BioRegen Polymer: A Regenerative Approach to Upcycling Waste From the Seafood Industry and Paper Waste Into Innovative and Environmentally Regenerative Biobased Polymers and Data Analysis Using the ARIMA and Linear Regression Models

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This project resulted from an observation that conventional plastics are a significant cause for pollution in our environment and aims to develop a compostable, environmentally friendly polymer using waste from the seafood and paper industries. Through research, it was discovered that a composite made of chitosan (from shrimp shells), partially hydrolyzed collagen (from fish waste), and cellulose (from paper waste) could enhance both the physical and environmental properties of the material. The project has three phases: First, the creation of a biopolymer film by blending chitosan, collagen, and cellulose in six distinct proportions; second, the assessment of the resulting bioplastic's mechanical strength, biodegradability, toxicity to plants, water resistance, flexibility, and surface analysis using SEM; and third, the use of predictive analytics, specifically ARIMA and Holt's trend analysis using Python, to understand material behavior. Data analysis shows that a higher content of collagen improves the material's tensile strength flexibility, and biodegradability, but slightly decreases its water resistance . Surface analysis results showed that the material surface was homogenous. The collagen matrix in gelatin significantly contributes to the strength and flexibility of the resulting bioplastic. Chitosan helps with water resistance due to its hydrophobic property. Cellulose adds strength to the bioplastic and also acts as a filler. These findings highlight the project's environmental benefits, in terms of upcycling waste materials to produce sustainable bioplastics.