Table S1: Primers used in this study.

Genes name	Primer sequence
Phvul.005G084500-F	GCAGGGAACACACCCAATAC
Phvul.005G084500-R	GCACCCAGGTTCTCAATGTT
PvACT11-F	TGCATACGTTGGTGATGAGG
PvACT11-R	AGCCTTGGGGTTAAGAGGAG
PvIDE-F	GCAACCAACCTTTCATCAGC
PvIDE-R	AGAAATGCCTCAACCCTTTG
ATTUB2-F	AGCCTTACAACGCTACTCTGT
ATTUB2-R	CAAATCACCAAAGCTGGGGG
ATACT11-F	ACTCCTGCCATGTATGTCGC
ATACT11-R	TGCAAGGTCCAAACGCAGAA
PvNAC52-F	ATTTCATTTGGAGAGAACACGGGGGACTCTAGAGGATCCC CGGGATGGGAGTTCCAGAG
PvNAC52-R	TTGCTCACCATAAGGGACTGACCACCCGGGGAATGCCTGA ACCC GAATCCCACCGGCTG
SOS1-F	GATTTGTCCCCACGAATGAGA
SOS1-R	TGCGAAGAAGGCGTAGAACA
P5CS1-F	CAAGATGAGATTACATTCG
P5CS1-R	GGTTATGATGACAGGAAT
RD29A-F	GAGCTGTTCAAAGTGAAGTAC
RD29A-R	GTTATACACATGACCACGATCAA
NCED3-F	CAGCACTCAATTCAAGCACTTG
NCED3-R	GTTGTAGGGCTGGTTTGGG
ABI3-F	TGTGACGACTCTTCTGGTGC
ABI3-R	TCATCGGAACAACGACCTGG
ABI5-F	CCAGCTCCGCTTTGTAGGAA
ABI5-R	CCTCCATTACCGCTACCACC
AtDREB1A-F	TCAATTTCGCTGACTCGGCT
AtDREB1A-R	TCCGCCGTGTAAATAGCCTC
AtDREB2A-F	AAGTACCTGCGAAAGGGTCG
AtDREB2A-R	CCAAAGCCTGCTACCTCGAT
AtLEA3-F	GAACGCCGTTTTCAGACGAG
AtLEA3-R	CTTGAAGCTTCCCCAGCTCT
AtLEA7-F	CAAAGACAAGACAGGAAGC
AtLEA7-R	CTCTGTGTCTCACGAGTAG
AtLEA14-F	TTCGATTCCGATCTGTGAG
AtLEA14-R	CACCAACGTCTCGAGCCAG
SOD-F	GGCCAATCTTTGACCCTTTA
SOD-R	AGTCCAGGAGCAAGTCCAGT
MSD1-F	GAAGAACCTTGCTCCTTCCAG
MSD1-R	GATTGGCAGTTGTGTCAACAAC
FSD1-F	GAGAGCTTCTTGCTTTGCTTG
FSD1-R	CATGCTCCCAGACATCAATG

