

Biotechnology: A tool for the improvement of human life

Abdul Hannan¹, Muhammad Qasim¹, Atif Bashir¹, Ejaz-ul-Hasan², Qurban Ali³ and Hafiz Saad Bin Mustafa^{2*}

¹ Centre of Agricultural Biochemistry and Biotechnology, UAF, Pakistan.

² Oilseeds Research Institute (AARI) Faisalabad, Pakistan.

³ Centre of Excellence in Molecular Biology, University of the Punjab, Pakistan.

*Corresponding author's email: saadpbg@gmail.com

Abstract: Increase in human population has given a big challenge to science to combat with food and health enhancement. With the initiation of biotechnological science a new world of science has opened the doors to overcome these challenges. Utilization of biological systems to design beneficial technologies for human welfare comes under the umbrella of biotechnology. The discipline of biotechnology has now many allied fields. New inventions in the life sciences in past few years have come through biotechnology. That is the reason biotechnology is the today's science in which happenings are occurring. Whether there is new invention of vaccine, whether we have to make new crop varieties, improve livestock, poultry meat and feed and milk quality and even in war industry biotechnology is playing its important role. It is well proofed that biotechnology has no limits. If it comes to GM crops, biotech crops are unstoppable in yield outcome. The basic aim of this review paper is to through light on latest happenings in biotechnology and to aware the research scientists about its significance in every field of science. All the biotechnology industry with its allied applications is considered in this review paper.

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Introduction:

Making of technologies through the use of desired organisms for the service of mankind is designated as biotechnology. Biotechnology has affected everyday life through its different inventions (Barış and Fatma, 2015). Almost in every field of life biotechnology have its products. Biotechnology has opened a whole new world of science (Knockaert *et al.*, 2015). Biotechnology has its vast application in agriculture. BT crops have been introduced to overcome the use of pesticides. Modest yield and grains are the core objective in biotechnological crops (James 2012). Introduction of shelf life enhancing genes in tomatoes has increased its production and stability. BT brinjals are also introduced in the market (Rao, 2010). Livestock production has increased many folds. Biotechnology has made the study of genetics very easy. The sequencing of 12s rRNA that was to identify the bovine meat is also an outcome of biotechnology (Prakash, *et al.*, 2000). Meat quantity and quality has been increased (Caroli *et al.*, 2009; Marletta *et al.*, 2007; Rando *et al.*, 2000). Milk quality has been enhanced by the use of many biotechnology techniques (Martin *et al.*, 2002; Vinesh *et al.*, 2013). Biotechnology has made climate smart plants to adjust in most environments (Odum and Odum, 2001). Biotechnology has made a great impact on human life through disease diagnosis and cure. Making of new medicines like insulin and generation 3rd antibiotics has made human disease management and cure easy. Vaccines are the new mega invention in the medical

history. PCR invented by Mullis and his fellows is great mark in history of biotechnology (Mullis *et al.*, 1986; Saiki *et al.*, 1988). PCR based diagnosis are much more reliable than the classic methods (Zarlenga and Higgins, 2001). Application of biotechnology in war industry is of much interest in modern days. Bioweapons and other technologies made from the use of organisms are much more concise and targeted. Fungal agents (Brillman and Quenzer 1998), bacterial agents and bio-regulators with bio chemicals are in use in modern era (Casarett LJ 2001).

Agriculture:

Agriculture is the foundation field through which sustaining of life is maintained. Food, shelter and clothes are the products of agriculture. Biotechnology played its vital role in the improvement of agriculture sector. By the introduction of genetically modified crops, there is a valuable increase in the quality and quantity of the crops. Many techniques have been made to study the genome of every crop. The yield of various crops and vegetables like corn, cotton, sugarcane, wheat, rice, chickpea, potato, tomato and chills need to improve through conventional and non-conventional techniques (Ali *et al.*, 2013; Ali *et al.*, 2014abc; Masood *et al.*, 2015ab; Dar *et al.*, 2014; Zameer *et al.*, 2015abc; Khan *et al.*, 2014; Javeed *et al.*, 2014; Waseem *et al.*, 2014; Ali *et al.*, 2015; Saeed *et al.*, 2014)

Biotechnology in crops:

Utilization of a few types of biotechnology in vagrant products is expanding with time in certain

creating nations. These products incorporate millets cowpea certain vegetables and natural product mixtures. These advances help in creating incentives for the more cultivation of the crops (Rosamond *et al.*, 2004; Qamar *et al.*, 2014; Tariq *et al.*, 2014). Most of the investment is going towards the cash crops internationally (James 2001). Many genomic techniques and molecular techniques have been identified to better understand the govern traits that have direct effect on plant physiological and economical values. Marker assisted selection techniques are widely used to identify and track the relation between the traits of the breeds that are difficult to observe (Rosamond L *et al.*, 2004). Such PCR based marker helped determination strategies were presented in Indonesia in 2002 (Toenniessen *et al.*, 2003). In china, national research programs are widely using marker assisted methods to improve the rice quality (Zhou *et al.*, 2003). These technologies are also used in the quality enhancement of fiber in cotton (Zhanget *et al.*, 2003). Qualities are altered by marker helped choice in single extensive scale marker helped determination (Ribaut and Betran, 1999). Whatever is left of the genome is recognized by the routine systems for field based reproducing (Singh *et al.*, 2000).

