A novel analytical method for D-glucosamine quantification and its application in the analysis of chitosan degradation by a minimal enzyme cocktail

Enzymatic depolymerization of chitosan, a β-(1,4)-linked polycationic polysaccharide composed of D-glucosamine (GlcN) and N-acetyl-D-glucosamine (GlcNAc) provides a possible route to the exploitation of chitin-rich biomass. Complete conversion of chitosan to mono-sugars requires the synergistic action of endo- and exo- chitosanases. In the present study we have developed an efficient and cost-effective chitosan-degrading enzyme cocktail containing only two enzymes, an endo-attacking bacterial chitosanase, ScCsn46A, from Streptomyces coelicolor, and an exo-attacking glucosamine specific β-glucosaminidase, Tk-Glm, from the archaeon Thermococcus kodakarensis KOD1. Moreover, we developed a fast, reliable quantitative method for analysis of GlcN using high performance anion exchange chromatography with pulsed amperometric detection (HPAEC-PAD). The sensitivity of this method is high and less than 50 pmol was easily detected, which is about 1000-fold better than the sensitivity of more commonly used detection methods based on refractive index. We also obtained qualitative insight into product development during the enzymatic degradation reaction by means of ElectroSpray Ionization-Mass Spectrometry (ESI-MS).

General information
State: Published
Organisations: Department of Chemical and Biochemical Engineering, Center for BioProcess Engineering, Norwegian University of Life Sciences, Apronex s.r.o., PT Biotech Surindo
Pages: 18-24
Publication date: 2016
Peer-reviewed: Yes

Publication information
Journal: Carbohydrate Research
Volume: 433
ISSN (Print): 0008-6215
Ratings:
BFI (2019): BFI-level 1
Web of Science (2019): Indexed yes
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 2.02 SJR 0.617 SNIP 0.744
Web of Science (2017): Impact factor 2.074
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 2.03 SJR 0.659 SNIP 0.796
Web of Science (2016): Impact factor 2.096
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 1.98 SJR 0.588 SNIP 0.828
Web of Science (2015): Impact factor 1.817
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 2.01 SJR 0.64 SNIP 0.85
Web of Science (2014): Impact factor 1.929
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 2.22 SJR 0.64 SNIP 0.852
Web of Science (2013): Impact factor 1.966
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 2.2 SJR 0.772 SNIP 1.01
Web of Science (2012): Impact factor 2.044