Proline concentration and its metabolism are regulated in a leaf age dependent manner but not by abscisic acid in pea plants exposed to cadmium stress

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Table S1. Oligonucleotide sequences of *Medicago truncatula* used as primers for amplification of internal fragments of the *Pisum sativum* genes. F, forward primer; R, reverse primer.

***Pisum sativum* gene**	**Accession number of the *Medicago truncatula* sequence in GenBank database**	**Oligonucleotide sequence (5'->3')**
PsP5CS1	AJ278818	F: CGCCCTGATGCATTGGTACAGATAGC R: CATTGTGAAAAACAGCAGCACTATC
PsP5CS2	JN809240	F: ATGACTGCTAAGGTTAATGCTGCTG R: GATCTTTGTGAACAAGAAGGGTTTCC
PsPDH1	XM_013595747	F: CATGCCAATATTGGTTGATGCTGAACACAC R: GTGCATCTGACATTCCACATAGTTG
PsProT1	XM_003600790	F: GACACATTAGATACAGAGATCTTGCTG R: GCAATGACTGATTGAAGGAAGGCTG
PsProT2	XM_013602264	F: CTATTGTTGGATATTGGGCTTATGG R: CGAAGAGCTGAAATTGTGGTTGC

Table S2. Primer sequences used for real-time PCR analysis. F, forward oligonucleotide; R, reverse oligonucleotide.

Gene	**Accesion number of the *Pisum sativium* sequence in GenBank database**	**Oligonucleotide sequence (5'->3')**
PsP5CS1	MW030636	F: CGAAGTGGGAATGGGCTTCTCTTG R: CAACTTAAGTAGCTCGGGTATTTCTGC
PsP5CS2	MW423825	F: CCATGCCAGATACAGTCGGTAGC R: CAAGAACAGGGATTCTTGTTGACTC
PsPDH1	MW183670	F: TTGGGGTTGGGAAAGTGAATCAC R: GTGCATCTGACATTCCACATAGTTG
PsProT1	MW030634	F: AGCAGCCAGTTGTCAAGAACATGATG R: GCAATGACTGATTGAAGGAAGGCTG
PsProT2	MW030635	F: GGAAAGACAGCTAGAACAGAGAAG R: CGAAGAGCTGAAATTGTGGTTGC
GAPDH	X73150	F: GTGGTCTCCACTGACTTTATTGGT R: TTCCTGCCTTGGCATCAAA
β-Tubulin	X54844	F: GCTCCCAGCAGTACAGGACTCT R: TGGCATCCCACATTTGTTGA
Actin	X90378	F: ATCATGGAGCCTGAGAGTTG R: CACATACCACTAGGCCAATC

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PsP5CS1      ------------------------------------------------------gacctg   6
MsP5CS1      ttttggagaaaacgtcatctcctttgggagttcttttaattattttcgagtctcgccctg   1414
MtP5CS1      ttttggagaaaacatcatctcctttgggagtccttttaattattttcgagtctcgccctg   1319
BnP5CS1      ttttggagaagacctcatccccattaggcgtactcctgattgtttttgagtctcgacctg   1342
AtP5CS1      tcttagagaagacctcatcaccattaggcgtacttctgattgtttttgaatcccgacctg   1629
                                                                  * ****

PsP5CS1      atgctcttgttcagatagcttccttggcaatacgaagtgggaatgggcttctcttgaaag   66
MsP5CS1      atgcattggtacagatagcttccttggcaatacgaagtgggaatgggcttctcttgaaag   1474
MtP5CS1      atgcattggtacagatagcttccttggcaatacgaagtgggaatgggcttctcttgaaag   1379
BnP5CS1      atgcacttgtacagatagcttcacttgctatccggagtggaaatggtcttctattgaagg   1402
AtP5CS1      atgcacttgtacagatagcttcacttgccatccgtagtggaaatggtcttctgctgaagg   1689
             ****  * ** ***********  * ** ** ** ***** ***** *****  **** *

PsP5CS1      gaggcaaggaggctaagagatcaaatgcaattttgcacaaagtaattactgaagctatac   126
MsP5CS1      gaggcaaggaggctaatcgatcaaatgccattttgcacaaagtaattactgaagccatac   1534
MtP5CS1      gaggcaaggaggctaatcgatcaaatgccattttgcacaaagtaattactgaagccatac   1439
BnP5CS1      gtggaaaggaggccaggagatcaaatgctatcttacacaaggtgataactgatgctattc   1462
AtP5CS1      gtggaaaggaggcccggcgatcaaatgctatcttacacaaggtgatcactgatgcaattc   1749
             * ** ********     ********** ** ** ***** ** ** ***** ** ** *

PsP5CS1      cagatactgttggttcaaaacttattggacttgtgacatcaagagcagaaatacccgagc   186
MsP5CS1      ctgatactgttggttcaaaacttattggacttgtgacatcaagagctgaaatacctgagc   1594
MtP5CS1      ctgatactgttggttcaaaacttattggacttgtgacgtcaagagctgaaatacctgagc   1499
BnP5CS1      cagagactgttggtggtaaactcattggacttgtgacttcaagggaagagattcctgatt   1522
AtP5CS1      cagagactgttgggggtaaactcattggacttgtgacttcaagagaagagattcctgatt   1809
             * ** ********    ***** ************** ***** *  ** ** ** **

PsP5CS1      tacttaagttggatgatgtaattgatctggtgattccaagaggcagcaacaaacttgttt   246
MsP5CS1      tacttaagctggatgatgtaattgatctggtgattccaagaggcagcaataaacttgttt   1654
MtP5CS1      tacttaagctggatgatgtaattgatctggtgattccaagaggcagcaataaacttgttt   1559
BnP5CS1      tgctcaagcttgatgacgttattgatcttgtgatcccaagaggcagcaacaagcttgttt   1582
AtP5CS1      tgcttaagcttgatgacgttatcgatcttgtgatcccaagaggaagcaacaagcttgtta   1869
             * ** *** * ***** ** ** ***** ***** ******** ***** ** ******

PsP5CS1      ctgatatcaaaagttccacgaaaatccctgttctgggtcatgctgatggaatttgtcacg   306
MsP5CS1      ctgatattaagagttcgacgaaaatccctgttctaggtcatgctgatgggatttgtcacg   1714
MtP5CS1      ctgatattaagagttcgacgaaaatccctgttctaggtcatgctgatggaatttgtcacg   1619
BnP5CS1      cccagattaaaaacactacaaaaatccctgttcttggtcatgctgatggaatctgtcatg   1642
AtP5CS1      ctcagataaaaaatactacaaaaatccctgtgctaggtcatgctgatggaatctgtcatg   1929
             *  * ** ** *   * ** ********** ** ************** ** ***** *

