

A versatile family 3 glycoside hydrolase from *Bifidobacterium adolescentis* hydrolyzes β -glucosides of the *Fusarium* mycotoxins deoxynivalenol, nivalenol and HT-2 toxin in cereal matrix

Supplemental Material

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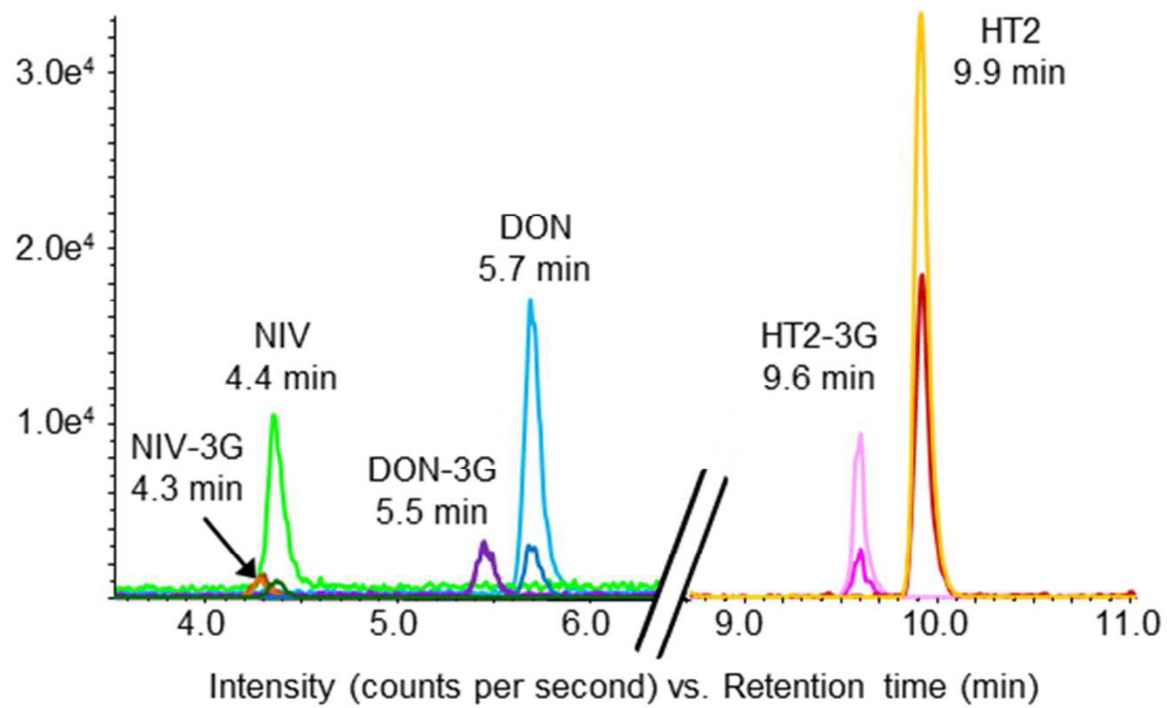
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Supplemental Table S1. Effect of deoxynivalenol (12 mM), EDTA (10 mM) and several salts (100 mM) on the activities of the GH3 glycosidases from *Lactobacillus brevis* (*LbBgl*) and *Bifidobacterium adolescentis* (*BaBgl*) determined with pNP- β -D-glucopyranoside at 37°C and pH 7.0 (100 mM Tris/Cl). All values represent the mean values of triplicate determination \pm standard deviation

Compound	Relative enzyme activity (%)	
	<i>LbBgl</i>	<i>BaBgl</i>
Control	100 \pm 5	100 \pm 1
Deoxynivalenol	99 \pm 1	98 \pm 1
EDTA	106 \pm 4	97 \pm 2
NaCl	101 \pm 1	90 \pm 2
KCl	109 \pm 1	93 \pm 3
CaCl ₂	107 \pm 3	68 \pm 1
MgCl ₂	107 \pm 2	75 \pm 1
MgSO ₄	103 \pm 3	100 \pm 0
K ₂ SO ₄	118 \pm 2	112 \pm 3
MnCl ₂	87 \pm 2	67 \pm 4
MnSO ₄	72 \pm 1	60 \pm 2