CSD1-F	GATGGTAAAACACACGGTGC
CSD1-R	GCCAGGCTGAGTTCATGGCCTC
POD-F	TTAGGGAGCAGTTTCCCACT
POD-R	AGGGTGAAAGGGAACATCAG
PRX57-F	TCCGAGAAAACTGCTGGACC
PRX57-R	GAGACGGAGATCGTTGGACC
PRX69-F	AAGTCGCGTGGTTCTCCAA
PRX69-R	CCGACGAATCTCCCCATCTG
PRX22-F	AGCGACATGTCCGTGTTCTT
PRX22-R	TGTTCTCACGTGCGCATTTT
CAT-F	TGATCGCGAGAAGATACCTG
CAT-R	CTTCCACGTTCATGGACAAC
ProDH-F	GATCTGCTGCGGTGGGAATA
ProDH-R	TCCTTCCATGAGCTGCTTCG
P5CDH1-F	CGTTGGCCTTATGGTCCTGT
P5CDH1-R	AAGTCCACATCTTCAGCGGG
P5CS2-F	ATCTGTGAACAGCTTGCGGA
P5CS2-R	CAACACCAGCACAAGCCTTC
pGBKT7-PvNAC52-F	GGAATTCATGGGAGTTCCAGA
pGBKT7-PvNAC52-R	CGGGATCCATGCCTGAAC
pGBKT7-PvNAC52-N	CGGGATCCCTTCTTGTATATACGAC
pGBKT7-PvNAC52-C	GGAATTCAACTCGAGTGCACAG
pBGKT7-T7	GTAATACGACTCACTATAGGGCGAGCCGCC
pBGKT7-3'BD	TAAGAGTCACTTTAAAATTTGTATAC
PvNAC52-644 bp-Anti-sense	CTGTATTGGGTGTGTTCCCTGCTCG
PvNAC52-475 bp-Anti sense	TGCCTTTCGGAGCTTTGCCAACGT
PvNAC52-614 bp-sense	ACGACGTTCTGGAATCG
PvNAC52-534 bp-sense	GAGGAGAAGGTGAACATTGAG
pAbAi-F	TCTGTGCTCCTTCCTTCGTTCTTCC
pAbAi-R	ATTTAGTGTGTGTATTTGTGTTTGCGTGTC
pAbAi-ABRE-F	agcttACGTGACGTGACGTGc
pAbAi-ABRE-R	tcgagCACGTCACGTCACGTa
pAbAi-MABRE1-F	agcttAAATGAAATGAAATGc
pAbAi-MABRE1-R	tcgagCATTTCATTTCATTTa
pAbAi-MABRE2-F	agcttAAAAGAAAAGAAAAGc
pAbAi-MABRE2-R	tcgagCTTTTCTTTTCTTTTa

Table S2: Gene sequence of *Phvul.005G084500.*

Genes name	sequence
Phvul.005G084500	ATGGGAGTTCCAGAGAAAGACCCTCTTGCCCAGCTGAGTC TACCTCCTGGTTTTCGATTCTACCCCACCGACGAGGAGCTT CTCGTTCAGTATCTCTGCCGCAAGGTCGCCGGCCACCATTT CTCTCTCCCAATCATTGCTGAAATTGATTTGTACAAGTTCG ACCCATGGGTTCTTCCAAGCAAGGCGATTTTCGGGGAGAA AGAGTGGTACTTTTTCAGCCCTCGAGACAGGAAGTACCCA AACGGGTCTCGACCCAACAGAGTAGCCGGGTCGGGTTATT GGAAAGCCACCGGAACCGACAAGATCATCACCACCGAAG GTAGAAAAGTGGGCATAAAAAAAGCCCTGGTTTTTTACGT TGGCAAAGCTCCGAAAGGCACCAAAACCAATTGGATCAT GCACGAGTATCGGCTTCTTGATTCTTCCCGAAAGACCACTG GTACCAAGCTGGATGATTGGGTTCTGTGTCGTATATACAAG AAGAACTCGAGTGCACAGAAGGCGGTGCAAAACGGCGTC GTTTCGAGCAGGGAACACACCCAATACAGCAACGGTTCCT CGTCGTCGTCATCGTCCCATCTGGACGACGTTCTGGAATCG CTGCCAACGATCGACGAACGGTGTTTCATGATGCCACGTG CTCACACGGTGCAGCAACAGCATGAGGAGAAGGTGAACA TTGAGAACCTGGGTGCGGGTGGGTTGGTGGATTGGGCGAA CCCTGCGGTTCTGAATCCGGTGGGTGATTTCGTTTCGGGGA ATAATCAAGTGGTGCAGGAGCATACTCAGGGGATGGTGA ACTACAGCGGGTGCAATGACCTTTATGTTCCAACCTTCTGC CACGTGGAGTCTGCGCTTCCGCAAAAGATGGAGGAAGAG GTGCAAAGCGGCGTGAGAAACCAAAACAGTAATAACTCG TGGTTTCTTCAGAACGATTTTACGCAGGGGTTTCAGAACTC GGTGGACACGTGTGGGTTTAAGTTCCCGGTTCAGCCGGTG GGATTCGGGTTCAGGCATTGA

