05G025310	PR-16	TC05G025310:1-678	7.39	7.76	7.40
TC05G025520	PR-16	TC05G025520_3UTR0:1-2210	5.28	5.46	5.36
TC05G025520	PR-16	TC05G025520:1-786	12.63	11.61	10.34
TC06G000370	PR-16	TC06G000370:1-657	6.37	6.38	6.32
TC01G033170	PR-16	TC01G033170:1-660	15.16	15.13	14.17
TC00G037180	PR-16	TC00G037180:1-657	10.71	10.56	9.96
TC05G008860	PR-16	TC05G008860:1-795	7.54	7.20	7.00
TC10G009710	PR-16	TC10G009710_3UTR0:1-282	11.52	10.68	9.59
TC10G009710	PR-16	TC10G009710:1-642	10.66	9.75	8.72
TC09G007080	PR-16	TC09G007080_3UTR1:1-235	14.81	14.41	13.93

TC09G007080	PR-16	TC09G007080:1-624	14.42	13.72	13.10
TC05G025480	PR-16	TC05G025480:1-534	9.86	8.58	7.38
TC00G013300	PR-16	TC00G013300:1-612	13.35	13.06	12.59
TC05G025360	PR-16	TC05G025360:1-615	5.40	5.40	5.44
TC03G016120	PR-16	TC03G016120_3UTR0:1-262	5.75	5.59	5.50
TC03G016120	PR-16	TC03G016120:1-2724	5.72	6.09	6.09
TC05G025470	PR-16	TC05G025470:1-480	6.22	6.07	5.87
TC06G009700	PR-16	TC06G009700:1-879	5.38	5.67	5.70
TC05G025430	PR-16	TC05G025430:1-573	5.69	6.38	6.28
TC00G054490	PR-16	TC00G054490:1-2223	5.18	5.13	5.20
TC09G019920	PR-16	TC09G019920:1-633	5.73	5.91	5.99
TC05G024940	PR-16	TC05G024940:1-624	7.14	7.23	7.15
TC07G004510	PR-16	TC07G004510:1-708	5.38	5.43	5.47
TC05G009390	PR-16	TC05G009390_3UTR0:1-86	7.43	8.07	8.60
TC05G009390	PR-16	TC05G009390:1-2814	6.07	6.31	6.71
TC09G019910	PR-16	TC09G019910:1-618	5.93	5.58	5.73
TC00G076490	PR-16	TC00G076490:1-516	5.57	5.84	5.67
TC06G000400	PR-16	TC06G000400:1-342	5.56	5.37	5.37
TC00G054500	PR-16	TC00G054500:1-450	5.22	5.22	5.26
TC07G004580	PR-16	TC07G004580:1-411	5.32	5.29	5.34
TC07G004710	PR-16	TC07G004710:1-468	5.25	5.20	5.22
TC02G009630	PR-17	TC02G009630_3UTR0:1-153	6.02	5.57	5.62
TC02G009630	PR-17	TC02G009630:1-681	6.57	6.09	5.53
TC02G009600	PR-17	TC02G009600	12.08	11.81	5.91

		:1-765			
TC02G009590	PR-17	TC02G009590 :1-678	7.94	9.06	5.82
TC02G009610	PR-17	TC02G009610 _3UTR0:1-440	9.80	9.19	5.46
TC02G009610	PR-17	TC02G009610 :1-705	10.26	9.62	5.58
TC02G009650	PR-17	TC02G009650 :1-624	6.61	5.70	5.47

Supplemental Table S12 - Log2 fold induction for all significantly regulated (Benjamini-Hochberg p < 0.05) PR genes on microarray.

TcID	Class	Log_2 Fold Induction by *P. palmivora*	Log_2 Fold Induction by *C. theobromicola*
TC02G002410	PR-1	6.969214921	5.803005844
TC00G083950	PR-2	5.481485868	5.274902853
TC02G028070	PR-2	-1.007284112	0
TC04G012520	PR-2	-1.004855831	0
TC04G029300	PR-2	7.038733873	5.124632397
TC05G016070	PR-2	3.471711585	3.852450373
TC09G024130	PR-2	3.091005297	3.525725486
TC09G031660	PR-2	0.931173332	0
TC01G000770	PR-3	5.062394087	4.232396812
TC01G000800	PR-3	4.204702138	0
TC01G032950	PR-3	1.664342235	0
TC02G003890	PR-3	4.762007095	4.575789895
TC04G018090	PR-3	2.245266721	0
TC04G018100	PR-3	4.486635225	3.058348476
TC04G018110	PR-3	4.868411348	3.524123658
TC04G018160	PR-3	5.987219197	6.191667463
TC05G027210	PR-4	4.635764914	3.904701358
TC05G027220	PR-4	3.465605498	2.74290496
TC05G027320	PR-4	5.73783208	4.153153375
TC00G056070	PR-5	4.451767113	0
TC00G060970	PR-5	3.180438493	4.230680177
TC03G026990	PR-5	3.914339712	4.075639354
TC03G027000	PR-5	2.187517329	2.553509804

