

Course: Single Cell Protein

Unit 1 Introduction to SCP production- Historical use and rediscovery of Spirulina importance-morphology, taxonomy and habitat of Spirulina – biochemical composition including proximate composition- amino acids- unsaturated fatty acids-minerals and vitamins. Human health benefits of Spirulina.

Unit 2 Natural production-laboratory cultivation-small scale commercial production-commercial and mass cultivation (tank construction, culture medium, strain selection, scaling up of the process)- importance of light and pH in Spirulina cultivation- harvesting, drying and packing.

Unit 3 Spirulina health benefits-Harvesting of Spirulina - Filtering of culture medium-Drying of fresh spirulina-Cost and profits in spirulina farming- Capital cost investment-Spirulina quality specifications..

Unit 4 Worldwide spirulina algae production systems- lake harvesting and cultivation systems- Commercial outdoor pond cultivation systems-Integrated production farms- Family and community microfarms. Local algae production.

Unit 5 Development of Spirulina industry- marketing; marketing products around the world-marketing evolution in the USA-Natural colours for foods and cosmetics- Future expansion of spirulina products.

References :

1. Changs T. and Hayanes W.A. (Ed.) (1978) Biology and Cultivation of Edible Mushrooms. Academic Press. N.Y.
2. Habib M.A.B., Parvin M., Huntington T.C. and Hasan M.R. (2008) A review on culture, production and use of Spirulina as food for humans and feeds for domestic animals and fish. FAO Fishers and Aquaculture Circular No. 1034, FAO, Rome, Italy.
3. Selvendran D. (2015) Large Scale Algal Biomass (Spirulina) Production in India. In: D.Das (Ed.) Algal Biorefinery: An Integrated Approach, Springer.
4. Spirulina World Food – How this micro algae can transform your health and our planet by Robert Henrikson 2010.

Course: Mushroom Cultivation

Unit 1

Introduction: General history, edible mushrooms and poisonous mushrooms .Common Indian mushrooms; Nutritional values, medicinal values and advantages. Systematic position, morphology, distribution, and structure of various species of mushrooms.

Unit 2

Cultivation: Paddy straw mushrooms- substrate, spawn making. Methods: Bed method, polythene bag, field cultivation. Oyster mushroom cultivation- substrate, spawning,. pre treatment of substrate.

Unit 3

Maintenance of mushroom. Diseases- common pests, disease prevention and control measures .Processing- Blanching, steeping, sun drying, canning, pickling, freeze drying. Storage- short term and long term storage

Unit 4

Production level, economic return, foreign exchange from mushroom. Cultivating countries and international trade. Mushroom based products.

Unit 5

Practical approaches: Cropping, Harvesting, Packaging- Spawning, Substrate preparation, Pasteurization, Incubation, Colonisation, Pinning, Harvesting.

References :

1. Adejumo, T.O. & Awosanya, O.B. (2005). Proximate and mineral composition of four edible mushroom species from South Western Nigeria. African Journal of Biotechnology, 4, 1084-1088.
2. Fazaeli, H. & Masoodi, A.R.T. (2006). Spent mushroom straw compost of *Agaricus bisporus* mushroom as ruminant feed. Asian-Australasian Journal of Animal Sciences, 19, 845-851.
3. Growing gourmet and medicinal mushrooms book by Paul Stamets.
4. Organic Mushroom Farming and Mycoremediation: Simple to Advanced and Experimental Techniques for Indoor and Outdoor Cultivation Book by Tradd Cotter
5. The Mushroom cultivator : A Practical Guide to Growing Mushrooms at home by Jeff S. Chilton.
6. Hall, I.R., Yun, W. & Amicucci, A.(2003). Cultivation of edible ectomycorrhizal mushrooms. Trends in Biotechnology, 21, 433-438.

Course: Genomics and Proteomics

Unit 1 –Nucleotide sequence Management: Introduction to Nucleic acid databases – NCBI/DDBJ/ ICGI. Retrieval of Nucleotide sequence – NUCLEOTIDE and GENE databases – Flat file/FASTA/Graphical formats. Uploading the sequences into NCBI – Sequin and BankIt tools.

