

**Table S1.** Partial amino acid sequence alignment of *Solanum tuberosum* APs and *Arabidopsis thaliana* APs (with known function) and six reference APs. Sequences surrounding the first and second catalytic aspartate and the C-terminal side of the protease domain from A) Typical aspartic proteases; B) Nucelline-like; C) atypical aspartic proteases. The alignment was done using mafft [1] with default parameters with 100 maxiteration and it was visualized in Bioedit [2].

(a) Typical aspartic proteases

Protein ID	FIRST CATALYTIC ASPARTATE	SECOND CATALYTIC ASPARTATE	C-TERMINAL END
StAP3.1	IVYVKNYMDVQYFAEIGIGSPPOHFAV- VEDTASSNLWVPSSKC	GCPAIVDTGTSELAG- PTTILTQI	PLWVLGDVFLRAYHTVFD FGN--- LQVGFAESA---
StAP9.3	IVYIKNYQDVQYFAE- ISIGSPPOHETTVVEDTGSSNLWVPSSKC	GCPAIVDTGTAFIS- GPTTILTQI	PLW----- -----
Pro-Car-dosinA	VVALTNDRDTSYFGEI- GIGTPPOKETVIFDTGSSVLWVPSSKC	GCOAFADSGTSLSGP TAIVTQI	PLWILGDVFMRPYHTVFDYGN--- LLVGFAEAA---
StAP7.5	IIALKNYLDAQYFGEISIGSPPOKETVIFD TGSSNLWVPSAKC	GCSAIVADSGTSLLAG- PTTIITQI	PLWILGDVFMGRYHTVFDSEK--- MRVGFAEAA---
Phytop sin	IIVALK- NYMAQYFGEIGVGTPPOKETVIFDTGSS NLWVPSAKC	GCAIVADSGTSLLAG- PTAITTEI	PLWILGDVFMGPYHTVFDYGK--- LRIGFAKAA---
StAP2.4	IIVALK- NYMDAQYFGEIGVGTPPOKETVIFDTGSS NLWVPSAKC	GCSAIVADSGTSLLAG- PTTVITMI	PLWILGDVFMGRYHTVFDSEK--- LRVGFAEAA---
StAP2.2	IIVALK- NYMDAQYFGEIGVGTPPOKETVIFDTGSS NLWVPSSKC	GCSAIVADSGTSLLAG- PTTVITMI	PLWILGDI FMGRYHTVFDYGK--- LRVGFAEAA---
StAP1.6	IIVPLKNYLDAQYFGEIGIGSPPOKFKII- FDTGSSNLWVPSSKC	GCAIVDSGTSLLAG- PTTIVTQI	PLWILGDVFMGPYHTVFDYGK--- SQVGFAEAA---
StAP3	IIVPLKNYLDAQYFGEI- GIGSPPOKFKVIFDTGSSNLWVPSSKC	GCAIVDSGTSLLAG- PTTIVAQI	PLWILGDVFMGPYHTVFDYGK--- SQVGFAEVHNSL

(b) Nucelline-like aspartic proteases.

