

EXERCISE QUESTIONS

CHAPTER-12 BIOTECHNOLOGY AND ITS APPLICATIONS

1. Crystals of Bt toxin produced by some bacteria do not kill the bacteria themselves because –

- (a) bacteria are resistant to the toxin**
- (b) toxin is immature;**
- (c) toxin is inactive;**
- (d) bacteria encloses toxin in a special sac.**

Ans - Bacillus thuringiensis produces the Bt toxin. Inactive protoxins, or Bt toxin, are created. Due to the alkaline pH of the insect's gut, it becomes active once inside. The insect dies as a result of the holes the activated poison generates. Toxin is contained by bacteria in a unique sac.

2. What are transgenic bacteria? Illustrate using any one example.

Ans - Transgenic bacteria are genetically altered microorganisms that have been given the desired gene. Intentionally inserted foreign genes can be found in the genome of transgenic bacteria. They undergo manipulation in order to express the desired gene, which results in the development of numerous valuable goods for the market.

E. coli, which is used commercially to produce a variety of goods, including insulin used by people with diabetes, is an example of transgenic bacteria. The A and B chains of the peptide sequence, which are eventually concatenated to produce the sequence of insulin, are put into the E. coli bacterial genome and cultured separately.

3. Compare and contrast the advantages and disadvantages of production of genetically modified crops.

Ans - - There are various benefits to producing genetically modified (GM) or transgenic plants.

I The majority of GM crops have been created to be pest resistant, which boosts crop yield and lessens the need for chemical pesticides.

(ii) Many GM food crop varieties have been created, with improved nutritional quality. For instance, the transgenic rice type known as "golden rice" is high in vitamin A.

(iii) By optimising the use of minerals, these plants stop the soil from losing its fertility.

(iv) They can withstand harsh abiotic conditions well.

(v) The post-harvest loss of crops is reduced by the adoption of GM crops.

A few of the drawbacks are as follows:

(i) GM crops have generated debate on their acceptance over conventional crops.

(ii) If the Bt toxin gene is expressed in the pollen of the flower, harming the honey bees, the process of pollination by honey bees will be impacted. This is one of the repercussions on a region's native and natural biodiversity.

Since GM crops contain new to the human body allergens and antibiotic resistance indicators, they may have an impact on human health.

4. What are Cry proteins? Name an organism that produce it. How has man exploited this protein to his benefit?

Ans - Cry genes produce cry proteins. These proteins, which are poisons made by the bacteria *Bacillus thuringiensis*, are present. These proteins are

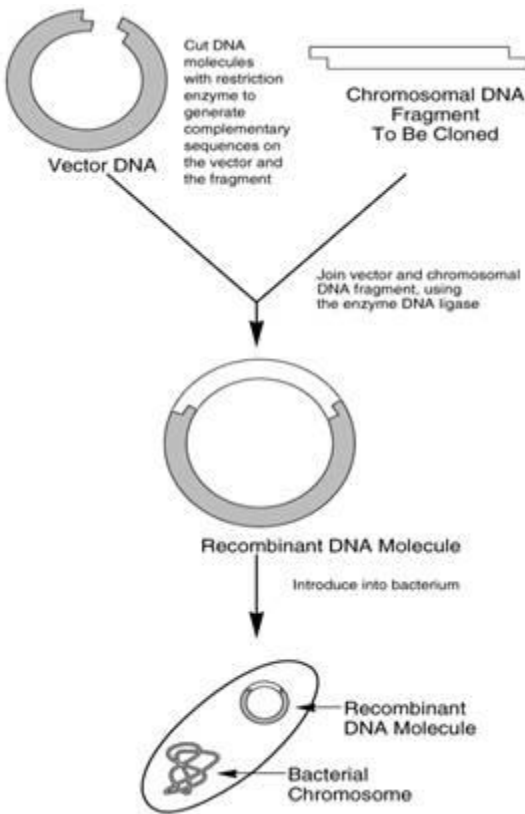
present in this bacterium's dormant form. The insect consumes an inert toxin protein, which is activated by the alkaline pH of the stomach. This causes the epithelial cells to lyse, which ultimately leads to the insect's demise. As a result, man has used this protein to create transgenic crops like Bt corn and cotton that are resistant to insects.

5. What is gene therapy? Illustrate using the example of adenosine deaminase (ADA) deficiency.

Ans- Gene therapy is a method for repairing a damaged gene through gene engineering. It entails the transfer of a healthy gene to the person to replace the unhealthy gene, such as the introduction of the ADA gene into an ADA deficient person. The immune system needs to be able to operate normally, which requires the adenosine deaminase enzyme. By transferring bone marrow cells, the person who has this condition can be treated. The patient's bone marrow is used to obtain lymphocytes in the first step. Then, with the aid of a retrovirus, a functional gene for ADA is transferred into lymphocytes. The patient's bone marrow is subsequently given these treated cells that have the ADA gene. Consequently, the gene is turned on, creating functional T-lymphocytes and activating.

6. Diagrammatically represent the experimental steps in cloning and expressing an human gene (say the gene for growth hormone) into a bacterium like E. coli ?

Ans - Diagrammatic representation of steps in DNA cloning



7. Can you suggest a method to remove oil (hydrocarbon) from seeds based on your understanding of rDNA technology and chemistry of oil?

Ans Recombinant DNA technology (rDNA) is a method for modifying an organism's genetic makeup to get the desired outcome. This method, for instance, is employed to remove oil from seeds. Oil is made up of glycerol and fatty acids. By blocking the synthesis of either glycerol or fatty acids, one can create oilless seeds using rDNA. This is accomplished by deleting the particular gene in charge of the synthesis.

8. Find out from internet what is golden rice.

Ans - Golden Rice is a type of rice (*Oryza sativa*) that has undergone genetic engineering in order for the edible sections of the rice to biosynthesize beta-

carotene, a precursor of vitamin A. [1][2] The goal is to create a fortified food that can be cultivated and eaten in regions that lack dietary vitamin A.

A lack of vitamin A results in xerophthalmia, which includes permanent blindness as well as a variety of eye diseases ranging from night blindness to more serious clinical outcomes like keratomalacia and corneal scarring. Additionally, it raises children's mortality risks from both diarrhoea and the measles. South Asia and sub-Saharan Africa had the greatest rates of insufficiency in 2013.

Despite strong criticism from environmental and anti-globalization campaigners, more than 100 Nobel laureates in 2016 backed the cultivation of golden rice.

9. Does our blood have proteases and nucleases?

Ans - Two enzymes that catalyse the hydrolysis of proteins and nucleic acids, respectively, are proteases and nucleases. Blood does not contain these enzymes; instead, it includes protease inhibitors, which prevent the breakdown of proteins. Nucleases are also not present in blood in a similar way.

10. Consult internet and find out how to make orally active protein pharmaceutical. What is the major problem to be encountered?

Ans- Pharmaceuticals made with orally active proteins include physiologically active components such as peptides, proteins, antibodies, and polymeric beads. It is ingested into the body orally through a variety of forms. It involves the use of penetration enhancers to encapsulate a protein or peptide in liposomes or formulations. These peptides or proteins are utilised as both vaccinations and treatments for a number of disorders. However, there are several issues with delivering these peptides or proteins orally. The proteases found in the stomach secretions denature the proteins after they have been consumed. Their impact will therefore be negated. Therefore, if

the therapeutic protein is administered orally, it must be shielded from digestive enzymes. This is the rationale behind the proteins' direct injection into the target site.