Identification and characterization of three chitinases with potentials in direct conversion of crystalline chitin into *N,N′*-diacetylchitobiose

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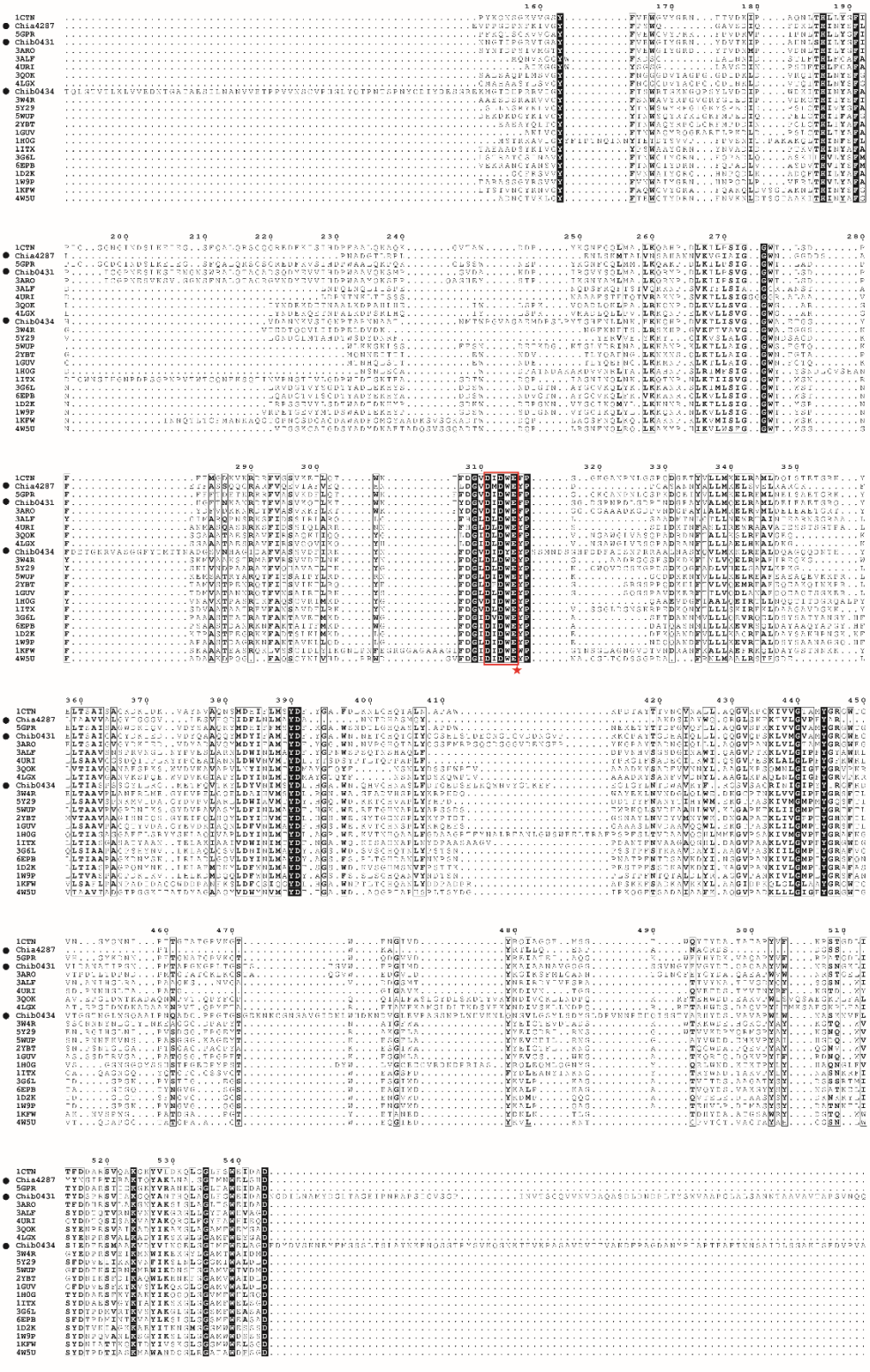
Table S1 General information of 26 type strains of *Pseudoalteromonas*.

