

Supplementary Table 17 *A. niger* carbohydrases

GLYCOSIDASES (GH)

Gene	CAZy family	CAZy description	gnal sequence*D1
An11g02100	Glycoside Hydrolase Family 1	candidate b-glycosidase; related to monolignol beta-glucosidase	+
An04g03170	Glycoside Hydrolase Family 1	candidate b-glycosidase related to b-glucosidases	+
An03g03740	Glycoside Hydrolase Family 1	candidate b-glucosidase	-
An12g01850	Glycoside Hydrolase Family 2	candidate b-glycosidase related to bacterial b-mannosidases	-
An11g06540	Glycoside Hydrolase Family 2	candidate b-mannosidase	+
An01g01260	Glycoside Hydrolase Family 2	candidate b-glucuronidase	-
An05g02410	Glycoside Hydrolase Family 2	candidate b-glycosidase distantly related to mammalian b-glucuronidases	-
An02g00610	Glycoside Hydrolase Family 2	candidate b-glycosidase distantly related to b-glucuronidases	+
An01g06630	Glycoside Hydrolase Family 2	candidate exo-b-D-glucosaminidase	+
An06g02460	Glycoside Hydrolase Family 3	candidate b-glycosidase distantly related to b-N-acetylglucosaminidases	+
An07g09760	Glycoside Hydrolase Family 3	candidate b-glycosidase related to b-glucosidases	+
An08g08240	Glycoside Hydrolase Family 3	candidate b-glucosidase	-
An11g00200	Glycoside Hydrolase Family 3	candidate b-glucosidase	+
An14g01770	Glycoside Hydrolase Family 3	candidate b-glucosidase	+
An01g09960	Glycoside Hydrolase Family 3	b-xylosidase (EC 3.2.1.37)	+
An17g00300	Glycoside Hydrolase Family 3	candidate b-glycosydase	+
An17g00520	Glycoside Hydrolase Family 3	candidate b-glucosidase	-
An03g05330	Glycoside Hydrolase Family 3	candidate b-glucosidase	-
An02g07590	Glycoside Hydrolase Family 3	candidate b-glycosidase related to b-N-acetylhexosaminidase	-
An06g02040	Glycoside Hydrolase Family 3	candidate b-glucosidase	-
An15g01890	Glycoside Hydrolase Family 3	candidate b-glucosidase	-
An16g09090	Glycoside Hydrolase Family 3	candidate membrane bound b-glycosidase related to b-N-acetylglucosaminidase	-
An11g06090	Glycoside Hydrolase Family 3	candidate b-glucosidase	+
An07g07630	Glycoside Hydrolase Family 3	candidate b-glycosidase related to avenacinases and tomatinases	+
An15g04800	Glycoside Hydrolase Family 3	candidate avenacinase	+
An18g03570	Glycoside Hydrolase Family 3	candidate b-glucosidase	+
An08g01100	Glycoside Hydrolase Family 5	candidate b-glycosidase related to exo-1,3-b-glucanases	+
An03g01050	Glycoside Hydrolase Family 5	candidate b-glycosidase	+
An16g02100	Glycoside Hydrolase Family 5	candidate b-glycosidase	-
An07g08950	Glycoside Hydrolase Family 5	endoglucanase (EC 3.2.1.4)	+
An01g11670	Glycoside Hydrolase Family 5	candidate endoglucanase; C-terminal CBM1 module	+
An16g06800	Glycoside Hydrolase Family 5	candidate endoglucanase; C-terminal CBM1 module	+
An05g01320	Glycoside Hydrolase Family 5	mannan endo-1,4-b-mannosidase (EC 3.2.1.78)	+