Biotechnology in GM crops:

Biotechnology is the only science that allows us to incorporate any foreign gene from outside the plant kingdom and get our desired results (Gassen and Hammes, 2001). Since GM crops have many issues ongoing around the world. Two recent incidents have

been occurred in USA. In 2000 a GM harvest of maize was found in human nourishment that was sanction for the food of creatures (Dorey, 2000). The second case was the inadvertent shipment of the unapproved GM product of maize somewhere around 2001 and 2004 (Herrera, 2005). For more delicate screening of the GM nourishment PCR investigation is consolidated (Lipp *et al.*, 2005). It is the entire need of the time to genetically transform desired genes in wheat to gain better yield (Mustafa *et al.*, 2015; Naseem *et al.*, 2015; Ali *et al.*, 2014)

Biotechnology in crop yields:

In vascular plants starch is the main source of carbohydrate which is structurally composed of glucose homo-polymers i.e., amylose and amylopectin. This is usually synthesized in plastids that are both basically photosynthetic and non-photosynthetic. The amount of starch in plants predicts the crop yield, more the starch more will be the crop yield (Francisco José Muñoz *et al.*, 2014). There is much knowledge of starch metabolism collected over the years, but breeders and biotechnologists have still unsuccessful attempts in increasing starch value in a predictable way (Chen *et al.*, 2012). Classic view of the synthesis of leaf starch is illustrated in *figure-1*. This figure also illustrated that AGP is the only source of ADPG and it is the major regulatory step in the starch biosynthesis process (Neuhaus *et al.*, 2005; Stitt and Zeeman, 2012; Streb and Zeeman, 2012; Streb *et al.*, 2009; Butt *et al.*, 2015; Ali *et al.*, 2015).

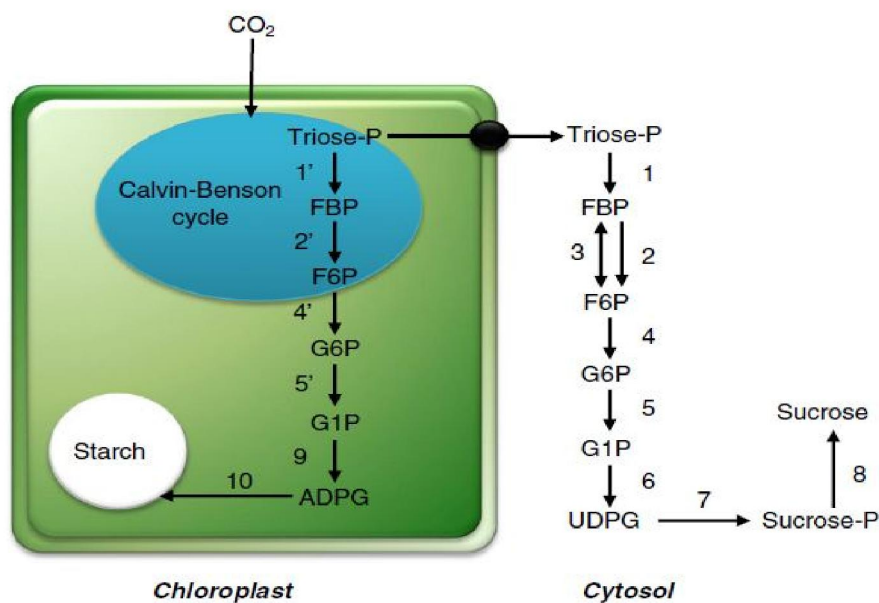


Fig. 1. Classic interpretation of the mechanisms of starch and sucrose syntheses in leaves. The enzymes are numbered as follows: 1, 1', fructose-1,6-bisphosphate aldolase; 2, 2', fructose 1,6-bisphosphatase; 3, PP; fructose-6-P 1-phosphotransferase; 4, 4', PGI; 5, 5', PGM; 6, UGP; 7, sucrose-phosphate-synthase; 8, sucrose phosphate phosphatase; 9, AGP; and 10, SS. According to this view, the starch biosynthetic process resides exclusively in the chloroplast and is segregated from the sucrose biosynthetic pathway that takes place in the cytosol.

Biotechnology in pest management:

As a part of integrated pest management (IPM), three nematodous fungi, *Paecilomyces lilacinus*, *Pochonia chlamydosporia* and *Plectosphaerella cucumerina* were studied for controlling potato cyst nematodes (PCN). The research is then conducted and it was concluded that *P. Lilacinus* when used in combination with different selected fungicides and nematicides showed great potential in controlling the potato cyst nematodes (Jacobs *et al.*, 2003; Sabbir *et al.*, 2014; Abbas *et al.*, 2014).

Biotechnology in weed resistant crops:

Glyphosate-resistant crops commonly known as GR crops have facilitated increased conservation in tillage production practices and simplified in controlling weed in certain crops which include GR soybean, cotton, canola and corn. The increased dependence on the glyphosate has resulted in weed shifts. This is great success in biotechnology field. Although the evolution of herbicide resistant crops is not a new topic. In past many crops have been made to encounter the problem of weeds (Owen 2008; Qamar *et al.*, 2015).

Crop nutrition and quality improvement:

Zinc is very essential to human health. Through biotechnology bio-availability of zinc has risen for the benefit of human health (Anika *et al.*, 2014). Potassium substance is enhanced much in crops to get better yield (Yi Wang, Wei-Hua Wu., 2015; Anwar *et al.*, 2013; Azam *et al.*, 2014; Jahangir *et al.*, 2013; Khan *et al.*, 2014; Muhammad *et al.*, 2013).

