Production of keratinase by an efficient feather-degrading Bacillus licheniformis

Baihong Liu, Juan Zhang*, Guocheng Du, Miao Wang*, Jian Chen

J. Chen - National Engineering Laboratory for Cereal Fermentation Technology, Jiangnan University, Wuxi 214122, China
G. Du - The Key Laboratory of Carbohydrate Chemistry and Biotechnology, Ministry of Education, Jiangnan University, Wuxi 214122, China
J. Zhang - State Key Laboratory of Food Science and Technology, Jiangnan University, Wuxi 214122, China
B. Liu · J. Zhang · G. Du · J. Chen
Key Laboratory of Industrial Biotechnology, Ministry of Education, Jiangnan University, Wuxi 214122, China
School of Biotechnology, Jiangnan University, Wuxi 214122, China

Keratinase is a particular protease that degrades keratins and has a great potential for application in animal feed and textile processes. Bioconversion of keratin-rich materials into amino acids, peptides, and soluble proteins by keratinases is a potential method to improve the nutritional value of keratinous wastes as feed supplements. In this study, a feather-degrading bacterium isolated from poultry soil was identified as Bacillus licheniformis by 16s rRNA gene sequence typing. The isolate showed a remarkable activity in feather degradation in a medium containing 20 g/l of chicken feather as the sole carbon and nitrogen. which can degraded feathers completely less than 24h. The optimum temperature and pH of growth were 37°C and pH 10.5. Glucose, lactose, maltose, starch, sugar, amylodextrin, yeast extract, soya peptone, beef extract, Mg2+, K+ promoted keratinase production, while corn steep powder, casein, urea, ammonium nitrate, ammonium sulfate, Zn2+, Mn2+, Ca2+ and Cu2+ exhibited inhibitory effects. After the above optimization, the maximum activity of keratinase was 732 U/ml. To investigate the degradation products, the isolated strain was grown in feather-meal medium for 2 days, and then amino acid analysis of the culture supernatant was performed. The result showed that 17 free amino acids including some essential amino acids were detected, which suggests the potential application of this enzyme from a non-pathogenic Bacillus licheniformis for animal feed, as a possible replacement for expensive food crops.

Key words: keratinase, Bacillus licheniformis, culture optimization, degradation products, animal feed