Genome-wide Identification of TCP Family Transcription Factors from *Populus euphratica* and Their Involvement in Leaf Shape Regulation

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Supplementary Table S1 TCP genes identified in *Populus trichocarpa* genome.

Name	Gene ID	Chromosome location	Exon/Intron number	Size/aa	Molecular weight	Isoelectric point
PtrTCP1	Potri.001G060000.1	Chr01:4606886..4608711 forward	1/0	302	32824.1	9.12
PtrTCP2	Potri.001G111800.1	Chr01:8915776..8918193 forward	1/0	397	41566.69	5.92
PtrTCP3	Potri.001G327100.1	Chr01:33128474..33130288 reverse	1/0	320	33881.91	8.99
PtrTCP4	Potri.001G375800.1	Chr01:39070007..39073153 reverse	1/0	413	45260.12	6.27
PtrTCP5	Potri.002G152200.1	Chr02:11505495..11507288 reverse	1/0	348	37322.96	9.51
PtrTCP6	Potri.003G120200.1	Chr03:14262872..14264067 reverse	4/3	287	30513.49	6.52
PtrTCP7	Potri.003G167900.1	Chr03:17835407..17836527 reverse	1/0	302	32569.92	6.23
PtrTCP8	Potri.004G046300.1	Chr04:3514571..3516334 forward	1/0	395	42703.64	7
PtrTCP9	Potri.004G065800.5	Chr04:5518337..5526108 forward	1/0	473	51719.14	7.88
PtrTCP10	Potri.004G116100.1	Chr04:10737586..10740883 forward	1/0	365	40352.07	7.19
PtrTCP11	Potri.004G222100.1	Chr04:22846150..22848314 forward	1/0	581	61311.54	6.74
PtrTCP12	Potri.005G090300.2	Chr05:6716502..6718585 reverse	1/0	272	27682.92	9.72
PtrTCP13	Potri.005G140600.1	Chr05:11788531..11788653 forward	1/0	41	4787.43	9.62
PtrTCP14	Potri.006G125800.1	Chr06:10151379..10152438 forward	1/0	198	21310.74	6.5
PtrTCP15	Potri.008G115800.1	Chr08:7411585..7413806 reverse	1/0	453	50789.88	6.58
PtrTCP16	Potri.009G009400.1	Chr09:1695921..1696474 forward	1/0	178	19484.71	5.59
PtrTCP17	Potri.010G130200.1	Chr10:14537655..14539110 forward	1/0	472	52976.54	8.94
PtrTCP18	Potri.011G055500.1	Chr11:4839143..4841262 forward	2/1	459	49920.59	7.42
PtrTCP19	Potri.011G083100.4	Chr11:8357434..8364561 reverse	1/0	478	51623.06	7.76
PtrTCP20	Potri.011G096600.2	Chr11:11763733..11766342 reverse	1/0	408	44468.04	6.49
PtrTCP21	Potri.012G059900.1	Chr12:6319154..6321338 reverse	2/1	394	44959.21	8.6
PtrTCP22	Potri.012G135900.1	Chr12:15188758..15189871 forward	1/0	357	38078.04	6.9
PtrTCP23	Potri.013G110700.1	Chr13:12370950..12373420 reverse	1/0	415	44095.33	7.2
PtrTCP24	Potri.013G119400.1	Chr13:13248572..13251015 forward	1/0	345	38049.44	5.94
PtrTCP25	Potri.014G078500.1	Chr14:6307930..6309239 forward	2/1	396	42892.04	9.58
PtrTCP26	Potri.015G050500.1	Chr15:5563400..5565125 forward	2/1	402	46041.59	6.35
PtrTCP27	Potri.015G058800.1	Chr15:8042378..8044079 forward	1/0	377	41264.43	7.77
PtrTCP28	Potri.015G138200.1	Chr15:14686905..14687993 forward	2/1	327	35283.41	6.09
PtrTCP29	Potri.016G074200.1	Chr16:5609370..5611923 forward	5/4	445	47611.13	5.97
PtrTCP30	Potri.016G094800.1	Chr16:8490852..8492588 reverse	1/0	200	21540.81	9.38
PtrTCP31	Potri.017G094800.1	Chr17:11175983..11178060 forward	2/1	333	36837.37	7.19
PtrTCP32	Potri.017G112000.1	Chr17:12758702..12760734 reverse	2/1	374	42177.97	9.31
PtrTCP33	Potri.019G081800.1	Chr19:11505280..11507506 reverse	1/0	417	44556.66	6.52
PtrTCP34	Potri.019G091300.1	Chr19:12229257..12232192 forward	1/0	346	38045.36	6.26
PtrTCP35	Potri.T044100.1	scaffold_41:210714..212429 forward	1/0	321	34146.02	8.99
PtrTCP36	Potri.T146100.1	scaffold_457:7249..10019 reverse	1/0	364	40352.07	7.19

