EX-BAC: The Extraction of Chitin and Chitosan from the Waste of Shrimp Shells and Potato Peels Mix with TiO2 as an Eco-friendly and Effective Bacteriostatic Agent

Lim, Eugene (School: Chung Ling High School Penang)
Leong, Daniel Yi Heng (School: Chung Ling High School Penang)

For decades, food wastes have been a global concern with 1.3 billion tons of food wasted annually costing 2.6 trillion USD. Besides, the outbreak of pathogenic bacteria causes almost 9 million casualties annually. Proper food wastes management to reproduce food wastes into value-added resources with antimicrobial properties are needed. This research proposes the extraction of chitin from shrimp shells waste (CSS) and chitosan from potato peels waste (CPP) as eco-friendly and effective antibacterial agent. Moreover, the addition of TiO2 (anatase) was proposed to enhance the antibacterial activity of the above extracts. FTIR analysis showed that chitin and chitosan were the main compounds in the extracts. The antibacterial activity of CSS and CPP mixture at various ratios against S. aureus(ATCC 29213) and E.coli (ATCC 25922) was studied. The antibacterial experiment consisted of 5 CSS/CPP samples, 7 control sets and 5 CSS/CPP/TiO2 samples. Samples with various concentrations were prepared with serial dilution on stocks. In the absence of TiO2, sample S1P1 showed the highest antibacterial activity with the colony forming unit (CFU) being decreased with sample concentration. When TiO2 was added, sample P100 showed the lowest CFU against both bacterial strains, indicating a significant inhibition on the growth of E.coli and S. aureus. The results indicated that sample S1P1 has the optimum CSS/CPP ratio to achieve antibacterial activity while a synergistically enhanced antibacterial activity has been exerted by sample P100 with TiO2, giving the highest antibacterial activity among all tested samples. These outcomes could benefit both the society and environment, add value to food waste and prevent pathogenic bacteria from spreading.

Awards Won:
Third Award of $1,000