Basella alba: A Novel Source for the Preparation of a Biopolymer Film to Detect Food Spoilage

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Food is a basic requirement of life. Despite several measures being taken to increase productivity and nutrient levels in food, food spoilage along the supply chain remains a major challenge. Researchers are using various methods, including engineering, chemical, and biological solutions, to prevent food spoilage; however, most of these methods can only be applied on a limited scale and need long-term infrastructural support. The present work focuses on the development of novel, cost-effective, plant-based biopolymers for the detection and further prevention of food wastage. To address this need, a biopolymer nanocomposite film that can detect food spoilage and convey spoilage information visually to consumers through changes in colour was developed. This research leverages the unique sensing properties of betacyanins sourced from Basella alba, a fast-growing plant with high fruit yield, along with the antibacterial properties of Bismuth molybdate nanoparticles to develop a multifunctional film. During spoilage of protein-rich food, volatile amines, including ammonia gas is released. The prepared Betacyanin-Bismuth molybdate film shows a visible color change in response to different pH levels and exposure time to ammonia. The film shows ~97% lower unit cost and 3-5x improvement in overall effectiveness relative to conventional gas-sensitive spoilage indicators. Thus, the developed film is an affordable, eco-friendly, easy-to-handle solution to detect food spoilage and contributes to achieving Sustainable Development Goals 2 and 12.

Awards Won: