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55387

SET 1 KEY

Q.1 Do as directed: (Any 15)

(15)

A) Define the following:

- i. **Blue biotechnology** – Study of Marine/ Aquatic biotechnology flora & fauna & its biotechnological aspects.
- ii. **Biopharming** -- gene pharming or mol. pharming :- It refers to the use of genetic engineering to insert gene that code for useful pharmaceuticals into animal/ plants host thus creating a GMO.
- iii. **Intellectual Property Rights (IPR)** – The right of an inventor to derive economic benefits from his invention i.e. Intellectual property. This right is called IPR.
- iv. **OncoMouseTM** -- Philip Leder at Harvard Medical School created OncomouseTM. It is an animal model used to study human cancer such as breast (Leukemias) and blood cancer (Lymphomas).
- v. **Agroinfection** -- Introduction of a viral genome into plant cells by placing it within the T DNA of a Ti plasmid and using Agrobacterium containing this recombinant plasmid for coculture the plant cell.
- vi. **Virus Vector** – A vector derived from plant/animal viral genome. Examples of Plant virus vector are BMV, TMV etc.
- vii. **Transgene** – A gene transferred into an organism using rDNA technology.
- viii. **Bioinsecticides** – Microorganisms used to control insect pests. These are biodegradable, non- toxic, some of these are based on B. thuringiensis.
- ix. **Pasteurization** – Pasteur suggested that high percentage of microorganisms is killed by heating the juice at 62.8⁰C

B) True or false

- x. False
- xi. False

C) Explain the following:

- xii. **Fermentation technology:** it is a field which involves the use of microbes and enzymes for the production of compounds of industrial importance.
- xiii. **Unit operation:** it involves the physical change or chemical change such as separation, crystallization, etc. for the processing of the food

D) Give one example of each:

- xiv. Probiotic organism: **lactic acid bacteria**
- xv. Method used in citric acid production: **surface /submerged**
- xvi. Genetically modified plant (**Golden rice, FlavrSavr, Bt Brinjal etc.**)

E) Fill in the blanks:

- xvii. **Food processing** involves combination of various procedures and processes needed to change the raw material into the finished product.
- xviii. The first antibiotic penicillin was discovered in 1930 by a scientist named as **Alexander Fleming**.
- xix. A scientist Craig Venter created **first synthetic bacterial cell** because it has been created out of already existing life using synthetic DNA.
- xx. CCP stands for the **critical control points** that are regulatory aspects to keep the quality of food under control.

Q2 A) (i) History of biotechnology

(04)



Ans- (01 mark for each point)

1. About 10,000 years ago human started to grow crops & raising animals for food & clothing.
2. Vedas showed practice of milk fat & ghee by churning process of curd.
3. Fermented microbial product, use of beverages has been offered to god. Sumerians & Babylonians (6000 B C) were drinking beer.
4. Biological make use of processes of microorganisms like bread/ cheese/ wine/ vinegar etc. about 4000 BC by Egyptians

(ii) Any one success story of biotechnology in India

(04)

Ans- About Biocon Ltd. (Kiran Mazumdar Shaw), Shantha Biotech Pvt. Ltd Hyderabad etc.

Q2 B)

(07)

Ans- Definition of biotechnology (01marks)-It is a Science of applied biological products or any perfect definition accepted.

Multidisciplinary nature (03marks)—Molecular biology, Genetic engg., Plant tissue culture, DNA technology, Industrial Biotechnology, Forensic science-Diagnostics & therapeutics etc.

Commercial potential of biotechnology (03marks)—GM crops, enzymes in food , mining, bioremediation, pharmaceutical -- biomolecules, vaccines, hormones, interferons. Stem cell therapy anticancer drugs, tissue culture for transplant therapy, organ culture etc.

OR

Q2 C) Public perception of biotechnology

(08)

Ans- ● Public perception of biotech products will have a major influence on rate and direction of developments.

- Public support is crucial for the introduction of new technologies and products
- Consumer attitude acts as factor that directly affects the competitiveness European survey showed growing public support regarding biotechnology & life sciences applications with the exception of food linked with GMO.
- Medical biotechnology has received much strong support from gene therapy and pharmacogenetics.
- Biotech firms were active in health care, food and beverage processing, agriculture etc.
- Europeans favour embryonic stem cell research with the condition of strong regulation with time. They keep the genetic data for personal medical diagnosis and gene banks but strongly oppose granting government or non-government agencies to access genetic information about individuals.
- Europeans more over support industrial biotechnology. 70% favours biofuels. bioplastics & biological processes to produce pharmaceuticals. They accept GM food if they are healthy.

3

- Bt cotton was first transgenic crop to be released in India in 2002 there has been a lot of controversy surrounding it. In 2007 a large field trials of Bt brinjal were done in india.