An06g02060	Glycoside Hydrolase Family 5	candidate b-glycosidase related to glucan 1,3-b-glucosidase	+
An18g04100	Glycoside Hydrolase Family 5	candidate glucan 1,3-b-glucosidase	+
An11g07660	Glycoside Hydrolase Family 5	candidate membrane bound b-glycosidase	-
An08g01760	Glycoside Hydrolase Family 6	candidate cellobiohydrolase	+
An12g02220	Glycoside Hydrolase Family 6	candidate cellobiohydrolase; N-terminal CBM1 module	+
An07g09330	Glycoside Hydrolase Family 7	cellobiohydrolase (EC 3.2.1.91)	+
An01g11660	Glycoside Hydrolase Family 7	candidate cellobiohydrolase (EC 3.2.1.91); C-terminal CBM1 module	+
An03g00940	Glycoside Hydrolase Family 10	candidate xylanase (EC 3.2.1.8)	+
An14g07390	Glycoside Hydrolase Family 11	candidate xylanase (EC 3.2.1.8)	+
An01g00780	Glycoside Hydrolase Family 11	xylanase (EC 3.2.1.8)	+
An01g14600	Glycoside Hydrolase Family 11	candidate xylanase	+
An15g04550	Glycoside Hydrolase Family 11	candidate b-glycosidase related to xylanases	+
An03g05380	Glycoside Hydrolase Family 12	related to endoglucanases	+
An14g02760	Glycoside Hydrolase Family 12	candidate endoglucanase	+
An01g03340	Glycoside Hydrolase Family 12	candidate xyloglucanase	+
An02g13240	Glycoside Hydrolase Family 13	candidate a-glycosidase related to a-glucosidases	-
An13g03710	Glycoside Hydrolase Family 13	candidate a-glycosidase related to a-glucosidases	-
An01g06120	Glycoside Hydrolase Family 13	candidate a-glycosidase related to glycogen-debranching enzyme	-
An05g02100	Glycoside Hydrolase Family 13	candidate a-amylase	+
An12g06930	Glycoside Hydrolase Family 13	candidate a-amylase	+
An11g03340	Glycoside Hydrolase Family 13	candidate a-amylase	+
An04g06930	Glycoside Hydrolase Family 13	candidate membrane-bound a-amylase	+
An12g02460	Glycoside Hydrolase Family 13	candidate membrane-bound a-amylase	+
An09g03100	Glycoside Hydrolase Family 13	candidate a-amylase	+
An15g07800	Glycoside Hydrolase Family 13	candidate membrane-bound a-amylase	+
An15g07810	Glycoside Hydrolase Family 13	candidate a-1,3-glucan synthase; N-terminal GH13 module and C-terminal GT5 module	+
An04g09890	Glycoside Hydrolase Family 13	membrane-bound a-1,3-glucan synthase (EC 2.4.1.183); N-terminal GH13 module and C-terminal GT5 module	+
An12g02450	Glycoside Hydrolase Family 13	candidate a-1,3-glucan synthase; N-terminal GH13 module and C-terminal GT5 module	+
An02g03260	Glycoside Hydrolase Family 13	candidate a-1,3-glucan synthase; N-terminal GH13 module and C-terminal GT5 module	+
An09g03070	Glycoside Hydrolase Family 13	candidate a-1,3-glucan synthase; N-terminal GH13 module and C-terminal GT5 module	+
An09g03110	Glycoside Hydrolase Family 13	candidate a-glycosidase related to a-amylases	-
An01g13610	Glycoside Hydrolase Family 13	candidate a-glycosidase related to a-amylases and maltohexaose-forming a-amylases	-

An14g04190	Glycoside Hydrolase Family 13	candidate 1,4- α -glucan branching enzyme	-
An03g06550	Glycoside Hydrolase Family 15	glucoamylase (EC 3.2.1.3); C-terminal CBM20 module	+
An12g03070	Glycoside Hydrolase Family 15	candidate α -glycosidase	-
An15g07760	Glycoside Hydrolase Family 26	candidate b-mannanase	+
An01g01320	Glycoside Hydrolase Family 27	candidate α -glycosidase related to α -galactosidases	+
An14g01800	Glycoside Hydrolase Family 27	candidate α -glycosidase related to α -galactosidases	+
An11g06330	Glycoside Hydrolase Family 27	candidate α -galactosidase	+
An02g11150	Glycoside Hydrolase Family 27	α -galactosidase (EC 3.2.1.22)	+
An06g00170	Glycoside Hydrolase Family 27	candidate α -galactosidase; C-terminal CBM13 module	+
An01g14650	Glycoside Hydrolase Family 28	exo-rhamnogalacturonase	+
An02g04900	Glycoside Hydrolase Family 28	endopolygalacturonase	+
An15g05370	Glycoside Hydrolase Family 28	endopolygalacturonase	+
An01g11520	Glycoside Hydrolase Family 28	endopolygalacturonase	+
An16g06990	Glycoside Hydrolase Family 28	endo-polygalacturonase	+
An01g14670	Glycoside Hydrolase Family 28	endopolygalacturonase	+
An05g02440	Glycoside Hydrolase Family 28	endopolygalacturonase	+
An04g09700	Glycoside Hydrolase Family 28	endo-xylogalacturonan hydrolase	+
An02g12450	Glycoside Hydrolase Family 28	endopolygalacturonase	+
An18g04810	Glycoside Hydrolase Family 28	exo-rhamnogalacturonase	+
An11g04040	Glycoside Hydrolase Family 28	exopolygalacturonase	+
An12g07500	Glycoside Hydrolase Family 28	exopolygalacturonase	+
An03g06740	Glycoside Hydrolase Family 28	exopolygalacturonase	+
An03g02080	Glycoside Hydrolase Family 28	exorhamnogalacturonase	+
An09g03260	Glycoside Hydrolase Family 28	endo-polygalacturonase	+
An11g06320	Glycoside Hydrolase Family 28	endo-rhamnogalacturonase	+
An11g08700	Glycoside Hydrolase Family 28	endo-rhamnogalacturonase	+
An12g00950	Glycoside Hydrolase Family 28	endo-rhamnogalacturonase	+
An06g02070	Glycoside Hydrolase Family 28	endo-rhamnogalacturonase	+
An07g01000	Glycoside Hydrolase Family 28	endo-rhamnogalacturonase	+
An14g04200	Glycoside Hydrolase Family 28	endo-rhamnogalacturonase	+
An13g02110	Glycoside Hydrolase Family 29	candidate α -glycosidase related to mammalian α -L-fucosidases	-
An01g04880	Glycoside Hydrolase Family 31	candidate α -glycosidase	-
An09g03300	Glycoside Hydrolase Family 31	related to α -glycosidases	+
An07g00350	Glycoside Hydrolase Family 31	related to α -glycosidases	+
An18g05620	Glycoside Hydrolase Family 31	candidate α -glycosidase	-
An01g10930	Glycoside Hydrolase Family 31	candidate α -glucosidase	+
An09g05880	Glycoside Hydrolase Family 31	candidate α -glucosidase	+
An04g06920	Glycoside Hydrolase Family 31	candidate α -glucosidase	+