Biotechnology in improving fatty acid in developing oil seed:

Polyunsaturated fatty acids (PUFAs) also known as conjugated fatty acids have numerous applications in the industrial productions of polymers and organic coatings. In a nutritional sense there is a research that shows that CFAs has anti-cancer value.

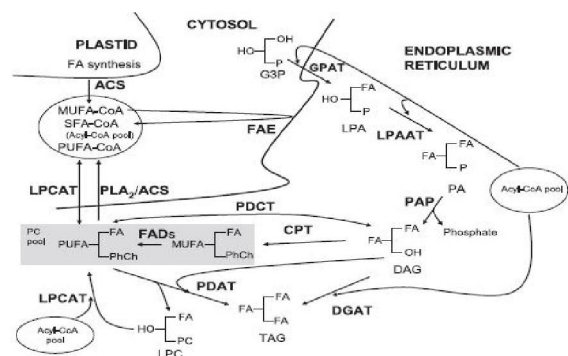


Figure 2. The illustration of generalization of triacylglycerol (TAG) biosynthesis

Above figure 2 shows the illustration of generalization of triacylglycerol (TAG) biosynthesis. In the gray box formation of polyunsaturated fatty

acids catalyzed by fatty acid desaturases. This occurs on phosphatidylcholine (PC). In plant species that produce C18 conjugated fatty acids use linolenic or α -linolenic acid (Cahoon *et al.*, 1999; 2001; Napier, 2007).

Biotechnology in livestock:

In producing adequate food supply for the growing population of the world biotechnology is the key technology in this regard. In livestock, cloning, gene mapping techniques and gender pre-selection are the miracles of biotechnology. Cryopreservation of the germplasm is also regarded as the gift of biotechnology (Smidt and Niemann 1999). The twenty first century is demonstrated as the century of employing genomic selection and the use of molecular genetic markers. Methane production in cattle (Pickering *et al.*, 2013) and genomic selection to increase the milk production are possible through biotechnology (Hayes *et al.*, 2013).

Biotechnology in use of livestock waste:

with an increasing world population the rising consumption for edible oil and animal fats has increased its prices due to low production and limited its use in the field of bio fuel particularly in developing countries (Silitonga *et al.*, 2013). Below is the figure 3 which the amount of biodiesel produced from the feed stock of different crop and animal waste by using the techniques of biotechnology (Pinzi *et al.*, 2014, Hill *et al.*, 2007, Birur *et al.*, 2007, Srinivasan, 2009). In biotechnology enzyme based production of biofuel is used. It is preferred among the chemical based production of the biofuel. It certainly overcome the limitations in the chemical based productions as the acid and base trans-esterification limitations also been overcome (kumar *et al.*, 2011, Lam *et al.* 2010, Gog *et al.*, 2012, Nielsen *et al.*, 2008, Kumari *et al.*, 2009).

Biotechnology in animal vaccine production:

Most of the animal farms around the world are owned and managed by small farmers. Due to their extremely limited sources no bio security is present. Among them many are at risk stage many diseases spread among them are of zoonotic nature. It is estimated that 1 billion livestock keepers are at high risk (Grace *et al.*, 2012). The use of new methods of sequencing many methods of genomics has made it easy to recognize a pathogen and make new and improved vaccines against it (OIE, 2012).

Nano-biotechnology overview:

The nanotechnology is the broad science of biotechnology interested to solve the problems in the fields of medicine, biology, chemistry, surface science, marine science, geology, engineering, and agriculture by involving the manipulation of different atoms, protons, and neutrons in a variety of way to take up the proper solution of these problems

(Kawazoe and Meeche, 2005). In nanotechnology we manipulate material and structure at the Nano scale range size approximately 1 and 100 nm (European Food Safety Authority, 2009). Nano research also attracts large scale investment by leading producers of agriculture and food products with some food, beverages and packaging products that incorporate nanotechnologies already commercially available in some countries (Gruere, 2012; Momin, Jayakumar and Prajapati, 2013). Nanotechnology is attracting almost all the fields of science, especially the agriculture and food sector is directly and indirectly involves from food processing, packaging and nutritional quality to public safety (Chaudhry and Castle, 2011; Momin *et al.*, 2013; Sekhon, 2014). Food technologists are greatly working in nanotechnology to get the maximum benefits in food industry to provide best and standard food products by increasing their shelf life and hygienic conditions (Chaudhry and Castle, 2011; Ranjan *et al.*, 2014). About the nanoparticles are simplest to produce are the carbon which are the utilization of carbon dark from the fuel-rich fractional ignition for the ink, tattoos and shade that goes back over 3000 years yet are still under perception in the examination areas (Lee *et al.*, 2006b; Lu and Schuth, 2006; Xia *et al.*, 2006). The biggest utilization is made of Nano stage carbon is as filler in the elastic levels which is more than 8 million metric tons created yearly (Lee *et al.*, 2006b). Another utilization of nanoparticles are assembling of crystalline carbon nanomaterial by means of high voltage circular segment power, laser removal, or the development under the controlled high temperature by utilizing the nanoparticles as the impetus (Dai, 2002; Jiao *et al.*, 1996; Kumar *et al.*, 1999). Moreover the carbon nanotubes either single walled and multiwall can be incorporated along these lines. Likewise, Fullerenes (e.g. C60, C72) and carbon nano-tubes, may be they are one walled or multi-walled, can be blended along these lines (Hu *et al.*, 1999; Iijima, 1991; Burghard, 2003; Dosa *et al.*, 1999; Iijima *et al.*, 1999; Iyeret *et al.*, 2003; Kroto *et al.*, 1985; Lei *et al.*, 2006; Lu *et al.*, 2006; El Hamaoui *et al.*, 2005; Hayashi *et al.*, 1996; Dai, 2002).