PsP5CS1      tctatgttgataaatctgcaaatctggagatggctaagcagattgtactcgatgcaaaaa   366
MsP5CS1      tctatgttgataaatctgctaatttggagatggctaagcagattgtactcgatgcaaaaa   1774
MtP5CS1      tctatgttgataaatctgctaatttggagatggctaagcagattgtactcgatgctaaaa   1679
BnP5CS1      tatatgtggacaaggcttgtaatgtggatatggctaaacgcatagtttctgatgcaaagt   1702
AtP5CS1      tatatgtcgacaaggcttgtgatacggatatggcaaagcgcatagtttctgatgcaaagt   1989
             * ***** ** **  **    **  *** ***** ** *  ** **    ***** **

PsP5CS1      cagattatccagcaggctgcaatgccatggaaacacttcttgttcataaggatttggtag   426
MsP5CS1      cagattgtccatcaggatgcaatgccatggaaacacttcttgttcataaggatttggtag   1834
MtP5CS1      cagattatccatcaggatgcaatgccatggaaacacttcttgttcataaggatttggtag   1739
BnP5CS1      tagactatccagcagcttgtaatgccatggaaactcttcttgtgcataaggatctggagc   1762
AtP5CS1      tggactatccagcagcctgtaatgcgatggaaacccttcttgtgcataaggatctagagc   2049
               ** * **** ***  ** ***** ******** ******** ********* * *

PsP5CS1      agaaaggctggataaataatattatcgtcgacttgcggacagaaggcgttacgatatatg   486
MsP5CS1      agaaaggctggctcaatagtattagtgacgatttgcggtcggaaggtgttactttatatg   1894
MtP5CS1      agaaaggctggctcaatagtattagtgtcaatttgcggtcagaaggtgttacgttatatg   1799
BnP5CS1      agaacgctgtgctcaatgagcttatatttgctctgcagagcaatggagtcactttgtatg   1822
AtP5CS1      agaatgctgtgcttaatgagcttatttttgctctgcagagcaatggagtcactttgtatg   2109
             **** *    * * ***    ***         *** *    * ** ** **  * ****

PsP5CS1      gaggacccaaagcaagttctctattagctattccacttgctcgttcactacatcacgagt   546
MsP5CS1      gaggaccgaaagcaagttctctgttgaatgttccacttgctcgttcattacatcatgagt   1954
MtP5CS1      gaggaccgaaagcaagttctctgttgaatgttccacttgctcgttcattacatcacgagt   1859
BnP5CS1      gtggaccaaaggcaagtaaaatacttaacctaccagaagcacggtcgttcaatcacgagt   1882
AtP5CS1      gtggaccaagggcaagtaagatactgaacataccagaagcacggtcattcaaccatgagt   2169
             * ***** *  ******    *  *     * ***   ** ** **  *  * ** ****
```

```
PsP5CS1      attgttcgttggcttgcactgttgaaatcgttgatgatgtttatgcagctatcggtcata   606
MsP5CS1      actgttcgttggcttgcaccttggaaatcgtggatgatgtttatgcagctattcatcata   2014
MtP5CS1      actgttcgttggcttgcaccgtggaaattgtggatgatgtttatgcagctattgatcata   1919
BnP5CS1      actgttccaaggcgtgcactgttgaagttgtagaagatgtttatggtgctgtagatcaca   1942
AtP5CS1      actgtgccaaggcttgcactgttgaagttgtagaagacgtttatggtgctatagatcaca   2229
             * *** *   *** *****  * *** * ** ** ** *******  *** *   *** *

PsP5CS1      taaatctttatggaagtgcacatactgattccattatcacggaagatcatgaagtagctg   666
MsP5CS1      taaatctttatggaagtgcacataccgattccattgtcacagaagatcatgaagtagctg   2074
MtP5CS1      taaatcgttatggaagtgcacataccgattccattgtcacagaagatcatgaagtagcta   1979
BnP5CS1      ttcaccgacatggaagtgcacacacagactgtattgtgacagaggatcccgaagttgcag   2002
AtP5CS1      ttcaccgacatgggagtgcacacacagactgcattgtgacagaggatcacgaagttgcag   2289
             *  * *   **** ******** ** ** *  *** * ** ** ****  ***** **

PsP5CS1      atgtatttcttcgtcaagtcgacagtgctgccgtatttcacaatg---------------   711
MsP5CS1      atgtatttcttcgtcaagtcgacagtgctgctgtttttcacaatgctagtacaagattca   2134
MtP5CS1      atgtatttcttcgtcaagtcgatagtgctgctgtttttcacaatgctagtacaagattca   2039
BnP5CS1      agctattccttcgccaagtggacagcgctgctgtgttccacaacgcaagcacaagattct   2062
AtP5CS1      agctattccttcgccaagtggatagcgctgctgtgttccacaacgccagcacaagattct   2349
             *  **** ***** ***** ** ** ***** ** ** ***** *
```

Figure S1. The alignment of the nucleotide sequence fragment of *Pisum sativum PsP5CS1* (MW030636) with the sequences of *P5CS1* genes from other plants. *Arabidopsis thaliana* (*AtP5CS1*, NM_129539), *Brassica napus* (*BnP5CS1*, AF314811), *Medicago sativa* (*MsP5CS1*, X98421), and *Medicago truncatula* (*MtP5CS1*, AJ278818). Identical nucleotides are marked by black asterisks.

