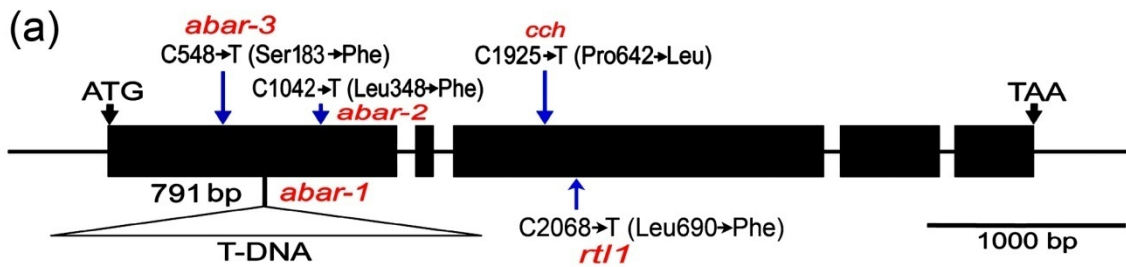


Supplementary data

Du S.Y. *et al.*, Roles of the different components of Mg-chelatase in abscisic acid signal transduction.

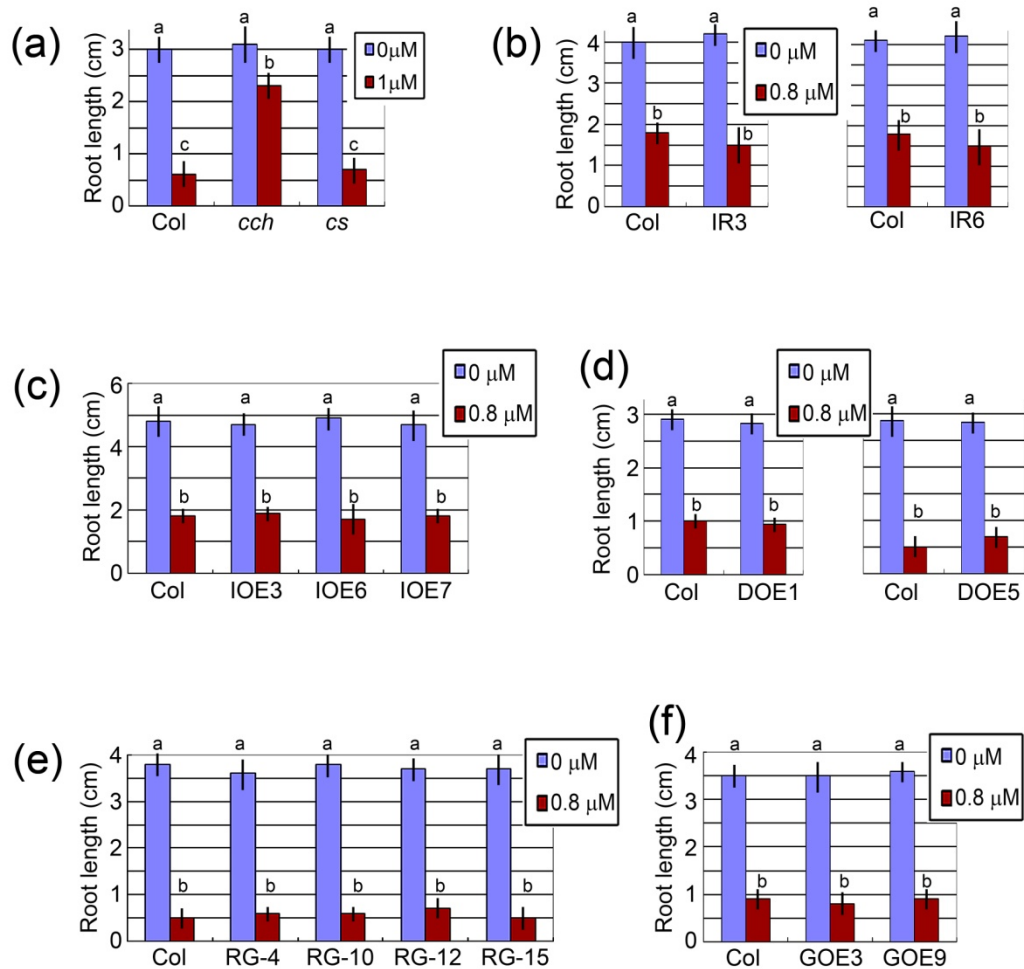


The map of the *abar* mutant alleles is shown above.

(b) Summary of the ABA-related phenotypes of the mutant alleles

Mutant allele	Seed germination	Early seedling growth	Stomatal movement
<i>abar-1</i> (lethal)	---	---	---
<i>abar-2</i>	ABA insensitive	Weakly ABA insensitive	Wild-type
<i>abar-3</i>	ABA hypersensitive	ABA insensitive	Wild-type
<i>cch</i>	Weakly ABA insensitive	Weakly ABA insensitive	Strongly ABA insensitive
<i>rtl1</i>	Weakly ABA insensitive	Wild-type	Strongly ABA insensitive

Supplementary Fig. 1 The identified mutant alleles of *CHLH/ABAR* gene and summary of their ABA-related phenotypes. (a) Diagram showing the locations of the *abar-1*, *abar-2*, *abar-3*, *cch* and *rtl1* mutations in the *CHLH/ABAR* genomic DNA (modified from Wu et al., 2009). (b) Summary of the ABA-related phenotypes of these mutant alleles.



