Discipline **Agricultural Biotechnology**

*Titles of Home tasks 4- 7*

Home tasks 4. Microbial Biotechnology in Foods and Agriculture

1. Benefits
2. replacement of dangerous chemical pesticides with  
   microbial pesticides to manage and control the  
   problem of pests
3. development of novel biomass products as  
   foodstuffs, using organisms such as algae, fungi,  
   bacteria and yeast.
4. FERMENTATION is
5. Any process that produces alcoholic beverages or  
   acidic dairy products
6. Any spoilage of food by microorganisms
7. Any large-scale microbial process occurring with  
   or without air
8. All metabolic processes that release energy from a sugar or other inorganic molecule.
9. During the fermentation process, microbial growth and metabolism result in the production of enzymes capable of breaking down carbohydrates, lipids and proteins.
10. Enzymes capable of breaking down.vitamins and antimicrobial compounds
12. texture-forming agents
13. 5. amino acids
14. 6. glutamic acid
15. 7. organic acids
16. 8. flavor compounds
17. Genetically Modified (GM) Beer
18. Fermentation carried by a genetically modified  
    brewers yeast, Saccharomyces cerevisiae,  
    containing glucoamylase gene from a  
    closely-related yeast, Saccharomyces diastaticus.
19. GM S. cerevisiae increases the yield of alcohol  
    and enable the production of a full-strength,  
    low-carbohydrate diet beer without the use of  
    extra enzymes after the beer had been brewed.
20. Genetically Modified Vitamin B2 - Riboflavin, a  
    water-soluble vitamin that is synthesized by  
    plants and many microorganisms but is not  
    produced by higher animals occurs naturally in  
    peas, beans, grains, yeast, milk, egg yolk and  
    liver. - chemically synthesized for use in food  
    and feed fortification and in small amounts as a  
    colouring agent in foods e.g. ice cream,  
    processed meat, fish products, sauces and soups.  
    - a very pure product could be produced using a  
    genetically modified strain of Bacillus subtilis.  
    Vitamin B2 Crystals from GM Bacillus subtilis

Home tasks 5. Microbial Biotechnology in Foods and Agriculture

1. Chemical industries - involve in the production of specialty chemicals such as amino acids,
2. Involve in the production of specialty chemicals such as enzymes, polysaccharides, vitamins, sweeteners,
3. Involve in the production of specialty chemicals such as food additives, flavors, fragrances etc. –
4. Involve in the conversion of biomass into specialty chemicals from either plants or  
   biological wastes generated from agriculture and food processing

Home tasks 6. *Microbial Biotechnology in Food, Medicine and Pharmaceutical Industries*

1. Used in the production of fermented foods (eg.  
   beer, wine, bread etc.)
2. Used in the production of enzymes and bioactive compounds for medical and pharmaceuticals
3. Used in bioremediation and waste treatment

*BLUE BIOTECHNOLOGY*

Blue biotechnologyBlue (Marine) Biotechnology is the use of living marine resources at (eco-)system, concept, organism at molecular level to provide beneficial solutions for the society.

**Concept for an value adding use: Cross-link to successful (regional) sectors**

**How does it relate to Industry and Agriculture?**  
Blue Biotechnology is providing many new solutions to Industry and Agriculture, including environmental friendly pesticides and salt-resistant enzymes that are helpful in many industrial applications. Single cell protein, bio fertilizers etc.,

**Application of biotechnology**  
1. Viral Diseases- development of vaccinesFish vaccines will greatly aid the fish industry, but very few are available.Fish are not easily vaccinated; it is usually done by injection or by immersing them in water with the vaccine. Using ultrasound can facilitate vaccine entry into fish.The vaccine is produced by isolating and expressing genes encoding viral proteins.Infectious hematopoietic necrosis (IHN) and infectious pancreatic necrosis (IPN).

**Intramuscular delivery of a DNA vaccine against viral**  
haemorrhagic septicaemia virus (VHSV) in rainbow trout and immuno-histochemical analysis of the injection siteThe fish were anaesthetized and injected with 20 μg of plasmid in the epaxial muscle In fish injected with a plasmid encoding the VHSV G-gene, expression of the G protein (red staining) by myocytes along the needle track induced a local inflammatory reaction (many infiltrating leucocytes with blue nuclei)

 2. Transgenic Fish.Gene transfers have been successful in several fishes e.g common carp, rainbow trout, Atlantic salmon, catfish.Salmon or rainbow trout growth hormone, chicken δ-crystalline protein, winter flounder antifreeze protein, E coli β-galactosidase and E coli hygromycin gene.

Transgenic techniques are used to introduce desirable traits into fish, primarily to allow them to increase the growth and weight of cultured finfish.Fish have large and transparent eggs, allowing it to be easy for gene transfer.methodselectroporation, microinjectionInjection through the micropyle

 Most fish eggs are injected within an hour after fertilization, because they are released from the female and the first division of the egg occurs one hour after fertilization.Salmonoid eggs are more difficult to inject because they have a hard outer covering called the “chorion” .Survival rates for microinjected fish embryos are much higher (35%–80%) than mammals, with 10%–70% of the fish being transgenic.

1. **Current and potential applications of transgenic fish**  
   Growth enhancementFreeze resistance and cold toleranceSalinity toleranceDisease resistanceMetabolic modificationImproved product for the consumerFishpharming production.

Home tasks 7. Genetic transformation of animal somaticcells

1. The principles of genetic engineering in Animal biotechnology:
2. constructing of genes for expressing in mammalian cells, selectable markers,
3. Methods of introducing the foreign DNAs into animal cells,
4. Identification of the foreign DNA in transformed cells and organisms,
5. Determination of the expression
6. Pattern of the foreign DNA.
7. Stem cell origin.
8. Stem cell applications