```
BnP5CS2      aggacgaggtggtatgactgcaaaagttaaagctgctgttaatgcagcttatggtggcat   883
AtP5CS2      aggacgaggggtatgactgcaaaagttaaagctgctgttaatgcagcttatggtggcgt   1067
PsP5CS2      ----------------actgctaaggttaatgctgctgttgctgctgctaatgctagtat   44
MtP5CS2      gggcagaggggtatgactgctaaggttaatgctgctgtttgtgctgcttattcaggcac   830
                          ***** ** ***** *********  *** *** **    *

BnP5CS2      tcctgttatcataaccagtgggtatgcagctgagaatatagctaaagttcttaaaggact   943
AtP5CS2      tcctgttatcataaccagtggatatgcagctgagaatataagtaaagtccttagaggact   1127
PsP5CS2      ccctgttattataattagtggctatgccacagacaacatcatacgagtgcttcaagggga   104
MtP5CS2      acctgtgattatcaccagtggctatcctaatgacaacatcatgcgagtgcttcaaggaga   890
              ***** ** ** *  ***** *** *    ** ** **      *** ***  ***

BnP5CS2      gcgtgttggtaccttgttccaccaagatgcacatttgtgggctagagtcgtagatactac   1003
AtP5CS2      gcgtgttggtaccctgttccatcaagatgctcatttatgggctccggtcgtagatactac   1187
PsP5CS2      gaaaataggtaccgtctttcataaagatgcacatctgtggaagagcttaaaggaagagac   164
MtP5CS2      aagaattggtactgtattccataaggatgctcacttgtggaccagcataaaggaaataac   950
                  * *****  * ** **  * ***** **  * ***       *    **    **

BnP5CS2      ttctcgtgacatggcagttgctgcaagggaaagttctagaaagcttcaggctttgtcttc   1063
AtP5CS2      ttctcgtgacatggcagttgctgcaagggaaagctcaagaaagcttcaggccttatcttc   1247
PsP5CS2      tgcacatgaaatggcagttgcagcacgtaatagttctagacgtcttcaggccctaaaatc   224
MtP5CS2      tgcacatgaaatggcagttgcagcacgcgacagctctaggaagcttcagattctaaattc   1010
             * * * *** *********** *** *  * ** ** **    ******    *    **

BnP5CS2      agaagataggaaaaacattctactagatatagccaacgctctagaagcaaatgagaaaat   1123
AtP5CS2      agaagataggaaacaaattctacacgacattgccaatgcccttgaagtaaatgagaaaac   1307
PsP5CS2      tgaagaaaggagggaagtattgctggccgtggctgatgcattggagaaaaaccaaaagtt   284
MtP5CS2      tgaacaaaggaagaaaatattgttggatgtggctgctgctatagagaaaaatgaaagtga   1070
              *** * ****   *  *  *    *   * **    **  * **   ***  * *

BnP5CS2      aattaaggctgagaatgatttagatgttgctgcagcacaagaagctggatatgaagagtc   1183
AtP5CS2      aattaaagctgagaatgatttagatgttgctgcagcacaagaagctggatatgaagagtc   1367
PsP5CS2      gataaagttagagaatgaggctgatattgctgatgcgttggaagccggatatgacaagtc   344
MtP5CS2      gatcaggcttgagaatgcttctgatgttgctgatgcagaggaggctggatatgagagatc   1130
              ** *     *******     *** ******  **    ** ** ********    **

BnP5CS2      tttggtagctcgtttagttatgaagcctggaaagatctcaagccttgcagcttctattcg   1243
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```
AtP5CS2      tttggtagctcgcttagttatgaagcctgggaagatctcaagccttgcagcttccgttcg   1427
PsP5CS2      tctgatatcacgtttaaccctgaagcctgagaagatctctagtcttgcaaagtctgtgcg   404
MtP5CS2      actgatatcgcgtttgacactgagacctgagaagattgctagtcttgtaaagtctgttcg   1190
               ** ** * ** **     ***  ****  *****  * ** **** *   **  * **

BnP5CS2      ccagctagctgaaatggaagacccaattggtcgtgttctaaagaaaactgaggttgcaga   1303
AtP5CS2      ccagctagccgaaatggaagatccaataggccgtgtattaaagaaaactcaggttgcaga   1487
PsP5CS2      cgtgctggcagatatggaagaaccaattggccaggttttgaagagaactgagctagctga   464
MtP5CS2      caagctggcagaaatggatgaacccattggtcagattttgaagagaactgagatagcaga   1250
             *  *** ** ** ***** ** ** ** ** *   *  * **** **** ** * ** **

BnP5CS2      tggtcttattttagagaaaacctcatcaccattaggtgttcttctgattgtttttgaatc   1363
AtP5CS2      tgatcttattttagagaagacctcatcaccaataggtgttcttctgattgtttttgaatc   1547
PsP5CS2      tgacctcgtcttggagaaaatatcatgttctcttggtgtcctcttgattatatttgagtc   524
MtP5CS2      taaactcgttctggagaaaatatcatgtcccttgggtgtacttctagttatattcgagtc   1310
             *   **  *  * ***** *  ****   *  * ***** **  *  ** * ** ** **

BnP5CS2      ccgtcctgatgcacttgttcagatagcttcacttgcaatcaggagtggaaatggtcttct   1423
AtP5CS2      ccggcctgatgcacttgttcagatagcttcgcttgcaatccggagtggaaatggtcttct   1607
PsP5CS2      acgacccgatgctcttgttcagatagctgcattggcaattcgaagtggaaatggcttatt   584
MtP5CS2      tcgacctgatgctcttgttcagatagctgcattggcaattcgaagtggaaatggtttatt   1370
              ** ** ***** ***************  *  * *****  * ***********  *  *

BnP5CS2      gctgaagggtggaaaagaggctcgtcgatcaaatgctatcttacacaaggtgatcactga   1483
AtP5CS2      gctgaagggtggaaaggaggctcgtcgatcaaatgctatcttacacaaggtgatcactga   1667
PsP5CS2      acttaaaggaggaaaggaagcccgaagatcaaatgcgatcttacacaagatcattacttc   644
MtP5CS2      gctcaaaggaggaaaggaagccaaaagatctaatgcagtcttacacaagattattacttc   1430
              ** ** ** ***** ** **     **** *****  *********** * ** ***

BnP5CS2      tgcaattccgaagactgttggaggtaaactcataggacttgtgacttcgagagatgagat   1543
AtP5CS2      tgcaattccggagactgttggaggtaaactcataggacttgtgacctcaagagaggagat   1727
PsP5CS2      agccatgccagatacagtcggtagcaaacttatcgggcttgtcacttcaagagatgaaat   704
MtP5CS2      agctataccagatacagttggtggcaaacttattggccttgtgacttcaagggaagcaat   1490
              ** ** **  * ** ** **  * ***** ** ** ***** ** ** ** ** *  **