Protein ID	FIRST CATALYTIC ASPARTATE	SECOND CATALYTIC ASPARTATE	C-TERMINAL END
StAP6.5	GNIHSEGLYYTYMLVGNPPR-- PYFLDIDTGS DLMWIQCDAP	VFD SGSTY- TYFTDQAY	ILGDISLRGQLFVYD NVNQKIGWIRSNCE----- R
NP_564539.1_AP CB1	GNVYPDGLYYTRILVVGK- PEDGQYHL DDTGS ELTWIQCDAP	LEDTGSSYT- YFPNQAY	ILGDISMRGHLIVYD NVKRRIGWMKSDCV----- R
StAP6.3	GNVYPICGYQVTLVVGQPPK--PYFFD- IDTGS DLTWLQCDAP	VFD SGSTFT- YFSSKAY	LIGDISLLDKMVYD NEKKQIGWL PANCK----- R
StAP6.1	GNVYPKGYQVTLVVGQPPK-- PYFLDIDTGS DLTWLQCDAP	ILD SGSTFT- YFNSKAY	LIGDISMLDKLVIYD NEKKQIGWAPANCN----- R
StAP6.2	GNVYPLGYYYVQLNIGQPSR-- PEFLDPDTGS DLTWLQCDAP	VFD SGSS- FSYLNHAHY	LIGDISMQDKMVIYD NEKQAIGWTSANCD----- R
Nucellin	GNVYPVGHFYATLNIGEPAK-- PYFLDVIDTGS NL TWLECHHP	VFD SGSTY- THVPAQIY	LIGAVTMQDLFVIYD NEKKQLGWVRAQCD----- R
OsAP2	GNVYPIGHFVETMNI SDPAK-- PYFLDIDTGS TL TWLQCDYP	IFD SGATY- TYFALQPY	LIGGITMLDQMVYD SERSLLGWVNYQCD----- R
StAP1.5	DLLINGYYTTHIWI GTTPQ-- KFALIVDTGSTVTVVPCSS-	ILD SGTAY LPEAVF	LLGGIVVRNTLVTVYDRENERIGFWKTNCS- ELWDR

(c) Atypical aspartic proteases

Protein ID	FIRST CATALYTIC ASPARTATE	SECOND CATALYTIC ASPARTATE	C-TERMINAL END
StAP1.3	EYFTRIGVGTPPK- YVYVLDITGS DVVWIQCS	-AGDGGVIVDSGTSVTRL- TRPAVALRDSFR	SGLSIIIGNIQQQGFRVVDLAGSRLG- FAPRGCA--

StAP1 0.1	EYFTRIGIGTK-YVYL- VLDTGSDIWIQCLP	-EGNGGVIVDSGTSVTRL- TRPGYIAVRDAFR	GGLSIIIGNIQQQGFRVVFEDLAGSRIG- FAPRGCSY-
StAP6. 6	EYFARLGVGEPAK- EFYMAIDTGS DINWLOCEP	-NGRGGIIVDSGTAVTRLQS- SAYNAIRDTFV	ESMSIICNVQQQGTRVSYDLT- NNLVGFSLDKC---
StAP3. 5	EYFTRIGLGQPVK- EYYMVLDTGSDITWVQCEP	-SGSGGIIVDSG- TAVTRLKSTAVNTLRDSFV	GSLSIICNVQQQGTRVSYDLANNLVGE- SPDKC---
StAP2. 1	EYFVRIGVGSPVR- QQYMLIDAGSDIWWVQCQP	-EGDGGVVMDTGTAVTRL- PQEAYVAFRDAFA	TRLSIICNVQQEGIQI- SIDGANGFVGFGNIC---
StAP4. 1	EYFVRIGVGSPAK- NQYMLDSGSDIWWVQCQP	-LGDGGVVMDTG- TAVTRLPSEAYVAFRDAFI	SKLSIICNVQQEGI- QISFDGANGFVGFGNIC---
StAP5. 6	EFLMQISIGSPSE-SYNAIM- DTGSDLIWTQCKP	-DGTGGMIL- IDSGTTITYLEESAFSLLKKEF S	SGMSIFCNVQQQNMVI- HDLDKETLSEVPTQCDKL
Ne- pen- thesinI	EYLMNISIGTEAQ-PFSAIM- DTGSDLIWTQCKP	-NGTGGIILIDSGTTLTY- FVNNAYQSVRQEFI	QGMSIFGNVQQQNMVLVYDTGNSVVSFAS AQCAS