Q2 D) Biotechnology research in India

(07)

Ans- ● Government of India has set up an official agency (NBTB)- national Biotechnology Board which started functioning under the Dept. of Science and technology. In 1986 NBTB was replaced & become a full fledged department, the Dept. of Biotechnology (DBT) under Ministry of Science and Technology for planning, promotion and coordination of various biotechnological programmes.

- Today India has DBT, DST, CSIR, ICAR, ICMR and IARI and other agencies which are working under govt.

- (Also the other centres of Biotech research in India of CSIR, ICAR, BARC Mumbai, IISc Bangalore, Universities etc.)

Q3 A) Golden rice & the benefits of using golden rice.

(08)

Ans-

1. Golden rice is genetically engineered rice that biosynthesis beta- carotene, a precursor of pro-vitamin A in its edible part. Presence of beta- carotene in the rice gives a characteristic yellow orange colour hence named as golden rice
2. Prof. Potrykus and Sr. Peter Bayer in 2000 have developed rice by introducing three genes involved in the biosynthetic pathway of carotenoid
3. The aim was to help millions of peoples, who suffered from night blindness due to vitamin A deficiency, especially who staple diet is rice.

Q3 B) Transgenic crops improves nutritional quality with examples

(07)

Ans- Transgenic crops with improves nutritional quality have been produced by introducing genes involved in the metabolism of vitamins, amino acids etc.

1. A transgenic *Arabidopsis thaliana* has been developed that can produce ten – fold higher vitamin E (alpha- tocopherol) then the native plant.
2. The glycinin gene from soybean has been introduced into rice, therefore, the transgenic rice plants produced glycinin with high content of lysine in plants.
3. Golden rice got enriched in pro-vitamin A (beta carotene)

OR

Q3C) Transgenic plants, benefits, use and risk into environment.

(08)

Ans- Plant containing a transgene (a gene of other organism) by rDNA technology. Examples- GM papaya, GM Tomato, Bt cotton

Benefits (05 marks)

1. They have proved to be extremely valuable tools in studies on plant molecular biology, regulation of gene action, identification of regulatory / promotory sequences
2. To improve their agronomic and other features
3. Resistance to various biotic and abiotic stress
4. Improving the produced quality like proteins, lipids, vitamin etc.

5. Aimed to produce novel biochemical like interferon, insulin, immunoglobulin (Ig) or useful biopolymers

Risks (03 marks)

1. Such gene could be toxic to humans/ animals
2. They contain antibiotic resistant genes
3. These gene could be passed on from the transgenic crops to some other organisms in the environment, and this could damage the ecosystem

Q3 D) Edible vaccines, its production method and advantage

(07)

Ans- (02+03+02 marks)=07

For production of vaccine antigens, the use of plant based system offers many advantages. For the propagation of mucosal vaccine on global scale. GM banana produces vaccine against hepatitis B virus, Tomatoes - rabies vaccine, Potatoes - rotavirus VP6 capsid protein etc.

Advantages

Orally administered, can be consumed as uncooked and unprocessed, designed for tropical application, less expensive.

Approach used for production

- a) Agrobacterium mediated gene transfer method
- b) Virus mediated based gene transfer method

Q4 A) Define food processing. its different unit operations involved in food processing. (08)

Ans- Food processing involves combination of various procedures and processes needed to change the raw material into the finished product.

Method involved in unit operation: material handling/cleaning/ separation/ disintegration/ mixing/heating/drying/packaging. Explain any 4 in detail with example.

(07)

Q4 B)

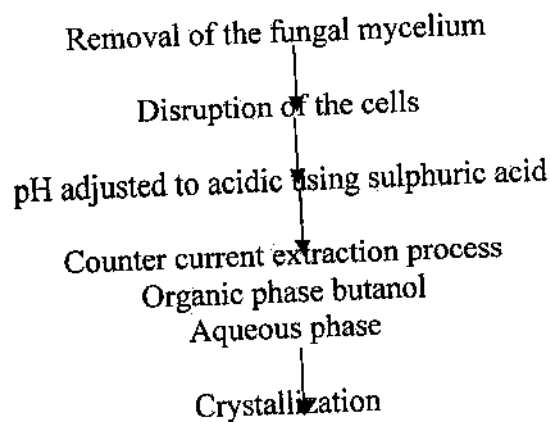
Major steps in the commercial production of Penicillin (4 marks)

Schematically represent the recovery of penicillin (3 marks)

Production

- Preparation of the inoculums
- Preparation and sterilization of the medium
- Inoculation
- Aeration and agitation