Supplementary Fig. 2 Root length of *cch*, *cs* mutants and different transgenic lines in ABA-containing medium. (a) The data for *cch* and *cs* mutants. For corresponding photos of seedling growth, see Fig. 4c. (b) The data for the *CHLI*-RNAi-transgenic lines IR3 and IR6. For corresponding photos of seedling growth, see Fig. 4d. (c) The data for the *CHL1*-overexpression transgenic lines IOE3, IOE6 and IOE7. For corresponding photos of seedling growth, see Fig. 4e. (d) The data for the *CHLD*-overexpression transgenic lines DOE1 and DOE5. For corresponding photos of seedling growth, see Fig. 6c. (e) The data for the *GUN4*-RNAi-transgenic lines RG-4, RG-10, RG12 and RG15. For corresponding photos of seedling growth, see Fig. 7c. (f) The data for the *GUN4*-overexpression transgenic lines GOE3 and GOE9. For corresponding photos of seedling growth, see Fig. 7d.

Values are the means \pm SE from three independent experiments and different letters indicate significant differences at $P < 0.05$ (Duncan's multiple range test). The experimental conditions are the same as described in the corresponding figures where the photos of the seedlings growth are presented (Fig. 4, 6, or 7).

Arabidopsis	MASLVVSPPTLSTSKAEHLSSLTNSTK..HSFLRKKHRSTPKPAKSFVKVSAVSGNGLFTQINPEVRRRIVPIKRDNVPT.....VKIVY	82
Tobacco	MASLVVSPPTLSPNSKVEHLSSISQKHFLHSFLPKKINPTY.SKSPKKFCNAIGNGLFTQITQEVRRRIVPENTQGLAT.....VKIVY	83
Barley	MASLVVSPPTATGAKQKARGPRPAPLHSLFLLTRG.....RGRRTA..IRCAVAGNGLFTQITNPDPVRRVVPAAE.....RGLPRVKVY	76
Rice	MASLVVSPPTTATGQKKGAFV..PLHSFLLSRPQAAGARGRAAAAAAIRCVAAGNGLFTQITKPEVRRVVPPEGASRRVPRVKVY	88
Soybean	MASLVVSPPTLSPKPDQLHSLAQKHLVLSFLPKKANYNGSSKSSLRVCAVIGNGLFTQITQEVRRRIVPENDQNLPT.....VKIVY	84
Arabidopsis	VVLEAQYQSSLSEAVQSLNKTSRFAS.YEVVGYLVEELRDKNTYNNFCEDLKDANIFIGSLIFVEELAKVKDAVEKERDRMDAVLVFPS	171
Tobacco	VVLEAQYQSSLTAAVQTLNKNQGPFAS.FEVVGYLVEELRDEITYKMFCKDLEDANVFIGSLIFVEELAKVKSAVEKERDRMDAVLVFPS	172
Barley	VVLEAQYQSSVTAANADPRRAAEFEVVGVLVEELRDADTYAAFCDVAANVFIGSLIFVEELAKVVRDAVAKHRDRMDAVLVFPS	166
Rice	VVLEAQYQSSVTAARELNADPRRAAGFEVVGVLVEELRDEITYKTFCADLADANVFIGSLIFVEELAKVKDAVEKERDRMDAVLVFPS	178
Soybean	VVLEAQYQSSITAAVIALNSKRKHAS.FEVVGYLVEELRDAEITYKTFCKDLEDANIFIGSLIFVEELAKVKAVEKERDRMDAVLVFPS	173
Arabidopsis	MPEVMRLNLKGSFSMSQLGQSKSPFFQLFKRKKQGSAGFADSMKLVRTLTPKVLKYLPSDKAQDARLYILSLQFWLGGSDPNLQNFVKMI	261
Tobacco	MPEVMRLNLKGSFSMSQLGQSKSPFFQLFKRKKPSSAGFSDQMLKLVRTLTPKVLKYLPSDKAQDARLYILSLQFWLGGSDPNLQNFVKMI	262
Barley	MPEVMRLNLKGSFSMAQLGQSKSPFFQLFKRKKRSGFADSMKLVRTLTPKVLKYLPSDKAQDARLYILSLQFWLGGSDPNLQNFVKMI	256
Rice	MPEVMRLNLKGSFSMSQLGQSKSPFFQLFKR..KNSGCFADSMKLVRTLTPKVLKYLPSDKAQDARLYILSLQFWLGGSDPNLQNFVKMI	267
Soybean	MPEVMRLNLKGSFSMSQLGQSKSPFFQLFKRKKQGSAGFADSMKLVRTLTPKVLKYLPSDKAQDARLYILSLQFWLGGSDPNLQNFVKMI	263
Arabidopsis	SGSYVPALGKGVKTEVSDPVLFLDTGIWHPLAPTMYDDVKEYLNWYDTRRDANDRKNPEAPVI GLVLQRSHIVTGDDGHYVAVIMELEAK	351
Tobacco	SGSYVPALGKMKIDVSDPVLFLDTGIWHPLAPCMYDDVKEYLNWYATRRDANEKLSNAPVI GLVLQRSHIVTGDDGHYVAVIMELEAK	352
Barley	AVSYVPALGADIRVNDPVLFLDTGIWHPLAPTMYDDVKEYLNWYDTRRDANDRKNPEAPVI GLVLQRSHIVTGDDGHYVAVIMELEAK	346