Role in Nano biotechnology

Nano biotechnology has its own impacts on life sciences like its use within the Nano devices i.e. use of fullerene electronic biosensors in genetic science to provide extremely specific electronic biomolecule detectors by victimisation single walled carbon nanotubes to research surface-protein and protein-protein binding (Chen, *et al.*, 2003). Currently now a days the economical and trendy technologies have developed during this era recently (FAIMS) High-field uneven wave shape particle quality spectroscopic analysis is one in every of the trendy technologies use

for on-line particle choice that's compatible with electrospray ionization (ESI). It facilitates within the identification of low-abundance amide ions typically levels photolytic digests gift in elements per million (ppm). This functioning and use of FAIMS in all probability play a very important role within the drug discovery and therefore the biomarker identification for observation and set the diseases (Venne, *et al.*, 2005). Nanowire devices area unit wide used recently within the discovery of latest medication and within the screening of specific binding of tiny molecules to macromolecule direct analysis that is additional economical (Wang, *et al.*, 2005). Biosensors area unit wide employed in the Nano biotechnological analysis areas for the identification, validity, assay development, metabolism, distribution, absorption and lead improvement for varied targets. These have the precise role in some areas like within the study of receptors thanks to the absence of receptors from the lipid membrane of the cell. A primary application of biosensors technologies is that the improvement of limited-scope drug libraries against the precise targets (Grimm, *et al.*, 2004) Gold particles conjointly also are nano-material employed in the identification of various diseases and also another uses within the life sciences they a number of the uses like connecting points to create biosensors within the detection of deoxyribonucleic acid Diseases, we have a tendency to use gold nanoparticles with the protein and different molecule like deoxyribonucleic acid rather than fluorescent molecule for the assembly of bar codes. though they'll be used for drug discovery by combining the opposite technologies to see Gold nano-particles, Gold nano-particles emits light-weight that's therefore intense that's simply doable to look at one nanoparticle at the optical maser intensities (Farrer, *et al.*, 2005). Nanomaterial have the distinguished role within the treatment of carcinoma analysis, Nanoparticles area unit wont to image tumors and to notice peripheral metastases by coupling with cancer specific targeting ligands (Fortina *et al.*, 2005).

Role of biotechnology in food and nutrition

Recently due to the increasing awareness of consumers towards the relationship between health, diet and disease prevention it is well known that consume such foods which fulfill their basic nutritional needs for a better health and disease prevention (Shahidi, 2009). All over the world for the development and commercialization of functional foods dietary supplements interest are grown up for the research for the foods having the health enhancing specific characters based on the health criterion (Shahidi, 2009). Food has also some genetic relationship with their vitamins and minerals such components not only comprises approximately 30

vitamins and minerals but also include components like antioxidants fatty acids which are unsaturated, probiotics and so on (DellaPella *et al.*, 1999). Functional foods have some importance in healthy ageing of the rapidly growing number of elderly people in the world. The main target is not to extend the life span but also to improve the quality and quantity of food for the elderly people. Genomics which is under biotechnological umbrella opened a new way into ageing and human diseases (Lockhart *et al.*, 2000; Peltonen and McKusick 2001; Alizadeh *et al.*, 2000). For packaging different material used the material that use for this purpose should dispose off on the condition so some of the conventional plastics used which is difficult to dispose off so bio-mass material is used for the packaging of food items which are the eco-friendly (Siracusa *et al.*, 2008; Farris *et al.*, 2009). Conventional polymer prepared for the obtaining of heat resistance, stronger, lighter and barrier properties by the Nano composites such as nylon 6 (Brody, 2007). To upgrade the obstruction properties and quality Nano mud power engineered polymers and their isomers, for example, polyethylene, polypropylene and so forth for the bundling of sustenance things (Dadbin *et al.*, 2008; Schirmer *et al.*, 2008). After the packaging the food safety measure are developed to ensure the food safety which is a major concern, different methods or devices used for this purpose such as the Nano sensors used to improve and enabling the food quality control and testing easily at home and factory. Nano sensor and micro sensors are used to integrate food packaging for the fitness of food for human consumption, these also used in the quality control and testing in the European Project GOOD FOOD (GOODFOOD project, 2004-2007). Regarding the food safety issues there are some recognized terminologies and the proper regulatory policy in US adopted by FDA that provide security about the genetically engineered foods that describes the food produced by GE technique or involving in it having the similar in “structure, composition and function “are already in food chain supply were considered “safe”. (US Food and Drug Administration. Statement of policy 1992, this term is later exchanged to the “substantially equivalent foods” (US Food and Drug Administration, 1997). In January 2001, statement of FDA that so called for the 120 day premarket notification for any bioengineered food (US Food and Drug Administration, 2001).) One more step in the view of the safety is the labeling of the genetically engineered foods in the market so for this purpose FDA contribute to manage and make differentiation of the organic and GE foods in the market to maintain the nutritional qualities of the GE and organic foods the guidance for this is purposed in 2001 to the food

industry for the labeling of the GE foods voluntary to the food industry (FDA Center for Food Safety January 18th, 2001).

