Chapter 9

Sericulture 4.0: Innovation Meets Tradition in Silk Production

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Abstract

This study investigates the significance of reintroducing ancient handloom processes into current fashion culture in order to encourage environmental, cultural, and ethical practices. Its goal is to involve disadvantaged populations, create fair employment, and boost rural areas' monetary flexibility by assisting local artisans and communities. According to the study, reinstating these approaches can help to build resilience and lead to a more socially and environmentally sustainable future. Silk-based scaffolds, which imitate the extracellular matrix, are excellent for tissue regeneration and regulated medication release. Researchers are working to improve their characteristics, integrate silk with other biomaterials, and create sophisticated production processes such as 3D bioprinting. The use of bioactive compounds in silk matrices is also being investigated. Combining silk's natural qualities with new technologies such as nanotechnology, microfluidics, and stem cell engineering might result in next-generation biomedical devices and therapies, possibly changing patient care. This paper examines silk sericin's characteristics and bioactivities, as well as its uses in tissue engineering and regenerative medicine, as well as its potential for the development of flexible electrical devices and 3D bioprinting. It shows that sericin-based biomaterials may enhance clinical results in tissue engineering and smart implanted devices. This article discusses the application of silk in neural soft tissue engineering, emphasizing its potential for neuronal development, nerve guidance, and controlled medication release. It also explains how silk-based biomaterials can be used to preserve and regenerate the injured nervous system. Previous research has employed silk to improve therapies for diseases such as stroke, Alzheimer's, Parkinson's, and peripheral trauma. The article also highlights research on altering silk biomaterials to increase neuroprotection and regeneration. Biomaterial research has transformed healthcare by integrating natural biological macromolecules into high-performance, versatile materials. This has resulted in a search for low-cost, environmentally beneficial, and renewable biomaterials. Silk along with other bioinspired materials are becoming more popular because to their superior mechanical qualities, flexibility, bioactive component sequestration, controlled biodegradability, biocompatibility, and low cost. These materials have the ability to govern temporal, spatial, biochemical, and biophysical processes.

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