Rice	AVSYVPALGKDKVDDPVLFLDAGIWHPLAPTMYDDVKEYLNWYDTRRDANDRKNPEAPVI GLVLQRSHIVTGDDGHYVAVIMELEAK	357
Soybean	SGSYVPALGKGVKTEVSDPVLFLDTGIWHPLAPCMYDDVKEYLNWYDTRRDANEKLSNAPVI GLVLQRSHIVTGDDGHYVAVIMELEAK	353
Arabidopsis	GAKVPIFAGGLDFSGPVEKVFVDFVSKQPIVNSAVSLTGFALVGGPARQDHPRA TEALMKLDVPIYI VALPLVQTTTEEWLNSTLGLHPI	441
Tobacco	GAKVPIFAGGLDFSRPIERYFIDITKPKFVNSVITSLGFAVGGPARQDHPRA TEALMKLDVPIYI VALPLVQTTTEEWLNSTLGLHPI	442
Barley	GAKVPIFAGGLDFSGPIERYLVDFITKPKFVNAVSVLTFGFAVGGPARQDHPKATAALMKLDVPIYI VALPLVQTTTEEWLNSTLGLHPI	436
Rice	GAKVPIFAGGLDFSGPTQRYLVDFITKPKFVNAVSVLTFGFAVGGPARQDHPKATAALMKLDVPIYI VALPLVQTTTEEWLNSTLGLHPI	447
Soybean	GAKVPIFAGGLDFSGPVEKVFIDITKPKFVNSVSLTGFALVGGPARQDHPRAVEALMKLDVPIYI VALPLVQTTTEEWLNSTLGLHPI	443
Arabidopsis	QVALQVALPELDGMEPIVFAGRDPRTEGK.....SHALHKRVEQLCIRAIRWCELKRRKTKAEKKLAITVFSFPDPKGNVGTAAVYLVNFAS	526
Tobacco	QVALQVALPELDGMEPIVFAGRDPRTEGK.....SHALHKRVEQLCIRAIRWCELKRRKTKAEKKLAITVFSFPDPKGNVGTAAVYLVNFAS	527
Barley	QVALQVALPELDGMEPIVFAGRDPRSKPQLLRKSHALHKRVEQLCIRAIRWCELKRRKTKAEKKLAITVFSFPDPKGNVGTAAVYLVNFAS	526
Rice	QVALQVALPELDGMEPIVFAGRDPRTEGK.....SHALHKRVEQLCIRAIRWCELKRRKTKAEKKLAITVFSFPDPKGNVGTAAVYLVNFAS	532
Soybean	QVALQVALPELDGMEPIVFAGRDPRTEGK.....SHALHKRVEQLCIRAIRWCELKRRKTKAEKKLAITVFSFPDPKGNVGTAAVYLVNFAS	528
Arabidopsis	IYSVLRDLKRDGYNVEGLPEETAELIEEIHDKEAQFSSPNLNIAKMNVREYQDLTPYANALEENWGKPPGNLNSDGENLLVYKQYGN	616
Tobacco	IYSVLRDLKRDGYNVEGLPEETAELIEEIHDKEAQFSSPNLNIAKMNVREYQDLTPYATALEENWGKPPGNLNSDGENLLVYKQYGN	617
Barley	IYSVLRDLKRDGYNVEGLPEETAELIEEIHDKEAQFSSPNLNIAKMNVREYQDLTPYANALEENWGKPPGNLNSDGENLLVYKQYGN	616
Rice	IYSVLRDLKRDGYNVEGLPEETAELIEEIHDKEAQFSSPNLNIAKMNVREYQDLTPYANALEENWGKPPGNLNSDGENLLVYKQYGN	622
Soybean	IYSVMKELKRDGYNVEGLPEETAELIEEIHDKEAQFSSPNLNIAKMNVREYQDLTPYATALEENWGKPPGNLNSDGENLLVYKQYGN	618
Arabidopsis	VF1GVQPTFGYEGDPMRLFLSKSASPHHGFAAYSYVFEKIFKADAVLHFHGTGSLFEMPGKQVMSDADFSDSLIGNIPNYYVYAAANNSP	706
Tobacco	VF1GVQPTFGYEGDPMRLFLSKSASPHHGFAAYSYVFEKIFKADAVLHFHGTGSLFEMPGKQVMSDADFSDSLIGNIPNYYVYAAANNSP	707
Barley	VF1GVQPTFGYEGDPMRLFLSKSASPHHGFAAYSYVFEKIFKADAVLHFHGTGSLFEMPGKQVMSDADFSDSLIGNIPNYYVYAAANNSP	706
Rice	VF1GVQPTFGYEGDPMRLFLSKSASPHHGFAAYSYVFEKIFKADAVLHFHGTGSLFEMPGKQVMSDADFSDSLIGNIPNYYVYAAANNSP	712
Soybean	VF1GVQPTFGYEGDPMRLFLSKSASPHHGFAAYSYVFEKIFKADAVLHFHGTGSLFEMPGKQVMSDADFSDSLIGNIPNYYVYAAANNSP	708
Arabidopsis	EATI AKRRSYANTI SYLTPPAENAGLYKGLQKSELIS SYQSLKDTGRGQIVSSI I STAKQCNLDKDVLDLDEGEELSPKDRD SVVGKV	796
Tobacco	EATI AKRRSYANTI SYLTPPAENAGLYKGLQKSELIS SYQSLKDSGRGQIVSSI I STAKQCNLDKDVLDLDEGEELSPKDRD SVVGKV	797
Barley	EATI AKRRSYANTI SYLTPPAENAGLYKGLQKSELIS SYQSLKDTGRGQIVSSI I STAKQCNLDKDVLDLDEGEELPANERD LVVGKV	796
Rice	EATI AKRRSYANTI SYLTPPAENAGLYKGLQKSELIS SYQSLKDTGRGQIVSSI I STAKQCNLDKDVLDLDEGEELPNRDL LVVGKV	802
Soybean	EATI AKRRSYANTI SYLTPPAENAGLYKGLQKSELIS SYQSLKDTGRGQIVSSI I STAKQCNLDKDVLDLDEGEELIPKDRD LVVGKV	798
Arabidopsis	YSKIMEIESRLLPCLGHVIGEPSSAIEAVATLVNIAALDRPEDESILASPILAECVGREIEDVYRGSKGIILADVLLRQITEASRGAVS	886
Tobacco	YSKIMEIESRLLPCLGHVIGEPSSAIEAVATLVNIAALDRPEDETSALPSILAECVGREIEDVYRGSKGIILADVLLRQITEASRGAVS	887
Barley	YKGLMEIESRLLPCLGHVIGEPSSAIEAVATLVNIAALDRPEENITSLPGLIAATVGRITIEDVYRGSKGIILADVLLRQITEASRGAVS	886