BnP5CS2      tcctgatttgctcaagcttgatgatgttattgatcttgtgatcccaagaggcagcaacaa   1603
AtP5CS2      tcctgatttgctcaagcttgatgacgttattgatcttgtgatcccaagaggcagcaacaa   1787
PsP5CS2      tccagatctactcaagcttgatgatgtgatagatcttgtggtccctagaggcagtaataa   764
MtP5CS2      tcctgatctactcaagcttgatgacgtgatagatcttgtggtccctcgaggcagtaataa   1550
             *** *** * ************** ** ** ********* ****  ******* ** **

BnP5CS2      gcttgtttctcagataaaaaactcaacgaaaatcccagtgctagggcatgcggatggtat   1663
AtP5CS2      gcttgtttctcaaataaaaaactcgacgaaaatcccagtgctaggccatgctgatggaat   1847
PsP5CS2      gctggtttctcaaatcaaggagtcaacaagaatccctgttcttggtcatgctgatggaat   824
MtP5CS2      gcttgtttctcaaatcaaggattctacaaagattcctgttctcggtcatgctgatggaat   1610
             *** ******** ** **  * ** ** *  ** ** ** ** ** ***** ***** **

BnP5CS2      ctgtcatgtgtatgttgacaagtcttgtaaagtagacatggcaaaacgtgttgtttcaga   1723
AtP5CS2      ctgtcatgtatatgttgataagtctggtaaactggacatggcaaagcgcattgtttccga   1907
PsP5CS2      ttgtcatatctatgttgacaagtctgctaatattgatatggcaaagcatatagttaggga   884
MtP5CS2      atgtcatgtatacattgacaaagcagctaatatcaatgtggcaaagaagattgttaagga   1670
              ****** * **  **** **  *   ***  *  *  *******     * ***   **

BnP5CS2      tgcaaagttagactatccagcagcctgtaacgctatggaaacccttcttgtacataagga   1783
AtP5CS2      tgcaaagttggactatccagcagcctgtaatgcgatggaaacccttcttgtacataaaga   1967
PsP5CS2      tgcaaagactgattaccctgcagcttgcaatgcattggaaacccttcttgttcacaaaga   944
MtP5CS2      tgcaaagactgattatcctgcagcctgcaatgcaatggaaacccttcttgttcacaaaga   1730
             *******   ** ** ** ***** ** ** **  **************** ** ** **

BnP5CS2      tctagagcagaatggtgtgctaaacgagcttatatatgccctgcaagccaatggtgtcac   1843
AtP5CS2      tttggagcagaatggtttttctcgatgatcttatttatgttctgcaaaccaaaggcgtcac   2027
PsP5CS2      t-------------------------------------------------------------   945
MtP5CS2      tctagcaggaaatggtggactgaatgaacttgttgctgaactccaaaaacaaggtgttca   1790
             *
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Figure S2. The alignment of the nucleotide sequence fragment of *Pisum sativum PsP5CS2* (MW423825) with the sequences of *P5CS2* genes from other plants. *Arabidopsis thaliana* (*AtP5CS2*, NM_115419), *Brassica napus* (*BsP5CS2*, AF314812), *Medicago truncatula* (*MtP5CS2*, JN809240). Identical nucleotides are marked by black asterisks.

```
AtPDH1      agctcatggaaggattcaagaaatctgtaggaaatgccaagagtccaatgtaccattgtt    1181
NtPDH2      agctcacaaaagacttacgaaaatttgcgagaaatgcttggaacacgacgttcctttact    890
MsPDH2      tgctaacaagagattccttgagctttgtcagaaatgtgtgcaagccaatattccattatt    1511
MsPDH1      tgctaacaagagattccttgagctttgtcagaaatgtgtgcaagccaatattccattatt    926
PsPDH1      ----------------------------------------------------ttatt    5
MtPDH1      agcaaaccaaagattacaacaactttgtaaaaaatgtgttgaagcaaacatgccaatatt    963
                                                                  *  *

AtPDH1      gattgatgcggaagacacaatcctccaacccgcgatcgattacatggcttattcatcggc    1241
NtPDH2      cattgatgccgaggatacaactattcaacctggaattgattacatggcttattctgcagc    950
MsPDH2      ggttgatgctgaacatacttcagttcaacctgctattgattactttacttactcttctgc    1571
MsPDH1      ggttgatgctgaacatacttcagttcaacctgctattgattactttacttactcttctgc    986
PsPDH1      ggttgatgctgaacacactactgttcaaccggctatcgattacttcacgtattcttctgc    65
MtPDH1      ggttgatgctgaacacactactgttcaaccagctattgattacttcacatactcttcagc    1023
