- **Gene interaction**

  A phenomenon where interaction between genes takes place is called gene interaction. The interacting genes, which are participating in the interaction, may include allelic genes or non-allelic genes. The interaction of genes affects the outcome of particular phenotypic character. Allelic genes are the genes present on same locus and non-allelic genes are present on different locus **(Fig 7)**.

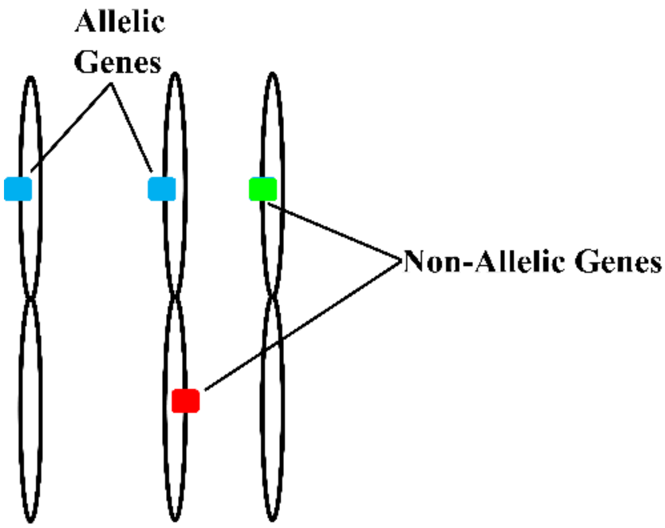


Fig 7

- **Epistasis**

  In epistasis alleles of two or more genes interact to control a single phenotype. The phenomenon of epistasis include a **epistatic** gene and a **hypostatic** gene. The epistatic gene mask the the phenotypic expression of the hypostatic gene. In other words, the epistasis event involves two genes, one gene (epistatic) masking the phenotype, and the other gene (hypostatic) whose phenotype is being masked.