An11g03200	Glycoside Hydrolase Family 32	inulinase (EC 3.2.1.7)	+
An06g02420	Glycoside Hydrolase Family 32	candidate b-glycosidase	-
An15g00320	Glycoside Hydrolase Family 32	candidate b-glycosidase	-
An11g03210	Glycoside Hydrolase Family 32	fragment of candidate exoinulinase	-
An12g08280	Glycoside Hydrolase Family 32	sucrose:sucrose 1-fructosyl transferase (EC 2.4.1.99)	+
An08g11070	Glycoside Hydrolase Family 32	candidate invertase	+
An06g00290	Glycoside Hydrolase Family 35	candidate b-glycosidase related to b-galactosidases	+
An01g12150	Glycoside Hydrolase Family 35	b-galactosidase (EC 3.2.1.23)	+
An07g04420	Glycoside Hydrolase Family 35	candidate membrane-bound b-galactosidase	-
An01g10350	Glycoside Hydrolase Family 35	candidate b-glycosidase related to b-galactosidases	+
An14g05820	Glycoside Hydrolase Family 35	candidate b-galactosidase	+
An09g00270	Glycoside Hydrolase Family 36	fragment of candidate a-galactosidase	?
An09g00260	Glycoside Hydrolase Family 36	fragment of a-galactosidase (EC 3.2.1.22)	+
An04g02700	Glycoside Hydrolase Family 36	candidate a-glycosidase distantly related to plants alkaline a-galactosidases	-
An15g03550	Glycoside Hydrolase Family 43	related to b-glycosidases	+
An11g03120	Glycoside Hydrolase Family 43	candidate b-glycosidase distantly related to b-xylosidases	-
An16g02730	Glycoside Hydrolase Family 43	candidate endoarabinase	+
An02g01400	Glycoside Hydrolase Family 43	candidate a-glycosidase related to endoarabinanases	+
An07g04930	Glycoside Hydrolase Family 43	candidate membrane-bound a-glycosidase distantly related to endoarabinanases	-
An02g00140	Glycoside Hydrolase Family 43	candidate b-glycosidase related to bacterial b-xylosidases	-
An08g01900	Glycoside Hydrolase Family 43	candidate b-glycosidase related to bacterial b-xylosidases	+
An02g10550	Glycoside Hydrolase Family 43	candidate endoarabinanase	+
An09g01190	Glycoside Hydrolase Family 43	endoarabinanase (EC 3.2.1.99)	+
An08g10780	Glycoside Hydrolase Family 43	candidate b-glucosidase related to galactan 1,3-b-galactosidase; C-terminal CBM35 module	+
An08g01710	Glycoside Hydrolase Family 51	candidate a-glycosidase related to alpha-L-arabinofuranosidases	-
An01g00330	Glycoside Hydrolase Family 51	a-L-arabinofuranosidase (EC 3.2.1.55)	+
An09g00880	Glycoside Hydrolase Family 51	candidate a-L-arabinofuranosidase	-
An18g05940	Glycoside Hydrolase Family 53	endo-1,4-b-galactanase (EC 3.2.1.89)	+
An16g06590	Glycoside Hydrolase Family 53	candidate endo-1,4-b-galactanase	-
An15g02300	Glycoside Hydrolase Family 54	a-L-arabinofuranosidase (EC 3.2.1.55); C-terminal CBM42 module	+
An12g04610	Glycoside Hydrolase Family 61	candidate endo-1,4-glucanase	+
An15g04570	Glycoside Hydrolase Family 61	candidate b-glycosidase distantly related to endoglucanases; C-terminal CBM1 module	+
An14g02670	Glycoside Hydrolase Family 61	candidate endoglucanase; C-terminal CBM1 module	+
An08g05230	Glycoside Hydrolase Family 61	candidate endoglucanase	+
An15g04900	Glycoside Hydrolase Family 61	candidate endoglucanase; C-terminal CBM1 module	+
An12g02540	Glycoside Hydrolase Family 61	candidate b-glycosidase related to endoglucanases	+