Rice	YAKIMEIESRLLPCLGHVIGEPSSAIEAVATLVNIAALDRPEDEITYSLPNLIAQTVGRNIEDVYRGSKGIILADVLLRQITEASRGAVS	892
Soybean	YSKIMEIESRLLPCLGHVIGEPSSAIEAVATLVNIAALDRPEDESILASPILAECVGREIEDVYRGSKGIILADVLLRQITEASRGAVS	888
Arabidopsis	AFVEKTSINSGQVVDVTKLSLILGFGINPEWVYELNNTKHYRANRDKLRTVFLGCECLKLVVMDNLSLMOALEGKVVPEPGGGDPI	976
Tobacco	AFVEKTSINSGQVVDVTKLSLILGFGINPEWVYELNNTKHYRANRDKLRTVFLGCECLKLVVMDNLSLMOALEGKVVPEPGGGDPI	977
Barley	AFVEKTSINSGQVVDVTKLSLILGFGINPEWVYELNNTKHYRANRDKLRTVFLGCECLKLVVMDNLSLMOALEGKVVPEPGGGDPI	976
Rice	TFVEKTSINSGQVVDVTKLSLILGFGINPEWVYELNNTKHYRANRDKLRTVFLGCECLKLVVMDNLSLMOALEGKVVPEPGGGDPI	982
Soybean	AFVEKTSINSGQVVDVTKLSLILGFGINPEWVYELNNTKHYRANRDKLRTVFLGCECLKLVVMDNLSLMOALEGKVVPEPGGGDPI	978
Arabidopsis	RNPKVLPTEGKNIHALDPAIPTTAAAMSAKIVVERLLEKQKADNGGKYPETIALVLWGTDNIKTYGESLAQVLMWIGVPEVADTFGRVNR	1066
Tobacco	RNPKVLPTEGKNIHALDPAIPTTAAAVQSAKIVVERLLEKQKADNGGKYPETIALVLWGTDNIKTYGESLAQVLMWIGVPEVADTFGRVNR	1067
Barley	RNPKVLPTEGKNIHALDPAIPTTAAAMSAKIVVERLLEKQKADNGGKYPETIALVLWGTDNIKTYGESLAQVLMWIGVPEVADTFGRVNR	1066
Rice	RNPKVLPTEGKNIHALDPAIPTTAAALKSAKIVVERLLEKQKADNGGKYPETIALVLWGTDNIKTYGESLAQVLMWIGVPEVADTFGRVNR	1072
Soybean	RNPKVLPTEGKNIHALDPAIPTTAAAMSAKIVVDRLEKQKADNGGKYPETIALVLWGTDNIKTYGESLAQVLMWIGVPEVADTFGRVNR	1068
Arabidopsis	VEPVSLEELGRPRIDVWVNCSGVFRDLFINQMNLDRAVKMAELDEPEEQNYVRKHAEQAELGIDIREAATRVFSNAGSYSYSSINIL	1156
Tobacco	VEPVSLEELGRPRIDVWVNCSGVFRDLFINQMNLDRAVKMAELDEPEEQNYVRKHAEQAELGIDIREAATRVFSNAGSYSYSSINIL	1157
Barley	VEPVSLEELGRPRIDVWVNCSGVFRDLFINQMNLDRAVKMAELDEPEEQNYVRKHAEQAELGIDIREAATRVFSNAGSYSYSSINIL	1156
Rice	VEPVSLEELGRPRIDVWVNCSGVFRDLFINQMNLDRAVKMAELDEPEEQNYVRKHAEQAELGIDIREAATRVFSNAGSYSYSSINIL	1162
Soybean	VEPVSLEELGRPRIDVWVNCSGVFRDLFINQMNLDRAVKMAELDEPEEQNYVRKHAEQAELGIDIREAATRVFSNAGSYSYSSINIL	1158
Arabidopsis	AVENSSWVNDKQLQDMYLSRKSFAFDSDAPGAGMTEKRVFEMALS TADATFQNLDSSEISLTDVSHYFSDPTNLVQLRDKKPKSSAY	1246
Tobacco	AVENSSWVNDKQLQDMYLSRKSFAFDSDAPGAGMTEKRVFEMALS TADATFQNLDSSEISLTDVSHYFSDPTNLVQLRDKKPKSSAY	1247
Barley	AVENSSWVNDKQLQDMYLSRKSFAFDSDAPGAGMTEKRVFEMALS TADATFQNLDSSEISLTDVSHYFSDPTNLVQLRDKKPKSSAY	1246
Rice	AVENSSWVNDKQLQDMYLSRKSFAFDSDAPGAGMTEKRVFEMALS TADATFQNLDSSEISLTDVSHYFSDPTNLVQLRDKKPKSSAY	1252
Soybean	AVENSSWVNDKQLQDMYLSRKSFAFDSDAPGAGMTEKRVFEMALS TADATFQNLDSSEISLTDVSHYFSDPTNLVQLRDKKPKSSAY	1248
Arabidopsis	IADTTTANAQVRTLSETVRLDARTKLLNPKWYEGMSSGYEGVREIEKRLTNTVGSATSQGVNDNWYEEANSTFIODEEMLNRLMNTNE	1336
Tobacco	IADTTTANAQVRTLSETVRLDARTKLLNPKWYEGMLSTGYEGVREIEKRLTNTVGSATSQGVNDNWYEEANSTFIODEEMLNRLMNTNE	1337
Barley	IADTTTANAQVRTLSETVRLDARTKLLNPKWYEGMSSGYEGVREIEKRLTNTVGSATSQGVNDNWYEEANSTFIODEEMLNRLMNTNE	1336
Rice	IADTTTANAQVRTLSETVRLDARTKLLNPKWYEGMSSGYEGVREIEKRLTNTVGSATSQGVNDNWYEEANSTFIODEEMLNRLMNTNE	1342
Soybean	IADTTTANAQVRTLSETVRLDARTKLLNPKWYEGMLSTGYEGVREIEKRLTNTVGSATSQGVNDNWYEEANSTFIODEEMLNRLMNTNE	1338
Arabidopsis	NSFRKLLQTFLEANGRGYWETSANIEIKLKQLYSEVEDKIEGID	1380
Tobacco	NSFRKLLQTFLEANGRGYWETSANIEIKLKQLYSEVEDKIEGID	1381
Barley	NSFRKLLQTFLEANGRGYWETSANIEIKLKQLYSEVEDKIEGID	1380
Rice	NSFRKLLQTFLEANGRGYWETSANIEIKLKQLYSEVEDKIEGID	1386
Soybean	NSFRKLLQTFLEANGRGYWETSANIEIKLKQLYSEVEDKIEGID	1382

