Identification and Functional Analysis of Chitinase 7 Gene in White-backed Planthopper, *Sogatella furcifera*

Chen Chen, Hong Yang, Bin Tang, Wen-Jia Yang, Dao-Chao Jin

PII: S1096-4959(17)30044-1
DOI: doi:10.1016/j.cbpb.2017.03.002
Reference: CBB 10082

To appear in: *Comparative Biochemistry and Physiology, Part B*

Received date: 27 December 2016
Revised date: 21 March 2017
Accepted date: 24 March 2017

Please cite this article as: Chen, Chen, Yang, Hong, Tang, Bin, Yang, Wen-Jia, Jin, Dao-Chao, Identification and Functional Analysis of Chitinase 7 Gene in White-backed Planthopper, *Sogatella furcifera*, *Comparative Biochemistry and Physiology, Part B* (2017), doi:10.1016/j.cbpb.2017.03.002

Identification and Functional Analysis of Chitinase 7 Gene in White-backed Planthopper, *Sogatella furcifera*

Chen Chen[1], Hong Yang[1,2,*], Bin Tang[3]，Wen-Jia Yang[4]，Dao-Chao Jin[1]

[1] Institute of Entomology, Guizhou University, Guiyang, Guizhou, 550025, China;
[2] College of Tobacco Science of Guizhou University, Guiyang, Guizhou, 550025, China;
[3] Hangzhou Key Laboratory of Animal Adaptation and Evolution, College of Life and Environmental Sciences, Hangzhou Normal University, Hangzhou 310036, China; tbzm611@163.com (B.T.)
[4] Key & Special Laboratory of Guizhou Education Department for Pest Control and Resource Utilization, College of Biology and Environmental Engineering, Guiyang University, Guiyang 550005, China; yangwenjia10@126.com (W.-J.Y.);
* Correspondence: agr.hyang@aliyun.com; Tel.: +86-13985470482

Academic Editor: name
Received: date; Accepted: date; Published: date

Abstract: Chitinase is used to degrade chitin in insect cuticles and the peritrophic matrix. In this study, the full-length cDNA sequence of a Cht gene (*SfCht7*) was identified and characterized from the white-black planthopper, *Sogatella furcifera*. The *SfCht7* cDNA was 3148 bp, contained an open reading frame of 2877 bp and encoded 958 amino acids with a predicted molecular weight of 107.9 kDa. Homology analysis indicated that SfCht7 has typical chitinase features include a chitin-binding domain, two catalytic domains and a signal peptide region. Phylogenetic analysis suggested that *SfCht7* belonged to the group III chitinases. Quantitative real-time PCR analyses showed that *SfCht7* was highly expressed before molting. After injecting *SfCht7* double-stranded RNA in the nymph stage, insects exhibited phenotypes of difficulty in molting and wing development. A lethal phenotype was that nymph bodies exuviated from the head but the old cuticle did not detach completely from the body. Another lethal phenotype was that elongated distal wing pads of fifth-instar nymphs with junctions between the thorax and abdomen in the treatment group that were thinner than in the control group, giving a "wasp-waisted" appearance. In another phenotype that was not lethal, nymphs exuviated and old cuticles detached completely from the body, but the wings of adults did not stretch normally.

Keywords: Chitinase; Eclosion; Rice planthopper; *Sogatella furcifera*; Wing extension

1. Introduction

Chitin, a β-(1, 4)-linked polymer of *N*-acetyl-*β*-*D*-glucosamine, is distributed widely in fungi, insects, nematodes, algae, protists, sponges, rotifers, arthropods, cuttlefish, brachiopods and mollusks (Merzendorfer, 2013). In insects, chitin is the main structural component of the cuticle, which is a complex exoskeleton. Chitin is also found in the internal structures of many insects, including the inner cuticular linings of the alimentary canal, genital ducts, tracheal system, and the ducts of the various dermal glands. The alimentary canals of most insects contain a chitinous peritrophic matrix (PM), which is an essential component of the insect intestinal tract that surrounds the food bolus and compartmentalizes digestion (Moussian, 2010, Zhu, 2016). As a major component of cuticles that form the exoskeleton, chitin protects insects and helps them maintain shape and limits their growth. To grow and develop, insects must degrade old cuticles and synthesize new ones (Kramer et al., 1993; Kramer and Koga, 1986; Merzendorfer and Zimoch, 2003;