Potential part of Genomics in quality confirmation of sustenance by different systems:

Genomics have some part in the quality confirmation of sustenance however there are some issue with the present nourishment supply because of the inconsistency among the velocity and multifaceted nature of the different parts the store network and rate and precision of the quality affirmation of development and transportation in industrial facilities a portion of the issues of time span of usability, packaging and others are faced by us in this era and genomics found useful in this regards such as the use of proteomics technique that will elaborate the presence of removable material or the pathogens also in any step of supply chain (Lockhart, Winzeler, 2000).

Role of biotechnology in war industry

Biological weapons are prepared in the biotechnological field usage in which the pathogens and their toxins are used for preparation to target the specific organs of the enemy. These are created for utilization with farming creatures and products to disturb the natural way of life (Ferguson, 1997). A diverse variety of various materials can be used in the arms and to produce nanoparticles such as metal oxide ceramics magnetic material and silicates (Holister *et al.*, 2003). Some of the clinical symptoms recently reviewed such as treatment and prophylaxis. There are also some of the devastating economic impacts of the biological weapons which are estimated recently (Tucker *et al.*, 1997; Kaufmann, *et al.*, 1997). Many account reported regarding the “Poisoning of well” back in 300 BC in which disease is spread by throwing the diseased corpses in the water supply of the enemy to cause disease (Patrick WC II, 1994).

Role of biotechnology in chemical industry

A noteworthy distraction of the compound business in the most recent decade has been the improvement of option substance material generation forms which in light of the renewable food stocks, significance those not got from the fossils or oil-based chemicals (Gwehenberger and Narodoslowsky, 2008). Case in point, the succinic corrosive which is utilized for the commercialization and have some waste material to clear it utilization of sugars as a food stock embroils maturation and bio-catalysis as likely be even is not by any means the only technique in creating such chemicals, supplemented by the chemo-catalysis process (Dapsens *et al.*, 2012; Thomas *et al.*, 2002; Bozell and Petersen, 2010; Herrera, 2004; Marr and Liu, 2011). In future huge numbers of the procedures will be utilized as a part of mechanical biotechnology and it is the one of the best devices accessible to accomplish this despite the fact that it is

plainly not by any means the only one, however a need in creating manageable procedure of substance on diverse levels (Saling *et al.*, 2002; Andraos, 2013; Dreyer *et al.*, 2003).

Mechanical Bio reactant procedure of chemicals:

In the bio reactant process one or more chemicals are utilized as the impetuses which may be non-developing cells or upheld on an immobilization network are known as biocatalyst (Schoemaker *et al.*, 2003). There have some future observation about these bioprocesses that such procedures are most predominant today in the pharmaceutical businesses (Pollard and Woodley, 2007). Be that as it may, additionally have intense impact on alternate ranges of the commercial enterprises of the synthetic generation for the oils and fats handling (Schmid *et al.*, 2001).

Role of biotechnology in Textile industry:

In fact the textile industry have significant importance on national level and have great influence on the GDP of the country and considered as the pillar industry of the economy. China is the top producer of textile industry by using the biotechnological techniques in the world since last two and half decades and improves their quality of textile. Now a day's china has owned at least eight strains of the cotton including the brown and green natural colored and going to produce the red, blue and black cotton by using transgenic technique to transfer the external gene in the cotton plant by the genetic manipulation (Qiu, *et al.*, 2000). Silk with natural colored in the shade of red, yellow, orange pink and green are successfully introduced in the market by the genetic modification (Luo *et al.*, 2004)

Role of biotechnology in petroleum industry

The major energy requirement in the world is fulfilled by the non-renewable fossil fuels that include the oil reservoirs. With the discovery of oil reservoirs it is necessary to maximize the fast recovery of trapped oil from the reservoirs (Brown and Vadie, 2000; Kerr, 2000; Mehta and Gair, 2001; Giles, 2004). Different processes are used for the extraction of trapped crude oil from the reservoirs and in this regard the biotechnology also plays significant role in the petroleum industry by the classification of thermal, chemical, and gas injection usage (Sen, 2008). In thermal recovery process oil is vaporize by heating the oil reservoirs and extracts it out. Mostly the reported temperature of the natural reservoir is 10 C in an avg. 27m deep Canadian Athabasca oil sands (Harner *et al.*, 2011). Now a days microbially enhanced oil recovery going to be done which is suggested by the Beckman as early in 1926 (Donaldson *et al.*, 1989). This innovation involves the microbes that enhance the oil production in the reservoirs and the produced population of the micro-organisms excretes their residual material in the oil wells or reservoirs and this

residual material metabolite the residual oil around their environment (Gaoand Zekri, 2011). On-shore gas flooding of oil field with CO₂ and flue gases from power plants have successfully been implemented by oil companies (Blunt *et al.*, 1993; Goodyear *et al.*, 2003). There are also some use of bio surfactants in the oil recovery and some of the strategies are applied in this field to use bio surfactants such as: injection of selected nutrients in the reservoir, penetration of metabolically active cells into the reservoir, (Banat *et al.*, 2000). Bio surfactants are in fact produced by the microorganisms when grown on water immiscible substrate have the properties of surface active and degradable organic compounds to reduce the interfacial and surface tension (Pacheco *et al.*, 2010). Thus to form the maximum oil extraction by forming the stable water-oil emulsion which is important for it. The bio surfactant has also specific pH range from 4 and 10. Many of them precipitate probably due to their isoelectric point near the pH=4 (Amani *et al.*, 2010; Al-Bahry *et al.*, 2013).