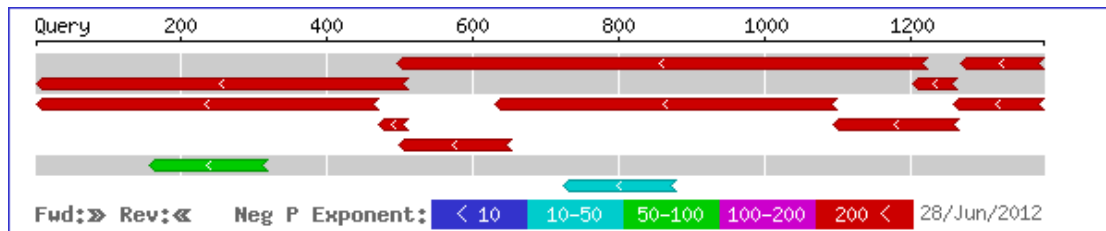
Supplementary Fig. 3 Alignment of the Amino Acid Sequence of Five Mg-Chelatase H Subunits (Identity = 89.30%).

Arabidopsis	MAMTPVASSSPVSTCRLFRCNLLPDLLPKPLFSLPKRNR IASCRFTVRA . . . SA . NATVE SPNGVPASTSDTDTETDTT	76
Tobacco	. . MGF CSTSTLPQTSLNSNSQSSFTFYLPKPCPILSSTYLRPKRLKFLRI . . . SA . TATIDSPNGAVAVVEPEKQPEKIS	74
Barley	. . . MAAMATALSTSLPH . LPPRRLP SHPVAALS LAPRGFRRRERAPARLA AVASA . SEVLDSTNGAAPAPTS PAPS GQK	74
Rice	. . . MAMATTALSASLPRLLPPRRRFPPTSSSSPSAASTSTRVVR LRAAAA SAPSEVLDSTNGAIPSGKGGG . . GQQ .	73
Soybean	. MGFALAYTASGCCSNLQFQSL LFAAASLRSKPCLSLCNSTYRPKRILQR . . . SP . IVGAQSENGALVTSEKPDNTY . . .	72
Arabidopsis	SYGRQFFPLAAVVGQEGIKTALLGAVDREIGGIAISGRRGTAKTVMARGLHEILPPIEVVVGSI SNADPACDEWEDDL	156
Tobacco	F . GRQYFPLAAVIGQDAIKTALLGAI DREIGGIAICGKRGTAKTLMARGLHAILPPIEVVVGSMANADPNCPDEWEDGL	153
Barley	Y . GREYFPLAAVVGQDAIKTSLLLGAI DREVGGIAISGKRGTAKTVMARGLHAILPPIEVVVGSIANADPNIEEWEEDHL	153
Rice	Y . GREYFPLAAVVGQDAIKTALLGAI DREIGGIAISGKRGTAKTVMARGLHAILPPIEVVVGSIANADPNYEEWEEDGL	152
Soybean	. . GRQYFPLAAVVGQDSIKTALLGAI DPGVGGIAISGKRGTAKTVMARGLHAILPPIEVVVGSIANADPTCEEWEEDGL	150
Arabidopsis	DERIEYNADNTIKTEIVKSPFIQIPLGVTE DRLIGSVDVEESVKRGTTFVFPGLLAEAHRGVLYVDEINLLDEGISNLLL	236
Tobacco	ADRAEYGS DGNKTKTQIVKSPFVQIPLGVTE DRLIGSVDVEESVKS GTFVFPGLLAEAHRGVLYVDEINLLDEGISNLLL	233
Barley	ADQVQYDADGNKCEIVKAPFVQIPLGVTE DRLIGSVDVEESVRS GTFVFPGLLAEAHRGVLYVDEINLLDDGISNLLL	233
Rice	ANQVQYDADGNKTEIKTSPFVQIPLGIT E DRLIGSVDVEASVKS GTFVFPGLLAEAHRGVLYVDEINLLDEGVSNLLL	232
Soybean	TECLEYDSTGNIKTRIIKSPFVQIPLGVTE DRLIGSVDVEESVKTGTTFVFPGLLAEAHRGVLYVDEINLLDEGISNLLL	230
Arabidopsis	NVLTDEGVNIVEREGISFRHPCKPLLIATYNPEEGAVREHLLDRVA INLSADLPMSEDRVA AVGIATQFQECNEVFRMV	316
Tobacco	NVLTDEGVNIVEREGISFRHPCKPLLIATYNPEEGAVREHLLDRVA INLSADLPMSEDRVA AVDTATRFQECNEVFKMV	313
Barley	NVLTDEGVNIVEREGISFRHPCKPLLIATYNPEEGSVREHLLDRVA INLSADLPLSFDRVA AVNIATQFQESSKDVFKMV	313
Rice	NVLTDEGVNIVEREGISFRHPCKPLLIATYNPEEGSVREHLLDRVA INLSADLPMSEDRVA AVDTATQFQESSKEVFKMV	312
Soybean	NVLTDEGVNIVEREGISFKHPCRP LLIATYNPEEGAVREHLLDRVA INLSADLPMSEFENRVA AVGIATEFQENSSQVFEMV	310
Arabidopsis	NEETE TAKTQIILAREYLKDVKISREQLKYLVL EAVRGGVQGHRAEL YAARVAKCLAAIEGREKVTIDDLRKA VELVILP	396
Tobacco	DEETDSAKTQIILAREYLKDV TISRDLKYLVM EAIRGGCQGHRAEL YAARVAKCLAAIDGREKVGVDLKKAVELVILP	393
Barley	EEETEVAKTQIILAREYLKDVAI STEQLKYLVM EAIRGGCQGHRAEL YAARVAKCLAAIEGREKVF AEDLKKAVELVILP	393