StAP7. 4	EYFMDVFGVTPPK- HFSLILDTGSDINWLOQVCP	-EGVGGTIIDSGTTLTY- FAEPAYEIIKEAFV	SALSIIICNVQQQNFHLYDTKRS- RLGYAPTRCADA
StAP5. 2	EYFMDVFGVTPPK- HFSLILDTGSDINWLOQVCP	-QGVGGTIIDSGTTLTY- FIEPAYEIIKEAFV	SAMSIICNVQQQNFHLYDTKRS- RLGYAPTKCADA
StAP1. 1	EYLMRYSIGTTPPV- HTLGVAIDTGS DITWTOCLP	--GEGNIILIDSGTVLTLF- STEINVKLES MVK	YGGQIFCNIAQMNFVGYDLK- NKRVSFKATDCSK-
NP_19 8319	EYLMNVSIGTTPPF- PIMAIADTGS DILWTOCAP	--SEGNIILIDSGTTLTL- LLPTEFYSELEDAVA	PSFSIYCINVAQ- MNFLVGYDTVSKTVSEKPTDCAKM
StAP8. 10	DYLMKIIAIGTTPR- KTYAILDTGS EITWIOCKP	DEDLGNIIIDSGTTLTL- PENFYNKFESILV	GQYGVYCNLAQMN- FLIGYDLVNRKLSFLPSDCTKH
StAP8. 3	EYLMKLSIGTTPPV- EIVAIAIDTGS DITWTOCKP	GGEEGNIILIDSGTTLTL- FLPNDFYSSLESTLV	----- -----
StAP8. 4	EYLMKLSIGTTPPV- EIVAIAIDTGS DITWTOCMP	DGQAGNIILIDSGTTLTL- PNDFYSNLESTLV	DEIAIFGNLAQGNFLIEYDL- VANKISFQPTDCTKY
StAP8. 1	---MKISIGTTPPI- DIFAFADTGS DITWTOCEP	--PQGNIIIDSGTTLTL- LVPVDFYAKLEKTLV	EEVSIILGNLAQMNLLIGFDL- VANKVSEFLPTDCTKH
StAP8. 6	EFLMKISIGTTPPI-DTFVI- ADTGS DITWTOCKP	GYDRGNIILIDSGTTLTYVPDVF YLNLESLLI	NQISILGNLAQANFLIGFDLEANK- MSEKPTDCTKY
StAP8. 5	EFLMKISIGTTPPI-DTFVI- ADTGS DITWTOCEP	GDDLGNIL- VIDSGTTLTYVPDGFYLN- LESLLM	NQISILGNLAQAN- FLIGYDLKAYKVSSEKPTDCTKY
StAP8. 2	EYLMKISIGTTPPI-ETLVI- ADTGS DITWTOCKP	GYDRGNIILIDSGTTLTYVPDGF YLNLESLLM	NQISILGNLAQANFLIGYDL- KANRVSEKRTDCTKY
StAP1. 2	VYLTKISIGTKPS- AKLVAVDTGSDIWIQCEP	-HKGGKIIIDSGTTFITFLPTH- MYSEMETIMK	KHLPITCNIAQTNFFVAYDLD- NKTVSEKPKQICAKL
StAP3. 4	NYIVTVTLG--GR- NMTVIVDTGS DITWTOCQP	--GKSGFLIDSGTIVTRL- PPSIYKAVKAEFL	GEIGIICNFQQRNTRVYDTKQSQVG- FAKETCSFM

StAP6. 4	NYIVTVTLG--GR- NTTVVDTGSDLTWVQCQP	--GKSGMVIDSGTVITRL- PPTIYKAVKAEFL	DEIGIIGNYQQKNTRVIYDIKQSQVG- FAKETCSF-
NP_56 5219	NYIVTVELG--GK-NMSLIV- DTGSDLTWVQCQP	--GR-GILIDSGTVITRL- PPSIYKAVKIEFL	NEVGLICNYQQKNQRVI- YD TTQERLGIVGENCRV-
StAP8. 7	NYIVTIGIGTPKK-DLT- LIFDTGSDLTWTQCEP	--KNAG- TIIDSGTVITRLPSTAYANMRA TFR	DSIGIFGN- TQQQTMEIVYDVAGEKLGFGYGGCT--
