INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH & DEVELOPMENT

ISSN: 2278 – 0211 (Online)

Chitinous Seafood Waste For Production Of A Fungicidal Enzyme

Haritha Meruvu
Andhra University College of Engineering, India
D.Sri Rami Reddy
Andhra University College of Engineering, India

Abstract:

Chitin rich seafood waste which is a major waste from seafood industries including crab shells, shrimp and prawn waste, and fish scales etc. Certain bacterium could produce an enzyme called chitinase for the degradation of the chitinous waste when provided the favorable growth conditions. Chitinase enzyme is said to possess antibiotic activity and could be used as antifungal agent for killing phytopathogenic fungi. Hence from seafood waste which is of no commercial use, an enzyme that could be used in treating fungi which cause diseases in plants could be obtained; Simultaneously the seafood waste could be disposed in an ecofriendly manner.

1.Introduction

In the biosphere, tones of chitin are estimated to be synthesized and degraded each year. The commercial sources of chitin are shrimp, crab and lobster wastes. (6)Chitin is the second most abundant organic compound in nature, after cellulose. It is a linear β-1,4-homopolymer of N-acetylglucosamine (2-acetamido-2-deoxy-D-glucose) found naturally in the shells of crustaceans, insect exoskeletons, fungal cell walls, and micro fauna and plankton Chitin is mainly used as a raw material to produce chitin-derived products, such as chitosan, chitooligosaccharides and glucosamine. Due to broad range of applications, The derivatives of chitin either in the form of oligomer or monomer has been paid attention. It is thus important to develop processes for the enzymatic hydrolysis of macromolecular chitin to yield oligomers or even monomers. It is reported that chitin and its derivative chitosan have many applications in the pharmaceutical, cosmetic, food, and textile industries.(3)

2.Chitinous Waste

The seafood processing industries produce wastes like shrimp shells, crab shells, prawn waste, fish scales which are of zero industrial importance. Moreover, it has been found that shrimp and crab processing waste contains 14-27% and 13-15% by dry weight of chitin respectively. However, there is still no known commercial chitin processing plant established though chitin recovery from seafood processing is largely useful for many biotechnological applications.(7)

3.Chitinase Enzyme

Chitinases (EC 3.2.1.14) belongs to group of complex hydrolytic enzymes that catalyze depolymerization of chitin. Chitin degradation is initiated by chitinase (endochitinase) to oligo N-acetyl glucosamine chains. The oligomers, tri-NAG and di-NAG are degraded to NAG monomers by chitobiase and it also called β N-acetylglucosaminidase (EC 3.2.1.52). (1,2)

4.Classification Of Chitinases

Chitinase is capable to cleave the bond between C1 and C4 of two consecutive N-acetyl-glucosamines of a chitin polymer into low molecular weight product. Broadly, chitinase are classified as the endochitinases, 2 N-acetyl-glucosaminide and exochitinases. The exochitinases are defined as the progressive action starting from the non-reducing end of

the chitin with release of successive diacetyl chitobiose units. N-acetyl-glucosaminide plays a role in the activities are defined as a random cleavage at the internal point in the chitin chain.(2)

5.Chitin Degradation

Chitins can vary by the arrangement of *N*-acetylglucosamine strands, degree of deacetylation, and presence of cross-linked structural components, such as proteins and glucans. There are research found that some of the chitinases to be specialized for hydrolysis of particular types of chitin and others to be involved in degradation of all chitins. The arrangement of the *N*-acetylglucosamine strands becomes one of the factors that were affecting chitin degradation by microorganisms. The antiparallel α configuration is the most tightly packed and the most commonly found structure of chitin in organisms.The end products of chitin hydrolysis, e.g., *N*-acetylglucosamine, glucosamine, and chitobiose, are known to induce chitinase synthesis.(1,7)

6.Applications Of Chitinase

Recent advances studies in the structure and properties of chitin and its derivatives have opened a lot of new avenues for its applications. Improvements in the properties of chitin for a particular application can be easily brought about by chemical modifications. In composting, chitinases play an important role in degrading complex organics such as cellulose, lignin, chitin and proteins. Due to their ability to colonize plant root surfaces, and their vast antibiotic potential, they function as potent biological control agents against many economically significant plant pathogens. A great deal of interest has been generated on chitinase because of its applications in the biocontrol of plant pathogenic fungi, molting process of insects, mosquito control, production of chitooligosaccharide, single cell protein and mycolytic enzyme preparation. Thus the roles of chitinase in actifungal activity is very important as they may endow their host plant with some natural protection against infections.(4,5)

7.Reference

1. Amy, L., Svitil, Sine´ad M. Ni´ chadhain, Jessica A. Moore, and David L. Kirchman (1997). Chitin Degradation Proteins Produced by the Marine Bacterium Vibrio harveyi growing on Different Forms of Chitin. Applied Environmental Microbiology. 63(2):408-413.
2. Binod, P., Pusztahelyi, T., Nagy, V., Sandhaya, C., Szakacs, G., Pocsi, I. and Pandey, A. (2005). Production and purification of extracellular chitinase from Penicillium aculeatum NRRL 2129 under solid-state fermentation. Enzyme and Microbial Technology. 36: 880-887.
3. Brinda Mahadevan and Don L. Crawford (1997). Properties of the chitinase of the antifungal biocontrol agent Streptomyces lydicus WYEC108" Enzyme Microbial Technology.20:489-493.
4. Felse P. A., Panda T. (2000). Production of microbial chitinases: A revisit. Bioprocess Engineering. 23:127-134.
5. Felse, P. A., Panda, T. (1999). Studies on applications of chitin and its derivatives. Bioprocess Engineering. 20:505-512.
6. Gupta, R., Saxena, R.K., Chaturvedi, P., and Virdi (1995) "Chitinase production by Streptomyces virifificans: Its potential in fungal cell wall lysis" Applied Bacteriology. 87:378-383.
7. Wiseman, A. (1996). Handbook of Enzyme Biotechnology. 2nd Edition. USA: McGraw-Hill Book Company.