A Retake on Statistical Genetics

Types of Varations:

1. Somatogenic Variations
   - Are not inheritable.
   - Result of 'Phenotypic Plasticity'
     - ie- and organism's capacity to acclamatize to its environment.

2. Blastogenic Variations
   - Inheritable.
   - Are of 2 types:
     - a. Continous:
       - Fluctuating.
       - Do not give rise to new species.
       - i. Meristic: Number of parts- Number of grains in an ear of wheat.
       - ii. Substantive: Size, shape and color ()
     - b. Discontinous
       - Also known as Mutations, Sports or Saltations.
       - Give rise to new species.
       - i. Meristic: Number of parts- Polydactyly.
       - ii. Substantive: Shape, color and size- Hairless cat, short legged sheep.

Some Allele Types:

1. Isoalleles
   - Alleles that produce similar phenotypes but can be distinguished by different optima.

2. Pseudoalleles
   - Two closely linked genes that can be identified by rare crossing over.
     - Eg- Star and asterix in traits in Drosophila.

Phenomenon	Example	Phen. Ratio	Comments
Complementary Genes	-Purple Flower Color in Sweet Pea (*Lathyrus odoratus*)	9:7 (9:3+3+1)	Genes expressed only when both of them are present in dominant phenotype. If even 1 of them is not present in dominant phenotype, the character is not expressed. Usually happens when 2 enzymes work together to produce a product. (A_bb=aaB_=aabb = Recessive)
Lethal Genes	-Yellow Body Allele in Mouse -Yellow Leaf in *Antirhinum majus*	2:1 (1-dead:2:1)	Gene lethal in homozygous dominant condition. Therefore 1 out of 4 dies. And the 2 other heterozygotes account for the dominant phenotype representation.
Duplicate Genes	-Capsules of Shephard's Purse. (*Capsella sp.*) Top Shaped Dominant.	15:1 (9+3+3:1)	2 unrelated genes, which may or may not be present on same chromosome, produce same phenotype. Therefore even if one gene is present in a dominant phenotype, the character is expressed. (A_B_= A_bb=aaB_ = Dominant)
Recessive Epistasis	-Body Color in Mice (Agouti color et al.)	9:3:4 (9:3:3+1)	Usually takes place when an enzyme needs another to produce a phenotype. E_A_=9: E_aa=3: ee__=4 E_C_ gives agouti mice. But when E is not present, C gene, even if present, cannot express its phenotype.
Dominant Epistasis	-Fruit Color in Summer Squash (*Cucurbita pepo*)	12:3:1 (9+3:3:1)	Epistatic gene 'E' masks expression of hypostatic 'A' when present in dominant phenotype. E___= 12: eeA_= 3 : eeaa= 1 Here, W___ gives white fruits, wwY_ gives yellow fruits, wwyy gives green fruits. Had wwyy given white fruits, effect would've been same as Inhibitory gene interaction.

Phenomenon	Example	Phen. Ratio	Comments
Inhibitory Genes	-Feather color in Fowl (White and Red)	13:3 (9+3+1:3)	Very similar to Dominant Epistasis. Dominant phenotype of one gene inhibits expression of other gene. Here, the 'I' gene for white feathers inhibits activity of 'C' gene. I___ = iicc = White iiC_ = Red Can be due to RNAi.
Polymeric Genes (Additive Genes)	-Fruit Shape in *Cucurbita pepo* (Kaddu) (9 Discoid: 6 Spherical: 1 Long)	9:6:1	When 2 genes are present in the dominant phenotype condition, they 'add' and produce a different phenotype. However, both produce same phenotype when only one of them is present in the dominant phenotype condition. Here, A_B_ produces discoid shape. aaB_ = A_bb produces spherical. aabb procudes cylindrical fruit. However, it is different from quantitative inheritance as, for instance, Aabb=AAbb.
Supplementary Genes		9:3:4	