Strain	Isolation source	Region	Reference
P. agarivorans DSM 14585^T	Ascidians	Pacific Ocean	1
P. aliena DSM 16473^T	Seawater	Sea of Japan	2
P. arctica DSM 18437^T	Seawater	Arctic	3
P. aurantia DSM 6057^T	Seawater	Nice, France	4
P. carrageenovora DSM 6820^T	Seaweed	Japan	5
P. citrea DSM 8771^T	Seawater	Mediterranean Sea near Nice	6
P. espejiana DSM 9414^T	Seawater	the coast of Northern California, U.S.	7
P. flavipulchra DSM 14401^T	Seawater	Nice, France	8
P. issachenkonii DSM 15925^T	Brown alga	Pacific Ocean	9
P. lipolytica JCM 15903^T	Seawater	the Yangtze River estuary , China	10
P. luteoviolacea DSM 6061^T	Seawater	Nice, France	11
P. marina DSM 17587^T	Seawater	East Sea in Korea	12
P. mariniglutinosa DSM 15203^T	Diatom	Marseille Gulf	13
P. nigrifaciens DSM 8810^T	Mussels	Sea of Japan	14
P. paragorgicola DSM 26439^T	Gorgonian	Pacific Ocean	15
P. peptidolytica DSM 14001^T	Seawater	Sea of Japan	16
P. phenolica JCM 21460^T	Seawater	Ogasawara Island, Japan	17
P. piscicida JCM 20779^T	Red tide waters	southwest coast of Florida, U.S.	18
P. prydzensis DSM 14232^T	Sea ice	Antarctica	19
P. rubra DSM 6842^T	Seawater	Mediterranean, Nice, France	20
P. spongiae JCM 12884^T	Sponge	Hong Kong waters, China	21
P. tetraodonis DSM 9166^T	Puffer fish	Japan	22
P. translucida DSM 14402^T	Seawater	Sea of Japan	15
P. tunicata DSM 14096^T	Tunicate	western coast of Sweden	23
P. ulvae DSM 15557^T	Marine alga	Australia	24
P. undina DSM 6065^T	Seawater	the coast of Northern California, U.S.	7

