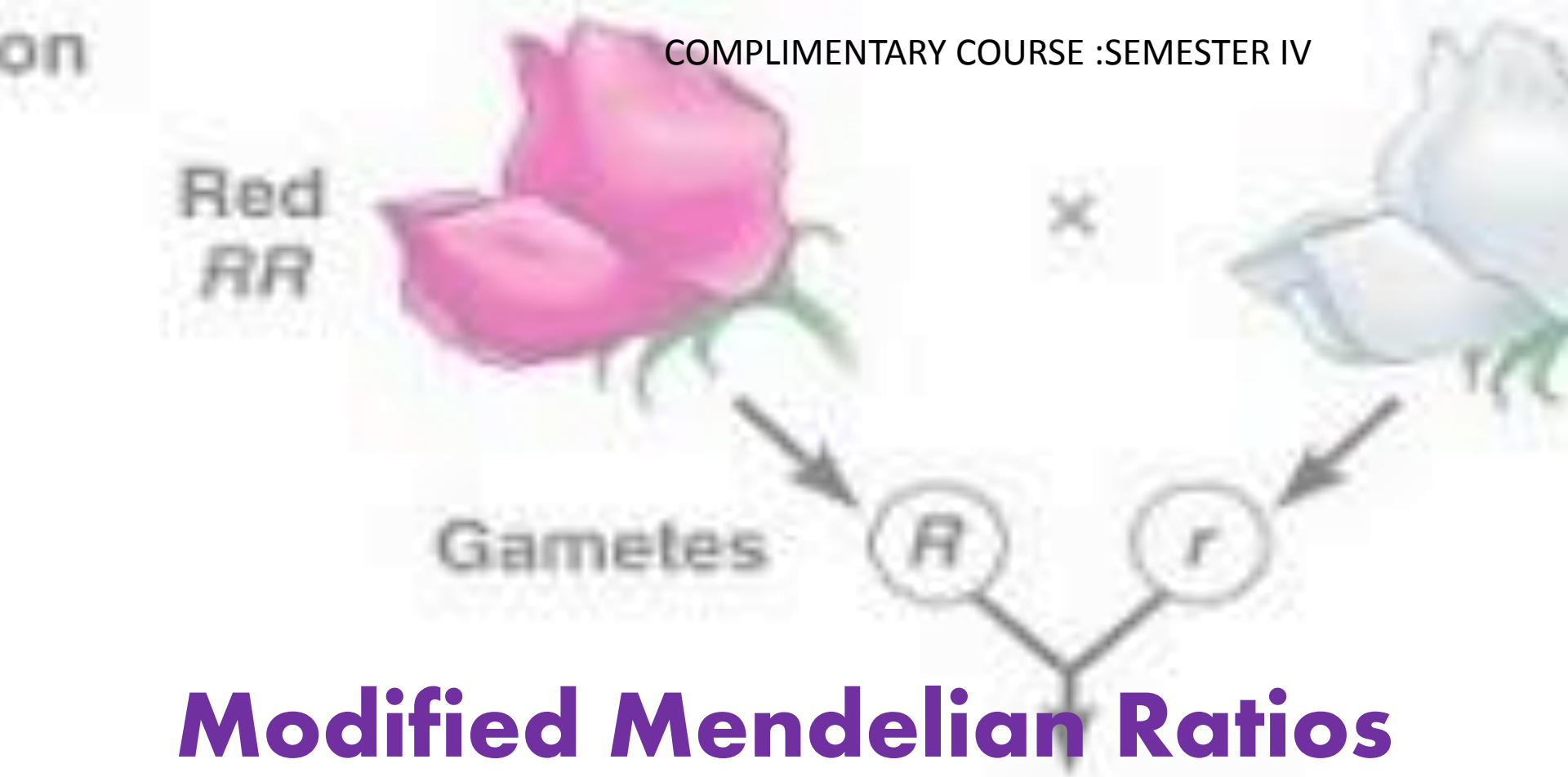
COMPLIMENTARY COURSE :SEMESTER IV



Modified Mendelian Ratios

Part 1

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Features of Mendelian inheritance