              ******* **  * **     * ***** *  ** ****** *  * ** **  * **

AtPDH1      gatcatgttcaatgctgacaaagaccgaccaatcgtttacaacacgattcaggcgtactt    1301
NtPDH2      aattaagtaccacaaagacg---atggccctttgattttcggaacaattcaagcttactt    1007
MsPDH2      tattatgcataacaaaggtg---aaaaccctattgtgtttggaaccattcagacttattt    1628
MsPDH1      tattatgcataacaaaggtg---aaaaccctattgtgtttggaaccttcagacttattt    1043
PsPDH1      gattgttcataacaaagatg---ataatcctattgtgtttggaacaattcaaacttactt    122
MtPDH1      aattatgcataataaagatg---ataatcctattgtgtttggaacaattcaaacttattt    1080
             **        *    *      *    **  *  * *     **  ****  * ** **

AtPDH1      gagagacgccggtgagagactgcatttggcagtacaaaatgctgagaaagagaatgttcc    1361
NtPDH2      gaaagacgcgaaagaaagaatggcgatagcgaaaaaagctgcagagaaaatgggagttcc    1067
MsPDH2      gaaagatgctaaggagagaatgttgttggcatcaaaggctgctgagaaaatggggatacc    1688
MsPDH1      gaaagatgctaaggagagaatgttgttggcatcaaaggctgctgagaaaatggggatacc    1103
PsPDH1      gaaagattctaaagagagattgtttcttgcgacacaagctgctgataaaagtggtattcc    182
MtPDH1      gaaagatgctaaggagagattgtttcttgcaacaaaagctgctgaaaaaattggaattcc    1140
            ** ***  *    ** *** **    * **   * *   *** ** ***       * **

AtPDH1      tatggggttcaagttggtgagaggggcttacatgtctagcgaagctagcttggcggattc    1421
NtPDH2      aatgggatttaagttggtgaggggtgcttatatgtgtagtgagagagagttggcttctcg    1127
MsPDH2      aatggggtttaagttggttagaggtgcttatatgtctagtgaaagaaaattggctgctga    1748
MsPDH1      aatgggatttaagttggttagaggtgcttatatgtctagtgaaagaaaattggctgctga    1163
PsPDH1      aatgggatttaagttggttagaggtgcttatatgtctatggaaagtaaaatagctgaatc    242
MtPDH1      tatgggatttaaattggttagaggtgcttatatgtcaacagaaagtacattggctgaatc    1200
             ***** ** ** ***** ** ** ***** ****  *  **        * **

AtPDH1      cctgggttgcaagtcgccagtc-cacgacacaattcaggatactcactcttgttacaatg    1480
NtPDH2      attaggattccaatctccaatt-catgatagcattgaacaaacacatgcttgcttcaatt    1186
MsPDH2      tttgggttatgcttctccaattacataacactattagggatactcataagtgtttcaatg    1808
MsPDH1      tttgggttatgcttctccaatt-cataacactattaaggatacacataagtgtttcaatg    1222
PsPDH1      tttcggatatggatcgccgatt-catgatactattcaagatacacatagtaacttcaatg    301
MtPDH1      ttttgggtctaagtcaccaatt-catgatactattaaagatacacataattgcttcaatg    1259
              * ** *     ** **  *  **  * *  ***    * ** **       * ****

AtPDH1      attgtatgacattcctgatggagaaagcatcaaacggttctggtttcggtgtcgttctcg    1540
NtPDH2      cttgcgctgagtttatgattgaagagattgctaatggctctggagcggttgtt---cttg    1243
MsPDH2      attgttcaaattatatgcttgagaagattgctaatggtcctggtggagttgtt---cttg    1865
MsPDH1      attgttcaaattacatgcttgagaagattgctaatggtcctggtggagttgtt---cttg    1279
PsPDH1      attgttcgtctttttgcttgagaaggttgcaaatggacgtggttctgtcgtc---cttg    358
MtPDH1      attgttcatcttatttgcttgagaagtttgctaatggaaaaggatctgttgtt---cttg    1316
             ***       *   ** * **  *     * ** **    **    *  **    ** *

AtPDH1      caacacataacgctgattc-------------------------------------------    1559
NtPDH2      ctactcataacattgagtcaggaaaacttgctgca--------------------------    1278
MsPDH2      caactcataacattgaatcaggtatatattatatgatatgatataatgatttatatttat    1925
MsPDH1      caactcataacattgaatc-------------------------------------------    1298
PsPDH1      ctacacataatattgaatc-------------------------------------------    377
MtPDH1      ctacacacaacattgaatc-------------------------------------------    1335
            * ** ** **   *** **
```