Supplemental Figure S1. Overlay of extracted ion chromatograms of the relevant mass transitions of a standard containing $300 \mu\text{g l}^{-1}$ of each substance. NIV – nivalenol, NIV-3G – NIV-3-*O*- β -D-glucoside, DON – deoxynivalenol, DON-3G – DON-3-*O*- β -D-glucoside, HT2 – HT-2 toxin, HT2-3G – HT2-3-*O*- β -D-glucoside

GH3-N →

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LbBg1 : -----MDIERTIAELTPEKAAALVSG-----KNNWY---LAA---VD----- : 31
BaBg1 : -----MSENTYPSVNDLIEKASLTSG-----GDAWH---LQG---VE----- : 33
TnBg13B : -----MEKVNEITLSQLTIEKVKLVVGVGLPGLF-----GNPHSRVAGAGE---THP---VP----- : 47
KmBg1I : -----MSKFDVEQLISELNQDEKISLLSA-----VDFWH---TKK---IE----- : 34
HjCe13A : -----VVPPAGTPWGTAYDKAKAAAKLNQDKVGVISGV-----GWNGGPCVGN---TSP---AS----- : 50
AaBg11 : -----DELAFSPFPYPSPWANGQGEWAEAYQRAVALYSQMTIDEKVNLTGTG-----GWELEKCVGQ---TGG---VP----- : 62
AnBg11 : -----MRFTLIEAVALTAVSLASADELAYSPYPSPWANGQGDWAQYRAVDIYSQMTIDEKVNLTGTG-----GWELEKCVGQ---TGG---VP----- : 81
BAD_1197 : MSSCGCAYDILKYQLVIKGNRFNEESEQSMTEETTENTVNLPIYRNPKLPTEERIALDGRMTEKVKVQMMQLDARSGDLD---DLIVNKHVGSILH---TSP---SDLPKAVETVNAKT--- : 110
TmXloA : -----MELYRDPSPPIEVRVRLDLSRMTIEKVAQLGVSVMGYELIDRKGFSREKA-----KELLKNGIGQITRPGGSTN-----TEPQEAALVNEIQRFL : 87
StBx1I : -----MTTAPWQDPALPATARVDDLARMTEKTKTAQLYGVVVGASTDGDGVAPHQEMNTDYDWDLELITRGLGLQTRSFGLAP-----VDPAVGARALANAQRRI : 96
AnX1nD : -----MAHSMSRPVAATAAALLA-LALPOLAQAQNTSYVDYNIENAPDLYPLCIETIPLSFDCQNGPLRSHLICDEIATPYDRAASLISLFTDELIAANTGTG : 99

