Gene Interaction-II

Duplicate gene action (15:1) (Duplicate dominant epistasis)

When a dominant allele at either of two loci can mask the expression of recessive alleles at both the, it is called duplicate dominant epistasis. In rice, awn character is controlled by two dominant duplicate genes (A and B). Presence of any of both alleles can produce awn. The awnless condition develops only when both these genes are in homozygous recessive state, i,e. aabb. A cross between awned and awnless produced awned plants in F1. Selfing of F1 plants produced awned and awnless plants in 15:1 ratio in F2 generation. The allele A is epistatic to a/b alleles and all plants having allele A will develop into awn. The other dominant allele B is epistatic to alleles a/b. An individual with these allele also develop awn character.

Parents awned rice	x	awnless rice
AAbb	x	aaBB
	AaBb	
	Awned rice	

♀ \ ♂	AB	Ab	aB	ab
AB	AABB (A)	AABb (A)	AaBB (A)	AaBb (A)
Ab	AABb (A)	AAbb (A)	AaBb (A)	Aabb (A)
aB	AaBB (A)	AaBb (A)	aaBB (A)	aaBb (A)
ab	AABb (A)	AAbb (A)	AaBb (A)	Aabb (a)

Ratio = 15 awned : 1 awnless

Inhibitory gene action (13:3)

Here, a dominant allele at one locus can mask the expression of both (dominant and recessive) alleles at the second locus. This is also known as inhibitory gene interaction. For example, anthocyanin pigmentation in rice. The green colour of plants is governed by the gene I, which is dominant over purple colour. The purple colour is controlled by a dominant gene P. when a cross was made between green (IIpp) and (iiPP) colour plants, the F1 was green. Selfing of F1 individuals produced green and purple plants in 13:3 ratio in F2 generation.

Parents awned rice x awnless rice

AAbb x aaBB

AaBb

Awned rice

♀ \ ♂	IP	Ip	iP	ip
IP	IIPP (G)	IIPp (G)	IiPP (G)	IiPP (G)
Ip	IIPp (G)	IIpp (G)	IiPp (G)	Iipp (G)
iP	IiPP (G)	IiPp (G)	IiPP (P)	iiPp (P)
ip	IiPp (G)	Iipp (G)	iiPp (P)	Iipp (G)

Ratio = 13 Green : 3 Purple