

Appendix A Specific primers for PCR amplification

| Gene | Orientation ¹⁾ | Sequence (5'-3') |
|-----------------------------|---------------------------|--------------------------------|
| <i>PbATPase 1-Like (a)</i> | F | AGAATCGATAGGCAGAGATGGATGA |
| <i>PbATPase 1-Like (a)</i> | R | CGAGACTCGGAGACTCAGACA |
| <i>PbATPase 1-Like (b)</i> | F | ATGGTGGTGGCCAAGTCG |
| <i>PbATPase 1-Like (b)</i> | R | CTAGAGGGTGTAGTTTTGGTTGATG |
| <i>PbATPase 1-Like (c)</i> | F | ATGTGGAATCCTCTGTCCTGGGT |
| <i>PbATPase 1-Like (c)</i> | R | CTAGAGGGTGTAGTTTTGGT |
| <i>PbATPase 2-like</i> | F | ATGGTGTGGATTCATGGCAA |
| <i>PbATPase 2-like</i> | R | CCCAATTGTTAGTCTTTATTGAAATCA |
| <i>PbATPase 4</i> | F | CCACCATGGCCGGCGATAA |
| <i>PbATPase 4</i> | R | TCAAATGTATAATGCTGTTGAATT |
| <i>PbATPase 4-Like (a)</i> | F | TTAACTTGTGAAAAGATGGGGAGT |
| <i>PbATPase 4-Like (a)</i> | R | GGCCCTTTCTTTCCAGGTAGC |
| <i>PbATPase 4-Like (b)</i> | F | GACTCCTCCACCATGGGCAGC |
| <i>PbATPase 4-Like (b)</i> | R | TTCCCTTTTGAAGGCTCATC |
| <i>PbATPase 5-Like</i> | F | TTTGTCAATTGCCCTGGGGA |
| <i>PbATPase 5-Like</i> | R | TCAAACCGTATAATGTTGTTGGATTGTAT |
| <i>PbATPase 8</i> | F | ATGGCCAACATCTCCTTAGAAGACG |
| <i>PbATPase 8</i> | R | CTAAACAGTGTAGTGTGTTGGATGGTGTCA |
| <i>PbATPase 9</i> | F | ATGGCGGAAGGCAAAGCAATTA |
| <i>PbATPase 9</i> | R | CATGCTAATGCGCTAGTTGTCTT |
| <i>PbATPase 11</i> | F | ATGGGGGAGAAGCCTGAAG |
| <i>PbATPase 11</i> | R | TTAACTGTGTATGATTGCTGAATCG |
| <i>PbATPase 11-Like (a)</i> | F | ATGGGGGAGAAGCCTGAAGTATT |
| <i>PbATPase 11-Like (a)</i> | R | TCTTAACTGTGTATGATTGCTGAA |
| <i>PbATPase 11-Like (b)</i> | F | ATGGATGCCCTTGAGACTATTTTGAAG |
| <i>PbATPase 11-Like (b)</i> | R | CAAAATGGTAACAAATTGGAAGGAAACTA |
| <i>PbATPase 11-Like (c)</i> | F | ATGGATGCCCTTGAGACTATTTT |
| <i>PbATPase 11-Like (c)</i> | R | TTACGCTGCCTTCGGAAGC |

¹⁾The orientation of the primer compared to the gene is indicated as Forward (F) or Reverse (R).

Appendix B The P_{3A}-type ATPase genes in different plant species

| Species | Database | URL | ID |
|------------------------------|-----------|---------------------------------------------------------------------------------------------------------|----------------------|
| <i>Dianthus caryophyllus</i> | NCBI | http://www.ncbi.nlm.nih.gov | AMR43371.1 |
| | | ov | |
| <i>Populus trichocarpa</i> | NCBI | http://www.ncbi.nlm.nih.gov | XP_006369068.1 |
| | | ov | |
| <i>Salix purpurea</i> | Phytozome | https://phytozome.jgi.doe.gov/pz/portal.html | SapurV1A.0273s0110.1 |
| <i>Gossypium raimondii</i> | Phytozome | https://phytozome.jgi.doe.gov/pz/portal.html | Gorai.011G053900 |