StAP5. 1	QYFVDLRLGTPPQ- RLLLVADTGSDELVWVSCSA	-LGNGGTVMDSGTTLT- FLAEPAYRRIVQAFK	SGFSVIGNLMQQGFMFEFDRDQSRIGFSR HGCG--
StAP1 2.1	NYVVRVKMGTPGQ- QMVMVLDTSIDAEVPCGG	-NTGAG- TVIDSGTVITRFVQPAYEAI RD EFR	SVLNVIANLQQQNLRLIM- FDTANSRVLGIAHEVCN--
StAP4. 4	NYVVRAKIGTTPGQ-- LMFMVLDTSSDTAWVPCSG	-NTGAGTVIDSGTVITRFVE- PIYNATRDEFR	SVLNVIANLQQQNLRLIFDTANSRLGI- ARELCN--
NP_56 3851A ED3	NYVVRAKIGTTPGQ-- LMFMVLDTSIDAVWLPCSG	-NSGAGTVIDSGTVITRF A- QPVYEAIRDEFR	AVLNVIANLQQQNL- RLIFDVPNSRLGIAPEPCN--
StAP1. 4	TVIVKAKIGTTPQ--TLLVALD- NSNDFSWFPCGG	-NTGAGTVIDSGTVITRFIVE- PAYTAVRNEFR	SVLNV I- ASWQQQNRRLIFDVPNSRVGVARETCS--
NP_18 7876N ANA	QYFTEIRVGTPEAK-- KFRVVDTGSELTWVNCRY	-TSGGGTVIDSGTSLT- LLADAAYKQVVTGLA	PATNVIGNIMQQNYLWEEFDL- MASTLSFAPSACT--
StAP6. 7	GYSIALSFGTTPPQ--KIPFIM- DTGSNFVWFPCCT	-NGNGGSIVDSGTT- FTFMNRGVTEPVLDAFV	GPSIILGNFQMQNYLVEFDLKD- NEKFGEKQMQCK--
StAP1 1.3	GYSITLFPFGTTPPQ--- MPFVMDTGSSSFVWFPC TK	-KGNGGTIVDSGTT- FTFLNHDIEVPVMNAFV	GPSIILGNFQMQNFVEFDLKNMFG- FRDQVCK--
StAP8. 11	DYTLSESLGSQ---- TISLYMDTGSDVWVLPCHP	-RGNGGMVVDSGTTF T- MLPLKFYETVVTEFV	GPAGILGNFYQQGFVVYDLEKKRVG- FAKRKCA--
StAP9. 1	TLTVSLSVGTPPQ-- NVTMVLDTGSELSWLHSN-	- TGAGQTMVDSGTQFTFL LGPAY TALRSEFL	IEAYIIGHHHQQNVWVEYDLEKSRI G- FAQVQC NIA (8)
NP195 839PC SC1	TLTVTLTVGTTPQ-- NISMVLDTGSELSWLRCN-	- TGAGQTMVDSGTQFTFL LGPVY TALRSHFL	MEAYVICHHHQQNMWVEFDLQRS- RIGLAPVECDVS (8)
StAP2. 3	SLTVSLSIGSPPQ-- QVVMVLDTGSELSWLHCK-	- TGAGQTMVDSGTQFTYLLGPAY TALKNEFI	VAAYII- GHHHQQNFWMVEFDLANSRVGLAQVS- CELA (8)
StAP1 1.1	ALIVTLPIGTTPQ-- DQQMVLDTGSQLSWIQCN-	- GGSGQTMIDSGTQYTFLLVEEAY SKVRDEVV	IASNIIICNFHQQLNWVEFDLS- NKRVGFGKVECK---
StAP5. 3	----- MVLDTGSQLSWIQCH-	-GGSGQTVDSGTEY- TFLVEEAYNKVREEIV	IASNIIICNFHQQLNWVEFDLRN- RRVGF GKGECSMQV
StAP7. 1	EYVASFLIGTQMI-- KNYLLLDTGSDLTWVQC GP	-MMNGGMFVDTGTS	SERSVLGMTQLQGVGLT FDTISSTLSFD- IDACD--

StAP7. 2	<div> <div>EYIAT-</div> <div>FNLGTDHDKFKRYLLVDTGSDLV</div> <div>WVQC</div> <div>GP</div> </div>	<div> <div>-AGDGGVIVDSGTSVTRL-</div> <div>TRPAYVALRDSFR</div> </div>	<div> <div>NPVTIIIGSYQLQGVGLTFD</div> <div>TATDTLSFD-</div> <div>IDACGAD</div> </div>
