

Spinks two  
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**ASSIGN  
BUSTER**

Spinks (1980) defined biotechnology as, “ the application of biological organisms, systems or processes to manufacturing and service industries”. European Federation of Biotechnology (1981) defined biotechnology as, “ the integrated use of biochemistry, microbiology and engineering sciences in order to achieve technological (industrial) application of the capabilities of microorganisms, cultured tissue cells and parts thereof’. In the report Biotechnology: A Development plan for Canada (1981) biotechnology is defined as “ the utilization of a biological process, be it microbial, plant or animal cells, and their constituents, to provide goods and services”.

**History:**

1. Pre pastures Era: Selection in plants and Fermentation. 2. Pasture Era: Microbes are cause of Fermentation, Enzyme convert sugar into alcohol. 3. Third Era: antibiotic (pencillin). Green revolution 4. Modern Era: DNA structure, Genetic Engineering 5.

Recent Era: Transgenic, marker, tissue culture etc.

**Importance:**

1. To Increase Nutrient Content. 2.

To Increase resistance to Biotic and abiotic stress. 3. To introduce gene 4. To Create variation. 5. To minimize inputs and maximize output.

**Contribution of Biotechnology to Agriculture:**

TechnologyUses1. Embryo culture to rescue otherwise in viable hybrids, to recover haploid plants from interspecific hybrids, micro propagation of

orchids etc. 2. Rapid clonal multiplication through meristem culture,, e. g., of many fruit and forest trees, such as, teak.

3. Recovery of virus and other pathogen free stocks of clonal crops; meristem culture is generally combined with thermotherapy/cryotherapy.

The first two applications are the most remarkable. Very high rates of multiplication; conventional rates very low. Very useful in clonal crop; particularly for germplasm exchange. 4. Germplasm conservation through storage in liquid nitrogen (at-196° C, cryo-preservation) or through . Slow growth.

5. Rapid isolation of homozygous lines by chromosome doubling of haploids produced through anther culture/interspecific hybridization/ovary culture. 6.

Isolation of stable somaclonal variants with improved yield/yield traits/disease resistance/ resistance to cold, herbicides, metal toxicity, salt and other abiotic stresses. 7. Gene transfers (genetic engineering) for insect resistance, protection against viruses, herbicide resistance, storage protein improvement etc. 8.

Molecular markers, e. g., RFLPs and RAPDs, for linkage mapping and mapping of quantitative trait loci.

Particularly useful in clonal crops, especially in those producing tubers, storage roots etc. Very successful in variety development in China, e. g., in rice and wheat. Many examples of successful isolation; many variations are stable and heritable, often due to gene mutation, which may sometimes, be novel.

Mainly using the Ti plasmid of *Agrobacterium*; also through particle gun, free DNA uptake; REVOLUTIONARY DEVELOPMENT in crop improvement. A powerful tool for indirect selection for quantitative traits; several other important applications. In agriculture, rapid and economic clonal multiplication of fruit and forest trees, production of virus-free stocks of clonal crop, creation of novel genetic variations through somaclonal variations, and transfer of novel and highly valuable genes (e. g.

), for disease and insect resistance through genetic engineering have opened up exciting possibilities in crop production, protection and improvement.