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Perspective

Advanced Pineapple Propagation Techniques for Sustainable Agricultural Economies

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ABOUT THE STUDY

Pineapple (*Ananas comosus*) is a tropical fruit appreciated worldwide for its sweet taste and unique flavour. With the increasing demand for pineapple products, there arises a need for efficient propagation techniques to ensure a steady and sustainable supply. Traditional methods of pineapple propagation, such as suckers and crowns, have limitations in terms of time, space, and yield.

One method that has shown possibility for quickly propagating pineapples is tissue culture. It involves the cultivation of plant cells, tissues, or organs in a controlled environment under sterile conditions. In pineapple, tissue culture has several advantages over traditional methods, including the production of disease-free plantlets, year-round availability, and faster multiplication rates. Researchers have developed protocols for the efficient regeneration of pineapple plantlets from various explant sources, such as meristems, leaf bases, and floral parts. By optimizing nutrient formulations and growth regulators, they have achieved high multiplication rates and uniform plantlet growth.

Micro propagation, a subset of tissue culture, involves the propagation of plants through the culture of small plant parts, such as shoot tips or nodal segments, on a nutrient medium supplemented with growth regulators. In pineapple micro propagation, individuals have improved procedures to increase rooting efficiency and shoot proliferation. They have investigated the effects of different cytokines, auxins, and other growth regulators on the multiplication and development of pineapple shoots. Additionally, advancements in culture vessel design and automation have streamlined the micro propagation process, allowing for large-scale production of uniform plantlets in a cost-effective manner. Somatic embryogenesis is another rapid propagation technique, involves the induction of embryos from somatic cells, bypassing the normal process of sexual reproduction. In pineapple, somatic embryogenesis provides advantages such as rapid multiplication, genetic uniformity, and the potential for genetic manipulation. Bioreactors play an important role in increasing the production of pineapple plantlets through tissue culture techniques. Bioreactors provide a controlled environment for the cultivation of plant cells or tissues, allowing for continuous monitoring and optimization of growth conditions. In pineapple tissue culture, bioreactors give advantages such as higher multiplication rates, reduced labour requirements, and lower contamination risks.

It is possible to improve pineapple cultivars through genetic transformation by adding desired characteristics including improved availability, disease resistance, and greater output. Researchers have developed transformation protocols using various techniques, including Agrobacterium-mediated transformation and particle bombardment. They have successfully introduced genes encoding traits of interest into pineapple plants, demonstrating the feasibility of genetic modification in this species.

The success of rapid propagation techniques in pineapple cultivation ultimately depends on the field performance of the propagated plantlets. Researchers have conducted field trials to evaluate the agronomic performance, yield potential, and fruit quality of tissue-cultured pineapple plants compared to conventionally propagated ones. Results have shown that tissue-cultured plants exhibit comparable or even superior performance in terms of growth, yield, and fruit characteristics. As a result, tissue-cultured pineapple plants have been commercialized in many regions, providing growers with access to high-quality planting material and contributing to the sustainability of pineapple production.

With fast, dependable, and scalable ways to produce planting material, rapid propagation techniques have completely changed the pineapple farming industry. The constraints of conventional propagation techniques have been overcome by producers due to developments in tissue culture, micropropagation, somatic embryogenesis, bioreactor systems, and genetic transformation. This has allowed them to satisfy the growing demand for pineapple products.

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