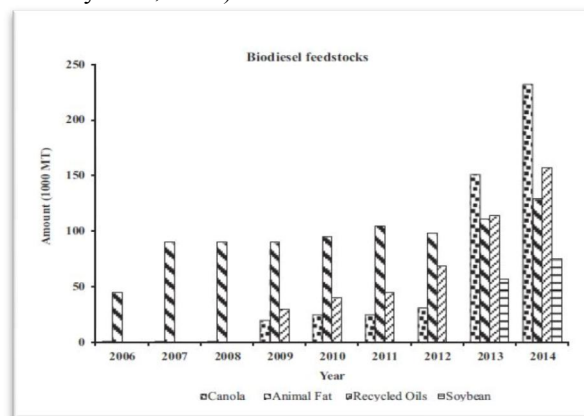


Figure 3, biodiesel production in Canada from various sources.

Role of biotechnology in Biofuels

Biofuels have been used since World War II, many farmers use ethanol for driving the vehicles at the time of crises and now a days it has much importance in the space journey especially (Lewis, 1981). Some of the scientists argue that the food versus fuel problem was grossly overdrawn and that it should be possible to coordinate bioenergy and agricultural production through government intervention or market forces (Ramsay, 1985). Some now advocate that biofuel on the basis of reduction in the use of land for animal feed, a point prefigured in the assessment of bioenergy for promoting its level in the plant species (Centre for Alternative Technology, 2010). At the time there is a need of biofuels through the supportable evaluation to consider in the "whole system" in an integrated manner recognized in many articles. However some of them focus on the

lignocellulose option for the biofuel production in the biotechnology (Black *et al.*, 2011; Haughton *et al.*, 2009; Singh *et al.*, 2010).

Role of Biotechnology on Environment:

Environmental biotechnology is science that's applied to review the natural atmosphere. Environmental biotechnology might additionally imply that one attempt to tackle process for industry and for its enhancements. There is an international Society for Environmental Biotechnology which defines environmental biotechnology as the manufacturing, use and regulation of biological systems for rectification of contaminated environments (land, air, water), and for environment-friendly. Environmental biotechnology will merely be outlined as the optimum use of nature, within the style of plants, animals, bacteria, fungi and alga, to provide renewable energy, food and nutrients in an exceedingly synergistic integrated cycle of profit creating methods wherever the waste of every method becomes the feedstock for different process.

Role in Waste Management:

Municipal solid waste consists of everyday things like commercial product packaging, appliances, paint, grass clippings, bottles, food scraps, furniture, clothing, waste paper, and batteries. On the average □80% of it consists of organic material, which is outlined because the perishable portion of home waste, market garbage, yard rubbish and animal and excretion. Once organic agricultural waste like straws of leaves, corn and wheat from wheat-processing facilities, wood and different residues from wood mills, is additionally thought-about, this element of solid waste may be a principal resource for bio-development (Louwrier *et al.*, 1998). Natural biotechnology is an approach to manage these progressions and can help to restore ecological quality. Biotechnology methodology like city sewage treatment plants and gas channels were created around the turn of the earlier century (Murphy, *et al.*, 1993). Biotechnological strategies are utilized as a part of which the waste is dealt with before or after it has been brought into nature are parts of ecological biotechnology instruments. Biotechnology can likewise be connected modernly for utilization in creating items and procedures that produce less waste and utilize less nonrenewable assets and expend low vitality. In this admiration biotechnology is all around situated to add to the improvement of a more feasible society through an economical situation. Recombinant DNA innovation has enhanced the potential outcomes for the counteractive action of contamination and guarantees for further advancement of bioremediation (EFB, Environmental Biotechnology, 1999). City sewage treatment plants and channels to purge town gas were created when the new century rolled over.

They demonstrated exceptionally powerful albeit, little was thought about the natural standards fundamental their capacity (Ezeronye, 1999).

Role in Oil Spills:

Rhamnolipid surfactants have been tried to expand the arrival of low solvency mixes from soil and different solids. They have been found to discharge three times as much oil as water alone from the shorelines in Alaska after the Exxon Valdez tanker spill (Harvey *et al.*, 1990). Removal productivity fluctuated by time and biosurfactant fixation (Scheibenbogen *et al.*, 1994). A totally distinctive methodology for oil cleanup was performed by Shulga. They inspected the utilization of the biosurfactants in cleaning oil from beachfront sand, and from the plumes and hides of marine fledglings and creatures (Shulga *et al.*, 2000). Oil spills in the marine environment can influence organic entities discovered in that by direct danger or by physical covering (Perry, *et al.*, 1980). Oil spills by and large, can bring about numerous harms to the swamp vegetations. It was found to diminish the development, photosynthetic rate, stem tallness, thickness, or more ground biomass of *Spartina alterniflora* and *S. Patens* and can bring about their passing (Krebs *et al.*, 1981). Unrefined petroleum spill a drift structures a surface smooth whose segments may take after numerous pathways. Some may go into the mass of seawater and proof recommends they may proceed for quite a while before their corruption by microorganisms in the water. The smooth typically turns out to be more thick and structures water-in-oil emulsion. Oil in water causes consumption of broke up oxygen because of change of the natural part into inorganic mixes, loss of biodiversity through a diminishing in amphipod populace that is imperative in evolved way of life, and eutrophication. Transient poisonous quality in fishes incorporates epidermal hyperplasia, lymphocytosis, hemorrhagic septicemia (Beeby *et al.*, 1993).