- Every heritable trait is governed by a single gene
- Each gene exist in two allelic forms
- One allele of each gene is completely dominant over the other
- Alleles exhibit segregation and independent assortment in inheritance
- A heterozygote is phenotypically identical to a dominant heterozygote

Concept of gene interaction

- Gens interact in many ways in many cases and modify Mendelian ratios
- Mendelian principles are not universally acceptable
- Interacting gens may mask, modify ,enhance, inhibit, or reverse the effect of the other or some genes may have different affects under different conditions

Every trait is a product of interaction of many genes

Interactions of genes

Allelic interactions

- Occur between alleles of the same gene that are located in identical loci on different homologous chromosomes

Non-Allelic interactions

- Take place between the alleles of different genes that are located at different loci on the same or different chromosome

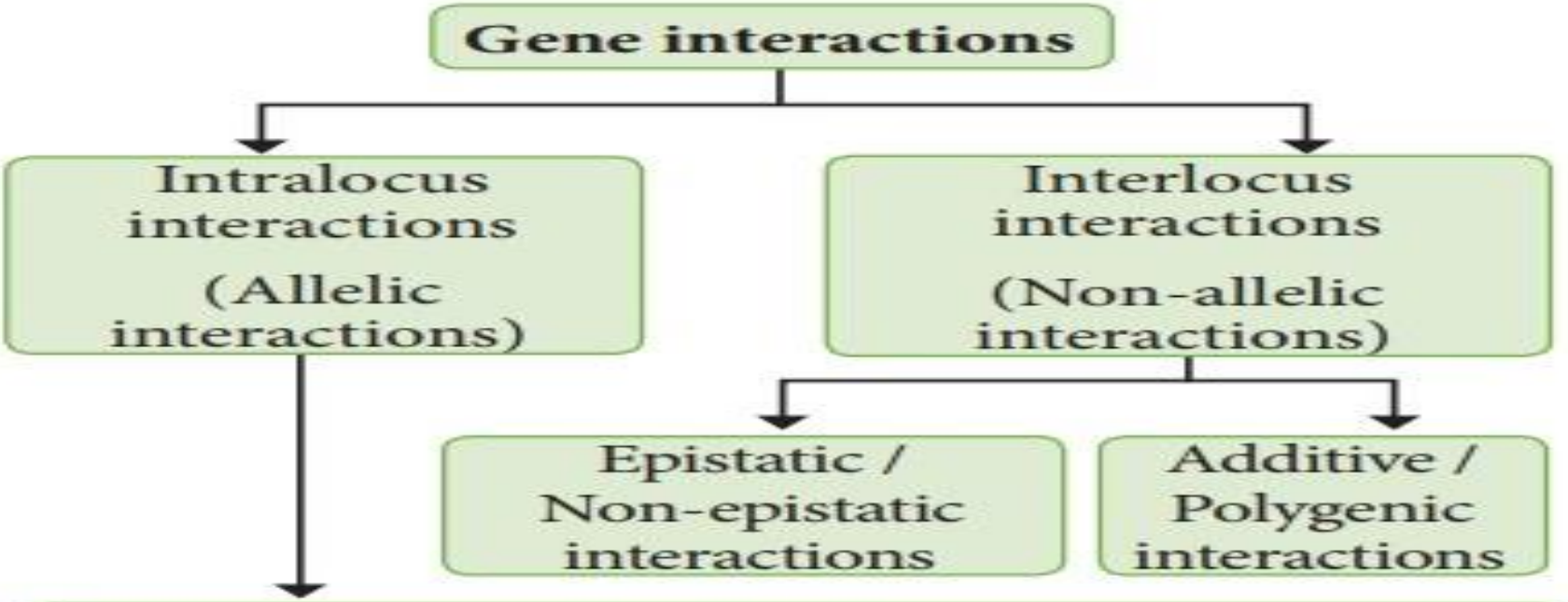
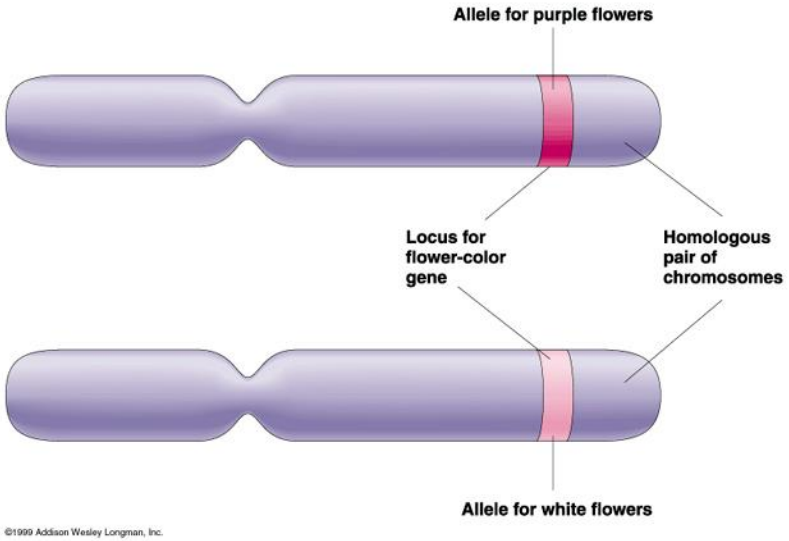