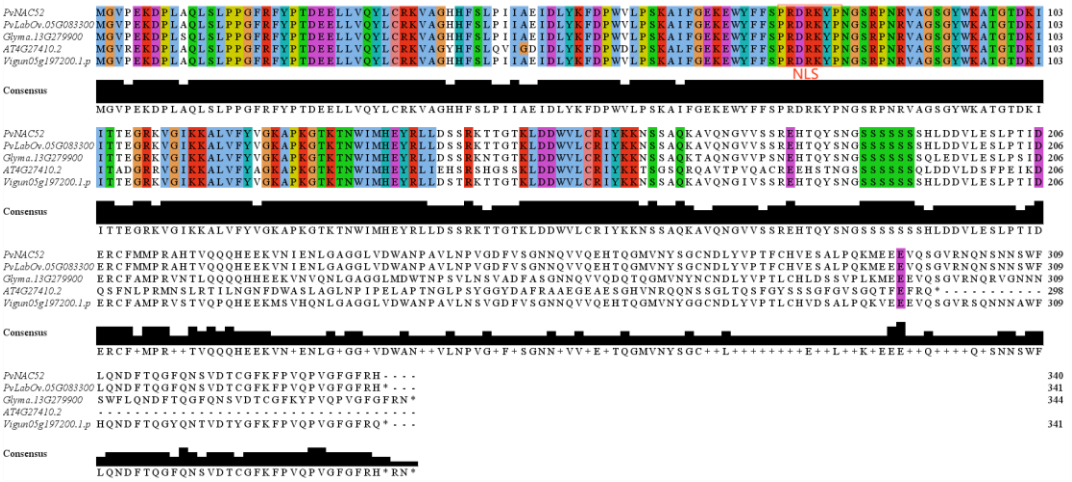


Figure S1. *PvNAC52* gene sequence analysis. All NAC (NAM, ATAF1/2, and CUC1/2) protein sequences used for sequence analysis were retrieved from the Phytozome 13 (https://phytozome-next.jgi.doe.gov/).