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LbBg1 : ---RIDLPAL-MMTGPSGLRKRQTN--SGTTNINDAIQAITYPAALASASVWNESLHQHGEHIGIARA-----EQVSLLLGEGVNV-KISPLGGRNFYLAEDPLVA---CKLGSAYVQGVQSQ-----HWVGA : 147
BaBg1 : ---AKGLPGY-MITGPHCLRKNSNSATTGEVDLNNVSPAICFPFAAGLSSSWNPELHQVGEAMAEICIQ-----EKVAVILGEGVNV-KRNPGLGRCRFYWSEDPYLA---CHEAVGIVAGVQSK-----CVGTS : 151
TnBg13B : ---RVGLPAF-VLADGPAGLRINPT---RENDENTYYTAFPPVEIMLASVWNRRELLIEEVKAMGEVRE-----YGVDVLLAPAMN-HRNPGLGRNFYWSEDPVLS---EMASSFVKGVQSQ-----GVGAC : 161
KmBg1I : ---RLGLPAV-RVSGPENGIRGTFK---FDGVPSCGFENGTGLASTDRDLLETAGKLMAKISIA-----KNAAVILGPTTN-QSGPLGGRGFYWSEDPYLA---MATSSVVKGVQSQ-----GHAAT : 144
HjCe13A : ---KISYPSL-CLQGPLCVRYSTG---SIAITPGVQAASVWVNLIRERQGFGEVKA-----SGIHVILGEGVNV-GKTPQCGRNFYWSEDPYLYL---IAMGQTINGHCVG-----GVQAT : 156
AaBg11 : ---RLNFGM-CLQDSPGIRSDSY---NSAFPAGNVAAVWTKNAYLRGQAVGQVFSF---KGIDVQLGPAAGP-CRSPDCGRNFYWSEDPALIT---VLFPAETIKHQLDA-----GVVAT : 168
AnBg11 : ---RLGVFGM-CLQDSPGIRSDSY---NSAFPAGNVAAVWTKNAYLRGQAVGQVFSF---KGADIQGPAAGP-CRSPDCGRNFYWSEDPALIS---VLFPAETIKHQLDA-----GVVAT : 187
BAD_1197 : ---RLGIFPLV-IGDCIHCYSFWPG---AIFPEQLGMATVWDSKVAQAGRATAEIVSA-----TGVHWFVSPVLC-IADTRWCRVGETTFGEDEPYLI---EMASSIVKGVQGGKAGEPLAKDAIILAC : 225
TmXloA : VEETRIQIPAM-IHEECLTCYMGGLG---NFPQATAMASVWDPDLIEKMTTAVREDMRK---IGAHCQVAPVLD---ARDRWCRVGETTFGESEYLVARMGVSYVKGQGG-----DIKKGVVAT : 199
StBx1I : AEAGRFGIPAV-AHEECLAGFTAWGA---LAPVPLAWGALVWDPQLVEMAARIGRDMRS---VGVHQCQVAPVMD---VRLDLRWRVGETTFGEDEPYLV---TIGSAYVVRGHESEA-----GIVAT : 204
AnX1nD : LGVSRIGLIPAVQVWSEALHGLDRANF---SDSGAYNWAISEPQPIILTTAALNRTLHQIASIISTCGRAFNNAGRYGLDV-YAENIN-TFHPVWGRGQETPGEVSLAAYVAYEYITG---GQP---DPESNLKILAT : 228

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LbBg1 : ---VKHFAA---NNRINQR-----FTASSDSERTRELYLRTFEIIVKSAYPATMTSNKINGVLSNQERLILRRILRDEWGF---HGAVMSDWDGA-----VANTVQALKAGLDLIMPVPGK-G-- : 251
BaBg1 : ---LKHFAA---NNQETDR-----LRVSANISQRAREIYFPAFEHIVKTAQPWTMCSVNRINGVHSAQRWLLITDVLRDEWGY---EGIVMSDWDGA-----DHDRVASLNLNGLIMPVPPS--- : 254
TnBg13B : ---IKHFVA---NNQETNR-----MVVDTIISERAREIYLRGFEIARVSKSPWSMSANKNLNGKYCSQEWLKKVLRDEWGF---EGFVMSDWDYA-----GDNVPEQLKAGNDLIMPVKGAYQV : 268
KmBg1I : ---VKHFVC---NDLEDR-----FSSNSISERAREIYLEPFLAVKHANPVCMTANKNVNGEHCSSQSKLLIDILRDEWKW---DGLMMSDWFPG-----TYTTAAAIKKNLDIEFPGP-T-- : 248
HjCe13A : ---AKHYIL---NEQQLNR-----ETISSNPDDRTHELYTWPFADAVQAN-VASVMSVKNVNTTWACEQYTLQTVLKDQLGF---PGVYVTDWNA-----QHTTVQSANSCLDMSMPGT-D-F : 260
AaBg11 : ---AKHYIL---NEQHFHQVAEAAGYGFNISDITISSNDDKTHEMYLWPFADAVRAG-VGAMCSVNSQINNSYGCQSYTLNKLKKAELGF---QGFVMSDWDGA-----HHSVGSALAGLDMSPGD-ITF : 286
AnBg11 : ---AKHYIA---YEQHFHQVAEAGYGFNISSEGSANDDKTHELYLWPFADAVRAG-AGAMCSVNSQINNSYGCQSYTLNKLKKAELGF---QGFVMSDWAFA-----HHAGVGSALAGLDMSPGD-VDY : 305
BAD_1197 : ---AKHFAGY---SETGGG-----DASEADSHRKLSEWLPPEFVAVKEG-CGTFMLGYESIEGVVPTFKWLLSDKLRGAWNY---QGITLITDDNDVGRSVWEQKVKPDYVQAADAVKSCNDLVMTTP--- : 342
TmXloA : ---VKHFAGY---SASGGK-----NWAPTNPREFKVEVLFPEFAAVKEANVLSVMSSEIDGVPCAAARKLLITDILRDKWGF---EGITVSDYFPAVKVLEDEYHRIRADKSEARLALAEAGIDVLPKT--- : 317
StBx1I : ---LKHFAGY---ASSAGAF-----NLAPVRAVGFEPADITLPPFEMALREGGARSMAAYTETDGVPSASAPRLLPELRLRQWGF---TCGIVVADYFAIDFLQTLHRVARSTAEAGRLAAGIDVLEPTV--- : 322
AnX1nD : ---AKHYAGYDIENWHNHS---LGNDMNTQQDSEYTPQHFVAARDAKVQSVCAVNAVNGVPACALSYFLQTLRDLTFGEVDHGVYVSDCDAYNIYNPHGYASSQAAAAEAAILAGTIDICGTT-Y-- : 352