Figure 2.13: Gene Interaction

Allelic interactions

1. Incomplete dominance
2. Co –dominance
3. Multiple allelism

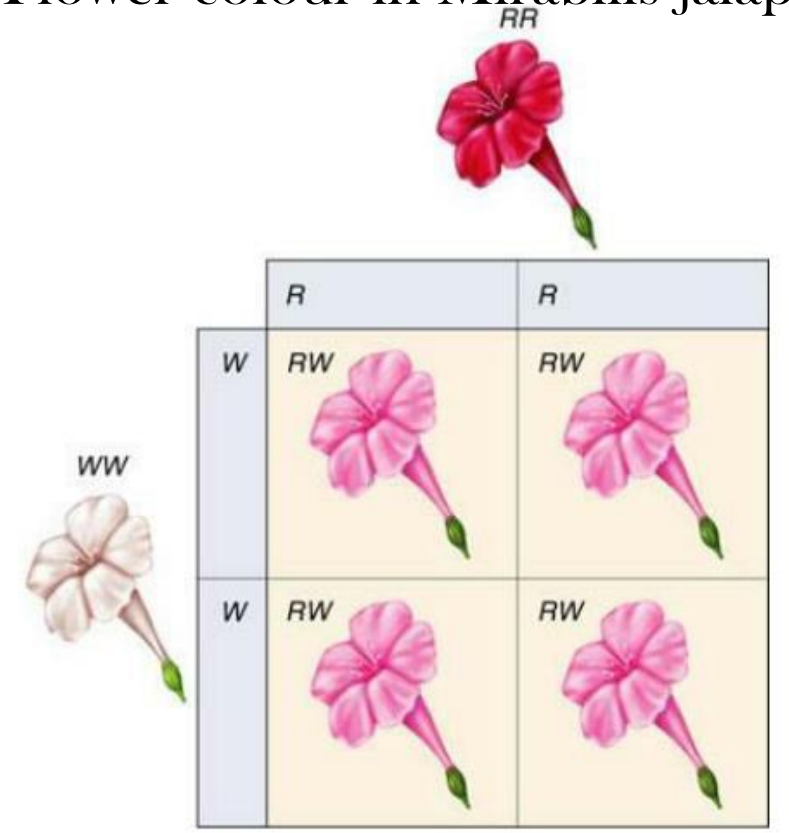


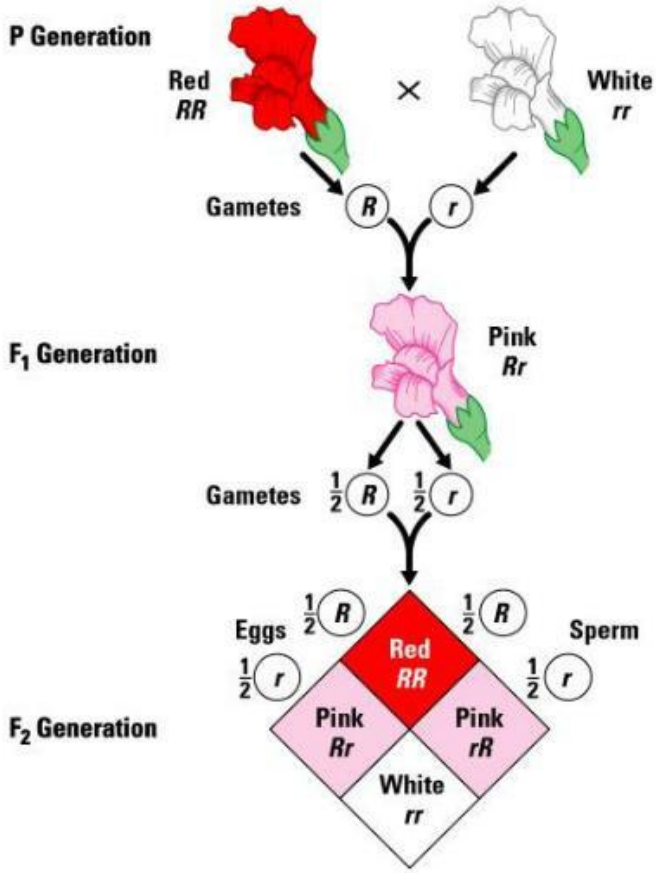
Incomplete dominance

- It is the condition in which the dominant allele is only partially expressed in the heterozygote
- In such cases , the phenotype of the heterozygote is apparently intermediate between those of dominant and recessive homozygotes