| | | | |
|--------------------------------|-----------|---------------------------------------------------------------------------------------------------------|-------------------|
| <i>Eucalyptus grandis</i> | Phytozome | https://phytozome.jgi.doe.gov/pz/portal.html | Eucgr.I02171 |
| <i>Theobroma cacao</i> | NCBI | http://www.ncbi.nlm.nih.gov | EOY27421.1 |
| <i>Linum usitatissimum</i> | Phytozome | https://phytozome.jgi.doe.gov/pz/portal.html | Lus10037466 |
| <i>Spirodela polyrhiza</i> | Phytozome | https://phytozome.jgi.doe.gov/pz/portal.html | Spipo2G0033700 |
| <i>Musa acuminata</i> | NCBI | http://www.ncbi.nlm.nih.gov | XP_009386770.1 |
| <i>Setaria italica</i> | Phytozome | https://phytozome.jgi.doe.gov/pz/portal.html | Si034109 |
| <i>Brachypodium distachyon</i> | Phytozome | https://phytozome.jgi.doe.gov/pz/portal.html | Bradi1g72417 |
| <i>Eutrema salsugineum</i> | Phytozome | https://phytozome.jgi.doe.gov/pz/portal.html | Thhalv10006710m |
| <i>Brassica rapa</i> | NCBI | http://www.ncbi.nlm.nih.gov | XP_009110417.1 |
| <i>Arabidopsis thaliana</i> | NCBI | http://www.ncbi.nlm.nih.gov | NP_173169.2 |
| <i>Capsella rubella</i> | Phytozome | https://phytozome.jgi.doe.gov/pz/portal.html | Carubv10008225m |
| <i>Capsella grandiflora</i> | Phytozome | https://phytozome.jgi.doe.gov/pz/portal.html | Cagra.0824s0094.1 |
| <i>Glycine max</i> | NCBI | http://www.ncbi.nlm.nih.gov | XP_003521833.1 |
| <i>Fragaria vesca</i> | NCBI | http://www.ncbi.nlm.nih.gov | XP_004303775.1 |
| <i>Rosa hybrid cultivar</i> | NCBI | http://www.ncbi.nlm.nih.gov | AMR43370.1 |
| <i>Malus domestica</i> | Phytozome | https://phytozome.jgi.doe.gov/pz/portal.html | mdp0000303799 |
| <i>Malus domestica</i> | Phytozome | https://phytozome.jgi.doe.gov/pz/portal.html | mdp00003290422 |
| <i>Malus domestica</i> | NCBI | http://www.ncbi.nlm.nih.gov | XP_008341531.2 |
| <i>Citrus sinensis</i> | NCBI | http://www.ncbi.nlm.nih.gov | XP_006465725.1 |
| <i>Petunia hybrida</i> | NCBI | http://www.ncbi.nlm.nih.gov | ABC59935.1 |
| <i>Phoenix dactylifera</i> | NCBI | http://www.ncbi.nlm.nih.gov | XP_008783452.1 |

Appendix C The accession numbers of P_{3A}-ATPase genes in pear

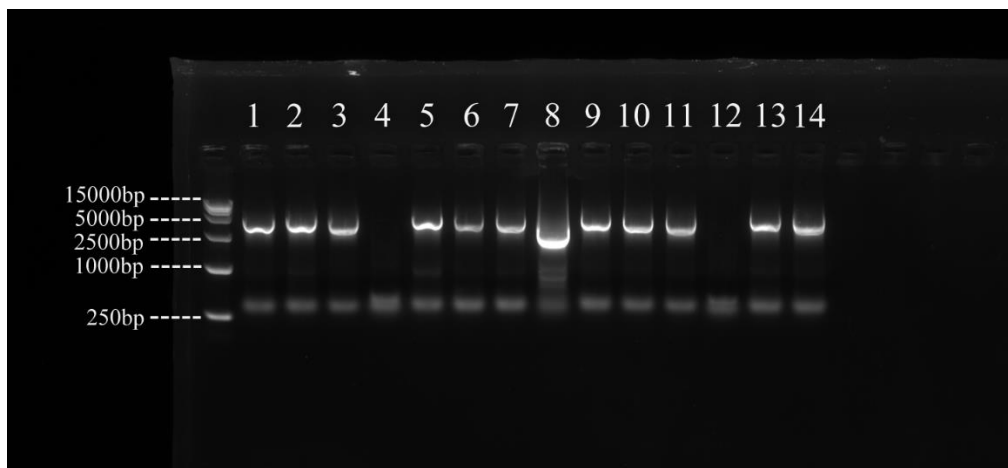
| Gene | Database | URL | ID |
|-----------------------------|----------|-----------------------------------------------------------------------|--------------|
| <i>PbATPase 1-Like (a)</i> | NCBI | http://www.ncbi.nlm.nih.gov | LOC103928497 |
| <i>PbATPase 1-Like (b)</i> | NCBI | http://www.ncbi.nlm.nih.gov | LOC103940029 |
| <i>PbATPase 1-Like (c)</i> | NCBI | http://www.ncbi.nlm.nih.gov | LOC103942434 |
| <i>PbATPase 2-like</i> | NCBI | http://www.ncbi.nlm.nih.gov | LOC103965264 |
| <i>PbATPase 4</i> | NCBI | http://www.ncbi.nlm.nih.gov | LOC103931136 |
| <i>PbATPase 4-Like (a)</i> | NCBI | http://www.ncbi.nlm.nih.gov | LOC103938711 |
| <i>PbATPase 4-Like (b)</i> | NCBI | http://www.ncbi.nlm.nih.gov | LOC103953576 |
| <i>PbATPase 5-Like</i> | NCBI | http://www.ncbi.nlm.nih.gov | LOC103957576 |
| <i>PbATPase 8</i> | NCBI | http://www.ncbi.nlm.nih.gov | LOC103955945 |
| <i>PbATPase 9</i> | NCBI | http://www.ncbi.nlm.nih.gov | LOC103927439 |
| <i>PbATPase 11</i> | NCBI | http://www.ncbi.nlm.nih.gov | LOC103958768 |
| <i>ATPase 11-Like (a)</i> | NCBI | http://www.ncbi.nlm.nih.gov | LOC103935396 |
| <i>PbATPase 11-Like (b)</i> | NCBI | http://www.ncbi.nlm.nih.gov | LOC103926618 |
| <i>PbATPase 11-Like (c)</i> | NCBI | http://www.ncbi.nlm.nih.gov | LOC103926622 |

