BTH 502 PLANT BIOTECHNOLOGY

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.

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, RFLP, RAPD, AFLP markers, QTL, SSR, STS markers, Proteomics, drug discovery 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, techniques of callus cultures, meristem cultures, anther culture, embryo culture, micropropagation, protoplast culture, somaclonal variation, synthetic seeds; Germplasm conservation and cryopreservation

UNIT III (13 hrs)

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 IV (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. Molecular diagnosis of plant diseases and biological control.

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