Role in Water Cleaning:

Streaming channels have been utilized to channel water for different end utilizes for very nearly two centuries. Organic treatment has been utilized to channel surface water for drinking purposes. Bio filtration is perfect for well, lake, lake, stream, and uncovered water. Bio channels expel the accompanying substances from air and water: iron and iron microscopic organisms, parasites, shading, pimples, manganese, pesticides, arsenic, lead, mercury, turbidity, broke down natural carbon (disintegrated natural material in water) and tannins. The viability of utilizing the parasite *Phanerochaete chrysosporium* as a part of the biofiltration of material profluent, polycyclic sweet-smelling hydrocarbons (PAH), and mash and paper effluents. The microorganism was fit for creating

extra-cellular proteins, for example, manganese peroxidase, cellulases, and lignin peroxidases, in accomplishing aggregate remediation of these effluents (Asamudo *et al.*, 2005; Shan *et al.*, 2015). Done a study to exhibit the viability of a yeast biofilter made of a blended society of *Saccharomyces* spp., *Candida* spp., *Schizosaccharomyces* spp. and *Geotrichum candidum* in the treatment of manure processing plant effluents and 98% treatment productivity was accomplished. The biochemical oxygen request (BOD) of the gushing was decreased from a scope of 1200–1400 to 135–404 mg/L. Besides ammonia nitrogen (NH₃-N) and nitrate-nitrogen (NO₃-N) were lessened from 1000–10 mg/L and 100–17.6 mg/L, individually (Ezeronye *et al.*, 1999). A framework was produced utilizing magma stones and clam shells was biofilter substrates for the oxidation of alkali in a recirculatory aquaculture framework. The gushing was dealt with utilizing the biofilter, and synthetic investigations were completed once every week for four successive weeks. The conclusions toward the end of the fourth week showed that the smelling salts and nitrite fixations were 0.0374 mg/L and 0.292 mg/L, individually, which were underneath the reasonable furthest reaches of 0.05 mg/L and 0.3 mg/L for nitrite and ammonia respectively (Ogunlela *et al.*, 2011).

Role in Air & Soil Pollution:

Bioremediation is the utilization of natural frameworks for the lessening of contamination from air or from sea-going or physical frameworks the point of bioremediation is the work of bio frameworks like organisms, higher creatures like plants (phyto-remediation) and creatures to lessen the potential poisonous quality of synthetic contaminants in nature by corrupting, changing, and immobilizing these undesirable aggravates (Vallero *et al.*, 2010). This fundamental study found that the expansion of supplements to soil builds the wealth of microorganisms that was connected with a corruption of hydrocarbons, for these situation petroleum by-items (Raymond *et al.*, 1975). Bio-filters are the most well-known system for expelling VOCs and musty segments from air streams. Biofiltration without a fluid stage is utilized to treat vapor stage toxins. Air bringing the volatilized contaminants upward through permeable media (e.g., manure) containing microorganisms adjusted to separate the framework can be warmed to expand the apportioning to the gas stage. Organisms in the bio-film encompassing every individual fertilizer molecule metabolize the contaminants into less difficult mixes, changing over them into carbon dioxide and water vapor (Vallero *et al.*, 2010).

Role of Biotechnology in human health

Biotechnology has a great role in human health as is has been used for the diagnosis of different diseases and their cures. Some of the applications of Biotechnology are given below:

Free radicals: In conspicuous biomedical composition the term 'free radical' is used as a piece of a wide sense moreover consolidates related responsive species like 'empowered states' that provoke free radical period or species that results from free radical reactions. All things considered, free radicals are brief, with half-lives in milli liter scale or nanoseconds. Free radicals have been caught in the etiology of a couple of human diseases and developing (Harman, 1958; Halliwell, *et al.*, 1997). Neuro-degenerative Disorders: Sensory tissue including personality is significantly vulnerable with the desire of complimentary radical damage due to high substance of lipids especially polyunsaturated unsaturated fats. In Alzheimer's illness (AD) biochemical and histological studies have shown affirmation for extended levels of oxidative uneasiness and film LP. Changing in levels of cell fortification impetuses, for instance, catalase and CuZn- and Mn-SOD in neurons in AD patients are dependable with their being under extended nervousness. Extended protein oxidation, protein nitration and LP happen in neurofibrillary tangles and neuritic plaques. Lipid peroxidation is exceptionally wide as exhibited by extended levels of peroxidation things, for instance, 4-hydroxynonenal (4-HNE) in the cerebrospinal fluid of AD patients. Iron (Fe²⁺) adds to extended LP in AD. Lipid peroxidation may progress neuronal going in AD by various parts that fuse impedance of the limit of film molecule manner of thinking ATPases (Na⁺/K⁺-ATPase and Ca²⁺-ATPase), glucose transporters and glutamate transporters. Lipid peroxidation prompts era of the aldehyde 4-HNE that subject to expect a vital part in the neurotoxic exercises of amyloid β- peptid (Yoshikawa *et al.*, 2000).

Proteomic Methodologies: Utilizing cutting edge mass spectrometry (MS)-based proteomic systems, a few gatherings have started to handle the bigger employment of deciding the arrangement of whole mitochondrial proteomes from various essential model frameworks and in addition from human tissues. Utilizing mitochondria segregated from human heart, Gibson and colleagues have distinguished 684 remarkable proteins from the consolidated peptide information acquired from more than 100,000 mass spectra created by MALDI-MS and superior fluid chromatography (HPLC) MS/MS examinations. This information is presently piece of 'MitoProteome', an openly available database for the human heart mitochondrial proteome.