Figure S3. The alignment of the nucleotide sequence fragment of *PsPDH1* (MW183670) with the sequences of stress-downregulated *PDH* genes from other plants. *Arabidopsis thaliana* (*AtPDH1*, NM_001339059), *Medicago sativa* (*MsPDH1*, AY556386; *MsPDH2*, AY615900), *Medicago truncatula* (*MtPDH1*; XM_013595747), and *Nicotiana tabacum* (*NtPDH2*, AY639146). The identical nucleotides are marked by black asterisks.

```
GmProT1      cacattaggtatagagatcttgctggatttatatacggtaagaaagcgtataatctcaca   511
PsProT1      ----------------------------------------aaaaaggcatataaactcaca   21
MtProT1      cacattagatacagagatcttgctggatatatatacggcaaaaaggcatattctatcact   547
AtProT2      cacattcgttacagagatcttgcaggcttcatctatggtaaaaagatgtatcgtgttaca   490
AtProT1      catattcgctatagagaccttgctggattcatttacggtaggaaggcttatcatcttaca   387
AtProT3      cacattcgctatagagaccttgcgggattcatttacggtagaaaggcttattgtcttaca   836
                                                 *  **    ***    * **

GmProT1      tgggttctgcagtatatcaatcttttcatgataaatactggctacatcattttggccggt   571
PsProT1      tgggctcttcagtatatcaatctttttatgataaatactggcttcattattctggctggt   81
MtProT1      tggactctgcagtatatcaatcttttcatgataaatactggttacatcattttagctggt   607
AtProT2      tggggattgcaatatgtcaatcttttcatgattaattgtggcttcatcatacttgctggt   550
AtProT1      tggggattgcaatatgttaatcttttcatgattaattgtggattcattatcctagctggt   447
AtProT3      tgggtgttgcaatatgtcaatcttttcatgattaattgtggtttcatcatactagctggt   896
             ***    * ** *** * ******** ***** ***  *** * *** **  * ** ***

GmProT1      tcagccttgaaagctacttatgttctattcagggatgatgggctgctgaaacttccatat   631
PsProT1      tcagccttaaaagctacttataccttgtttagggatgatgctcagctgaagcttccatat   141
MtProT1      tcagccttgaaggctgcttataccgtgtttcgagatgatggtgtactgaagcttccgtat   667
AtProT2      tcggccttaaaggctgtttatgtacttttagagatgatagtctcatgaaactgcctcac   610
AtProT1      tccgccttaaaggctgtttatgtgcttttcagggatgatcataccatgaaactacctcat   507
AtProT3      tccgccttaaaggctgtttatgtgcttttagggatgatcatgccatgaagttacctcat   956
             ** ***** ** ***  ****    * **  * ******       ****  * **  *

GmProT1      tgtattgccataggtggatttgtgtgtgcaatgtttgccatctgcattcctcatctttca   691
PsProT1      tgtatagttatagctggttttgtgtgtgcaatgtttgccatttgtattcctcatctttca   201
MtProT1      tgtattgctatagctggaattgtgtgtgcaatgtttgccatttgcattcctcatctttca   727
AtProT2      ttcatcgccatcgcgggtgttgtatgcgcgattttcgcaatcggtattcctcatttatca   670
AtProT1      tttatagccattgctggtttgatttgtgcgattttcgctattgggattcctcatttatcg   567
AtProT3      tttatagctattgcgggtctgatttgtgcggtttttgctattggaattcctcatttgtcg   1016
             *  ** *  ** *  **  *  * ** **  * ** ** **  * ********* * **

GmProT1      gctctgggaatttggctaggattttcaacagtcttcagcctggcatatattgttatatca   751
PsProT1      gctcttggaatttggttggcagtttcaaccgtcttcggcttggtatacatttccgtagca   261
MtProT1      gctcttggagtttggttgggagtttcaacagtcttcacctttgtttacattgtcatagca   787
AtProT2      gctcttggaatctggctaggagtttcaacaatcctcagcataatctacattattgttgca   730
AtProT1      gctcttggggtctggcttggagtttcgaccttcctcagtctcatctatattgttgtggca   627
AtProT3      gctcttgggatatggcttgcggtttcgactatcctcagcctcatctatatcgttgtggca   1076
             ***** **  * *** * *   **** **  ** **    *    ** **     *  **

GmProT1      tttgtgttgtcgcttaaagatggattacaatcaccgcctcgagattacgagattccagga   811
PsProT1      tctgttctatcaattaaagatggaatacattcaccgcctcgagattacaccattccagga   321
MtProT1      ttggtgctatcaattaaagatggaatgaattcacctgctcgagattacgctgttccagaa   847
AtProT2      atagttctatcagctaaagatggagtaaacaagcctgaaagagattacaacatacaagga   790
AtProT1      atcgtgctatcggttagagatggagtaaaaacaccttcaagagattacgagatacaagga   687
AtProT3      atcgtgctatcggttaaagatggagttaaagcaccttcaagagattacgagatacaagga   1136
                ** * **   ** ******* *  *    **     ********    * * ** *

GmProT1      gatggtgtaagcaaaatctttacaataattggagcatctgctaaccttgtgtttgcattt   871
PsProT1      gaaggggcaagtaaagtatttgaaacgattggggcgtctgctaacctagtgttcgcatat   381
MtProT1      catggtgtaactaaaatattcacaacaattggggcgtctgctagtctagtgttcgcatac   907
AtProT2      tcatcaataaacaaactctttaccataacaggagcagctgcaaatctagttttcgcattc   850
AtProT1      tcatcattgagcaaacttttttaccatcacaggagcagccgcaaatctggttttcgcattc   747
AtProT3      tcaccactaagcaaacttttttaccatcactggagcagccgctacactagttttcgtattc   1196
                      *  *** * **    *  *  ** **  * ** *  ** ** ** * **

GmProT1      aataccggcatgcttcctgagatacaggcaacaattaggcaaccagttgttaagaacatg   931
PsProT1      aacaccggcatgcttcccgagattcaggcaacaattaagcagccagttgtcaagaacatg   441
MtProT1      aataccggcatgcttcctgagatacaggccacaattaagcaaccagttgtcaagaacatg   967
AtProT2      aacacgggaatgctcccggaaatacaggccacggtgaagcaaccggtcgttaaaaacatg   910
AtProT1      aacaccgggatgcttccagaaattcaggcaacagtgaggcaaccagttgttaaaaacatg   807
AtProT3      aacacagggatgcttccagaaattcaggcaacagtaaagcaaccagtagtaaaaaacatg   1256
             ** ** ** ***** ** ** ** ***** **  * * *** ** ** ** ** ******

GmProT1      atgaaagccttgtactttcagtttaccgttggagttctaccattgtacctggttgccttt   991
PsProT1      atgaaatccctttatttttcagtttacagtcggagttataccattgtaccttataacctttt   501
MtProT1      atgaaatccctgtggtttcagtttaccattggacttgtaccaatgtacatggttacctttt   1027
AtProT2      atgaaggctctgtattttcaattcactgttggtgttttacctatgtacgcggttacattc   970
AtProT1      atgaaggctctatactttcaattcacagcgggtgttttaccgatgtacgcagttacattc   867
AtProT3      atgaaggctctatactttcaattcacggtgggtgttttaccgatgtttgcggttgtattc   1316
             *****  *  * *  ***** ** **    **  ** ****  ***      *    **
```

```
GmProT1      acaggatactgggcttatggatcttccacagaagtgtatttgctgaatagtgtgaatggt   1051
PsProT1      tcaggatattgggcttatggatcttccacagaaacctatttactgaatagtgtcaacggt   561
MtProT1      gcaggatactgggcttatggaaataagacagaaacctatttgctgaatagtgtgaacggt   1087
AtProT2      atcggatattgggcttacgggtcctcgacatcgacttatctcttaaacagcgtcagtgga   1030
AtProT1      atcggatattgggcttacggatcctcaacctcgacctatctactaaacagtgttaatggc   927
AtProT3      atcgggtattgggcttacggatcctcgacctcgccctatctactaaacaacgttaatggt   1376
                ** ** ******** **       **       *** *  * ** *  ** *  **

GmProT1      ccagtttgggtgaaggcttctgccaacatcacagcctttcttcaatcagtcattgcattg   1111
PsProT1      ccggtctgggtgaaggctttcgccaatatttcagccttccttcaatcagtcattgc----   617
MtProT1      ccagcttgggtgaaagctttggccaatattacagccttccttcaatcagtcattgcatta   1147
AtProT2      cctgtttgggtcaaagcactcgctaacatttcagcttttctccaatctgttatctcttta   1090
AtProT1      ccactctgggtcaaagcccttgctaacgtctctgctatccttcaatctgttatctctttg   987
AtProT3      ccactttgggttaaagcccttgctaacatctccgctatccttcaatccgttatctcgttg   1436
             **    ***** ** **    ** **  *  * **  * ** ***** ** **  *
```

