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***A Case study :***

# Enhancing crop productivity by biotechnology

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Food crises in the sixties led to the development of high yielding varieties of cereals particularly, rice and wheat which resulted into green revolution and food production was increased significantly. A rapidly expanding population is a serious concern for food security especially for developing countries including that of India. To keep pace with the present population growth and consumption pattern, India's food requirement has been estimated to 225 million tons by the year 2005. Green revolution technologies, though contributing to food production, they are inadequate to meet the challenges lie ahead. Recently developed biotechnological techniques undoubtedly have major role to play in solving the food security problem, just as the green revolution had its origins in science and technology, and particularly in science of genetics. So the application of novel biotechnological tools could lead to gene revolution. With the wide spread of advanced cellular and gene technology, the new technologies will certainly help in enhancing the crop productivity.

Key words : Somaclones, Transgenic, Gene technology, Food crises, Productivity.

## INTRODUCTION

The quest for agriculturist for greater productivity and improvement of existing cultivars with better quality food continues with great vigor and spirit. The success in applying conventional plant breeding principals and agricultural practices to crop improvement reaches its peak when high yielding wheat and rice varieties were cultivated in 1960's, with profound impact on agricultural production (Borlaug, 1983). The Green Revolution was successful due to the introduction of improved seeds, fertilizer, irrigation and plant protection measures combined with positive policy support, liberal public funding for agricultural research and development and dedicated work of farmers. Not withstanding all round achievements, the basic problems of food security, poverty, equity and sustainability, continues to be a cause of concern in India today (Mashelkar, 1999). The conventional methods of plant breeding and traditional agricultural practices have done tremendous job and contributed to a great deal towards the above goal. However, in view of the acuteness of the problem and renewed fears regarding the availability of the proper and enough food, these methods alone are not sufficient to meet the situation. Today, the new techniques of biotechnology in general and genetic engineering in particular may help us escaping the dangers of food scarcity for rapidly growing population of India.

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*Application of cellular technology :*

Cellular technology or plant tissue culture is an enabling technology from which many novel tools have been developed to assist plant breeders. Tissue culture techniques are used for both, to increase the efficiency of conventional breeding methods by creating new genetic variation for crop improvement and by maintaining genetic purity of the genotype. They include micropropogation, anther culture, *in-vitro* selection, embryo rescue, somaclonal variation, somatic hybridization and transformation. Among these, somaclonal variation occupies some what unique position because it has both advantages and disadvantages of tissue culture system.

Cell or tissue culture passage has been shown to increase the frequency of mutations, thus leading to a higher production of non-uniform genotypes among regenerated plants (Murai and Kinoshita, 1986). This induced variation can broaden the existing genetic base of the crop and provide new genetic material for improvement of the genotype. Heritable genetic variation generated during the passage through tissue culture have been termed as somaclonal variation (Larkins and Scowcraft, 1981). An extensive number of reports are available in a whole range of species, indicating that somaclonal variation is widespread and therefore readily accessible to all plant breeders (Karp, 1991). Utilization of in-vitro induced novel genetic variation is one of the