StAP7. 3	<div> <div>EYVATFTIGAEET--</div> <div>KSFLLIDTGSDLVWQCKP</div> </div>	<div> <div>-EGNGGVIVDSGTSVTRL-</div> <div>TRPGYIAVRDAFR</div> </div>	<div> <div>QNVATIGNHQLQGVGLTFD</div> <div>TGTD-</div> <div>TLSEDLDA</div> <div>---</div> </div>
StAP8. 9	<div> <div>GYTVKIGLGTGRQ--</div> <div>NFELMFDTGSPATWVRCKS</div> </div>	<div> <div>-IGNGGVIVDSGTSVTRLIR-</div> <div>PAYIAMRDAFR</div> </div>	<div> <div>DNLSIIGSVQQRGMNVIYDLKQKRIGFG-</div> <div>TNCP</div> <div>TY</div> </div>
StAP8. 8	<div> <div>LFTVKISLGSPQQ--YYSLIV-</div> <div>DTGSRWTWVR</div> <div>CRF</div> </div>	<div> <div>-TGNGGVIVDSGTSVTRL-</div> <div>TQPAYVALRDAFR</div> </div>	<div> <div>ESYSIIGIVQQRGFNVLYDLEWKTIGFG-</div> <div>TNCT--</div> </div>
StAP1 1.2	<div> <div>LYFTRVQLGSPPK--</div> <div>EFYVQIDTGSDLVWVSCAS</div> </div>	<div> <div>-NGRGGIIVDSGTAVTRLQS-</div> <div>SAYNALRDTFV</div> </div>	<div> <div>QGLTILGDLVLKDKIIVYDLAQQRIG-</div> <div>WANYDCSQA (53)</div> </div>
StAP1 0.2	<div> <div>FYYTKVQLGSPPR--</div> <div>EYNVQIDTGSDILWVTCGS</div> </div>	<div> <div>-SGSGGVILDCG-</div> <div>TAVTRLQQTAYNSLRDAFL</div> </div>	<div> <div>LGLTILGDLVLKDKIIVYDLARQRIG-</div> <div>WAEYDCSSP (65)</div> </div>
StAP9. 2	<div> <div>LYFTKVRIGTTPR--</div> <div>EYNVQIDTGSDILWVTCSS</div> </div>	<div> <div>-SGSGGIITIDSG-</div> <div>TAVTRLQTEIYNLSLRDSFV</div> </div>	<div> <div>QGVITILGDLVLKDKIIVYDLARQRIG-</div> <div>WTDYDCSSS (53)</div> </div>
StAP1 0.3	<div> <div>LYYTKVKGSPPR--</div> <div>EYNLLIDTGSEISWIACSS</div> </div>	<div> <div>-LGDGGVIMDTG-</div> <div>TAVTRLPSSEAYVAFRDAFI</div> </div>	<div> <div>PSLTVLGDIALRDKSIVYDLAHQRIG-</div> <div>WADHDCSLP (34)</div> </div>
StAP3. 3	<div> <div>LYFTKLSIGTTPSK--DY-</div> <div>HVQVDTGSDILWVNCAG</div> </div>	<div> <div>-DGTGGM-</div> <div>IDSGTTITYLEETAFFKVLKEEF</div> <div>T</div> </div>	<div> <div>DELYLLGDLVLSNKLIVLYDLEKKTL-</div> <div>GWTDYDCSSN (42)</div> </div>