Figure S4. The alignment of the nucleotide sequence fragment of *PsProT2* (MW030635) with the sequences of *ProT* genes from other plants. *Arabidopsis thaliana* (*AtProT1*, X95737; *AtProT2*, X95738; *AtProT3*, NM_129215), *Glycine max* (*GmProT1*, XM_003552545), and *Medicago truncatula* (*MtProT1*, XM_003600790). Identical nucleotides are marked by black asterisks.

```
GmProT2      gaggaaggccctgtatttacaatatacagtgggagttctgttctattatggtgttaccgt   931
PsProT2      ----------------------------------------------------------Ctat   4
MtProT2      gaggaaagccttgtactcacaatatacagtaggagccttgttttattatggtgttactat   1117
AtProT2      gatgaaggctctgtattttcaattcactgttggtgttttacctatgtacgcggttacatt   969
AtProT1      gatgaaggctctatactttcaattcacagcgggtgttttaccgatgtacgcagttacatt   866
AtProT3      gatgaaggctctatactttcaattcacggtgggtgttttaccgatgtttgcggttgtatt   1315
                                                                        *

GmProT2      aatgggatattgggcttatggatcaatggtgtccgcataccttcctgaaaacttaagtgg   991
PsProT2      tgttggatattgggcttatggatcaatggtatcttcctatcttcctgaaaatttaagtgg   64
MtProT2      tgttggatattgggcttatgggtcaatggtatcttcatatcttcctgaaaatctaagtgg   1177
AtProT2      catcggatattgggcttacgggtcctcgacatcgacttatctcttaaacagcgtcagtgg   1029
AtProT1      catcggatattgggcttacggatcctcaacctcgacctatctactaaacagtgttaatgg   926
AtProT3      catcgggtattgggcttacggatcctcgacctcgccctatctactaaacaacgttaatgg   1375
               * ** *********** ** **       **  * ** **     * *   * * ***

GmProT2      tcccaaatggattgacgtcctcattaatgccatcgtctttttgcagtccatagtcaccca   1051
PsProT2      accaagatggatcaatgtcattgttaatgtcattgtttttctacaatccatagtttctca   124
MtProT2      tcctagatggatcaatgtgctcgttaatgtcatcgtctttcttcagtctgcagtttctca   1237
AtProT2      acctgtttgggtcaaagcactcgctaacatttcagcttttctccaatctgttatctcttt   1089
AtProT1      cccactctgggtcaaagcccttgctaacgtctctgctatccttcaatctgttatctcttt   986
AtProT3      tccactttgggttaaagcccttgctaacatctccgctatccttcaatccgttatctcgtt   1435
              **    *** *  * *   *   ***       *   *  * ** **     *  *

GmProT2      acatatgtttgtagcaccaattcatgaggcattggacactaagttcctagaaattgacaa   1111
PsProT2      acatatgtttgtggcaccaattcacgaagctatggacacgagatttctcgaaatcggcaa   184
MtProT2      acatttatttgtggtaccaattcatgaggctttggacactagatttctagaaattggcaa   1297
AtProT2      acatatttttgcaagtccgacttatgagtatatggacacaaagtatggagtcaaaggaag   1149
AtProT1      gcacatatttgcgagtccaacatatgagtacatggacacaaagtatgggatcaaaggaaa   1046
AtProT3      gcacattttgcaagtccaacatatgagtacatggacaccaagtttgggatcaaaggaaa   1495
              **  * ****     ** *   * **     ******* *  *        *  *  *

GmProT2      ggccatgcattcaggggagaacttgaaacgcttatttctcctacgtgcgcttttctttac   1171
PsProT2      aggtatgcattcaggggagaatttcaaacgtttgtttcttctacgagtcttcttctatac   244
MtProT2      gggtatgcattcaggggagaatttgaaacgcttatttctcctaaggatgtgcttctatac   1357
AtProT2      tccattggcaatgaagaatctg---ttgtttagaacagtagcaagaggaagctacattgc   1206
AtProT1      cccatttgcgataaagaacttg---ctgtttaggatcatggcgagaggcgggtacatagc   1103
AtProT3      cccattggcattaaagaacttg---ttgtttaggatcatggcaagaggcgggtacatagc   1552
                  *         * *                   *     *       * *    *
```

```
GmProT2      agggaacacattcgttgctgcagcatttccttttatgggtgactttgtaaactttcttgg   1231
PsProT2      aggaaacacattcatcgcggccgcatttccttttatgggtgactttgtaaacttgttagg   304
MtProT2      tgggaatacattcattgctgcagcatttccttttatgggtgactttgtaaacttgctagg   1417
AtProT2      ggtgagcactcttctctctgcgcttttaccgtttctcggagatttcatgagccttaccgg   1266
AtProT1      ggtaagcacgcttatctcagcgctgctgccgttcctcggtgacttcatgagcctaactgg   1163
AtProT3      agttagtacgcttctctcagcactcttgccgttccttggggacttcatgagcctcactgg   1612
              *  *  **  *  *  * **     * ** **  * ** ** **  * * * *    **

GmProT2      ctcattttcactcgttcctctgaccttcatgttccccagcatggtcttcatcaaggttaa   1291
PsProT2      ctcattttcacttgttcccctaacattcatgttcccaagcatgatttttcttaaggtaaa   364
MtProT2      ctcattttcactagttcctcttaccttcatgttcccaagcatgatctttcttaagataaa   1477
AtProT2      agcgataagcacgttccctctcacattcatattagcgaatcacatgtatcttgttgctat   1326
AtProT1      tgcagtgagcacattccctctcacattcattctagccaaccatatgtactataaggcaaa   1223
AtProT3      tgcagtgagcacattccccttacattcattctagccaaccacatgtactataaggctaa   1672
               *  *        * ** ** ** *****  *  * *      * *          *

GmProT2      gggaagaacagctagaatagagaagaaggcgtggcactggttcaacatcgtttttcttt   1351
PsProT2      gggaaagacagctagaacagagaagaaggcatggcattggatcaacattatattttcatt   424
MtProT2      gggaaaaactgctagaacagagaagaaggtgtggcattggatcaacattgtcgtttcatt   1537
AtProT2      gaatgatgagcttagtcttgtgcaaaagctatggcattggctcaatgtttgcttctttgg   1386
AtProT1      gaacaataagctgaatgctatgcaaaagctatggcattggcttaacgttgtcttctttag   1283
AtProT3      gaacaataagctcaatactttgcaaaagctatgccattggctcaacgttgtcttcttcag   1732
             *           *       * * ***   ** ** *** * **  *     * *

GmProT2      tctgctcacaatagcaaccacaatttcagcaattcggttgatagtcaacaacatccaaaa   1411
PsProT2      tctacttacaatagcaaccacaatttcagctcttcg-----------------------   460
MtProT2      tctacttacaatagcaaccacaatttcagctcttcggttcataatcaacaacgttcaaaa   1597
AtProT2      attaatgtctcttgctgctgctattgctgctgttagactcatctctgttgactccaagaa   1446
AtProT1      tttgatgtctgttgctgcagccattgcagctgtcagactcatcgccgttgattccaaaaa   1343
AtProT3      tttgatgtctgttgctgccgccattgcagctcttaggctcatcgcccttgactccaaaaa   1792
               *  *  *  * **  *  * *** * **  *  *
```