Free radicals have been ensnared in the etiology of incredible number of real illnesses. They can

antagonistically change numerous essential organic particles prompting loss of structure and capacity. Such undesirable changes in the body can prompt sick conditions. Cell reinforcements can secure against the harm affected by free radicals acting at different levels. Dietary and different segments of plants structure real wellsprings of cancer prevention agents. The connection between cell reinforcements and free radicals and proper functioning of different organs and organ frameworks is exceedingly intricate and the revelation of 'redox flagging' is a turning point in this critical relationship. Late research revolves around different techniques to ensure pivotal tissues and organs against oxidative harm affected by free radicals. Composed examination including biomedical researchers, nutritionists and doctors can have noteworthy effect to human wellbeing in the impending decades. Research on free radicals and cell reinforcements including these is one such exertion in the right heading.

BACTERIOPHAGES; A Tool for gene therapy

It has been perceived that bacteriophages have a few potential applications in the cutting edge biotechnology industry, have been proposed as conveyance vehicles for protein and DNA immunizations; as quality treatment conveyance vehicles; as different options for anti-toxins; for the recognition of pathogenic microorganisms; and as instruments for screening libraries of proteins, peptides or antibodies. These differences, and the simplicity of their control and creation, imply that they have potential uses in exploration, therapeutics and assembling in both the biotechnology and medicinal fields. It is trusted that the extensive variety of researchers, clinicians and biotechnologists right now exploring or putting phages to commonsense utilization have the capacity to aptitude and subsequently quicken progress towards further advancement in this energizing field of biotechnology (Clark *et al.*, 2006).

MicroRNAs correlates with human cancer:

MicroRNAs (miRNAs) square measure a motivating category of very little non-protein-coding RNAs that capability as negative quality controllers. They management different natural procedures, and bioinformatic data demonstrates that every miRNA will management several quality targets, underscoring the potential impact of miRNAs on each hereditary pathway. Late proofs have incontestable that miRNA transformations or mis-expression connect with completely different human growths and demonstrates that miRNAs will work as tumor silencers and oncogenes. miRNAs are incontestable to quell the declaration of important malady connected qualities and should demonstrate useful within the analysis and treatment of tumour (Kerscher *et al.*, 2006).

P53 tumor suppressor gene therapy for cancer:

The most recent two decades have prompted a more noteworthy comprehension of the hereditary premise of human harm. Albeit various hereditary changes have been distinguished in malignancy, actuation of onco-genes and inactivation of cell cycle controllers (e.g., tumor silencer qualities) are presently known not a discriminating part in the movement of the illness. Helpful procedures in light of particular sub-atomic changes in malignancy incorporate reintroduction of wild-sort tumor silencer capacity to cells without the quality. p53 quality treatment gives an alluring methodology to test the potential clinical practicality of this methodology. Adjustments in p53 capacity are available in pretty nearly 50% of all malignancies, and articulation of wild-sort p53 can bring about apoptosis in human tumor cells. This audit condenses current examinations with p53 quality treatment, highlighting the preclinical endeavors with adenoviral, retroviral, and lipid-based quality conveyance frameworks. A far reaching audit of the different clinical targets proposed for p53 quality treatment is given together difficulties and prospects for future clinical examination (Nielsen *et al.*, 1998).

Cancer Gene Therapy with HER2:

Over expression of the human epidermal development consider 2 (HER2) onco-gene in human bosom carcinomas have been connected with a more forceful site of ailment. The purpose behind this affiliation is still misty, it has been recommended to rest in expanded expansion, vessel development, and/or obtrusiveness. On the other hand, anticipation may not be specifically identified with the vicinity of the oncoprotein on the phone film, yet rather to the bosom carcinoma subset distinguished by HER2 over expression and described by a particular quality expression profile. HER2 has additionally been connected with affectability to anthracyclins and imperviousness to endocrine treatment, recommending that tyrosine kinase receptor and hormone receptor pathways speak to two noteworthy expansion pathways only dynamic in bosom carcinomas, one touchy to chemotherapeutic medications and the other to anti-estrogens. HER2 at present speaks to a standout amongst the most proper focuses for particular treatment. Surely, *trastuzumab*, a monoclonal counter acting agent coordinated against the extra cellular area of HER2, is remedially dynamic in HER2-positive bosom carcinomas. On the other hand, a predictable number of HER2-positive tumors are not receptive to HER2-driven treatment, showing the requirement for a superior comprehension of the component of activity of this new organic medication in vivo. While preclinical studies recommend immunizer ward cell cytotoxicity as the significant component, determination of NK action at the season

of treatment stays compulsory, particularly in patients treated with immunosuppressive medications. The viability of prophylactic immunization has been completely shown in preclinical models, while continuous investigations of dynamic immunotherapy utilizing an assortment of inoculation regimens against HER2 in tumor-bearing mice and patients have met with just direct achievement (Menard *et al.*, 2003).

siRNA-mediated gene silencing:

RNA obstruction is presently settled as a vital organic method for quality quieting, however its application to mammalian cells has been constrained by nonspecific inhibitory impacts of long dsRNA on interpretation. There is a viral-intervened conveyance system that outcomes in particular quieting of focused on qualities through articulation of little meddling RNA (siRNA). Confirmation of a standard by particularly reducing articulation of exogenous and endogenous qualities in vitro and in vivo in cerebrum and liver, and further apply this methodology to a model arrangement of a noteworthy class of neurodegenerative issue, the polyglutamine maladies, to show diminished polyglutamine accumulation in cells is built up. This viral-interceded system ought to demonstrate for the most part helpful in lessening articulation of target qualities to model organic procedures or to give treatment to prevailing human sicknesses (Xia *et al.*, 2002).

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