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**ASSIGNMENT**

Biotechnology is the broad area of biology, involving living systems and organisms to develop or make products. Depending on the tools and applications, it often overlaps with related scientific fields.

Biotechnology is the research and development in the laboratory using bioinformatics for exploration, extraction, exploitation and production from any living organisms and any source of biomass by means of biochemical engineering where high value-added products could be planned.

Biotechnology encompasses three aspects of woody plant biology:

(1) in vitro culture,

(2) use of immunological methods to quantify plant metabolites, and

(3) genetic engineering, that is, the transfer of genes between organisms without normal sexual reproduction. Rapid developments in these areas have made feasible the production and mass propagation of new genotypes of important forestry and horticultural crop plants.

The procedures of biotechnology largely depend on an understanding of the molecular biology of DNA replication, transcription, and translation. In association with cell division, replication of DNA occurs via DNA polymerases simultaneously at many locations on the genome where chromosomal DNA has been unwound. Gene expression begins with transcription, the synthesis of messenger RNA (mRNA) in a series of reactions involving RNA polymerases and various regulatory molecules.

In the process of genetic transformation, new genes are stably introduced into the genome of target cells. There are a variety of methods to achieve transformation, including those associated with biological vectors and physical methods of introduction through direct exposure of cells or protoplasts to DNA and the acceleration of small DNA-coated projectiles into plant tissues.Cocultivation of the bacterium with plant cells or protoplasts results in incorporation of the gene of interest, along with (1) DNA sequences that direct its transcription, (2) a reporter gene that confirms the presence of the desired gene after elimination of the bacterium from culture, and (3) a gene conferring resistance to subsequently applied chemicals so that nontransformed cells can be eradicated.

Protein products are frequently detected and quantified by antibody-based assays. Antibodies are produced in animals in response to the introduction of foreign macromolecules into the body.Molecular biology techniques have greatly facilitated genetic analysis. Genetic variation at the DNA level can be detected by restriction fragment length polymorphism (RFLP) analysis wherein plant DNA is cleaved by restriction enzymes at specific base sequences and the fragments are separated by electrophoresis.

Genetic engineering often is conducted on cells and protoplasts cultured in vitro, which must be regenerated to whole plants. In addition, it often is desirable to propagate en mass new genotypes generated by traditional breeding and selection methods. Hence, there has been substantial effort directed toward developing means of multiplying plant materials vegetatively for distribution. Such methods may be associated with traditional techniques such as rooting of cuttings or in vitro culture techniques.Micropropagation may be accomplished through culture of undifferentiated callus tissues and subsequent induction of organs by manipulation of culture media and plant growth regulator concentrations. Alternatively, propagules can be obtained directly from rooting of microcuttings derived from shoot culture of differentiated tissues such as shoots, buds, or leaves.Potential plant improvements that may be obtained from genetic engineering are numerous, including increased tolerance of herbicides, greater resistance to insect, fungus, and virus pests, precocious flowering, delay of fruit degradation and flower senescence, color alteration in floricultural crops, and enhanced resistance to pollutants.Additionally, as methods to achieve plant transformation usually require in vitro culture, these techniques may not be available for many recalcitrant woody plants. Appropriate controls must be developed to prevent movement of foreign genes into natural plant populations.