TC03G027010	PR-5	6.323194993	4.724213803
TC03G027030	PR-5	3.052693754	3.127005464
TC05G022770	PR-6	1.183812493	0
TC10G005840	PR-6	3.835164484	0
TC10G005870	PR-6	4.563892059	3.899141195
TC10G005890	PR-6	3.680034051	0
TC10G005920	PR-6	5.657179105	3.836989675
TC00G032610	PR-7	-0.648659534	0
TC01G037020	PR-7	2.035243353	0
TC03G022580	PR-7	3.765800623	2.700390846
TC06G000810	PR-7	-0.690191189	0
TC08G000230	PR-7	-1.338701774	0
TC01G035050	PR-8	3.469055016	3.86143576
TC03G017760	PR-8	5.029322581	5.186825269
TC00G014230	PR-9	1.368199733	0
TC00G045400	PR-9	5.477616751	3.822067416
TC00G045460	PR-9	1.427169267	0
TC00G045610	PR-9	3.837201882	3.813211387
TC00G045630	PR-9	2.217918663	0
TC01G004590	PR-9	1.830104938	2.002740813
TC02G011950	PR-9	0	1.782274543
TC02G012020	PR-9	1.266651919	1.90791588
TC04G004370	PR-9	0	1.795617951
TC05G006120	PR-9	2.715351743	0
TC05G031640	PR-9	3.883928429	0
TC06G014950	PR-9	-1.484519935	0
TC08G013300	PR-9	1.988816031	0
TC09G034930	PR-9	3.087674485	0
TC10G015970	PR-9	1.88389408	1.792325945
TC00G031750	PR-10	2.611666618	3.82153607
TC01G031100	PR-10	5.316404504	5.84017564
TC04G028740	PR-10	3.307337415	0
TC04G028750	PR-10	1.342116344	0
TC04G028780	PR-10	4.673157106	4.677570649
TC04G028860	PR-10	2.588858057	5.7382445
TC04G028900	PR-10	1.354054231	0
TC04G028940	PR-10	0	3.610891829
TC10G014440	PR-10	3.63370518	4.528033057
TC09G001640	PR-11	2.498752807	1.799829394
TC09G003110	PR-11	2.604179538	2.161760349
TC09G003140	PR-11	1.611253048	1.512622369

TC09G035150	PR-14	4.925714025	3.253387745
TC09G035160	PR-14	6.471086738	4.26631556
TC03G009350	PR-16	1.274992795	1.221255725
TC05G009390	PR-16	-1.17371423	0
TC05G025410	PR-16	1.687828981	0
TC05G025420	PR-16	2.38964617	0
TC05G025440	PR-16	1.771075747	0
TC05G025450	PR-16	2.620742802	0
TC05G025480	PR-16	2.47117974	0
TC05G025520	PR-16	2.293160405	0
TC02G009590	PR-17	2.120548009	3.244115829
TC02G009600	PR-17	6.168643409	5.90180022
TC02G009610	PR-17	4.503543332	3.884228221

Supplemental Table 13 - Percent identify of PR-1 family members. Highlighting in the same color indicates that the genes are grouped in a tandem array.

