Review Article

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A Review on Applicative Biotechnology and Human Development

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Abstract

The knowledge of biotechnology is applied in all major areas of human life like medicine, agriculture, petrochemical, food processing and aromatic manufacturing industry. Medicinal plants have been grown on this plant since ancient times. With passage of time human beings developed the technique of extraction of medicines from the medicinal plants. The medically important components like antioxidants, analgesics, antiviral, antibacterial etc agents are extracted from medicinal plants through the latest biotechnological techniques and methods. Lipids are in great demand in biochemical industries and to fulfill this demand biotechnological techniques come into play for extraction of the same. This paper reviews various applicative aspects of biotechnology through literature review and positive impact of the same on human development.

Keywords: Analgesics; Antioxidants; Biotechnology; Medicinal; Medicines.

INTRODUCTION

Pharmaceutical industry utilizes all kinds of biotechnological tools and techniques for extraction and obtaining of biological active and important compounds. All kinds of culture like organ, tissue and cell culture are conducted through biotechnological means. The active substances obtained through these means are of great importance for both pharmacological and medicinal industry. Thus, components obtained through biotechnological techniques are natural in origin. It is said that these are less harmful than medicine obtained from synthetic substances.[1-3]

There are various lipids in various industries and particularly bacterial lipids are of remarkable use. Lipases obtained from bacteria like Bacillus, Staphylococcus, and Pseudomonas their production is conducted at industrial level. This is done just because of their huge biochemical use.[4]

Rice is one of the most important staple foods of most of the countries of the world. Various kinds of biotechnological techniques have been utilized to increase the production and varieties of rice. Due to global population growth the demand for rice has increased dramatically in the past few decades. Various biotechnological measures were undertaken to increase the production and currently the production of rice has increased manifold. As rice has great demand for irrigation facilities and agricultural land for its yield, to increase the per

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unit area increase of rice production is a must. Advancement in gene technology and genome sequencing has helped in increasing the yield of rice internationally.[5]

With great demand for dyes universally in all kinds of industries ranging from textiles, food processing to pharmaceuticals and advancement in organic chemistry. We could see rampage use of synthetic colors everywhere. We very well know that use of such dyes are harmful to humans and in the last few years large scale research has been conducted to extract natural dyes from natural products primarily from plant sources with the aid of biotechnology sciences. When we look into the scientific aspect of dye production naturally microorganisms play important roles from the beginning to end of the pigment production process. Pigments like pythons, melanin, carotenoids, phenazine, flavins, etc. are all natural pigments responsible for appearance of natural colors like green, blue, red, orange, yellow and brown etc. Bacteria are the natural source of pigments, dyes and colorants in this world. With the use of biotechnology, the pigments can be extracted from them for our use. Such pigments are safe for human consumption. Microorganisms can be easily grown and propagated then in comparison to vegetable propagation. They can easily grow in controlled conditions and their growth has no dependency on season, which on contrary is a must for plant propagation. The microorganism can be grown in huge biomass for industrial production of pigments and colorants.[6]

Biotechnology has helped in improved production of many vital enzymes, which are of significant medical and pharmaceutical importance. To elaborate on it we can discuss the enzyme L-asparaginase. L-asparaginase is one of the most vital enzymes of medical importance. In the present day when cases of cancer are universal medical havoc. L-asparaginase is used in the treatment of cancer. It is not only used in the medical industry but also in the food processing industry. Looking into the medical importance of the enzyme L-asparaginase various biotechnological tools were used for mass production of this enzyme.[7] Another vital agent that is used as an important anti-cancer drug is laccases. Biotechnology has helped in the production of this agent and this agent itself is of great nano-biotechnological importance. Laccases are also an important component of the cosmetic industry as well as an agent used in bioremediation.[8]

There are many nanomaterials that are of great nanotechnology and biotechnological importance. One such material is graphene. There are huge bio applications of graphene. It is used in biosensors, large numbers of biological devices, molecular medicine, bioassay and molecular analysis.[9]

The field of biotechnology has witnessed the genome sequencing of various plants and animals be it prokaryotic or eukaryotic. After genome sequencing biotechnology is advancing towards deep understanding of gene and protein functionality in various processes.[10]

The term "proteomics" can be defined as the qualitative and quantitative comparisons of proteomes to identify cellular mechanisms which are involved in biological processes.[11]

Proteomics hugely helps in molecular biology. It specifically helps in molecular study of reproductive functions of various animals.[10]

Biotechnology has come to the rescue even in the textile industry to curtail water waste in the coloration process. Biotechnology has significantly helped in decolorization of textile wastewater. Biotechnological techniques are being used to prepare dyes that can be safely washed via least water usage.[12]

DISCUSSION

There are various applications of biotechnology ranging from diagnostics to evolutionary studies. Biotechnology has definitely revolutionized the field of molecular biology. Biotechnological methods are used for functional identification of rare particles, small molecules and advance identification of many parts and functions at molecular level.[13]

Biotechnology has also helped us in study significantly for algal study. Algae is of great significance today as it is largely used as food and feed for a large number of living organisms. So, the biotechnology of microalgae is also important for human development. As there is great diversity in the varieties of microalgae, it helps in the genetic engineering studies.