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GH3-C →

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LbBg1 : ---QASVNDIRAVHT---EIDDEGTNKAVRHLH---VV---DDWLPADHAQPYPDHA---AHHQFARKLADDGILLNHNHEDELPLD---PQTGTGVVVICELAE---ENPRFQGS : 347
BaBg1 : ---YTDDQVYAARD---RIQPEQLRMAQGMVDL---VNKTR---SAMSIDDYHFVDV---AHDEVAHQAAIESVLLLNNDDDLIPV---AANAKLAVCEFA---RTPRYGGG : 349
TnBg13B : NTERERDEIEEMEAKE---KLSSEVLEECVRNLIKV-LVNAPSFK-----NYRYSNKPDL---KHAKVAYEAGAEGVLLLN---EEALPL---SENSKIALFCT---GQIETIKG : 366
KmBg1I : ---RWRTRAVSHSLNSREQITTEDVDRVRQVLMKIKFVVDNLE---KTGIVENGPESTSNNTK---ETSDLLRRIAADSIVLLNKNKNILPL---KKEDNLIIVCPNA---KAKTSSGG : 354
HjCe13A : NGNRLWGPATNAVNSN---QVPTSRVDMVTRILAA-WYLTGQDQ---A---GYPSFNLSR---NQVGNHKTNVRAIARDGIVLLNNDANILPL---KKPASLAVVGSAAIIGNHARNSPS : 367
AaBg11 : DSATSWFGTNTIAVLN---TVPQWRVDMAVRIMAA-YKVGDRDLWQPPNFSSWTRDEYGFKYFYPOEGPYEYKVNHFVNVQRNHSVIRKLGADSTVLLLN---NVALPLT---GKERKVALICEDA---GSNSYGANG : 415
AnBg11 : DSGTSYWGNTLITISVLN---TVPQWRVDMAVRIMAA-YKVGDRDLWTPPNFSSWTRDEYGYKYFYVSEGPYKVNRYVNVQRNHSVIRKLGADSTVLLLN---DGALPLT---GKERLVALICEDA---GSNSYGANG : 434
BAD_1197 : ---KFY-EGAIKAVKT---LDESLLAAVARIILAL-KFRLGLFE---DPRLPDQKRIDAVLGSE---HQQLNLEVAREVALLLN-DGSLPFN---VAGAKRLAVGPLA---DDVQTQLG : 445
TmXloA : ---ECY-QYKDLVEK---IISSEALIEAVTRVRL-KFMLGLFE---NPYVEVEKAKIE---SHRDLALEIARKSILLLN---DGILPL---QKNKKVALICPNA---GEVRNLLG : 413
StBx1I : ---KAYGDEVAARS---EYPEELVRAARRVILQ-KCELGLLD---ADWTPEVPEGPVLDLSA---ENRAVARRLAEEVLLNANPDGVLP---PADGRILAVGCPRA---ADALAMLG : 425
AnX1nD : ---QWH---NESIAG---DLSRDDIEQGVIRLYTT-LVQAGYFD---SNTTKANNPYRDLWSWD---VLETDAWNISYQAATQGVLLLNNSNVLP---TEKAYPPSNTTVALICPWA---NATTQLLG : 462