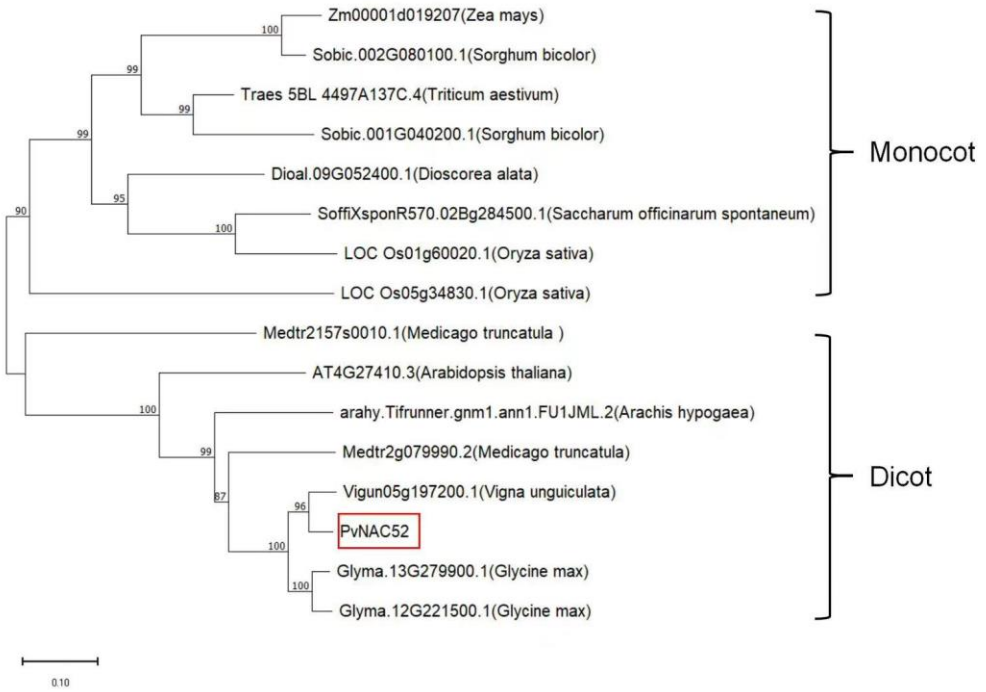


Figure S2. Phylogenetic tree analysis of PvNAC52. All NAC (NAM, ATAF1/2, and CUC1/2) protein sequences used for the phylogenetic analysis were retrieved from the Phytozome 13 (https://phytozome-next.jgi.doe.gov/).

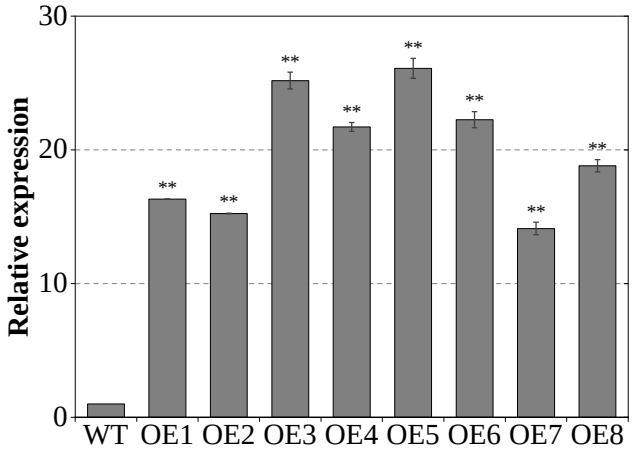


Figure S3. Expression analysis of *PvNAC52* in transgenic lines. Asterisks represent significant differences in relative expression compared to those in WT plant (**P<0.01).