- Here the phenotypic and genotypic ratio of the F_2 is 1:2:1

INCOMPLETE DOMINANCE

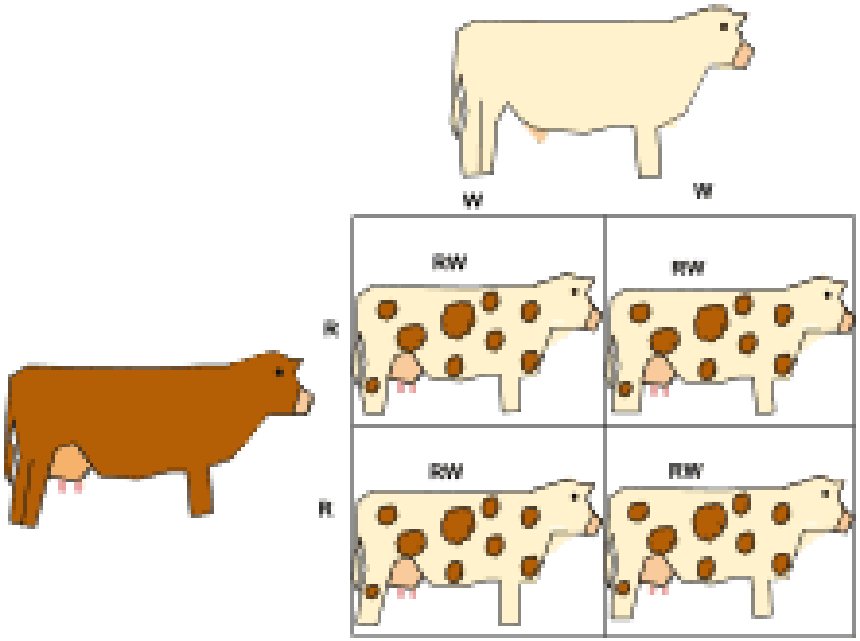
Eg :Flower colour in Mirabilis jalapa





Co-Dominance

- In this condition both the alleles of a gene are simultaneously ,fully and equally expressed in a heterozygote
- So the heterozygote will have the both the phenotypes