Rice	EEETEVAKTQIILAREYLKDVAI STEQLKYLVM EAIRGGCQGHRAEL YAARVAKCLAAIEGREK VELVILP	383
Soybean	EEETDNAKTQIILAREYLKDV TLNREQLKYLVI EALRGGCQGHRAEL FAARVAKCLAAIEGREKVYVDDLKKA VELVILP	390
Arabidopsis	RSLSLDETPPEQQN . QPPPPPPPPQN SESCEEENEEEQEEEEDE SNEENENEQQDQIPEEFIFDAEGGLVD	467
Tobacco	RSTIVENPPDQQNQPPPPPPPPQN QDSSEEQNEEEKEEEDQEDEKDRENEQQQPVDEFIFDAEGGLVD	465
Barley	RSIISDNPEQQN . QPPPPPPPPQNQD NAEDQDEKED EKD EEEKEDDE . ENKQDDQIPEEFIFDAEGGLVD	468
Rice	RSILSDNPEQQDQPPPPPPPPPPQDQSDQEDQDEDE EEDQEDDE . ENKQDDQIPEEFIFDAEGGLVD	453
Soybean	RSIVTENPPDQQN . QPPPPPPPPQN QESCEEQNEEE QEDDKDEENEQQEQLEPEEFIFDAEGGLVD	456
Arabidopsis	EKLLFFAQAQQRKRGKAGRAKNVIFSEDRGRYIKPMLPKGPFVKRLAVDATLRAAAPYQKLRRKDISGTRKVFVEKTDMR	547
Tobacco	EKLLFFAQAQQRKRGKAGRAKNVIFSEDRGRYIKPMLPKGPFVKRLAVDATLRAAAPYQKLRRAKDIQKTRKVFVEKTDMR	545
Barley	DKLLFFAQAQQRKRGKAGRAKNVIFSEDRGRYIKPMLPKGPFVRR LAVDATLRAAAPYQKLRRKSLDKTRKVFVEKTDMR	548
Rice	EKLLFFAQAQQRKRGKAGRAKNVIFSEDRGRYIGSMLPKGPIRR LAVDATLRAAAPYQKLRRKDRDKTRKVFVEKTDMR	533
Soybean	EKLLFFAQAQQRKRGKAGRAKNVIFSEDRGRYIKPMLPKGPFVKRLAVDATLRAAAPYQKLRRKDSGNRRKVFVEKTDMR	536
Arabidopsis	AKRMARKAGALVIFVVDASGSMALNRMQNAKGAALKLLAESYTSRDQVSIIPFRGDAAEVLLPPSRSIAMARNRLERLPC	627
Tobacco	AKRMARKAGALVIFVVDASGSMALNRMQNAKGAALKLLAESYTSRDQVCIIPFRGDAAEVLLPPSRSIAMARNRLERLPC	625
Barley	AKRMARKAGALVIFVVDASGSMALNRMQNAKGAALKLLAESYTSRDQVAIIPFRGDYAEVLLPPSRSIAMARKRLEKLP	628
Rice	AKRMARKAGALVIFVVDASGSMALNRMQNAKGAALKLLAESYTSRDQVSIIPFRGDFAEVLLPPSRSIAMARNRLEKLP	613
Soybean	AKRMARKAGALVIFVVDASGSMALNRMQNAKGAALKLLAESYTSRDQVSIIPFRGDAAEVLLPPSRSIAMARKRLEKLP	616
Arabidopsis	GGGSLAHLGTTAVRVGLNAEKSGDVGRIMIVAITDGRANITLKRSTDPESI . APDAPRPTSKELKDEILEVAGKIYKAG	706
Tobacco	GGGSLAHLGTTAVRVGMNAEKSGDVGRIMIVAITDGRANISLKRSTDP EAE . AS . DAPRPSSELKDEILEVAGKIYKI	703
Barley	GGGSLAHLGTTAVRVGLNAEKSGDVGRIMIVAITDGRANVSLKKSNDPEAAAAS . DAPRPSSTQELKDEILDVSAKIFKA	707
Rice	GGGSLAHLGTTAVRVGLNAEKSGDVGRIMIVAITDGRANVSLKKSNDPEAT . . S . DAPRPSSELKDEILEVAGKIYKA	690
Soybean	GGGSLAHLGTTAVRVGLNAEKSGDVGRIMIVAITDGRANISLKRSTDP EAA . AATDAPKPSAQELKDEILEVAGKIYKA	695
Arabidopsis	MSLLVIDTENKFVSTGFAKEIARVAQGYYYL PNASDAVISATTRDALSDLKNS	760
Tobacco	GMSLLVIDTENKFVSTGFAKEIARVAQGYYYL PNASDAVISAA TKDALSALKE	757
Barley	GMSLLVIDTENKFVSTGFAKEIARVAQGYYYL PNASDAVISAA TKTALADLKS	761
Rice	GISLLVIDTENKFVSTGFAKEIARVAQGYYYL PNASDAVISAA TKTALS DLKS	744
Soybean	GMSLLVIDTENKFVSTGFAKEIARVAQGYYYL PNASDAVISSATKEALSALKS	749

