

Objective(s)

To impart knowledge to the student on the ultra structure of cell and its organelles, principles of genetics and their application in plant breeding for improving agriculture productivity.

UNIT I

Cell: Differences between plant cell and animal cell – differences between prokaryotic and eukaryotic cell; Ultrastructure of cell and cell organelles; Nucleus: Ultra structure; Study of chromosome structure, morphology, number and types, Karyotype and Idiogram; Cell division: Cell cycle and its regulation; (mitosis, meiosis). Introduction and definitions of cytology, genetics and cytogenetic – interrelationships among cytology, genetics, plant breeding and also with other branches of science – history – historical developments – cell theory and protoplasm theory.

UNIT II

Deoxyribo Nucleic Acid (DNA) and RNA (Ribo Nucleic Acid) as genetic material- its structure and DNA replication; Genetic code– outline of protein-Transcription-Translation -Operon concept

UNIT III

Mendelian genetics – terminology – Mendel's work, Mendel's Laws - Modification of Mendelian ratio, different type of epistasis; Gene action – types of gene action– multiple alleles; Qualitative and quantitative characters- Multiple factor hypothesis

UNIT IV

Linkage– coupling phase and repulsion phase – types of linkage - pleiotropism; Crossing over – mechanism of crossing over – types of crossing over– coincidence – interference; Cytoplasmic inheritance- Polyploidy in plants

UNIT V

Mutation- Types of mutation, methods of inducing mutations- physical and chemical mutagen.

Reference Book(s):

1. Gupta, P.K. 1985. *Cytology, Genetics and Cytogenetics*. Rastogi Publications, Meerut.
2. Gupta, P.K. 2007. *Genetics*. Rastogi Publications, Meerut.
3. Pundhan Singh, 2000. *Elements of Genetics*. Kalyani Publishers, Ludhiana.
4. Singh, B.D. 2007. *Fundamentals of Genetics*. Kalyani Publishers, Ludhiana.
5. Strickberger, M.W. 2004. *Genetics*. Prentice – Hall of India Pvt. Ltd., New Delhi.

Practical(s):

1. Study of monohybrid ratio and its modifications
2. Study of dihybrid ration and its modification
3. Study of chi-square analysis and goodness of fit
4. Example related to chi-square for monohybrid ratio, dihybrid ratio and dihybrid testcross
5. Study of gene interactions (dominance epistasis, recessive epistasis and duplicate recessive epistasis)
6. Study of gene interactions (duplicate with additive, duplicate dominance and dominance recessive epistasis)
7. Estimation of Linkages using various methods.

8. Evolution of different crop species like Cotton, Wheat, Tobacco, Triticale and Brassicas
9. Instruments/equipments related to cytogenetic studies- Cell sorter, Flow Cytometer, Micro manipulator, FISH, GISH,
10. Computer application in genetics