Supplementary Table S2 TCP genes identified in *Populus euphratica* genome

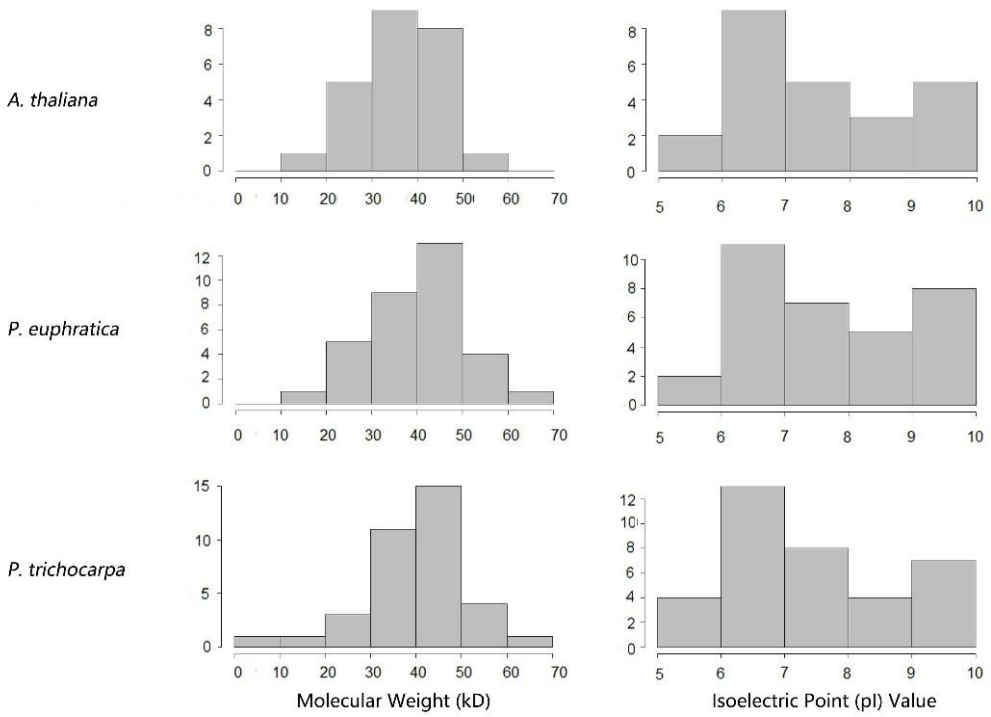
Name	Gene ID	Exon/Intron number	Size/aa	Molecular weight	Isoelectric point
PeuTCP1	CCG000586.1	2/1	426	48070.51	6.44
PeuTCP2	CCG001135.1	2/1	374	42259.97	9.32
PeuTCP3	CCG002481.1	1/0	476	52186.43	7.38
PeuTCP4	CCG002729.1	2/1	405	45962.78	8.24
PeuTCP5	CCG003334.1	1/0	271	27639.92	9.72
PeuTCP6	CCG005156.1	1/0	200	21374.82	9.38
PeuTCP7	CCG006044.1	1/0	360	38316.84	6.05
PeuTCP8	CCG006216.1	5/4	623	68064.55	7.07
PeuTCP9	CCG007195.1	1/0	312	33041.71	7.17
PeuTCP10	CCG007701.1	1/0	363	40361.95	7.74
PeuTCP11	CCG007964.1	1/0	414	45293.21	6.46
PeuTCP12	CCG009717.1	1/0	320	33893.85	8.99
PeuTCP13	CCG010631.1	1/0	332	35489.13	9.96
PeuTCP14	CCG011685.1	1/0	478	51802.22	8.19
