

MiPG21-1 1 -----MSKLSVSCKFFIISFLTFLFQLTVEAYN-----  
 MiPG23-3 1 -----MENKTSYNLLLLLILASLNLAFLFSSWSASASSFN-----  
 MiPG14 1 ---MALLHPYASETFFSIIFIPFILLSYFCLSVKDTPTYDYHQEAYGYGHDSLAYPSHLTAI  
 MiPG69-1 1 ----MKLKIFTFMVLMSMAHCGSSQLSLKPRAFEYS-----  
 MiPG49 1 ---MARVFLLFSLILLLSYVSSFSLASVITCSGIVPLRYR-----  
 MiPG46-3 61 SVSYLPVVILLVLTLSGAARQNVKESDGHCKYARSLI EPR-----

MiPG21-1 28 -----VISFGAKPDGQTDSTQAFANAWESAC  
 MiPG23-3 34 -----VVSFGAKADGKSDSTKAFIDAWAQAC  
 MiPG14 58 EDAEFEEYLIKIMRKEILGSNVVGLFSTARNIVVDDFGAKGDGSTDDEAFKKAWEAC  
 MiPG69-1 34 -----VNVMNMGAVDGTDDSQAFKAWAAVC  
 MiPG49 37 -----NDTISITDFGGVGDGKTLNFKAFREAIYRIE  
 MiPG46-3 100 -----PHSVSLTEFGAVGDGKTLNIVAFQNAIFYLK

MiPG21-1 54 KSTRPATINVPKG--RFLIKPIYFNGTCN-NEIIFQINGTIVAPASYSSLG-DSGFWIIF  
 MiPG23-3 60 GSATAATVYVPKG--RFLLRNSVFAGQCKSTKITVRIDGTLVAPSDYNVIG--NSKYWLLF  
 MiPG14 118 SQG--AVLVVPGDKTYYLKPIRFSGPCKPN-IMVEIYGTLEASDSQSDYRKRDRKHWLLF  
 MiPG69-1 62 GAQKSEPLVVI PGKTFLLYPVTFRGPCCSSSVNIQI WGNIVAPEYSAWKGRDQVQIWLIF  
 MiPG49 68 RLRRRGGTLLYVPSGVYLTSEFNLTSHMTLYLARGAVIKATQD TDNWP LIAPLPSYGRGR  
 MiPG46-3 131 SFADKGAQLYVPPGRWL TGSFNLTSHLTLFLERGA VILGSRDYSHWEVVEPLPSYGRGI

MiPG21-1 110 YRVSG--LIVRG-----GTFDAKGAAYWDCR--KSGKSCPSLPRSVTFMES  
 MiPG23-3 117 QQVNT--VTING-----GILDGQGTGLWACK--NSGKSCPGGAT SISFMNS  
 MiPG14 174 DSVEN--LLVEGG-----GTINGNGRIWQNSCKVNKSLPCKDAPTALTFYRS  
 MiPG69-1 122 DSINW--LKIDGN-----GQIDGRGESWWRN--AYSYPNRP SALTFNNC  
 MiPG49 128 ELPGGRYMSFIHGDGLHDVVITGENGTIDGQGA IWWNMWR---QRTLPTFRPNLIEFINS  
 MiPG46-3 191 DLPGGRYRALINGN-----NLIDVGSVWWELEFN--SGDLKYSRPHLVEFTGS

MiPG21-1 152 SNVVVSRLKSLNSRYFHIAIDGCENITLEKLNISAPSWSPNTDGIHIQSSSGISITDSSI  
 MiPG23-3 159 NNIVINGLTSQNSQLYHIVFNGCANNVQM QGVRISASRTSPNTDGIHVQLSTSVSIYNTRI  
 MiPG14 220 KNLVVRNLNIQDSQQIHVSFQKSTNVMASNLMITAPADSPNTDGIHVNTQNI RITSSTI  
 MiPG69-1 162 NNLHVNGLHHVNSQRNHITVTGSKSVVLSQLTITAPDSSPNTDGI DLDQSSNVIVKDCFI  
 MiPG49 185 RSI IISNVIFQNSPFWNIHPVYCSNVVIRYV TILAPLDSFNITDGI DP DSSSNVCIEDSYI  
 MiPG46-3 236 NDVTISNLTFLNSPAWNIHPVYCSNVVQVQNTAYAPPESPFTCGVVPD S SEHVCI EKSN I

MiPG21-1 212 KTGDDCISLPGSKNLLIQRIACGPGHGISIGSLGDNAY-----EEGVENVTVSDS  
 MiPG23-3 219 ATGDDCVSVGPGTANLWIENVQCGPGHGISIGSLGKHLE-----EPGVQNVTVKTT  
 MiPG14 280 RTGDDCISIVGGSONVQAEITCGPGHGISIGSLGAKNS-----EGYVSGVTVNGA  
 MiPG69-1 222 GTGDDCIAVGTE SFNFTFNRI TCGPGHGISIGSLGARGT-----SARVQNILVYDS  
 MiPG49 245 STGDDLVAVKSGWDEYGIAYGRPSSGITIRRITG-SSPFAGI AVGSETSGGVENVLAENI  
 MiPG46-3 296 SMSYDAISLKSGWDEYGISYKATTKVHIREVQLQSSSGSLAFG SQMSGGISEILAENI

MiPG21-1 263 TISRAENGVRIKTWARSSNGFAKNINFQNIIMKNAYNPILIDQYYCPGHKGC PNQVIN--  
 MiPG23-3 270 TPTGTQNGVRIKSWGRPSNGFARNILFQHAVMSNVQNP I IDQNYCPDNINCPGRVSGVK  
 MiPG14 331 QISGTTNGVRIKTWQGGG--GTASNIKFQNIYMFNVSNPI I IDQNYCDQEEPCKEQSSAVQ  
 MiPG69-1 273 IFKGTNGVRIKTWQGGG--GSAKNITFDKIRLESVQNP I IDQYYCPHRN--CQNQTSAVR  
 MiPG49 304 NLYNVGVGIHVKTNMGRG--GFIRNITVSDVYMEGARKGIKLAGDVGDHPDENFNPNALPV  
 MiPG46-3 356 HSRNSLIGINLKTNRGRG--GYMKAIVVSDVEMENVQMALRV TGD FGLHPDDKFDPKALPV

**Supplementary Figure S6.** Sequence alignment of polygalacturonases that were modeled to obtain theoretical models, the exons were colored with different colors. MiPG21-1 and MiPG23-3 are from clade C, MiPG14 from clade B, MiPG69-1 from clade F; while MiPG46-3 and MiPG49 are from clade E.