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LbBg1 : GSSHV---NPTK---LVSPIDA---LADS--- : 367
BaBg1 : GSSHI---TPTK---MTFLDT---LAAR--- : 369
TnBg13B : GTGSG---AIILEG---IKER--- : 388
KmBg1I : GSASMNSYVVSPYEGIVNKLKGEVDYTVGAYSHKSIGGLAESSLIDAAPKADAENSGLIAKFYSNPVEERSDDEEPFHVTKVNRSNVHLDFDKHEKVDPKNPFYFVTLTGQYVPEQEDGDYIFSLQVYGSGLFYLNDEL : 494
HjCe13A : CNDKG---CDDGALGMGWGSSGAVNYFY---FVAPYDA---INTR--- : 402
AaBg11 : CSDRG---CDNGTLAMAGWGSSTAEPFY---LVPEQA---IQAE--- : 450
AnBg11 : CSDRG---CDNGTLAMAGWGSSTANFPY---LVPEQA---ISNE--- : 469
BAD_1197 : DWAGS---SQINWMPD---GHPREM---ITVLDG---FKQLAP : 478
TmXloA : DMYL---AHIRALLDNI DDVFG-NPQIPRENYERLKKSIIEHMKSI---FKEE--- : 466
StBx1I : CYSFP---SHVG---VQHPDVPNG---TEIPVLDL---LRAELP : 458
AnX1nD : NYGN---APY---MIIPRAA---FEEA--- : 481

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LbBgl1 : -GLKAD---*YYP CYRLDQS-----*720-----*740-----*760-----*780-----*800[E458]-----*820-----*840 : 438
BaBgl1 : -GVDVA---FAPCF TLDLE-----PADRTLE-----AEAVETAKNA DVVLMFGL---PEAAESECF-----DRETD---TPAKQVELLKA VAAE--- : 440
TnBg13B : -GLNFDEELAKTYEDYIKKMRTEEYKPRR-----DSWGTI IKPKLPENFLSE-----KEIHKLA KKN DVAVIVL-----SRISGE CY-----DRKPVKGFY---SDDETDL IKT VLSREFHE : 488
KmBg1I : IDQKHNRQERGSFCFAGTKERTKKLTLKKGQVYNVRVEYSGSPTSGLVGEFGAGGFQAGVIKAI DDDEEI---RNAEELAAKH KAVLIIHGL---NGEWETECY-----DRENMD---LPKRTNELVRAVLKA--- : 613
HjCe13A : -ASS---OCTQV TLS-----NTDNT-----SSGASAA RKG DVAVIVL-----TADSGCYITVEGNACDRNNLD---PWHNGNALVQAVAGA--- : 472
AaBg11 : -VLKH---KCSVYAIT-----DNWAL-----SQVETLAKQASVSLVFW-----NSDAGECYISVDGNEGDRNNIT---TWKNGDNL IKA AANN--- : 521
AnBg11 : -VLKH---KNGVFTAT-----DNWAI-----DQIEALAKTASVSLVFW-----NADSGCYINVDGNLGRNNIT---LWRNGDNV IKA AANN--- : 540
BAD_1197 : EGCVEV---YSRCANI VDL-----VPDPEGEFYPDGQPRPKIGVSAKIDRALLGEAVENARKSDIIVAVVGD---VIQAIGEC---STATTE---LGGQNAL I DAL SNVARE : 575
TmXloA : -GIEFE---YAKCCEVTGE-----DRSGF-----EEAIEIAKKS DVAVIVVGDKSGLLTDC TTEGSR---DMANK---LPGVQEELVLEVAKT--- : 540
StBx1I : -DAKVT---FTECGVSDE-----DTSGF-----AAVARAREADV CVAVL GDRSGLFGRGTSGETC-----DVADLN---LPGVQAL I DAL VDS : 532
AnXlnD : -GYKVN---FAECSGTISST-----STSGF-----AAALSAQSA DVIIYAGGI---DNTLEAIAL-----DRESLA---WPGNQLDL I DAL ASAAG : 552