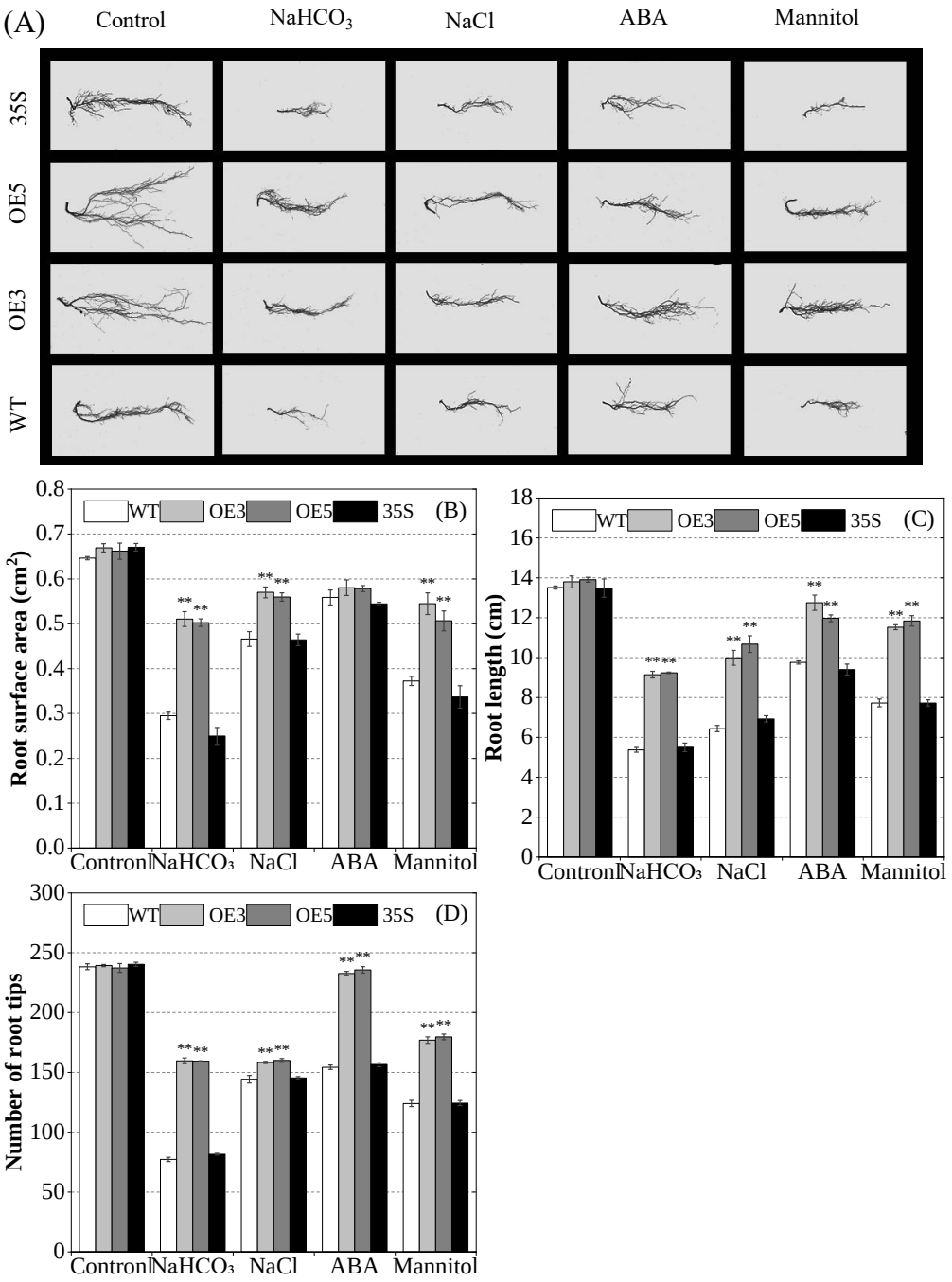


Figure S4. Analysis of root growth under different treatments. (A) Scanning image of four plant roots; (B) root surface area; (C) root length; and (D) number of root tips. Untreated seedlings were used as controls; asterisks represent significant differences compared with the WT plants(**P<.01).

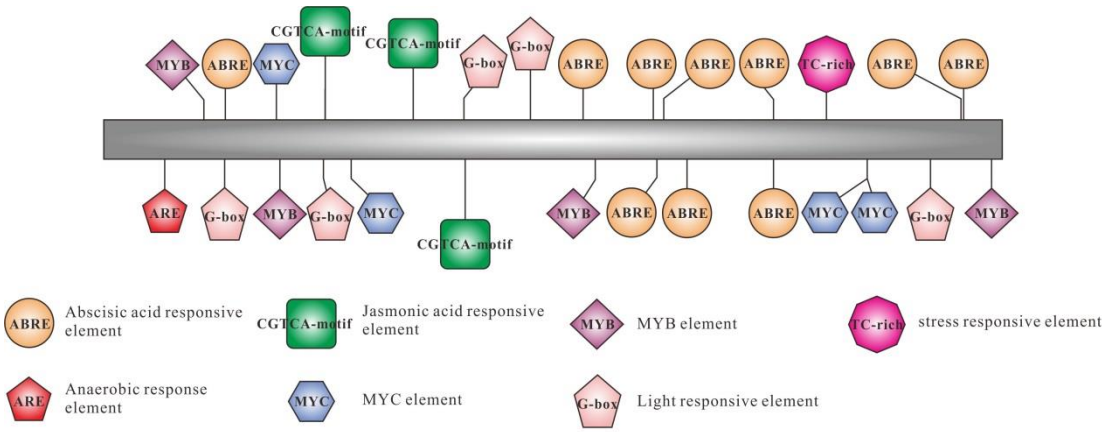


Figure S5. Prediction of *PvNAC52* promoter cis-acting elements.