PeuTCP15	CCG012390.1	1/0	377	41285.37	6.39
PeuTCP16	CCG012899.1	1/0	346	38129.38	6.23
PeuTCP17	CCG013012.1	5/4	444	47806.3	5.84
PeuTCP18	CCG015462.1	3/2	350	38835.65	9.55
PeuTCP19	CCG018013.1	1/0	274	27955.01	9.51
PeuTCP20	CCG018118.1	1/0	176	19262.68	6.31
PeuTCP21	CCG019123.2	2/1	299	32062.04	9.15
PeuTCP22	CCG020734.1	1/0	278	30140.78	9.14
PeuTCP23	CCG021224.1	1/0	478	51819.21	8.19
PeuTCP24	CCG023727.1	1/0	199	21441.89	6.3
PeuTCP25	CCG024429.1	1/0	396	41441.54	5.71
PeuTCP26	CCG025130.1	1/0	472	52937.45	8.8
PeuTCP27	CCG026334.1	1/0	364	40420.12	7.21
PeuTCP28	CCG026357.1	1/0	414	43815.27	7.87
PeuTCP29	CCG026590.1	1/0	346	37988.42	6.09
PeuTCP30	CCG026656.1	1/0	417	44523.66	6.52
PeuTCP31	CCG028420.1	2/1	400	45920.55	7.08
PeuTCP32	CCG031555.1	1/0	278	29918.78	6.53
PeuTCP33	CCG032104.1	1/0	395	42646.71	6.9