StAP4. 2	<div> <div>LYYTKLTIIGTTPSK--DY-</div> <div>HVQVDTGSDILWVNCAG</div> </div>	<div> <div>-NGTGGIIDSGTTITY-</div> <div>FVNNAYQSVRQEFI</div> </div>	<div> <div>KEITLLGDLVLSNKLIVLYDLENQSIG-</div> <div>WTEYNYI--</div> </div>
StAP5. 5	<div> <div>LYYTKISIGTTPSR--</div> <div>DFHVQVDTGSDILWVNCAS</div> </div>	<div> <div>-EGVGGTIDSGTTLSY-</div> <div>FAEPAYEIIKEAFV</div> </div>	<div> <div>SEITLLGDLALSNNKLIVLYDIENQITIG-</div> <div>WTEYDCSST (47)</div> </div>
StAP5. 4	<div> <div>LYFAEIGIGTTPN--</div> <div>NYEVQVDTGSDIMWVNCA</div> </div>	<div> <div>--GEGNIIDSGTVLTTLF-</div> <div>STEINVKLES</div> <div>SMVK</div> </div>	<div> <div>WNLIIVFGDLVLSNRLIVLYDLENQAIG-</div> <div>WTEYNCSN (46)</div> </div>
StAP9. 4	<div> <div>LYYAKIGIGTTPSN--</div> <div>GYVQVDTGSDIMWVNCVG</div> </div>	<div> <div>--GEGNIVIDSGTTLT-</div> <div>LLPSNFYELLESVVA</div> </div>	<div> <div>WNLTIVFGDLVLSNKLIVLYDLEKQAIG-</div> <div>WTEYNCSSS (46)</div> </div>
StAP2. 6	<div> <div>LYYANVTVGSPGL--</div> <div>SFLVALDTGSDLEFWLPCD-</div> </div>	<div> <div>DEDLGNIIIDSGTTLTTL-</div> <div>PENFYNKFESILV</div> </div>	<div> <div>--VNIIGNFMTGYRVLYDREKMVL-</div> <div>GWKASDCYDS (84)</div> </div>
StAP3. 2	<div> <div>LYYANVTVGTPGL--</div> <div>SFLVALDTGSDLEFWLPCN-</div> </div>	<div> <div>GGEEGNIIDSGTTLT-</div> <div>FLPNDFYSSLESTLV</div> </div>	<div> <div>--VNIIGNFMTGYQVLYDREKMVL-</div> <div>GWKPSDCYDS (80)</div> </div>
StAP2. 5	<div> <div>LYYTVTLGTPEGL--</div> <div>KFLVALDTGSDLEFWVPCE-</div> </div>	<div> <div>GDDLGN-</div> <div>VIDSGTTLTYVPDGFYLN-</div> <div>LESLLM</div> </div>	<div> <div>--LNIIGNFMTGYRFVLYDREKIIL-</div> <div>GWKKFDCYDY (69)</div> </div>
StAP4. 3	<div> <div>LHYMWVDIGTPNV--SFLVAL-</div> <div>DAGSDLEFWVPCE-</div> </div>	<div> <div>SKRTGNIIDSGTTLT-</div> <div>LLDSGFYDDFGTAVE</div> </div>	<div> <div>-EIGTIGNFMTGYRMVLYDRENKL-</div> <div>GWSRSDCEDL (81)</div> </div>
StAP0. 1	<div> <div>LHYVVIDIGTPNA--SFLVAL-</div> <div>DAGSDLEFWLPCN-</div> </div>	<div> <div>--LEGNIVIDSGTTLTY-</div> <div>FPVSYCNLVRQAVE</div> </div>	<div> <div>-----</div> <div>-----</div> </div>