Figure S5. The alignment of the nucleotide sequence fragment of *PsProT2* (MW030635) with the sequences *ProT* genes from other plants. *Arabidopsis thaliana* (*AtProT1*, X95737; *AtProT2*, X95738; *AtProT3*, NM_129215), *Glycine max* (*GmProT2*, XM_014775460), and *Medicago truncatula* (*MtProT2*, XM_013602264). Identical nucleotides are marked by black asterisks.

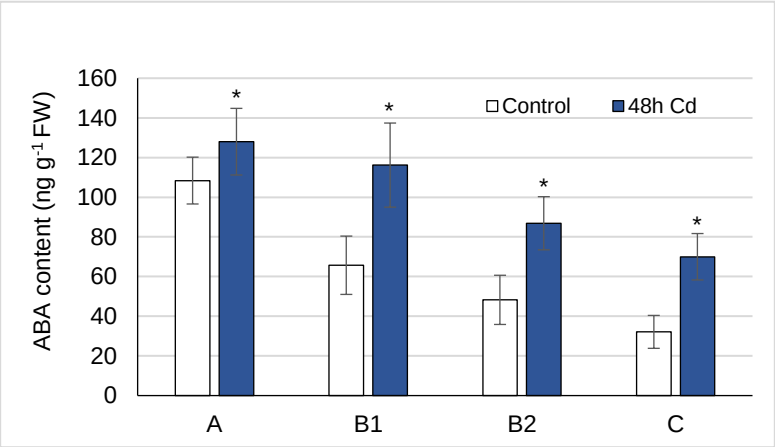

Figure S6. Changes in the abscisic acid (ABA) content after 48 hours of Cd treatment. Cadmium was applied as 50 µM $CdCl_2$. A, the youngest unexpanded leaves; B1, the youngest fully expanded leaves; B2, fully expanded mature leaves; C, the oldest true leaves. The results are the means (±SD) of three biological replicates. Asterisks indicate statistically significant differences between control and Cd-treatment ($P < 0.05$).

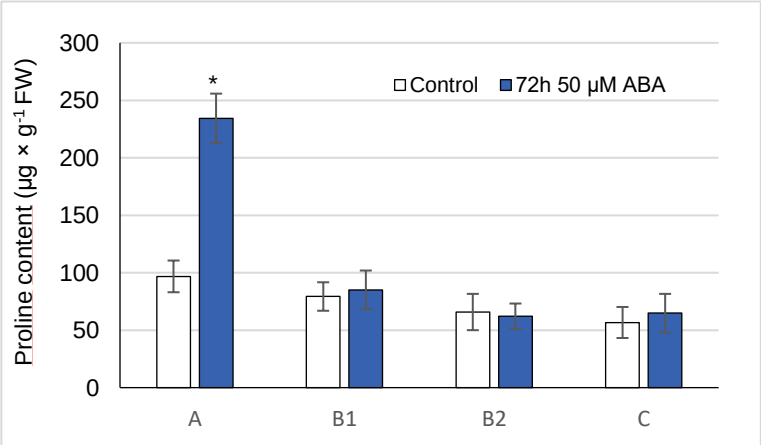

Figure S7. Changes in the proline content after 72 hours of abscisic acid (ABA) treatment. ABA was applied at concentrations of 50 µM. A, the youngest unexpanded leaves; B1, the youngest fully expanded leaves; B2, fully expanded mature leaves; C, the oldest true leaves. The results are the means (±SD) of three biological replicates. Asterisks indicate statistically significant differences between control and ABA-treatment ($P < 0.05$).

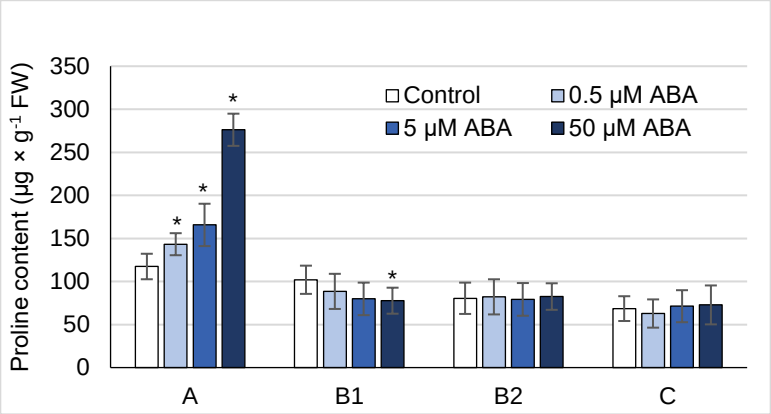

Figure S8. Changes in the proline content after 24 hours of abscisic acid (ABA) treatment. ABA was applied at concentrations of 0.5, 5, and 50 µM. A, the youngest unexpanded leaves; B1, the youngest fully expanded leaves; B2, fully expanded mature leaves; C, the oldest true leaves. The results are the means (±SD) of three biological replicates. Asterisks indicate statistically significant differences between control and ABA-treatment ($P < 0.05$).

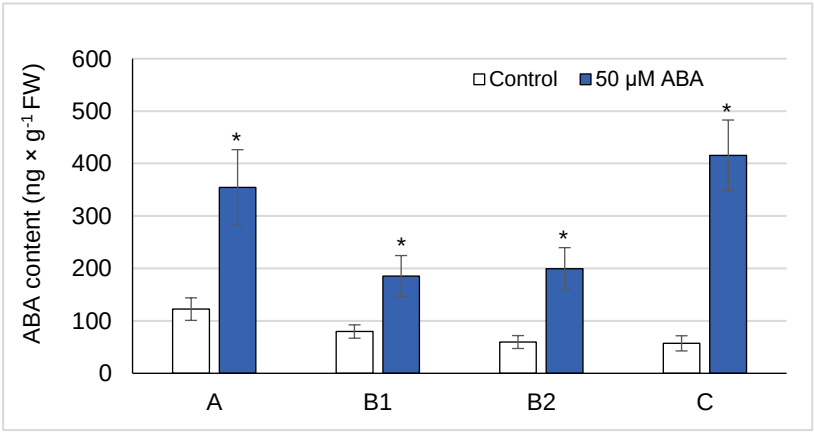

Figure S9. Changes in the abscisic acid content after 24 hours of abscisic acid (ABA) treatment. ABA was applied at concentrations of 0.5, 5, and 50 µM. A, the youngest unexpanded leaves; B1, the youngest fully expanded leaves; B2, fully expanded mature leaves; C, the oldest true leaves. The results are the means (±SD) of three biological replicates. Asterisks indicate statistically significant differences between control and ABA-treatment ($P < 0.05$).