Demonstration and Efficiency Tests of the Biodegradation of Polyurethane by Microorganisms in the Gut of the Zophobas atratus Larvae

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The research testifies whether superworms can biodegrade Polyurethane(PU) using the gut bacteria Pseudomonas. Also, the study examines how environmental factors of humidity of the surroundings and density of the PU foams impact the effectiveness of the biodegradation process of superworms. The mass change rate of PU foam and the survival rate of superworms at different humidity and PU densities were checked daily for 10 days. Then, the frass of superworms and PU foams were compared and verified using ATR-FTIR for compositional analysis and DSC-TGA for thermoanalytical analysis. In addition, it was examined whether biodegradation of the PU film exposed to gut bacteria Pseudomonas occurred using SEM. The result showed that superworms could consume PU efficiently in high moisture of 30%. It was also confirmed by ATR-FTIR and DSC-TGA analysis that superworms not only ingested but also biodegraded PU foams, and SEM visually verified that the intestinal microorganisms Pseudomonas biodegraded the surface of the PU film.

Awards Won:
Third Award of $1,000