Supplementary Table S3 Primers used in qRT-PCR

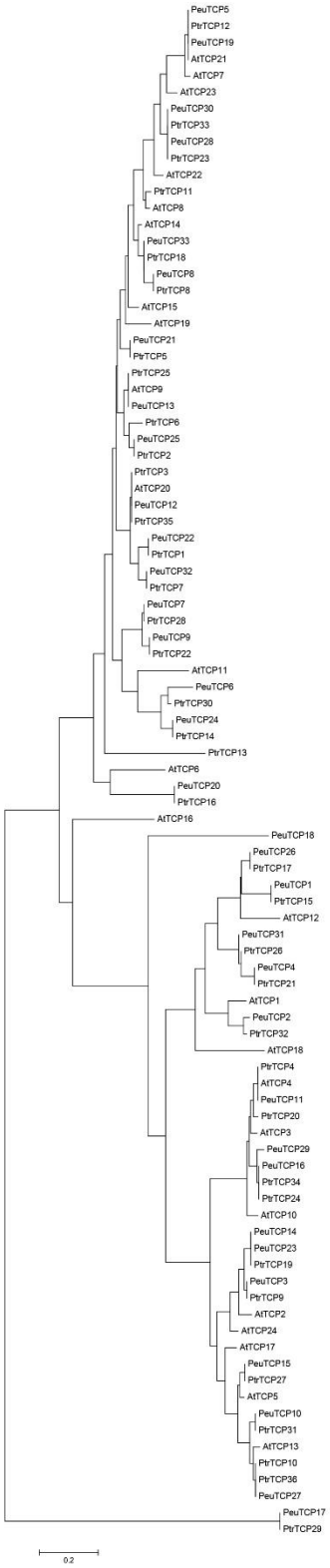
Primer Name	Sequence (5'-3')
	P. trichocarpa
PtrTCP1-qF	CCTGCCTCTGAGGACAAGAAA
PtrTCP1-qR	TGACACAACACTCCCCCAAT
PtrTCP2-qF	CCACGCTGATCAAAATCGTAGG
PtrTCP2-qR	ACCACACTACTGTTCATGGCT
PtrTCP3-qF	TCAAAGAGGAGTAGAGGACCCA
PtrTCP3-qR	GCCCTTGGGATCCATGAACA
PtrTCP4-qF	CAGCACCACACACCAGAAAT
PtrTCP4-qR	TCTGTAGCGGTGGTAGTGGT
PtrTCP5-qF	TTGTTAAGTGGGGCCTGCAT
PtrTCP5-qR	CATTAGCAGGGACCACCAGT
PtrTCP6-qF	ATTGCTTTGCTGCTGCCGAC
PtrTCP6-qR	CAAATATTGGAGCTGCGGTGG
PtrTCP7-qF	ACAGTAAAGCGTACATTCCCA
PtrTCP7-qR	GAAAGGCAGAAAAGCACCTGT
PtrTCP8-qF	TAAAGCTCGTCCAGCTCTTCC
PtrTCP8-qR	ATAGGATACTGTGTCGAGGGG
PtrTCP9-qF	AGCCTTGCTGCTGGTTTCAA
PtrTCP9-qR	CGTTTGTGGTGGATCCGTCTA
PtrTCP10-qF	TCACATGCCACAGCTTCCAT
PtrTCP10-qR	GTCCGGTGGACTTTCGCTAT
PtrTCP11-qF	AACTCAAGAGCCCCACCAAT
PtrTCP11-qR	AGCCCATGAAAGGACCTTGA
PtrTCP12-qF	TTGTTTTTCGGGGTGCCTGT
PtrTCP12-qR	CGCATAAGGCAATGGCACA
PtrTCP13-qF	TACGACAACAACAACAAGACGC
PtrTCP13-qR	AAATTGGAAGATCCCGGCAG
PtrTCP14-qF	CCGTGTTACAGTGCAGGGTC
PtrTCP14-qR	AGAAGCCACGAGGATTGAGG
PtrTCP15-qF	TGCTCGGCTTCGATAAAGCA
PtrTCP15-qR	CAAACACTCTTGCCGTCAGC
PtrTCP16-qF	GAGATCGTCGTATCCGCCTG
PtrTCP16-qR	AGCCACTCAATGGTCTCACC
PtrTCP17-qF	GCGAACAGGGAAGAAGGACA
PtrTCP17-qR	TGCTTTATCGAAGCCGAGCA
PtrTCP18-qF	GATACAACAGCACCCAAAAGAGA
PtrTCP18-qR	TGTGGGAATTTCTCCAATGGC
PtrTCP19-qF	TGGTGGAAAAGATCGGCACA
PtrTCP19-qR	CAACCGATCTTGGAGGTCGT
PtrTCP20-qF	GTGGAGGAAGTGCAGGACTC