A



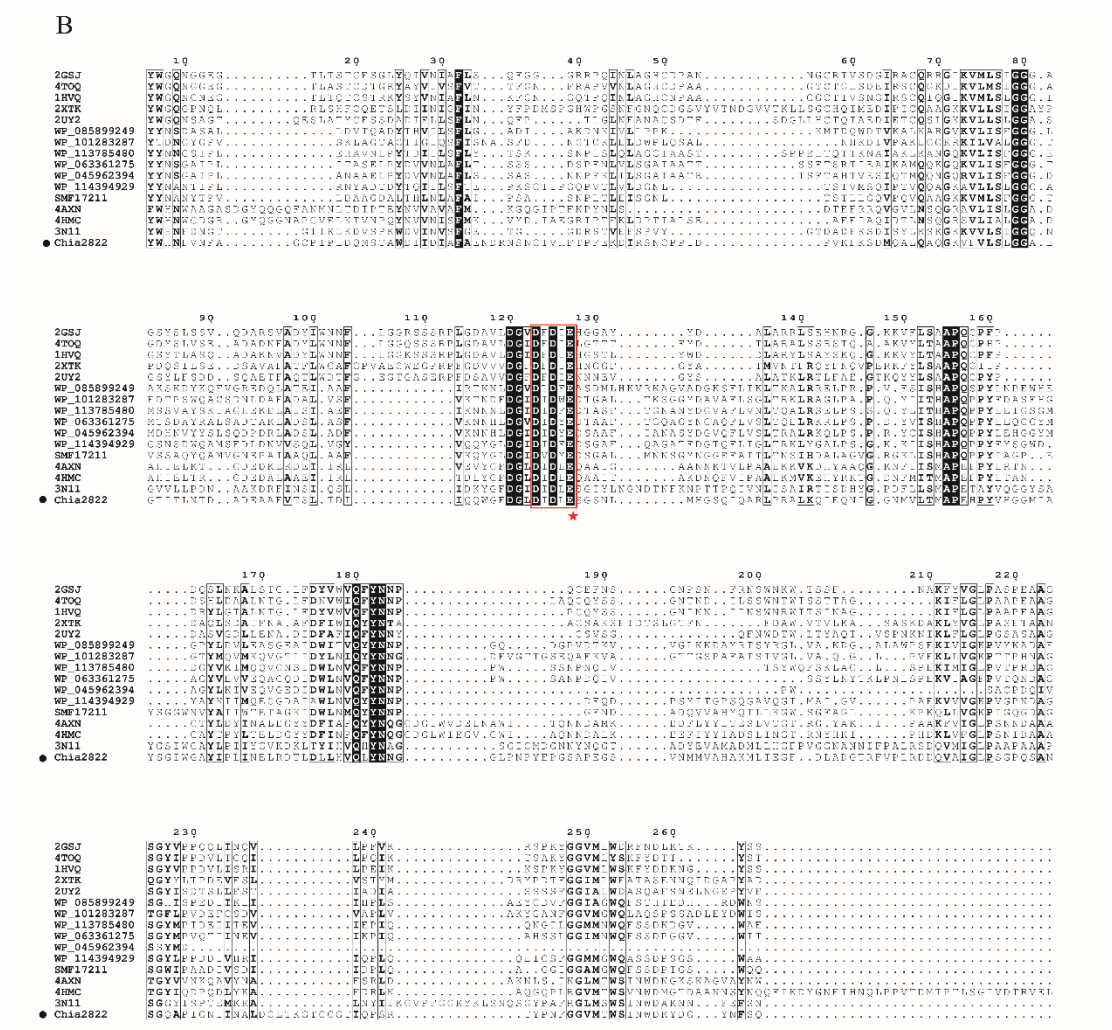


Figure S1. Multiple sequence alignments of Chib0431, Chib0434, Chia4287 and Chia2822 with known GH18 chitinases. The conserved catalytic motif (DxDxE) in GH18 chitinases is indicated by red boxes. (A) The alignments of Chib0431, Chib0434, Chia4287 with known GH18A subfamily chitinases. (B) The alignments of Chia2822 with known GH18B subfamily chitinases.