Recovery

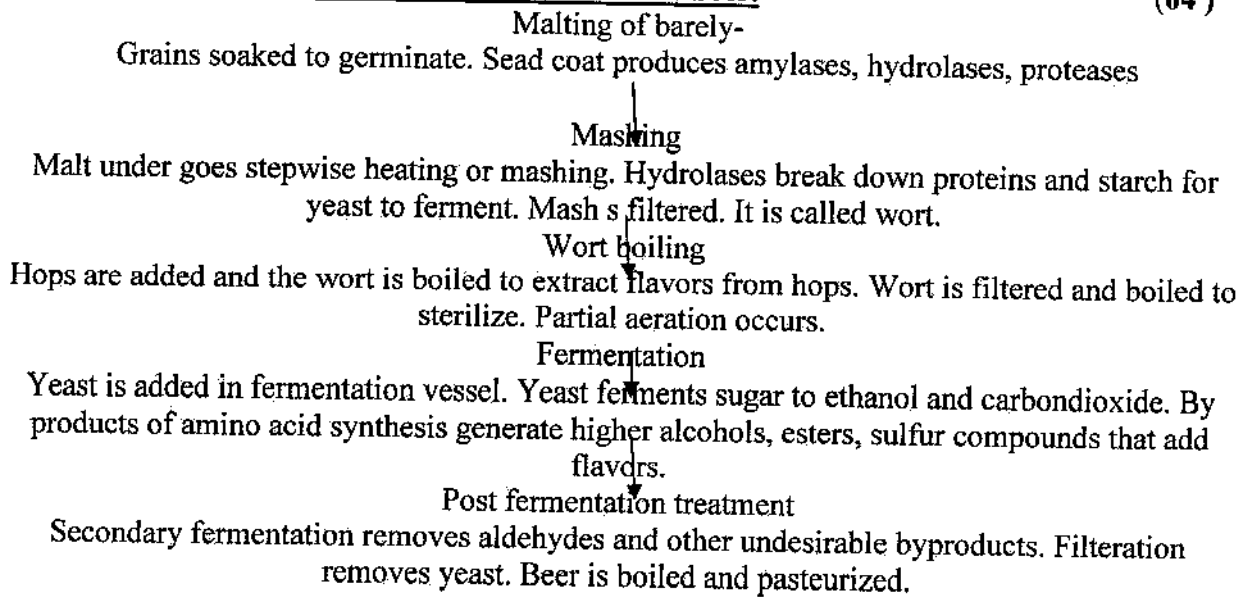


5

OR

Q4 C. i) Schematics for industrial fermentation of beer.

(04)



Q4C ii) Citric acid production by submerged fermentation process.

(4)

Raw material used: molasses, starchy materials.

Organism: *Aspergillus niger*

Submerged fermentation: aeration, precultured mycelia or spores

Q4D) Production process and the recovery of enzymes produced by fermentation

(07)

Solid state fermentation

Medium added in batch/ continuous process

Conditions- pH, temperature, oxygen requirements

Recovery and purification

Extracellular enzymes- in the broth

Intracellular enzymes- cell disruption by physical or chemical process

Centrifugation

Removal of nucleic acids

Precipitation

Q.5 Short note on:

(15)

a. Traditional biotechnology:

During ancient time's human use to collect the wild plants as farmers, cultivated them and selected the best yielding strains for mass production of agricultural products. Therefore, yielding new products or modifying the existing ones by using living organisms by applying number of ancient ways is called as traditional biotechnology.

Animal and vegetable species were selected and crossed to get more productive strains.

Early Romans recovered copper leached by bacteria from natural copper sulphide deposits.

In early 1700 the first large bio-mining process was started in Spain.

The yeast was used to ferment bread, beer and wine.



b. Mechanism of action of Cry protein crystals:

When insects ingest toxin Cry protein crystal, the crystal dissolves in the guts. The alkaline pH and reducing environment in the insect mid gut helps to dissolve the crystal into proto-toxin subunits of ~130,000 Da. The proto-toxin is then digested by pancreatic trypsin to form the activated toxin which is the half the size of the proto-toxin. The activated toxin binds to specific receptors on the insect mid gut and forms pore in the epithelial membrane of the mid gut. These membranes maintain the ion balance and hence the ion balance is destroyed due to disruption of mid gut. Therefore, the insect are paralyzed and soon dies.

c. Ethics in Biotechnology:

Many ethical issues are raised for pharming regarding the treatment of animal.
Many transgenic offspring have birth defects and gross abnormalities or do not produce desired proteins
Biosafety and ethical problems arise while using transgenic animals as source of pharmaceutical proteins.
Besides several benefits, decision making ethical issues cannot be ignored by the biotechnology industries, scientists, policy makers and the public.
To ensure the safety for animals and health of humans and animals new policies regarding transgenic and cloned animals must be prepared.

d. Biotech policy initiatives:

The union Govt. and State Govt. of India have taken various initiatives. Such as govt. of Karnataka, Tamil Nadu, A.P. Mahatashtra, U.P. Uttarakhand Himachal Pradesh and Delhi.
They encourage entrepreneurs to set up industries and made liberal policies.
Biocon Ltd. is one of the leading biotech company for bio-pharmaceuticals
India is today's largest producer of vaccines, enzymes for green technologies etc.

e. Use of microbial enzymes in industry: Cellulase, invertase, etc