PtrTCP20-qR	CGGGTCTATCCAAGCACGAA
PtrTCP21-qF	CGTACTCCAGAGGGCATGAT
PtrTCP21-qR	TCTGAGAATTGATGCTCCTGAT
PtrTCP22-qF	CGAGTGCTAGTACTGGTGGC
PtrTCP22-qR	ACGCAAGCCAGTCATCTCAA
PtrTCP23-qF	CCTGTGCTAATGCCTGTCGAT
PtrTCP23-qR	GAACTAGTGCAGACATGGGACA
PtrTCP24-qF	GAGCTCTTTCGGCTCAACTCT
PtrTCP24-qR	ATTGTGGGTTTGCAGCAATAG
PtrTCP25-qF	GGTGATTGGCAGGTACAAACC
PtrTCP25-qR	TCATGCTCGCATCTTCTCCA
PtrTCP26-qF	TGAAGCTGAAGTGCCGTTCT
PtrTCP26-qR	TGAATTGATTCTCTTGAGGAATTCCA
PtrTCP27-qF	GATGGGCAGGTGCAAAACAG
PtrTCP27-qR	CGGGGACCTGTCCAGTAGTA
PtrTCP28-qF	AGGGAGTAGTGTCGGTGTTG
PtrTCP28-qR	AGTACTTGATCCGGCCAAT
PtrTCP29-qF	ATGTGCCTGGTCCTGAAG
PtrTCP29-qR	GTGCACTTTCTGATGCCGTT
PtrTCP30-qF	GTTCGCTACCAACCCTGCT
PtrTCP30-qR	AGTCTCGCTCCAGCTAATCC
PtrTCP31-qF	CACCTGGTACAACACAGTCT
PtrTCP31-qR	AACTGTATGGTATGGACTCG
PtrTCP32-qF	CATCTGCAACAATGGGTTATCA
PtrTCP32-qR	AGTTGTATTTCTGTAGACGGA
PtrTCP34-qF	AAAGGGCAGTGTGTTTGGGG
PtrTCP34-qR	TACCCACCACTCCTACCCAC
PtrTCP35-qF	TGTCTGCTACACGTGCTGAT
PtrTCP35-qR	GCAGACATAAACGGCTCTTTGG
PtrTCP36-qF	GTGCACAGAGGAAGTAGAGGA
PtrTCP36-qR	ATCCGGTGTCAAAACTGCCT
	P. euphratica
PeuTCP3F	AGATCTATGGAGGCGGAGGAGATTCAG
PeuTCP3R	GCTAGCTCAGTTCTTCCCTTTGCCTTTC
PeuTCP4F	AGATCTATGTTTCCATTAAGCTACAATGCC
PeuTCP4R	ACTAGTTCAAGGGTGGTCAGAGAGATG
PeuTCP5F	AGATCTATGTCAGATAACAGTGGTGCTGT
PeuTCP5R	ACTAGTTCAACGCTGATCCTCCTCTC
PeuTCP6F	AGATCTATGGCTTCTGAAACGGTTCTCTA
PeuTCP6R	ACTAGTCTACATCTTATGCTCCCCAGTTA
PeuTCP8F	AGATCTATGGAAGGAGGTGATGATCAGC
PeuTCP8R	ACTAGTTTAAAAACTAATGGCATAATTCGA
PeuTCP11F	AGATCTATGGGAGAGAGCCACCACCA
PeuTCP11R	ACTAGTTCAATGGCGAGAATCAGAGGAAG