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LbBgl1 : -NVHTTIVV LQNGSAVEV-----*860-----*880-----*900-----*920-----*940-----*960-----*980 : 552
BaBgl1 : -NKNIVV LSNGSVSV-----*APWAGN-----AKGILLESWLLGQAGCPALADVIFCKVSPSGKLAQT-IPMNI-NDDPSMINWPGE---EGHVDYEGEVFVGYRY-DTYDKAVDYPPFGGLSYAIFAIDG--- : 555
TnBg13B : QGKKVIV LNIIGSPVEV-----*VSWRDL-----VDGILLVWQAGCETGRIVADVLTCRNP SGKLPIT-FPRDY-SDVPS-WTFPGEPKDNPQKVVYEEDIYVGYRY-DTFGVEPAYEFPYGLSYTTEYSD--- : 607
KmBg1I : -NPNTIVV LQNSGTPVEF-----*PWLED-----ANALVQAWYGCNELGNATADVLYGDPV P NGLSLS-WPFKL-QDNPAFLNFKTE---FGRVIYGEDIFVGYRY-EKLQRKVAFPFGYGLSYTTELDI--- : 727
HjCe13A : -NSNIVV LHSVGAII-----*EQILALPQ-----VKAVVWAGLPSQESCNALVDVWGDVSPSGKLVYI-IAKSP-NDYNTRIVS-----GGDSFSEGLFIDYKHE-DDANITPRYEFYGLSYTKENYSR--- : 586
AaBg11 : -CNNTIVV LHSVGPVL-----*DEWYDHPN---VTAILWAGLPGEAGGRATVIT IYCKVNP SGKLPIS-FWKTR-EAYGDYLVRELNNGNAPQDDFSEGVFIDYRG-DKRNETPIYEFYGLSYTKENYSN--- : 647
AnBg11 : -CNNTIVV LHSVGPVL-----*NEWYDNPN---VTAILWGGLPGEESGNSADVLYGRNP GA SPFT-WGKTR-EAYQDYLVTPEPNNGNAPQEDFVEGVFIDYRG-DKRNETPIYEFYGLSYTKENYSN--- : 666
BAD_1197 : TGKPFV VLVSSKPOV---PASVIGTNGVIVDETPAEGTSA L L WAPSPMKGGQAEIILGGETE P SGR L PIS-FPRHA-GQLPVYVYQIRG---QHGN-----RVDLTONPAFAFEGGLSYTTEYGDPTI--- : 696
TmXloA : -GKPVV L VITGRPYS-----*KNVVDK---VNAIQVWLPGEAGGRATVIT IYCKVNP SGKLPIS-FPRSA-GQIPV-FHYVKP---SGGRSHWHG---D VDESTKPLFPFGHLSYTKENYSN--- : 648
StBx1I : -GTPVV L VLTGRPYAL-----*GRWADR---LAAV VQAFFPGEEGCPAVAGVLSGRNP SGKLPIS-VPRLP-GGQP-WTYLQP---PLGLA---G---EVSSLDPTPLYPFGHGRSYTTEFRWED--- : 636
AnXlnD : -KKPLV L VQMGGGQVDS-----*SSLKNNTN---VSELLWGGYPCSGCFALRLITCKKNPAGRLVITIQYPASYAEFPATDMNLRPEGDNPGQ-----TKWYTGAVYEFYGLSYTTEFAESSNNTT--- : 668