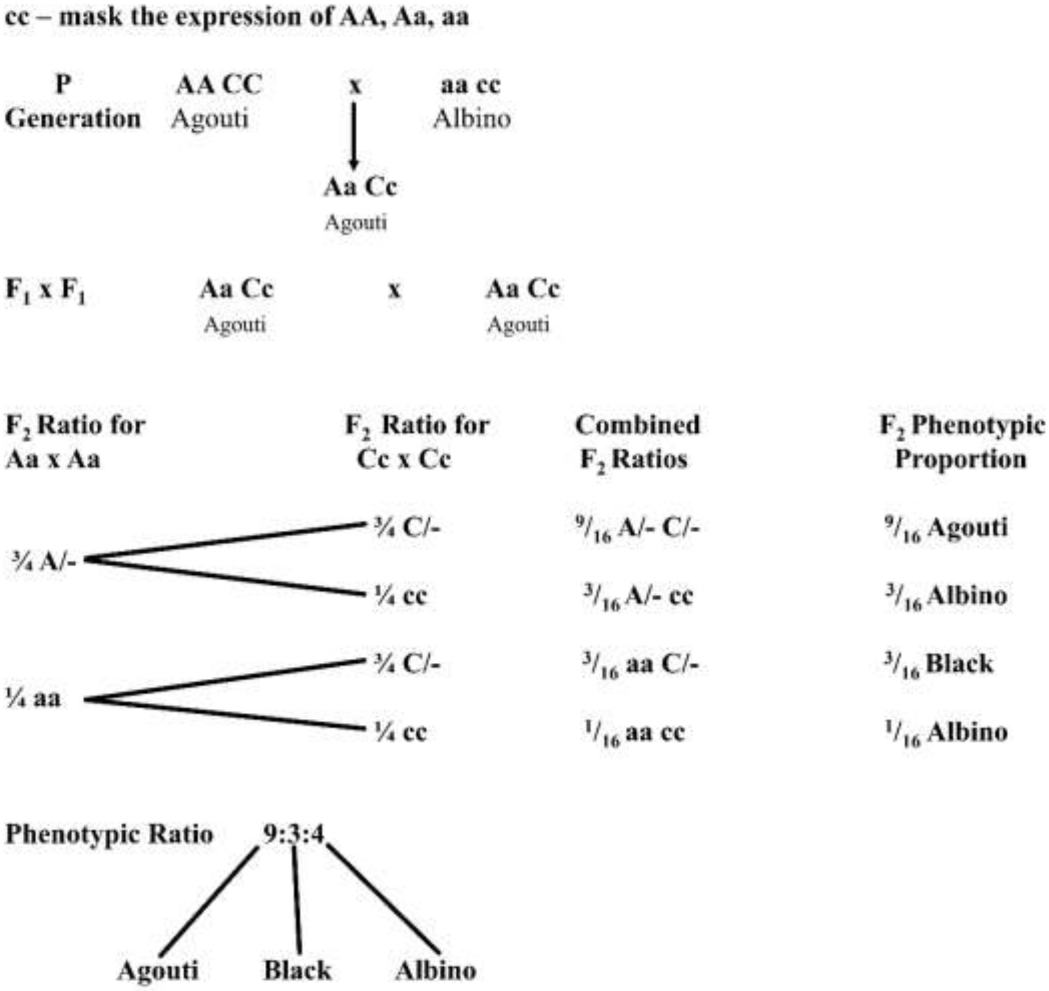
  Epistatic Gene – masking gene

  Hypostatic gene – The gene whose phenotypic expression is being masked.

Epistasis are of following types:

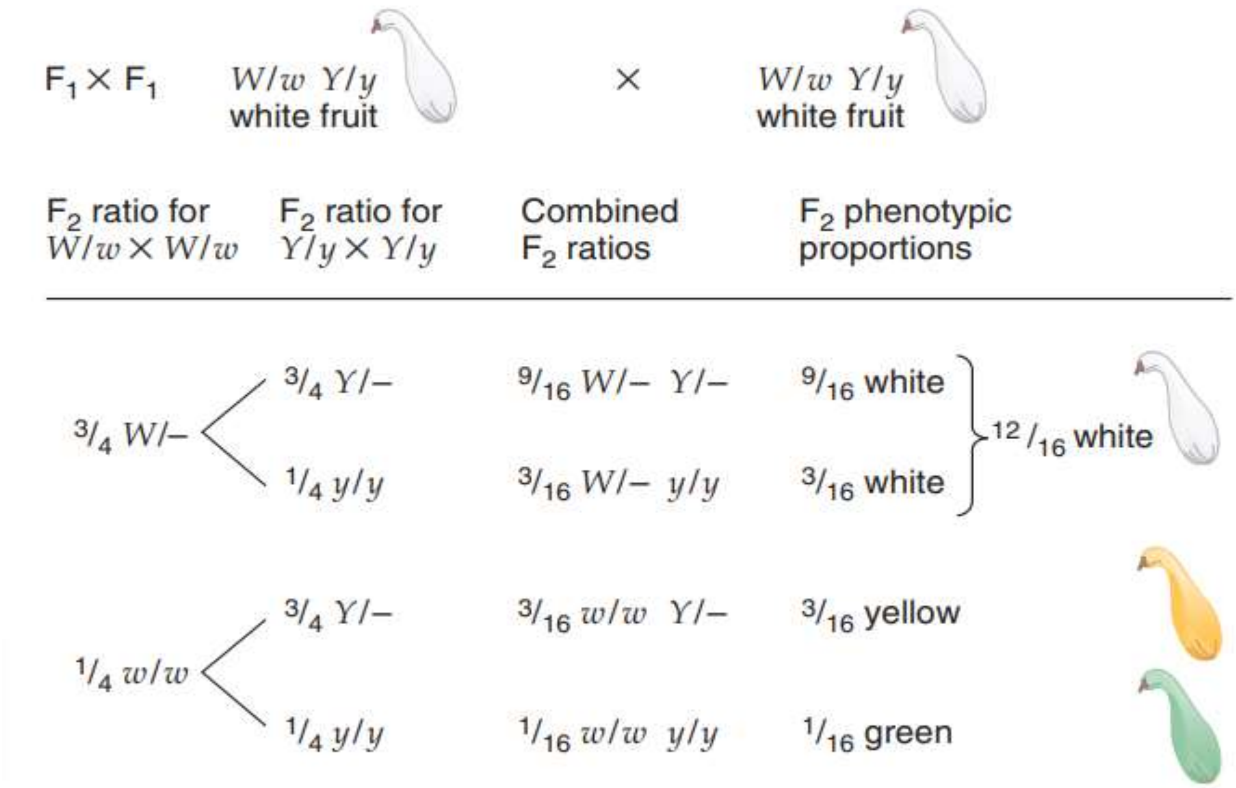
1. **Recessive Epistasis:** Recessive allele of one gene in homozygous condition hides or mask the expression of all alleles of other gene.

Example: Coat color in rodents. In the given example allele **cc** produce albino coat color and it is epistatic to A and Aa, and aa. In this epistasis the **F_2** phenotype of dihybrid cross changes from **9:3:3:1** to **9** Agouti: **3** Black: **4** Albino.



