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Technological Development of a Biostimulant Bioproduct for Fruit Seedlings: An Engineering Overview

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Abstract : The successful technological development of any bioproduct, including those of the biostimulant type, requires to adequately completion of a series of stages allied to different disciplines that are related to microbiological, engineering, pharmaceutical chemistry, legal and market components, among others. Engineering as a discipline has a key contribution in different aspects of fermentation processes such as the design and optimization of culture media, the standardization of operating conditions within the bioreactor and the scaling of the production process of the active ingredient that it will be used in unit operations downstream. However, all aspects mentioned must take into account many biological factors of the microorganism such as the growth rate, the level of assimilation to various organic and inorganic sources and the mechanisms of action associated with its biological activity. This paper focuses on the practical experience within the Colombian Corporation for Agricultural Research (Agrosavia), which led to the development of a biostimulant bioproduct based on native rhizobacteria Bacillus amyloliquefaciens, oriented mainly to plant growth promotion in cape gooseberry nurseries and fruit crops in Colombia, and the challenges that were overcome from the expertise in the area of engineering. Through the application of strategies and engineering tools, a culture medium was optimized to obtain concentrations higher than 1E09 CFU (colony form units)/ml in liquid fermentation, the process of biomass production was standardized and a scale-up strategy was generated based on geometric (H/D of bioreactor relationships), and operational criteria based on a minimum dissolved oxygen concentration and that took into account the differences in the capacity of control of the process in the laboratory and pilot scales. Currently, the bioproduct obtained through this technological process is in stages of registration in Colombia for cape gooseberry fruits for export.

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