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FnIII →

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LbBgl1 : LKLTQN---*1000-----*1020-----*1040-----*1060-----*1080-----*1100-----*1120 : 587
BaBgl1 : VNVAKTG---ANT-----*DERA-FAYWSEKFNWDHVEAGEYIVVEVTS SRD-AA-VAVVTL DGDGKALPLDEWSTFGEWADDP-----VGSKIVASVYAEAGEAGNLQPLPNDMMRMFLKSMF--- : 722
TnBg13B : LNVSFD---GET-----*PVRD-LASFNGE--EWVVEAGEYEVVCGAS SRNKL-KGTFVSGEERRFKP-----*KLTMDFGKNSPAPITTEYMAAIVKNPQLRDLDFKQVVLAPEYA-GPENFLATDDQGSLOIFQDRMFMN : 722
KmBg1I : SDFKVT---*DDK-----*LATSVDVKNTGDKFACSEV V V-----*VSKHEARTRLNKANQSQVYS-- : 803
HjCe13A : LSVLSTAKSGPATGAVV-----*PVRD-LASFNGE--EWVVEAGEYEVVCGAS SRNKL-KGTFVSGEERRFKP-----*KLTMDFGKNSPAPITTEYMAAIVKNPQLRDLDFKQVVLAPEYA-GPENFLATDDQGSLOIFQDRMFMN : 722
AaBg11 : LNASSNAQVATEGAAPTFGQVGNASDYVYPEGLTRISKFIYPWLNSTDLKASSGDPYGVDTAEHVPEGATDGSQPVL P AGGSGGNPRLYDELIRVSVTVKNTGVRV-ACDAMPOL-----*KLTMDFGKNSPAPITTEYMAAIVKNPQLRDLDFKQVVLAPEYA-GPENFLATDDQGSLOIFQDRMFMN : 722
AnBg11 : LSAPEYEPASGETEAAPT FGEVGNASDYLYPSGLQRITKFIYPWLNGTDL EASSGDASYGQDSSDYLP EGATDGSAQIP L P AGGSGGNPRLYDELIRVSVTVKNTGVRV-ACDAMPOL-----*KLTMDFGKNSPAPITTEYMAAIVKNPQLRDLDFKQVVLAPEYA-GPENFLATDDQGSLOIFQDRMFMN : 722
BAD_1197 : TNVPESGIFAETDT-----*PVRD-LASFNGE--EWVVEAGEYEVVCGAS SRNKL-KGTFVSGEERRFKP-----*KLTMDFGKNSPAPITTEYMAAIVKNPQLRDLDFKQVVLAPEYA-GPENFLATDDQGSLOIFQDRMFMN : 722
TmXloA : LR-IEPKEVPPAGE-----*PVRD-LASFNGE--EWVVEAGEYEVVCGAS SRNKL-KGTFVSGEERRFKP-----*KLTMDFGKNSPAPITTEYMAAIVKNPQLRDLDFKQVVLAPEYA-GPENFLATDDQGSLOIFQDRMFMN : 722
StBx1I : FEGSGDGRIGTDGS-----*PVRD-LASFNGE--EWVVEAGEYEVVCGAS SRNKL-KGTFVSGEERRFKP-----*KLTMDFGKNSPAPITTEYMAAIVKNPQLRDLDFKQVVLAPEYA-GPENFLATDDQGSLOIFQDRMFMN : 722
AnXlnD : KEVKLNIQDILSQTH-----*PVRD-LASFNGE--EWVVEAGEYEVVCGAS SRNKL-KGTFVSGEERRFKP-----*KLTMDFGKNSPAPITTEYMAAIVKNPQLRDLDFKQVVLAPEYA-GPENFLATDDQGSLOIFQDRMFMN : 722