2. **Domnant Epistasis**

The dominant allele of one gene mask the expression of the alleles of another gene. **Example**: Fruit colour of summer Squash. In this example **W** allele is responsible for white colour of the fruit, **Y** allele express yellow fruit color in the absence allele **A**, and in the absence of dominant alleles of both genes, the fruit color will be green**.** In the given example the gene **W** is epistatic to **Y/_** and **yy** and hide the expression of **Y/_** and **yy** allele. In dominant epistasis the F_2 phenotypic ratio from 9:3:3:1 changes to **12** White: **3** Yellow: **1** Green.

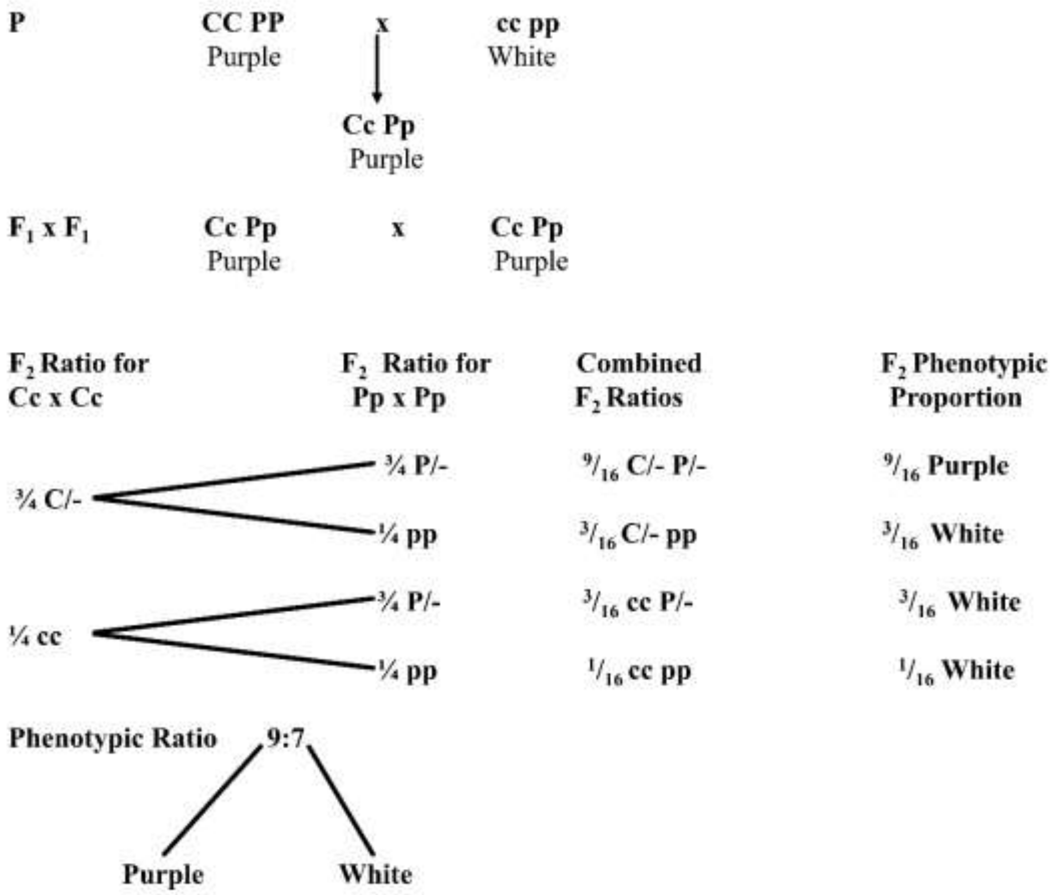


Epistasis Involving Duplicate Genes

In this type of gene interaction the genes two gene loci produce same phenotype.