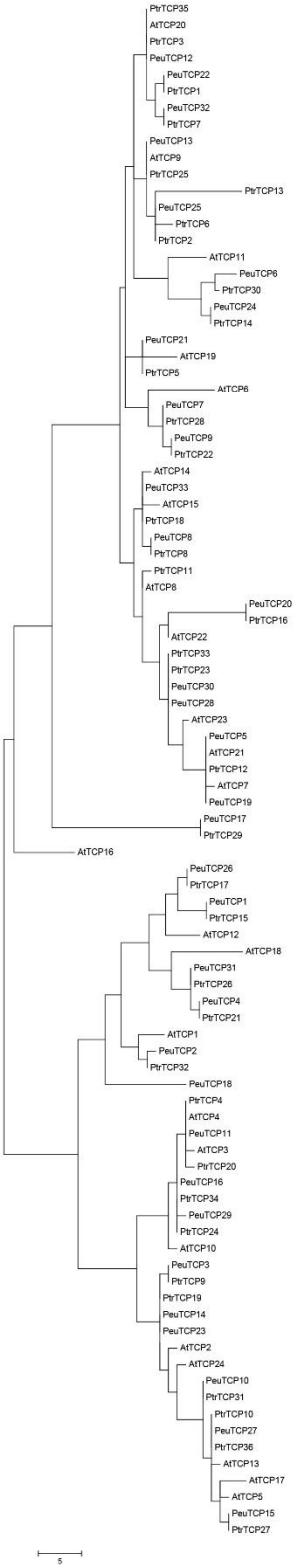
PeuTCP12F	AGATCTATGGATCCCAAGGGCTCTAAC
PeuTCP12R	ACTAGTTCACTGCCCTGATCCTTGTG
PeuTCP21F	AGATCTATGGCATCGACACAAAAGCAG
PeuTCP21R	ACTAGTTCAAGATCGAGACATGAACTGT
PeuTCP27F	AGATCTATGATTACTAGTTCAAAGCAAGTGG
PeuTCP27R	TCTAGATCATTTACAAGGGAATTGTGGGT
PeuTCP29F	AGATCTATGAAGAACACCGGAGGAGA
PeuTCP29R	ACTAGTTCAATTCTGAGAATTTGGAGAAGAGG
PeuTCP33F	AGATCTATGGAAGGAGGTGATGATCAGT
PeuTCP33R	ACTAGTTTATGAGTGATGACTCGTTGT
PeuSPL8F	AGCAGCTCTCTCCCTATGGT
PeuSPL8R	GGGTTTGCCTCTCTTGCCTA
PeuSPL6F	CGTCAATGGACTGCAGCAAC
PeuSPL6R	TGTGCCCTGCTAAACGTCTC
PeuSPL17F	CGCCTAGCTGGCCATAATGA
PeuSPL17R	CTCAGAAGACCTTGGAGCGG
PeuSPL23F	TGGTGGTAGTGGTAGGTCGT
PeuSPL23R	ACTCAGATAAATCATGGAACCTGC
PeuSPL27F	CACTAGTGTGGTGGAGAGCG
PeuSPL27R	GGACCCGTCACCTGCATAAA



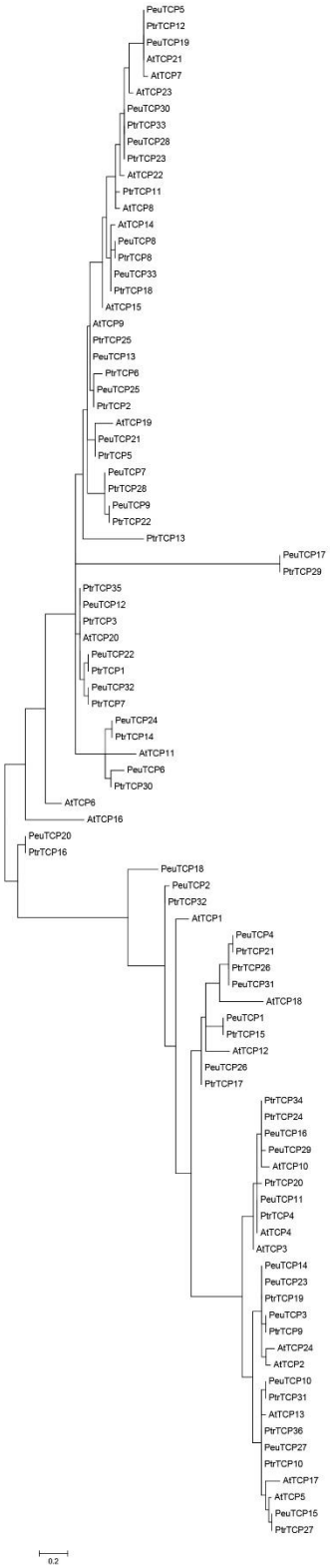
Supplementary Figure S1. Distribution of Molecular weight and isoelectric point of TCP proteins from *Arabidopsis*, *P. euphratica* and *Populus trichocarpa*.