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LbBgl1 : ASHV-PM TKE L AFTKV-AIAPGETETVTLA---*1140-----*1160-----*1180-----*1200-----*1220-----*1240-----*1260 : 722
BaBgl1 : KAAV-AR KHEL GFRKV-FLKAGE SAEITFD---*DERA-FAYWSEKFNWDHVEAGEYIVVEVTS SRD-AA-VAVVTL DGDGKALPLDEWSTFGEWADDP-----VGSKIVASVYAEAGEAGNLQPLPNDMMRMFLKSMF--- : 722
TnBg13B : KGKI-DK FQEL AFHKTRLNLPGESEEVVLE---*PVRD-LASFNGE--EWVVEAGEYEVVCGAS SRNKL-KGTFVSGEERRFKP-----*KLTMDFGKNSPAPITTEYMAAIVKNPQLRDLDFKQVVLAPEYA-GPENFLATDDQGSLOIFQDRMFMN : 722
KmBg1I : NSKV-SR VKE L GF EKV-HLEPG EKKTVNID---*ELKDAISYFNEELGKWHVEAGEYIVVSVTS SDDLS-VKEFKVKEKELYWKGL-----*KLTMDFGKNSPAPITTEYMAAIVKNPQLRDLDFKQVVLAPEYA-GPENFLATDDQGSLOIFQDRMFMN : 722
HjCe13A : SSAP-RT PKQL GF AKI-NLTPG OSGTATFN---*RRRD-LSYWTASQKVVVPS SFGHSVCA SRDRL-TSTLSVA-----*KLTMDFGKNSPAPITTEYMAAIVKNPQLRDLDFKQVVLAPEYA-GPENFLATDDQGSLOIFQDRMFMN : 722
AaBg11 : LGGP-NE KVL K FDR- TLKPS ETVWTTT---*TRRD-LSNWTAAQDWWI TSYPKKVVHVS S SRQPL-HAALPKVQ-----*KLTMDFGKNSPAPITTEYMAAIVKNPQLRDLDFKQVVLAPEYA-GPENFLATDDQGSLOIFQDRMFMN : 722
AnBg11 : LGGP-NE KIV L QFER- TLQPS EETKWS TT---*TRRD-LANWVVEKQDWEI TSYPKKVVHVS S SRQPL-RASLPTVH-----*KLTMDFGKNSPAPITTEYMAAIVKNPQLRDLDFKQVVLAPEYA-GPENFLATDDQGSLOIFQDRMFMN : 722
BAD_1197 : VTSY-SWTDRELAFORV-ELEPG KSKTVAFD---*PVSD-CTIVVSE-ANRIVEPGEFEVLTCHS SRREHLKRTTFTVA-----*KLTMDFGKNSPAPITTEYMAAIVKNPQLRDLDFKQVVLAPEYA-GPENFLATDDQGSLOIFQDRMFMN : 722
TmXloA : FASV-TR VKE L GF EKV-SLKAK EKKTVVFR---*HMDV-LAYVNRD-MKLVVEPGEFKVMVVS S SEDRL-TGSFVSGVEKREVVGMKRFTEACEE-----*KLTMDFGKNSPAPITTEYMAAIVKNPQLRDLDFKQVVLAPEYA-GPENFLATDDQGSLOIFQDRMFMN : 722
StBx1I : VASV-TR DVRL IGYQRV-ELEPG ARRV TFRFHTDL-SAF T L S-GRRVVEPGELEBRLAAS AADVRH-TARLTLTGEVQRVGHDRRLRCETELSTAD-----*KLTMDFGKNSPAPITTEYMAAIVKNPQLRDLDFKQVVLAPEYA-GPENFLATDDQGSLOIFQDRMFMN : 722
AnXlnD : DAGPAPY KKW V G WDR- GEV K V G- TRELRVP---*EVGS-FARVWED-GDWVVFCTFEBALNLE-RKVRV-KVVLEGE EEVV LKWP GKE-----*KLTMDFGKNSPAPITTEYMAAIVKNPQLRDLDFKQVVLAPEYA-GPENFLATDDQGSLOIFQDRMFMN : 722

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LbBgl1 : -MPLRAVVALGGPQALITDFITRANTLLRQ---*1280-----* : 751
BaBgl1 : -SMPM--LMSDGGKA--ITAFMLDEYAKIAETA E---* : 751
TnBg13B : ----- : -
KmBg1I : ----- : -
HjCe13A : ----- : -
AaBg11 : ----- : -
AnBg11 : ----- : -
BAD_1197 : ----- : -
TmXloA : ----- : -
StBx1I : ----- : -
AnXlnD : ----- : -

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Supplemental Figure S2. Sequence alignment of GH3 β -glucosidases and β -xylosidases. The alignment was made with Mega 6 (Muscle algorithm). Catalytic nucleophile (D242) and acid/base (E458) are highlighted pink, residues involved in glycon binding via electrostatic interactions (hydrogen bonds) green; residues involved in glycon binding via hydrophobic interactions yellow.

LbBgl1 (*Lactobacillus brevis*, [ERK40902.1](#)); *BaBgl* (*Bifidobacterium adolescentis*, [NC_008618.1](#)); *TnBgl3B* (*Thermotoga neapolitana*, [pdb|2X40|A](#), ref. 1); *KmBglI* (*Kluyveromyces marxianus*, [pdb|3AC0|A](#), ref. 2); *HjCel3A* (*Hypocrea jecorina*, anamorph of *Trichoderma reesei*, [pdb|3ZYZ|A](#), ref. 3); *AaBgl1* (*Aspergillus aculeatus*, [pdb|4IIB|A](#), ref. 4); *AnBgl1* (*Aspergillus niger*, CAB75696.1, ref. 5); *BAD_1197* *Bifidobacterium adolescentis*, NC_008618.1); *TmXloA* (*Thermotoga maritima*, AAD35170.1), *StBxII* (*Streptomyces thermoviolaceus*, BAD02389.1, ref. 6); *AnXlnD* (*A. niger*, CAB06417.1, ref. 7).

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