Unit 2 Protein sequence Management: Accessing Expasy-Swiss Prot databases. Retrieval of protein sequence from UniProtKb – File formats. Protein sequence characterization – PROT PARAM.

Unit 3 Pair wise and multiple alignments: BLAST analysis of nucleic acid and protein sequences. Protein pair wise alignment – EBI EMBOSS tool. Multiple alignment of nucleic acids and proteins – CLUSTALX.

Unit 4 Phylogenetic analysis: Trimming of multiple aligned sequences – DAMBE. Conversion of file formats for Phylogenetic analysis. Construction of Phylogenetic trees through Maximum Likelihood/ Maximum Parsimony/ Neighbour Joining methods – PHYLIP and MEGA.

Unit 5 Protein structure management: Retrieval of protein structures from PDB database. Molecular visualization of proteins. Secondary structure prediction of unknown proteins - GOR. Tertiary structure prediction of proteins – SWISS MODEL server. Validation of protein structures.

References :

1. Rastogi S C, Namita Mendiratta, Parag Rastogi. 2013. Bioinformatics: Methods and Applications: Genomics, Proteomics and Drug Discovery. Prentice Hall India Learning Private Limited; 4th Revised edition
2. Orpita Bosu and Simminder Kaur Thukral. 2007. Bioinformatics: Databases, Tools, and Algorithms. Oxford University Press.
3. Ruchi singh. 2014. Bioinformatics: Genomics and Proteomics. Vikas Publishing House.
4. Jonathan Pevsner. 2015. Bioinformatics and Functional Genomics. Wiley-Blackwell; 3 edition.
5. Teresa Attwood. 2007. Introduction to Bioinformatics. Pearson Education; 1 edition.
6. Jin Xong. 2006. Essential Bioinformatics. Cambridge University Press; 1 edition.

Course: Protein Engineering

UNIT I

An overview of protein isolation: Properties of proteins, the conceptual basis of protein isolation, Protein purification table.

UNIT II

Extraction and sub-cellular fractionation: Phenol extraction methods, TCA/Acetone precipitation, Ammonium sulphate precipitation, centrifugal sub-cellular fractionation-differential centrifugation.

UNIT III

Concentration of the extract and Quantification: Freeze drying, dialysis, ultrafiltration, concentration/fractionation by salting out, fractional precipitation with polyethylene glycol, protein quantification- Lowry's method, Bradford assay.

UNIT IV

Chromatography: Principles of chromatography, Thin layer chromatography, Gel Filtration Chromatography, Ion exchange chromatography, hydroxyapatite chromatography, affinity Chromatography, hydrophobic interaction chromatography.

UNIT V

Electrophoresis techniques and blotting: Principles of electrophoresis, the effect of the buffer, electroendosmosis, SDS polyacrylamide gel electrophoresis (SDS-PAGE), starch gel electrophoresis, SDS-PAGE zymogram for proteinases, Two-dimensional gel electrophoresis (2D-PAGE), Isoelectric focusing, Blotting technique-Western Blotting.

TEXT BOOK:

1. A guide to protein isolation. Clive Dennison. kluwer academic publishers new york, boston, dordrecht, london, Moscow. 2002.
2. Protein Purification Applications, S.L.V. Harris and Angal IRL Press, (1990).
3. Membrane Protein Purification and Crystallization;Carola Hunte, Gebhard von Jagow and
4. Hermann Schagger, Academic Press (2011).
5. Creighton TE, Chasman DI (1997) Protein structure: a practical approach: IRL press Oxford
6. Branden and Tooze (1999) Introduction to Protein Structure (2nd Edition) Garland Publishing
7. Protein Purification: Principles and Practice (Springer Advanced Texts in Chemistry) by Robert K. Scope (1983)
8. Protein Purification Techniques: A Practical Approach (Practical Approach Series) by Simon Roe (2001)