We very well know that bio petroleum is produced through biotechnological advancement. This will both help in reducing the dependency on non-renewable sources and help in natural product waste management or agricultural waste management. In large parts of Europe raw grass covers thirty percent of the land and this grassland is of no use but just to serve as fodder for animal husbandry. The grasses from the grassland can be used in bioethanol production. Bio-based economy is gaining importance because of increased awareness regarding deteriorating environment

and reducing natural resources. Lignocellulosic biomass can be used for biopetrol preparation as it is of no use to husbandry or human industry.[14]

Now we will discuss why in vitro secondary production of metabolites for human use are produced. The reason behind it is that such metabolites are safe for human consumption. The advantages are as follow:

1) They are natural in origin
2) Directly cultured from the specific organ, tissue or cell. So grants precise effect
3) Production cycle is small via such methods so production is easy.

Some examples of secondary metabolites obtained in vitro from some medicinal plants are Antioxidant agents, Analgesic agents, Antibacterial agents and Antidiabetic agents.[1]

These agents have helped human beings easily tackle complicated health problems.

Examples of some important antioxidant agents are as follows:

Table 1: Tabular representation of compounds, plants, biotech process and plant species

Compound	Plant Species	Culture	Antioxidant Testing
Anthocyanins	Daucus carota	Callus and cell suspension	Lipid peroxidation
Anthocyanins	Ajuga reptans	Flower cell culture	β-carotene bleaching and lipid peroxidation
Anthocyanins	Glehnia littoralis	Callus and cell Suspension	Many in vitro chemical assays
Anthocyanins	Vaccinium pahalae	Cell and aggregate Suspension	Many in vitro chemical assays
Apigenin	Saussurea arabica	Hairy roots	Overexpressing CHI, H2O2 induced cell damage
Abietane and Diterpenoids	Torreya nucifera	Cell suspension	LDL oxidation and nitric oxide inhibition
Crocin	Crocus sativus	Callus	Alleviation of oxidative stress in cultured mammalian cells
Cynarin and chlorogenic acid	Cynara cardunculus	Callus	TBARS
Carnosic acid	Rosmarinus Officinalis	Callus and shoot Culture	Oxidative stress reduction in living cells and many chemical in vitro assays
Flavonoids	Artemisia Judaica	Shoot cultures in Bioreactor	DPPH
Flavone-C-glycosides	Passiflora Quadrangularis	UV irradiated callus	DPPH
Flavonols and flavones	Petroselinum sativum	Cell suspension	In vivo (rats)
Flavonoids	Stevia rebaudiana	Callus	FRAP and DPPH
Kinobeon A	Carthamustinctorius	Cell suspension	Cell membrane peroxidation, XOD/NBT and singlet oxygen quenching
Lithospermic acid B and rosmarinic acid	Salvia miltiorrhiza	Callus, regenerated plantlets and hairy roots	DPPH
Phenylethanoid glycosides	Cistanche eserticola	Cell suspension	DPPH
Piceatannol (a stilbene)	Arachis arabica	Callus	Oxidative DNA damage in cell culture
Kinobeon A	Carthamustinctorius	Cell suspension	Cell membrane peroxidation, XOD/NBT and singlet oxygen quenching
Rosmarinic acid	Anchusa officinalis	Cell suspension	Many in vitro chemical assays

Plant biotechnology is an important alternative branch of life sciences for production of photochemical of use in scientific world. These productions are vital for both biodiversity of plant kingdom and human civilizations development on this earth. The biochemical products mentioned in table 1 are vital products for metabolic use for both plants and animals in science and medical field.

We know that oxidation is very important process in most of the chemical-based industries. The synthetic or chemical oxidation and reduction process is very hazardous to the environment.

The biological oxidation is carried out in mild environment and the product achieved is all in controlled conditions. So enzymatic oxidations have great advantages over chemical catalyst-based oxidation. One such enzyme is laccase enzyme. Applications of laccase enzymes aredecolourization ofdyes, denim bleaching, degradation ofxenobiotics, biopulping, biobleaching, biosensors, effluent treatment, food industry and organic synthesis.

Even L-asparaginase an enzyme obtained from various bacteria sources are used in various therapeutic activities. It is used in drug delivery process, antimicrobial activities, cancer treatment, infectious diseases, autoimmune diseases, food industry, health industry, veterinary hospitals and as virulence factor in many diseases.

CONCLUSION

The biotechnologically enzymes are very important in the present world for the scientific advancement of human civilization. For example, L-asparaginase is playing vital role in chemotherapeutic treatment of various kinds of cancer. They are of great role in many other autoimmune diseases, which were consider uncurable in the past.

Through biotechnological aids the treatments are done at the molecular level, which has granted a different dimension to the treatment procedure.

Hopefully even in the future the tools and technique of biotechnology will be used in these kinds of positive and advantageous work of human development.

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