An04g08550	Glycoside Hydrolase Family 61	candidate endoglucanase	+
An03g00960	Glycoside Hydrolase Family 62	arabinoxylan arabinofuranohydrolase	+
An14g05800	Glycoside Hydrolase Family 67	a-glucuronidase (EC 3.2.1.139)	+
An01g01870	Glycoside Hydrolase Family 74	candidate xyloglucanase; C-terminal CBM1 module	+
An15g04530	Glycoside Hydrolase Family 78	candidate a-glycosidase related to bacterial a-L-rhamnosidases	-
An01g06620	Glycoside Hydrolase Family 78	candidate a-L-rhamnosidase	+
An10g00290	Glycoside Hydrolase Family 78	candidate a-glycosidase related to bacterial a-L-rhamnosidases	-
An08g09140	Glycoside Hydrolase Family 78	candidate a-glycosidase related to bacterial a-L-rhamnosidases	+
An12g05700	Glycoside Hydrolase Family 78	related to a-L-rhamnosidases	+
An07g00240	Glycoside Hydrolase Family 78	candidate a-glycosidase related to bacterial a-L-rhamnosidases	-
An04g09070	Glycoside Hydrolase Family 78	candidate a-L-rhamnosidase	-
An18g04800	Glycoside Hydrolase Family 78	candidate membrane-bound a-glycosidase related to a-L-rhamnosidases	+
An01g01340	Glycoside Hydrolase Family 88	candidate glycosidase related to a bacterial d-4,5 unsaturated glucuronyl hydrolase	-
An16g00540	Glycoside Hydrolase Family 95	candidate a-glycosidase distantly related to a-1,2-L-fucosidases	+
An16g02760	Glycoside Hydrolase Family 95	candidate a-glycosidase distantly related to a-1,2-L-fucosidases	+
An14g05340	Glycoside Hydrolase Family 105	distantly related to rhamnogalacturonyl hydrolases	+
An14g02920	Glycoside Hydrolase Family 105	related to rhamnogalacturonyl hydrolases	-

POLYSACCHARIDE LYASES (PL)

Gene model	Defline	JGI_Description	
An10g00870	Polysaccharide Lyase Family 1	pectate lyase (EC 4.2.2.2)	+
An11g04030	Polysaccharide Lyase Family 1	candidate pectin lyase	+
An19g00270	Polysaccharide Lyase Family 1	pectin lyase (EC 4.2.2.10)	+
An03g00190	Polysaccharide Lyase Family 1	pectin lyase (EC 4.2.2.10)	+
An14g04370	Polysaccharide Lyase Family 1	pectin lyase (EC 4.2.2.10)	+
An15g07160	Polysaccharide Lyase Family 1	pectin lyase (EC 4.2.2.10)	+
An14g01130	Polysaccharide Lyase Family 4	candidate rhamnogalacturonan lyase	+
An11g00390	Polysaccharide Lyase Family 4	candidate polysaccharide Lyase of Family 4 distantly related to rhamnogalacturonan lyases	+

CARBOHYDRATE ESTERASES (CE)

Gene model	Defline	JGI_Description	
An12g02550	Carbohydrate Esterase Family 1	candidate feruloyl esterase	+
An07g03100	Carbohydrate Esterase Family 1	candidate esterase, related to s-formylglutathione hydrolase	-
An12g05010	Carbohydrate Esterase Family 1	candidate acetyl xylan esterase	+
An04g09690	Carbohydrate Esterase Family 8	candidate pectin methylesterase	+
An03g06310	Carbohydrate Esterase Family 8	candidate pectin methylesterase	+

An02g12505	Carbohydrate Esterase Family 8	candidate esterase; distantly related to pectin methylesterases	+
An09g02160	Carbohydrate Esterase Family 12	candidate rhamnogalacturonan acetyl esterase	+
An04g09360	Carbohydrate Esterase Family 12	candidate rhamnogalacturonan acetyl esterase	+

* Signal sequences were predicted with SignalP (<http://www.cbs.dtu.dk/services/SignalP>).
In some cases the lack of a signal sequence might be due to an incomplete amino-terminus