Supplementary Figure S2. Phylogenetic tree of TCPs built with the minimal evolution method

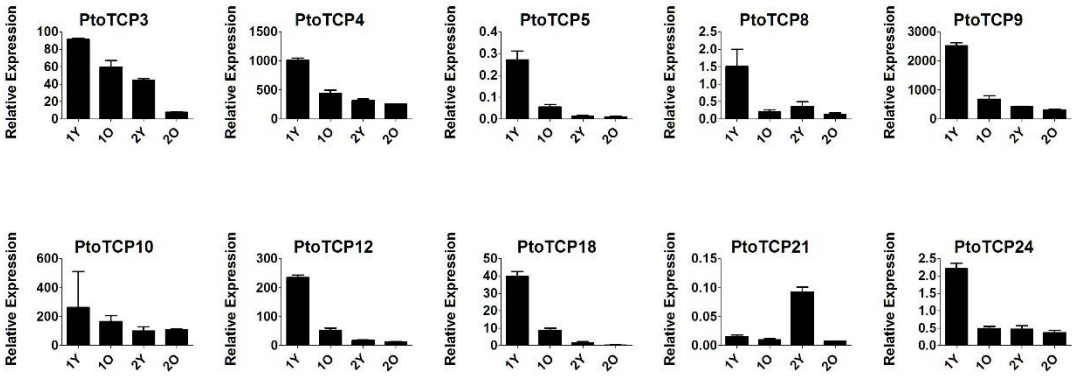


Supplementary Figure S3. Phylogenetic tree of TCPs built with the maximal parsimony method

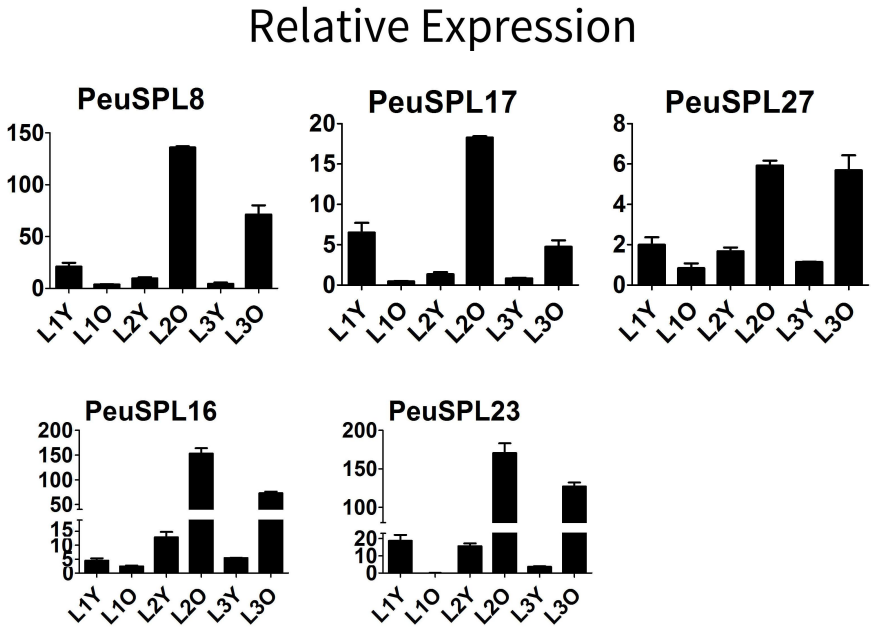


Supplementary Figure S4. Phylogenetic tree of TCPs built with the neighbour-joining method

Supplementary Figure S5. Protein motifs identified by MEME



Supplementary Figure S6. Expression pattern of selected TCP genes in *P. tomentosa* leaves. Each bar represents three biological replicates and error bar represents S.D.



Supplementary Figure S7. Expression pattern of selected SPL genes in *P. euphratica*. Each bar represents three biological replicates and error bar represents S.D.

Reference

1 Li, C. & Lu, S. Molecular characterization of the SPL gene family in *Populus trichocarpa*. *BMC Plant Biology* **14**, 1 (2014).