cephalosporin, Tetracycline, streptomycin) Vitamins (Vitamin B12, Riboflavin, and Vitamin A), peptide antibiotics (Lantibiotics) and Steroids.

UNIT IV (13 hrs)

Production of enzymes and other bioproducts: Production, purification and applications of Industrial Enzymes (Protease, amylase, invertase pectinase, xylanase). Biopreservatives, Biopolymers, Biodiesel, Bioconversion, Biofuels and waste Utilization of biofuels. Microbial exopolysaccharides - classification and applications (Health, Pharmaceuticals and Food industries): Alginate, Cellulose, Hyaluronic acid, Xanthan, Dextran, Gellan, Pullulan, Curdlan, polysaccharides of lactic acid bacteria; Chitin, chitosan and chitin derivatives. Microbial beverages: Production of wine, beer, and vinegar. Microbial foods: Oriental foods, sauerkraut, Cheese, Saffron production, SCP, SCO (PUFA), & Mushroom cultivation, Baker's yeast, Probiotics, silage, nutraceuticals. silk Production. Production of recombinant proteins having therapeutic and diagnostic applications, vaccines. Bioprocess strategies in Plant Cell and Animal Cell culture.

References

1. Comprehensive Biotechnology. Vol. 1, 2, 3 & 4. Moo-Young, M., Pergamon Press, 2011
2. Fundamentals of Biotechnology. Prave,P.et al., Wiley-Blackwell Pub., 1987
3. Industrial Microbiology. Cassida, L.E., John Wiley & Sons, 1968
4. Industrial Biotechnology. Crueger, W.&Crueger,A., Sinauer Associates Inc., 1990
5. Industrial Biotechnology. Demain, A.L., American Society for Microbiology, 1986
6. Microbial Biotechnology. Glazer, A.G., WH Freeman and Company, 1994
7. Microbial Technology. Peppler, H.J., Vol. 1 & 2. Academic Press, 1979
8. Biochemical Engineering fundamentals, Bailey J., Bailey J. & Ollis D.F., McGraw-Hill Pub., 1986
9. Chemical Engineering. J.M Coulson &J.F. Richardson, Pergamon Press, 2002
10. Comprehensive Biotechnology. Volumes 1, 2, 3 & 4. Moo-Young M., Pergamon Press, 2011
11. Fundamentals of Biotechnology. Prave P.et al., Wiley-Blackwell Pub., 1987
12. Principles of Fermentation Technology. StanburyP.F. et al Pergamon Press, 1984

AGRIBIOTECHNOLOGY Hours: 52

Course outcomes:

After successful completion of the course, students will be able to:

CO 1. Compare the plant genome with chloroplast and mitochondrial genomes, to demonstrate the application of plant breeding methods, to differentiate the mechanism involved in different biological process.

CO 2. Demonstrate different techniques involved in the plant tissue culture for the propagation of plants and germplasm preservation.

CO 3. Utilise plant tissue culture methods for the production of commercially important secondary metabolites.

CO 4. Demonstrate the genetic manipulation of plants for the production of elite plants with superior traits such as insect resistance, improved nutrient content etc.

CO 5. Learn protection and registration of new plant varieties and plant germplasm conservation, General agreement on trade and tariff, use of traditional knowledge digital library i.e ayurvedic and unani medicinal plants, Farmers rights and plant breeders rights

UNIT I (13 hrs)

Plant genome structure, gene families in plants, organization of chloroplast genome, mitochondrial genome and their interaction with nuclear genome, RNA editing in plant

mitochondria. Mitochondrial DNA and Cytoplasmic male sterility. Plant breeding mechanism: types and applications**.** Plant genomics, molecular markers aided plant breeding. Biological oxidation: Electron transport chain, chemiosmotic hypothesis, ATP synthesis, oxidative phosphorylation, substrate level phosphorylation, uncouplers and inhibiters of respiration. Photosynthesis, regulation, Calvin cycle, C_3-C_4 plants

UNIT II (13 hrs)

Regulation of gene expression in plant development: Germination, apical meristem, floral development, leaf development, seed development and seed storage proteins. Plant hormones (auxins, cytokinins and gibberellins, IBA, NAA, 2-4-D, TDZ). Plant tissue culture, history, laboratory design, aseptic conditions, methodology, media, Various in vitro techniques: callus cultures, meristem cultures, anther culture, embryo culture, micropropagation, protoplast culture, somaclonal variation, synthetic seeds; cryopreservation. Cell suspension cultures and bioreactor technology, plant biosynthesis and production, regulation, commercial importance of secondary metabolites by tissue culture. Plant-derived vaccines, plantibodies and pharmacognosy. Gene rearrangement. Tissue culture in Industrial Biotechnology including gene transfer methods.

UNIT III (13 hrs)

Development of transgenic plants for virus, bacteria, fungi, insect resistance. Transgenic crops for improved quality (Bt cotton, Bt brinjal, golden rice), herbicide tolerant, stress resistant plants, RNAi and antisense RNA technology, delay of softening and ripening of fleshy fruits by antisense RNA, ACC gene synthesis in tomato, banana and watermelon, terminator seed technology, GM foods and human health. Plant microbe interactions: Rhizosphere, mycorrhizas, rhizobia, diazotrophs and endophytes. Plant pathogen interactions. Biopesticides - *Bacillus thuringiensis*, *Bacillus popillae*, *Trichoderma*, Baculoviruses., Biofertilizers - *Rhizobium, Azotobacter, Azospirillum,* Cyanobacteria, *Mycorrhiza*, phosphate solubilizers, *Frankia.*, Plant Growth Promoting Rhizobacter. Molecular diagnosis of plant diseases and biological control.

UNIT IV (13 hrs)

CBD, GAAT, TRIPs, Plant variety protection, International Union for the Protection of new Varieties of Plants (UPOV), plant protection act, registration of new varieties, rights and obligations, farmer's rights; traditional ecological knowledge. Traditional knowledge digital library (TKDL). Plant germplasm conservation, characterization and documentation. Seed certification (laws, regulations and standards), seed patent law, Patent-related litigations and controversies (neem, basmathi rice, turmeric).

References

1. Biotechnology in Agriculture and Forestry. Bajaj, Y.P.S., Springer, 2007.
2. Biotechnology of Higher Plants. Russell, G.E. Intercept Pub., 1988
3. Plant Cell and Tissue Culture. A Lab manual. Reinert, J.& Yeoman, M.M., Springer, 1982
4. Plant Biotechnology. Mantell,S.H. & Smith, H. Cambridge University Press, 1983
5. Introduction to Plant Biotechnology. Chawla, H.S. Science Publ. Inc., 2002