1. **Duplicate Recessive Epistasis**

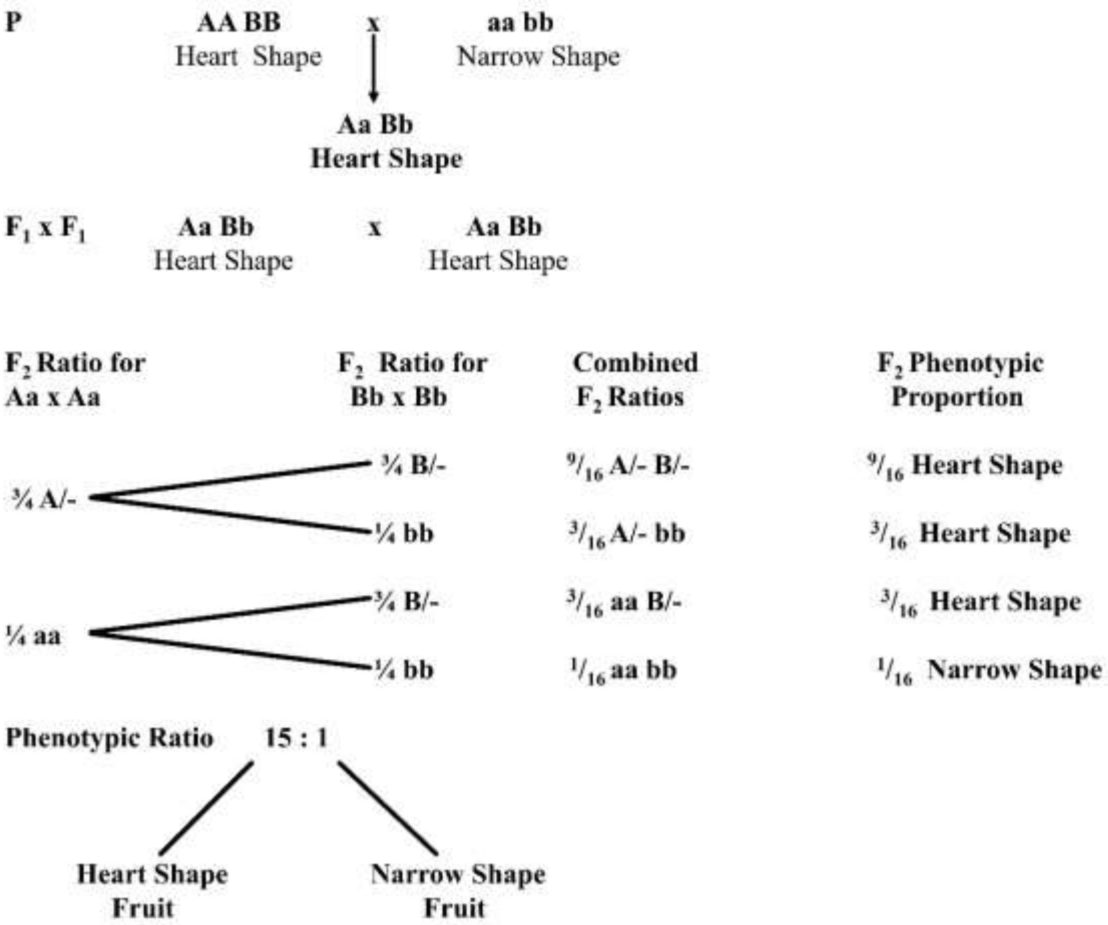
   In duplicate recessive epistasis (also called complementary gene action) recessive allele from both the loci can hide the expression of dominant allele from both the loci. **Example** flower colour in sweet peas where purple flower colour is dominant to white. Purple colour will produced in a condition when at least one dominant **C** allele and one dominant **P** allele is present in a given genotype. In the given example either **pp** or **cc** allele can hide the expression of both dominant allele i.e. **CC** or **PP**. because of the duplicate recessive epistasis the ratio from **9:3:3:1** changes to 9 purple : **7** white. In this example allele **pp** is epistatic to **C** and **c,** and **cc** is epistatic to **P** and **p**.



2. **Duplicate Dominant Epistasis**

In this type of epistasis, the only one dominant allele from both the loci can hide the expression of other alleles. **Example** Fruit shape in the shepherd's purse plant. The plant produces fruits with two different types of shapes. The heart shape is dominant phenotype and the narrow shape is recessive phenotype. The allele **A** and **B** are responsible for heart shape seed whereas allele **aa** and **bb** is responsible for narrow shaped seed. Either allele **A** or **B** can hide the expression of **aa** and **bb** alone**.**

When a true-breeding plant that produces heart-shaped **(AABB)** fruit is crossed with a narrow-shaped **(aabb)** fruit producing plant, all the **F_1** plants produce heart-shaped fruit. When the heart-shaped **F_1** plants are crossed, the **F_2** show a ratio of **15 heart-shaped fruit plants : 1 narrow fruit plant**. This is a modification of the **9:3:3:1** ratio, with the genotypes **A/– B/–, A/– b/b, and a/a B/–** all producing the phenotype—heart-shaped fruit—and the genotype **a/a b/b** producing the other phenotype of narrow fruit.



• **Collaborative genes** Two dominant genes produce a new phenotype. **Example** Comb shape in poultry. In the given example allele **R** can hide the expression of **pp** and produce **rose shaped comb**, and allele **P** can hide the epression of **rr** and produce **pea shape comb** phenotype, but **R** and **P** from two gene loci produce **walnut shape comb** together.	R_P_ Walnut Comb R_pp Rose Comb rr P_ Pea Comb rr pp Single comb Phenotypic Ratio 9:3:3:1