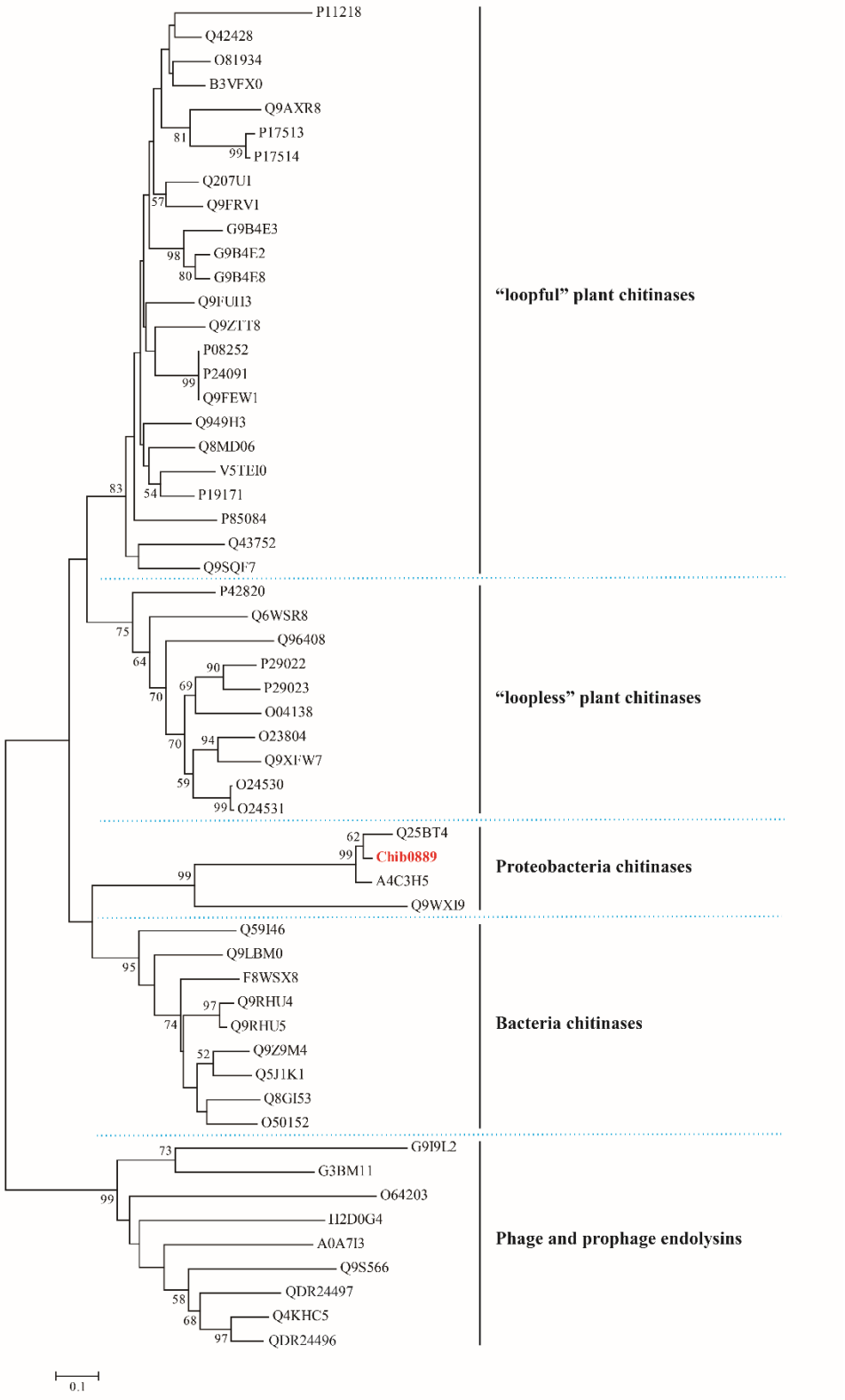


Figure S2. Phylogenetic analysis of Chib0889 with other GH19 chitinases. The phylogenetic tree was constructed by the Neighbor-Joining method. Bootstrap analysis of 1,000 replicates was conducted.

Table S2 Purification of the recombinant enzymes Chib0431, Chib0434 and Chia4287.

Enzyme	Purification step	Total volume (mL)	Protein concentration (mg/mL)	Enzyme activity (U/mL)[a]	Total activity (U)	Specific activity (U/mg)	Purification fold[b]	Yield (%)[c]
Chib0431	Cell extract	137	3.21	0.012	1.64	0.004	1	100
	Affinity chromatography	3.5	3.25	0.087	0.30	0.027	6.75	18.29
Chib0434	Cell extract	120	4.60	0.015	1.80	0.003	1	100
	Affinity chromatography	3.5	0.96	0.015	0.05	0.016	5.33	2.78
Chia4287	Cell extract	90	9.05	0.086	7.74	0.010	1	100
	Affinity chromatography	3.5	12.67	0.926	3.24	0.073	7.30	41.86

[a] Enzyme activity was measured with chitin powder as the substrate.

[b] (Ratio of the specific activity after purification tothat of the cell extract.

[c] Percentage of total activity recovered after purification compared with that of the cell extract.

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