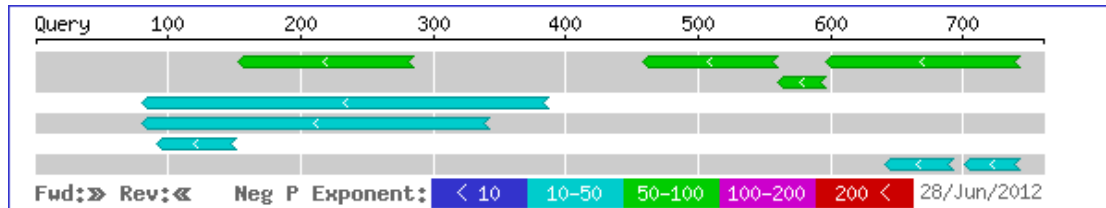
Supplementary Fig. 4 Alignment of the Amino Acid Sequence of Five Mg-Chelatase D Subunits (Identity = 82.94%).

Tabacco	..MASLLGTSSSAAAAI LASTPLSSRSCKPAVFSLFP.SSGQSQGRKFYGGIRVPVKGRSQFHVAISNVATEINLLKNR	77
Arabidopsis	..MASLLGTSSSAIWASPSLSSPSKPSSSPICFRPG.KLFGSKLNAGIQIRPKNRSRYHV.SVM..NVATEINSTEQV	74
Barley	MAMASPFSPASAA.AASPALFAVSTSRP.....LSLTTAATAAVSARAPSRTRSGLRGRFVAVC...NVAAPSAAEQET	70
Rice	..MASAFSPATAAPAASPALFSASTSRP.....LSL.TAAAAAVSARIPSRRGF..RRGRFTVC...NVAAPSATQOEA	66
Soybean	..MASALGTSSIAVLPSTRYF...SSSSKPSIHTLSL.TSGQNYGRKFYGGIGIHGIKGRAQLSVT...NVATEVNSVEQA	72
Tabacco	V.RNL.LEESQRPVYPFAAIVGQDEMCLCLLNVIDPKIGGVMIMGDRGTGKSTTVRSLVDLLPEIKVISGDFNFNSDPDD	155
Arabidopsis	V.GKFDSKKSARPVYPFAAIVGQDEMCLCLLNVIDPKIGGVMIMGDRGTGKSTTVRSLVDLLPEINVVAGDPYNSDPID	153
Barley	KPAAA.AKESQRPVYPFAAIVGQDEMCLCLLNVIDPKIGGVMIMGDRGTGKSTTVRSLVDLLPDISVVVGDPFNSDPYD	149
Rice	K.AAG.AKESQRPVYPFAAIVGQDEMCLCLLNVIDPKIGGVMIMGDRGTGKSTTVRSLVDLLPDIRVVVGDPFNSDPDD	144
Soybean	Q.SIA.SKESQRPVYPFAAIVGQDEMCLCLLNVIDPKIGGVMIMGDRGTGKSTTVRSLVDLLPEIKVVAGDPYNSDPQD	150
Tabacco	QEVMSAEVRDKLRSGQQLPISRKINMVDLPLGATEDRVCCTIDIEKALTEGVKAFEPGLLAKANRGILYVDEVNLLDDH	235
Arabidopsis	PEFMGVEVRERVEKGEQVPVIATKINMVDLPLGATEDRVCCTIDIEKALTEGVKAFEPGLLAKANRGILYVDEVNLLDDH	233
Barley	PEVMGPEVRDRLLKGESLPVTTTKITMVDLPLGATEDRVCCTIDIDKALTEGVKAFEPGLLAKANRGILYVDEVNLLDDH	229
Rice	PEVMGPEVRERVLEGEKLPVVTAKITMVDLPLGATEDRVCCTIDIEKALTEGVKAFEPGLLAKANRGILYVDEVNLLDDH	224
Soybean	PEFMGVEVRERVLQGEELSVLTKINMVDLPLGATEDRVCCTIDIEKALTEGVKAFEPGLLAKANRGILYVDEVNLLDDH	230
Tabacco	LVDVLLDSAASGWNTVEREGISISHPARFILIGSGNPEEGELRPQLLDRFGMHAQVGTVRDAELRVKIVEERARFDPK	315
Arabidopsis	LVDVLLDSAASGWNTVEREGISISHPARFILIGSGNPEEGELRPQLLDRFGMHAQVGTVRDADLRVKIVEERARFDSNPK	313
Barley	LVDVLLDSAASGWNTVEREGISISHPARFILIGSGNPEEGELRPQLLDRFGMHAQVGTVRDAELRVKIVEERARFDRDPK	309
Rice	LVDVLLDSAASGWNTVEREGISISHPARFILIGSGNPEEGELRPQLLDRFGMHAQVGTVRDAELRVKIVEERARFDRDPK	304
Soybean	LVDVLLDSAASGWNTVEREGISISHPARFILIGSGNPEEGELRPQLLDRFGMHAQVGTVRDAELRVKIVEERARFDPK	310
Tabacco	EFRESYKAEQEKLNQIDSARNALSAVTIDHDLRVKISKVCAELNVDGLRGDIVTNRAAKALAAALKGRDVTPEDIATVI	395
Arabidopsis	DFRDTYKTEQDKLQDQISTARANLSSVQIDRELKVKISRVCSSELNVDGLRGDIVTNRAAKALAAALKGRDVTPEDDVATVI	393
Barley	TFRQSYLEEQDKLQEQITSARSNLGSVQLDHDLRVKISQVCSSELNVDGLRGDIVTNRAAKALAAALKGRDVTVEDISTVI	389
Rice	AFRESYLEEQDKLQEQISSARSNLGAVQIDHDLRVKISKVCAELNVDGLRGDIVTNRAAKALAAALKGRDVTIVEDIATVI	384
Soybean	EFRDSYKAEQEKLQEQITSARSVLSVQIDQLKVKISKVCAELNVDGLRGDIVTNRAAKALAAALKGRDNVSAEDIATVI	390
Tabacco	PNCLRHRRLRKDPLESIDSGVLVVEKFYEVF	425
Arabidopsis	PNCLRHRRLRKDPLESIDSGVLVSEKFAEIF	423
Barley	PTVLRHRRLRKDPLESIDSGLLVVEKFYEVF	419
Rice	PNCLRHRRLRKDPLESIDSGLLVVEKFYEVF	414
Soybean	PNCLRHRRLRKDPLESIDSGLLVTEKFYEVF	420