	Tc02_g002380	Tc02_g002410	Tc02_g002400	Tc02_g002420	Tc02_g010380	Tc02_g002390	Tc01_g034430	Tc02_g002430	Tc05_g005530	Tc09_g016590	Tc09_g016580	Tc09_g000720	Tc01_g003940	Tc10_g000980
Tc02_g002380		70.625	69.167	60.208	58.958	63.502	52.795	57.764	51.235	55.144	48.283	45.342	46.138	43.558
Tc02_g002410	70.625		88.889	62.526	63.395	71.097	51.016	60.772	51.919	50.101	44.643	47.967	44.711	48.394
Tc02_g002400	69.167	88.889		63.561	61.728	67.089	51.329	59.714	51.423	50.407	45.509	48.671	46.185	47.475
Tc02_g002420	60.208	62.526	63.561		55.28	62.42	47.737	67.695	48.262	51.329	45.582	46.296	40.404	44.919
Tc02_g010380	58.958	63.395	61.728	55.28		60.549	41.24	52.929	43.882	47.904	43.367	44.982	43.82	64.815
Tc02_g002390	63.502	71.097	67.089	62.42	60.549		48.428	59.119	48.958	51.667	45.808	49.057	42.593	46.377
Tc01_g034430	52.795	51.016	51.329	47.737	41.24	48.428		51.205	50.08	50.1	43.027	48.566	42.697	38.856
Tc02_g002430	57.764	60.772	59.714	67.695	52.929	59.119	51.205		49.301	48.104	45.098	45.783	41.815	44.98
Tc05_g005530	51.235	51.919	51.423	48.262	43.882	48.958	50.08	49.301		49.701	46.024	44.92	41.341	37.733
Tc09_g016590	55.144	50.101	50.407	51.329	47.904	51.667	50.1	48.104	49.701		52.242	49.701	42.353	36.727
Tc09_g016580	48.283	44.643	45.509	45.582	43.367	45.808	43.027	45.098	46.024	52.242		44.561	46.369	34.893
Tc09_g000720	45.342	47.967	48.671	46.296	44.982	49.057	48.566	45.783	44.92	49.701	44.561		44.007	34.531
Tc01_g003940	46.138	44.711	46.185	40.404	43.82	42.593	42.697	41.815	41.341	42.353	46.369	44.007		33.725
Tc10_g000980	43.558	48.394	47.475	44.919	64.815	46.377	38.856	44.98	37.733	36.727	34.893	34.531	33.725	

Supplemental Table S14 - Percent identify of PR-3 family members. Highlighting in the same color indicates that the genes are grouped in a tandem array.

	Tc01_g000770	Tc02_g003890	Tc01_g000800	Tc01_g032950	Tc01_g010350	Tc04_g018160	Tc06_g000490	Tc04_g029180	Tc04_g018100	Tc04_g018090	Tc04_g018110
Tc01_g000770		63.291	65.657	52.415	60.792	42.749	44.374	42.316	40.684	43.388	39.266
Tc02_g003890	63.291		64.015	53.623	53.061	44.408	42.029	43.565	41.635	43.169	42.345
Tc01_g000800	65.657	64.015		57.987	54.966	42.765	46.424	46.303	42.342	43.372	43.629
Tc01_g032950	52.415	53.623	57.987		49.933	40.247	43.31	44.014	44.613	43.951	41.605
Tc01_g010350	60.792	53.061	54.966	49.933		35.139	43.307	41.47	36.929	39.142	36.653
Tc04_g018160	42.749	44.408	42.765	40.247	35.139		34.093	35.216	58.918	61.728	59.03
Tc06_g000490	44.374	42.029	46.424	43.31	43.307	34.093		71.097	38.235	36.156	33.876
Tc04_g029180	42.316	43.565	46.303	44.014	41.47	35.216	71.097		36.52	36.323	34.773
Tc04_g018100	40.684	41.635	42.342	44.613	36.929	58.918	38.235	36.52		77.047	67.544
Tc04_g018090	43.388	43.169	43.372	43.951	39.142	61.728	36.156	36.323	77.047		68.272
Tc04_g018110	39.266	42.345	43.629	41.605	36.653	59.03	33.876	34.773	67.544	68.272	

Supplemental Table S15 - Percent identify of PR-4 family members. Highlighting in the same color indicates that the genes are grouped in a tandem array.

	Tc05_g027210	Tc00_g012980	Tc05_g027320	Tc05_g027220	Tc05_g027230	Tc10_g011130	Tc05_g027250
Tc05_g027210		68.065	62.005	69.213	66.204	67.361	67.593
Tc00_g012980	68.065		66.323	55.787	49.432	55.324	55.556
Tc05_g027320	62.005	66.323		50.105	45.724	49.686	49.895
Tc05_g027220	69.213	55.787	50.105		90.754	91.727	88.129
Tc05_g027230	66.204	49.432	45.724	90.754		96.215	91.607
Tc10_g011130	67.361	55.324	49.686	91.727	96.215		92.686
Tc05_g027250	67.593	55.556	49.895	88.129	91.607	92.686	