Appendix D Specific primers for qRT-PCR

| Gene | Orientation ¹⁾ | Sequence (5'-3') |
|----------------------------|---------------------------|--------------------------|
| <i>PbATPase 1-Like (a)</i> | F | ATTGTCGCTCTGCCAGTTGA |
| <i>PbATPase 1-Like (a)</i> | R | GCATCATTAACGCCGTCACC |
| <i>PbATPase 1-Like (b)</i> | F | GTTTAAGCTCCGATGAACGGTT |
| <i>PbATPase 1-Like (b)</i> | R | GCAACGGCAATGATAGCTGC |
| <i>PbATPase 1-Like (c)</i> | F | GGTCTTCTGCCTCTCTTCGAC |
| <i>PbATPase 1-Like (c)</i> | R | ACCGATTGCAAGTTGGTCCC |
| <i>PbATPase 4</i> | F | TGAAGCGCTTGGAATAACA |
| <i>PbATPase 4</i> | R | AGCCGACATGTGAGTAAAAACA |
| <i>PbATPase 4-Like (a)</i> | F | TGTTGGAGAGCATTCTGTGC |
| <i>PbATPase 4-Like (a)</i> | R | AGGACATTGTTGGCCCCTT |
| <i>PbATPase 4-Like (b)</i> | F | CCTTGAAGAGTGAGAAGCGA |
| <i>PbATPase 4-Like (b)</i> | R | GGAGAAACCTCTGCCCAATATTTA |
| <i>PbATPase 5-Like</i> | F | ATCGAGTGAAGCCATCTCCA |
| <i>PbATPase 5-Like</i> | R | CGAAAAGAAGTCGGTATCTCTCA |
| <i>PbATPase 8</i> | F | CCAGGGCTGAGTGTGATTGT |
| <i>PbATPase 8</i> | R | AGCAACGAGCATGAATCCCA |
| <i>PbATPase 9</i> | F | AGCATGGGAATCCAGTGTTTCAT |
| <i>PbATPase 9</i> | R | TACAACCGATTCCAACCTTAGGT |

| | | |
|-----------------------------|---|---------------------------|
| <i>PbATPase 11</i> | F | TCCTAGTGTGCTGAGAGTAAAGACG |
| <i>PbATPase 11</i> | R | AAACGTAGACAACAGCTGATTGAAG |
| <i>PbATPase 11-Like (b)</i> | F | AAGAACATTCCTGAGAGGCACAC |
| <i>PbATPase 11-Like (b)</i> | R | AGCTGTGCAAAGGACTCGAC |
| <i>PbATPase 11-Like (c)</i> | F | CATCATGGCTGAAGAAGCCAG |
| <i>PbATPase 11-Like (c)</i> | R | TGCGGTTTCGTTTGTGAAGAG |
| <i>Actin</i> | F | ACAGTGTCTGGATTGGAGGGTC |
| <i>Actin</i> | R | CATTTGGAGAACTCAGAAGCACT |

¹⁾The orientation of the primer compared to the gene is indicated as Forward (F) or Reverse (R).



Appendix E The result of PCR amplification of P_{3A}-type ATPase genes in pear.

Serial numbers represent the different genes. 1: *PbATPase 1-Like (a)*; 2: *PbATPase 1-Like (b)*; 3: *PbATPase 1-Like (c)*; 4: *PbATPase 2-Like*; 5: *PbATPase 4*; 6: *PbATPase 4-Like (a)*; 7: *PbATPase 4-Like (b)*; 8: *PbATPase 5-Like*; 9: *PbATPase 8*; 10: *PbATPase 9*; 11: *PbATPase 11*; 12: *PbATPase 11-Like (a)*; 13: *PbATPase 11-Like (b)*; 14: *PbATPase 11-Like (c)*.



Appendix F GUS staining in pear fruit