

In the past there were many attempts to change natural foodstuffs into high-value products. Cheese, bread, wine, and beer were produced, traditionally using microorganisms as biological tools. Later, people influenced the natural process of evolution by artificial selection. In the 19th century, observations regarding the dependence of growth and reproduction on the nutrient supply led to the establishment of agricultural chemistry.

Simultaneously, efforts were directed at defining the correlation between special forms of morphological differentiation and related biochemical processes. New experimental systems were developed after the discovery of phytohormones and their possible use as regulators of growth and differentiation. In these systems, intact plants or only parts of them are cultivated under axenic conditions. These methods, called "in vitro techniques", were introduced to modern plant breeding.

In the field of basic research, plant cell cultures were increasingly developed and the correlations between biochemical processes and visible cell variations were explored further. It should be possible to manipulate the basic laws of regulation and the respective biochemical processes should be regarded as being independent of morphological processes of plant development.

Presently, biotechnology is characterized by the application of the discoveries made in biological science concerning the use of plants as suppliers of more and new useful products. These discoveries stem from cell biochemistry and enzymetic research. This leads to the production of immobilized cells and enzymes, and to improved techniques in gene and immunotechnology and cell culture methods. In particular, gene isolation and cloning as well as transformation and expression of foreign genes, called recombinant DNA technology, should be mentioned.

Moreover, there are equally important developments in other areas, resulting in the production of better reactors, optimized processes, and improved automatic controlling techniques. Using this technology, plant cells can be cultivated on a large scale.

The integrated use of the above-mentioned techniques of biology, biochemistry, and process engineering, using plants, organs, tissues,

and cells as producers of more and new products, is called plant biotechnology.

The keystones of this discipline are based on results from different research areas. Therefore, a collection of lectures for students from biology, biochemistry, and agriculture departments, established for the first time in 1982, provided the groundwork of this book. It is intended as a contribution to a more comprehensive understanding of the fundamental problems concerning plant cell biotechnology.

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