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FACULTY OF ENGINEERING &
TECHNOLOGY

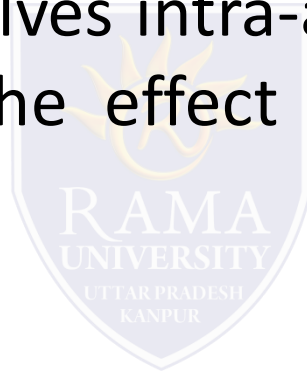
Introduction

- Epistasis is the phenomenon where the effect of one gene is dependent on the presence of one or more genes.
- Originally the term meant that the phenotypic effect of one gene is masked by a different gene.

In epistasis, the gene that does the masking is called an epistatic gene; the gene whose effect is masked is a hypostatic gene. Epistatic genes may be recessive or dominant in their effects.

Types of Epistasis

Dominance: It involves intra-allelic gene interaction. One allele hides the effect of other allele at the same gene pair



One gene hides the effect of other gene at different gene loci .

Dominant Epistasis

Dominant allele (eg., A) of one gene hides the effect of allele of another gene (eg., B) and expresses itself phenotypically.

- The B allele (hypostatic) will be expressed only when gene locus A contains two recessive (aa) alleles.
- Thus, the genotype AA BB or Aa Bb and AA bb or Aa bb produce the same phenotype
- genotype aa BB or aa Bb and aa bb produce two additional phenotypes.
- This type of dominant epistasis modifies the classical ratio of 9:3:3:1 into 12:3:1

Epistatic alleles	Hypostatic alleles	Phenotypic Expression
aa	bb	b
aa	BB, Bb	B
AA, Aa	Bb, Bb, bb	A

Example:

- Studied in summer squash (*Cucurbita pepo*)
 - Common fruit colors-white, yellow & green
 - White (W) is dominant over colored squash
 - Yellow (Y) is dominant over green squash
 - Pure breeding white fruited variety is crossed with the double recessive green variety, F₁ hybrids are all white
 - When the hybrids are selfed-white, yellow & green fruited plants arise in the ratio of 12:3:1

❖ The effect of dominant gene 'Y' is masked by the dominant gene 'W' (epistatic gene)

❖ P WWYY X wwyy
(white) ↓ (green)

❖ F1 WwYy
(white) (selfed)

❖ F2
White:Yellow:Green

❖ 12 : 3 : 1



♂/♀	WY	Wy	wY	wy
WY	WWY Y	WWY y	WwY Y	Ww Yy
Wy	WWY y	WWyy	WwYy	Wwy y
wY	WwY Y	WwYy	wwYY	wwY y
wy	WwYy	Wwyy	wwYy	wwy y

Recessive epistasis (Supplementary interaction)

- Recessive allele (aa) of one gene locus hides the effect of another gene locus (BB, Bb or bb) and expresses itself phenotypically.
- The alleles of B locus express themselves only when epistatic locus has dominant alleles (eg., AA or Aa).
- This will modify the ratio 9:3:3:1 to ratio 9:3:4

Epistatic alleles	Hypostatic alleles	Phenotypic Expression
aa	BB, Bb, bb	a
AA, Aa	BB, Bb	B
AA, Aa	bb	b

Example:

- In horses, brown coat color (*B*) is dominant over tan (*b*).
- However, how that gene is expressed in the phenotype is dependent on a second gene that controls the deposition of pigment in hair.
- The dominant gene (*C*) codes for the presence of pigment in hair, whereas the recessive gene (*c*) codes for the absence of pigment.

BbCc x **BbCc**



Sperm

BC **bC** **Bc** **bc**

Ova

BC	BBCC	BbCC	BBCc	BbCc
bC	BbCC	bbCC	BbCc	bbCc
Bc	BBCc	BbCc	BBcc	Bbcc
bc	BbCc	bbCc	Bbcc	bbcc



9



4



3