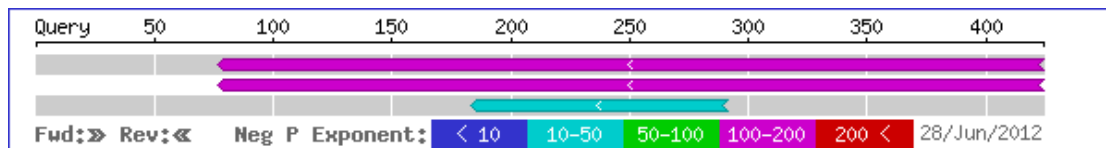
Supplementary Fig. 5 Alignment of the Amino Acid Sequence of Five Mg-Chelatase I Subunits (Identity = 82.74%).



1. Alignment summary of CHLH from *Arabidopsis thaliana* and *Nicotiana benthamiana*

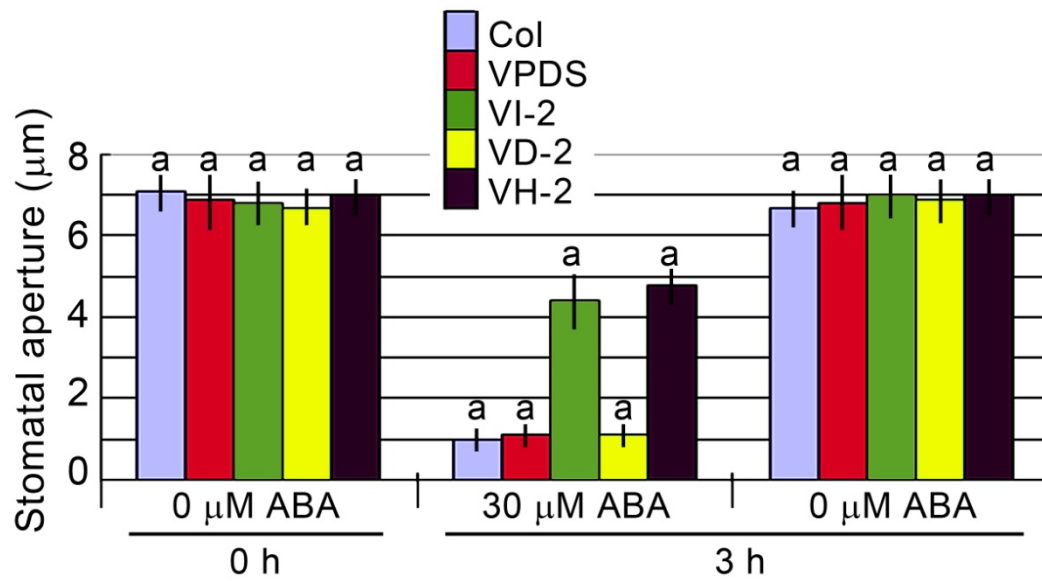


2. Alignment summary of CHLD from *Arabidopsis thaliana* and *Nicotiana benthamiana*



3. Alignment summary of CHLI from *Arabidopsis thaliana* and *Nicotiana benthamiana*

Supplementary Fig. 6 Alignment of the Amino Acid Sequence of Mg-Chelatase H, D and I Subunits of *Arabidopsis thaliana* and *Nicotiana benthamiana*.



Supplementary Fig. 7 ABA-induced stomatal closure in the VIGS transgenic tobacco leaves. WT, wild-type plants; VPDS, VI-2, VD-2 and VH-2, the same transgenic lines as described in Fig. 5a. Stomatal aperture was assayed in the ABA-free medium (0 µM ABA) and ABA-containing medium (30 µM). Values are the means \pm SE from three independent experiments and different letters indicate significant differences at $P < 0.05$ (Duncan's multiple range test) when comparing values within the same ABA concentration. $n = 60$ apertures per experiment.