Subject Code : N3P8

MOLECULAR BIOLOGY AND MICROBIAL BIOTECHNOLOGY

MOLECULAR BIOLOGY

Unit – I

Nucleic acids : DNA and RNA types and structures – DNA, t-RNA, r-RNA, m-RNA, Vectors – Plasmids – cosmids – bacteriophages – Ti plasmid, pBR 322, pSC 101, pUC – Structure & assay methods. Enzymes – Nucleases – restriction endo nucleases – RNAses – Ligases, Taq polymerases – their uses and applications. Protein – Histones and non-histones.

Unit – II

Definition of a gene, structure, cloning techniques, genomic library, c DNA – expression systems, - Gene rearrangement by RNA and DNA splicing.

MICROBIAL BIOTECHNOLOGY

Unit – III

Biotechnology – definition, concepts and scope - history and achievements in the last century. Screening for new products from micro-organisms – inoculum development – nutritional improvement – long term preservation of the important microbes. Biological approaches in the microbial production of useful amino acids, organic acids, antibiotics, vitamins, steroids and sterols.

Unit – IV

Genetic engineering and strain improvement – application of conjugation, Transformation, transduction and transfection – principles and applications of recombinant DNA technology – enzymology of the process – restriction enzymes – types, recognition sites and specificity – ligases and their uses – cloning strategies, gene libraries and cDNA cloning. Principles and techniques of nucleic acid hybridization and cot curves, sequencing of proteins and blotting techniques, polymerase chain reaction & DNA fingerprinting. Patent laws and legal protection in Biotechnology.

Unit – V

Biotransformation – strategies and techniques involved in the process – precursor feeding, mutational impairing – biosynthesis of hybrid molecules. Immobilization methods and substrates, application of immobilization protoplasting of microbial cells, their immobilization and advantages. Enzyme biotechnology – enzyme production technology from microbes – problems and applications – enzyme immobilization. Production of antigens, antibodies (MAB), unsulin, somatotropin, interferons and vaccines by cloning and expression in microbes. Microalgal biotechnology – cultivation methods of Dunaliealla and spirulina Biotechnological potentials microalgae. Biotechnological potentials of microalgae as food, feed, fuel and

pharmaceuticals valuable compounds of microalgae. Production technology of microbial biofertilizers – cyanobacteria, Azolla, Rhizobium, Azotobacter, Azospirillum & Phosphobacter.

PRACTICALS

1. Isolation of plasmids from bacteria – Spectrophotometric assay.
2. Isolation of chromosomal DNA from bacteria – spectrophotometric assay.
3. Principles and applications of agarose gel, electrophoresis and plasmid separation in agarose gel.
4. Restriction digestion of DNA.
5. Scoring for mutants through physical and chemical agents.
6. Separation of proteins using column chromatographic techniques. (Ion exchange, Gel filtration).
7. Principles and applications of protein gel electrophoresis (Native denatured).
8. Protoplast and spheroplast isolation.
9. Assay of commercially important compounds – certain vitamins and plant hormones.
10. Microbial biotransformation – demonstration with any known compound.
11. Immobilization techniques for compound isolation and preservation.

References:

1. Microbial genetics by David Freifelder, 1990, Narosa Publishing House, India.
2. Principles of gene manipulation by R.W. Old and S.B.Primrose, 4th ed. 1989, Blackwell Scientific Publication, London.
3. Molecular Biology of the Gene by James D.Watson, I and II Volume.
4. Bacterial plasmids by Kimber Hardy, Van Nostand Reinhold (VK) Co., Ltd.,
5. Mobile DNA by D.E. Berg and M.M.Howem 1989. American Society for Microbiology, Washington, DC.
6. Biotechnology – the biological principles by Traven et al., Tata McGraw Hill edition, 1990.
7. Principles of Gene Manipulation by R.W.Old and S.B.Primrose, 4th ed. 1989, Blackwell Scientific Publications, London.
8. Algal and Cyanobacterial Biotechnology by R.C.Cresswell, R.A.V.Ress & N.Shah, 1989, Longman Scientific & Technical , New York.
9. Manual of Industrial Microbiology and Biotechnology by A.L.Demain and N.A.Solomon, American Society for Microbiology, Washington DC, 1988.
10. Fundamentals of Biotechnology P.Prave, V.Fauet, W.Sitting and D.A.Sukatasch. 1987. VCH Veriagagesellschaft. MbH, Weinhksim.