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GPB-121 Fundamentals of Genetics 3(2+1)

Theory

Pre and Post Mendelian concepts of heredity, Mendelian principles of heredity, Cell division – mitosis, meiosis, Probability and Chi-square. Dominance relationships, gene interaction. Multiple alleles, pleiotropism and pseudoalleles. Sex determination and sex linkage, sex limited and sex influenced traits, Blood group genetics, Linkage and its estimation, crossing over mechanisms, chromosome mapping.

Structural changes in chromosome, numerical changes in chromosome, introduction to mutation, classification, Qualitative & Quantitative traits, Polygenes and continuous variations, multiple factor hypothesis, Epistatic interactions with examples. Cytoplasmic inheritance. Genetic disorders.

Nature, structure & replication of genetic material. proof for DNA as genetic material and genetic code, Protein synthesis, Transcription and translational mechanism of genetic material, Gene concept: Gene structure, function and regulation, Lac and Trp operons.

Practical

Study of microscope. stains and fixatives, Study of cell structure. Experiments on monohybrid, dihybrid, trihybrid, test cross and back cross, Experiments on epistatic interactions including test cross and back cross. Practice on mitotic and meiotic cell division, Experiments on probability and Chi-square test. Determination of linkage and cross over analysis (through two point test cross and three point test cross data). Study on sex linked inheritance in Drosophila. Study of models on DNA and RNA structure.

Lecture Schedule:Theory

S.N.	Topic	No. of lectures
1	Pre and Post Mendelian concepts of heredity	1
2	Mendelian principles of heredity	1
3	Cell division – mitosis	1
4	Cell division – meiosis	1

5	Probability and Chi-square	1
6	Dominance relationships and gene interaction	1
7	Epistatic gene interactions with examples (complementary, supplementary, duplicate gene interactions)	1
8	Epistatic gene interactions with examples (masking, inhibitory, polymeric and additive gene interactions)	1
9	Pleiotropism, pseudoalleles, Multiple alleles and Blood group genetics	1
10	Sex determination	1
11	Sex limited, sex influenced and sex linked traits	1
12	Sex linkage	1
13	Linkage and its estimation	1
14	Crossing over : introduction & mechanisms	1
15	Chromosome mapping	1
16	Structural changes in chromosome	1
17	Numerical changes in chromosome	1
18	Mutation: introduction, characteristics & classification	1
19	Mutagenic agents: physical and chemical mutagens	1
20	Induction of mutation, Methods of inducing mutation & CIB technique	1
21	Qualitative & Quantitative traits, Polygenes and continuous variations	1
22	Multiple factor hypothesis	1
23	Cytoplasmic inheritance	1
24	Genetic disorders	1
25	Nature, structure and types of genetic material	1
26	Proof for DNA as genetic material	1
27	Replication of genetic material	1
28	Genetic code & Protein synthesis	1
29	Transcription mechanism of genetic material	1
30	Translational mechanism of genetic material	1
31	Gene concept: Gene structure and function	1
32	Gene regulation, operon concept, Lac and Trp operons	1

Lecture Schedule: Practical

S.N.	Topic	No. of lectures
1	Study of microscope: parts and types	1
2	Study of cell structure	1
3	Experiments on monohybrid, test cross and back cross	1
4	Experiments on dihybrid, test cross and back cross	1
5	Experiments on trihybrid, test cross and back cross	1
6	Experiments on epistatic interactions including test cross and back cross	1
7	Experiments on epistatic interactions including test cross and back cross	1
8	Stains and their preparation	1
9	Fixatives and their preparation	1
10	Practice on mitotic cell division	1
11	Practice on meiotic cell division	1
12	Experiments on probability	1
13	Experiments on Chi-square test	1
14	Determination of linkage and cross over analysis (through two point test cross and three point test cross data)	1
15	Study on sex linked inheritance in <i>Drosophila</i>	1
16	Study of models on DNA and RNA structure	1

References:

1. Gupta P.K.2004. *Cytology, Genetics and Evolution*. Rastogi Publications, Meerut. (Hindi Edition)
2. Klug, W.W. and Cummings, M.R.2005.*Concepts of Genetics*. Pearson Education (Singapore) pvt. Ltd., Indian Branch, Pratap Ganj, New Delhi.
3. Singh, B.D. 2001.*Genetics*. Kalyani Publishing House, New Delhi.
4. Strickberger, M.W.2001.*Genetics*. Prentice Hall of india. Pvt. Ltd., New Delhi.
5. Sharma, A. K. and Sharma, R. A. 2013. *Crop Improvement and Mutagenesis*. Scientific Publishers, Jodhpur.

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