Algae as a Resource for Bioplastic Production: Evaluating Species-Specific Characteristics and Biodegradability of Closterium, Chlorella, Scenedesmus, Volvox, Spirogyra, Saccharina latissima and Alaria esculenta

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Plastic pollution, with an annual human ingestion rate of approximately 1.38 million grams/per year, requires sustainable alternatives. The development of biodegradable bioplastics from algae as a means to reduce environmental impact and combat climate change was investigated. Exploring the creation of bioplastics using green and brown algae, each processed through distinct chemical methods. Farming green algae under controlled conditions to optimize biomass production was followed by the extraction of biopolymers through flocculation. Brown algae bioplastics were developed by mixing dried algae with water, glycerol, and cornstarch. The aim was to evaluate the biodegradation, tensile strength, and melting point of these bioplastics, hypothesizing that Saccharina Latissima (brown algae) would exhibit superior properties because of its high growth rate, and substantial yield of polysaccharides and alginate. Biodegradation was tested using an analytical scale and water immersion; tensile strength was measured using calipers and a spring meter; the melting point was determined with a hot plate and thermometer. The Data confirmed that Saccharina Latissima bioplastics had a biodegradation rate of 1.2% per day, a tensile strength of 0.6 MPa, and a melting point of 65°F. The high alginate content in brown algae contributes significantly to the enhanced film-forming capabilities, flexibility, and transparency of the bioplastics. These bioplastics, with their varied properties, can potentially replace conventional plastics in numerous applications, ranging from water bottles to industry-level PVC pipes. This research underlines Saccharina Latissima's potential as a sustainable alternative to traditional plastics, offering promising prospects for environmental conservation.