Eg: Inheritance of the antigens of Human blood group

- There are two antigens A and B
- They exist in three allelic forms I^A ,I^B and I^O

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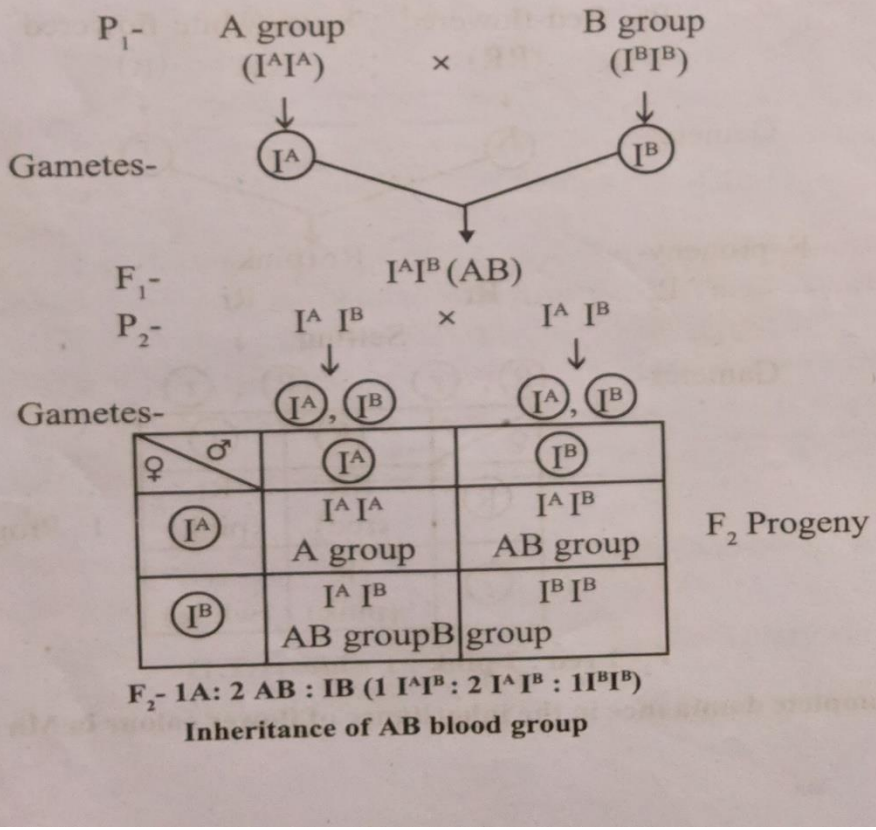
- I^A and I^B are co dominant to each other but are dominant to I^O
- When I^A and I^B coexist they produce the blood group AB
- Phenotypic ratio :1:2:1

Genotype	Phenotype
ABO system	
$I^A I^A$, $I^A I^O$	A group
$I^B I^B$, $I^B I^O$	B group
$I^A I^B$	AB group
$I^O I^O$	O group
MN system	
$L^M L^M$	M group
$L^N L^N$	N group
$L^M L^N$	MN group

ABO and MN blood group systems showing codominance



F_2 Progeny

F_2- 1A: 2 AB : IB (1 I^AI^B : 2 I^AI^B : 1I^BI^B)

Inheritance of AB blood group

Multiple allelism

- In this a single gene existing more than two allelic forms
- Eg; human blood group
- The production of antigens A and B is governed by the gene I .This gene exist in three alternative forms , I^A ,I^B and I^O

Allelic (genotypic) combinations	Nature of the combination	Phenotypic expression
(i) I^AI^A	Homozygous dominant	A group blood
(ii) I^AI^o	Heterozygous	do
(iii) I^BI^B	Homozygous dominant	B group blood
(iv) I^BI^o	Heterozygous	do
(v) I^AI^B	Codominant	AB group blood
(vi) I^oI^o	Homozygous recessive	O group blood