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INTRODUCTION

The enormous increase in agricultural output achieved within the last decades was due mainly to progress in mechanization, to increased application of fertilizers and pesticides, as well as to introduction of highly productive plant varieties and lines of breeding animals. However, it seems that optimization of the production processes, which give most spectacular results in modern, computer-controlled green houses and breeding farms, is reaching the limits of its effectiveness: the increase in expenditure leads no more to an adequate increase of income. What is much worse, the production methods which led to the "green revolution" have brought also dangerous side effects. Deep degradation of the natural environment is manifested by decreased area of forests and other arable lands of ecological importance, by water eutrophization, by erosion and pollution of soil. Moreover, there appeared pesticide-resistant lines selected from natural populations of common weeds, insects and pathogens.

It seems that the approaching economic and ecological dilemma could be solved by applying in agriculture the methods and means of production created in biotechnological laboratories.

Every technique making use of a living organism to produce or modify a defined product, to improve some properties of plants and animals, or to construct microorganisms with the desired useful properties belongs to the field of biotechnology. The techniques of DNA recombination, commonly termed "genetic engineering", serve as the basis of modern biotechnology. They make possible the transfer to any chosen organism of any gene cloned out of any other organism, with a precision and speed incomparably higher than it is possible to achieve by conventional breeding methods.

Biotechnology, applied together with traditional methods of agriculture, will permit to raise the agricultural output and maintain it at a permanently high level. It will lead to more economical processing of crops and increased diversity of products offered on the market, assuring at the same time their high quality and performance. Moreover, biotechnology could lower the present-day dependence of modern agriculture on chemicals and other potentially noxious means of production. It will give rise to better knowledge, protection and utilization of genetic resources, and will also lead to more environment friendly use of other natural resources.

Biotechnology in the farm practice means the possibility of taking advantage of the ornamental plants seedlings produced *in vitro*, of "artificial seed" or tomato varieties with a delayed ripening. These practical aspects of biotechnology correspond, however, only to a peak of an enormous iceberg, the main body of which consists of basic scientific research, encompassing not only the problems

of genome structure and regulation of its function by endogenous or exogenous factors, but also studies on a variety of biochemical and biophysical processes related to the metabolism of a living cell.

The issue of *Kosmos* now presented to the reader contains a collection of papers chosen in such a way as to reflect, at least partly, the complexity of the biotechnological "iceberg". The first paper concerns *Arabidopsis thaliana*, an organism which serves in plant molecular biology the same purpose as does *Drosophila* in studies on animals. Three successive papers concern organization and expression of plant genome. The next one, by M. Krzymowska and J. Hennig, is the first of a series devoted to one of the most important trends in biotechnology, i.e. the research into natural mechanisms of plant resistance to pests and pathogens, and introducing those mechanisms into cultivated plants. In the same series are included the papers dealing with symbiosis of the *Papillionaceae* plants with the molecular-nitrogen fixing bacteria. This problem is of special interest because of the plant-microorganism "dialogue" which is characteristic of both pathogenesis and symbiosis. The following four papers discuss regulation of plant life processes by phytohormones, and the effect exerted by abiotic factors. Near the summit of the "iceberg", i.e. the implementation of biotechnological methods in agricultural practice, can be located the questions discussed in the six papers closing the issue. They are focused on the problems ralated to production of transgenic plants in the laboratory and their subsequent transfer to field cultures. The first two papers of this series are devoted to various plant transformation methods, the next one — to control of plant morphogenesis in *in vitro* cultures, with special emphasis on somatic embryogenesis. The fourth paper concerns the possibility of raising haploid plants and their utilization in biotechnology. The paper by E.M. Szewczyk examines the perspectives of transferring into plants of the bacterial genes encoding synthesis of biodegradatable polyesters. The next paper approaches the important question of obtaining varieties of cultivated plants that would be resistant to nematod infection. The last paper, by S. Malepszy, considers the usefullness of transgenic plants in agriculture, for assessment in field trials of the value of the varieties obtained, as well as in large-scale cultivation.