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INTERACTION OF GENES

In production: The usual Mendelian monohybrid and dihybrid crosses were based on the assumption that each character is determined by a single gene pair. But it has been found later on that in some crosses the usual ratio (3:1 or 9:3:3:1) is not obtained and that a number of non-allelic genes may influence a single character. This is known as interaction of genes.

In case of usual Mendel's ratio two alleles of a single gene participated in such a way that one allele was ^{dominant} ~~dominant~~ and the other was recessive and this occurred between two alleles of a single gene. We can designate this condition as intra-allelic gene interaction. But there are cases where alleles of two different genes interact in various ways to produce a different kind of offspring. The factors or genes in such cases may be present on the same or different chromosomes. When these genes interact, the usual Mendelian ratio is changed and we call these interaction of genes as interallelic gene interactions. Some cases of interallelic gene interaction are given below.

① Interaction between dominant factors (complementary interaction)

Have two pairs of factors effect the same character by mutual nonepistatic interaction. A classical experiment was performed by Bateson and Punnett (1905-1908) in fowl. Tably the characters of comb and the interaction between dominant factors. There are 4 types of comb in fowl, rose, pea, single and walnut.

When the rose and pea are crossed the two dominant factors R and P come together. Rose and pea are dominant over single, R determines the rose comb and P determines the pea comb. Now F_1 hybrid having both the dominant factors produces the new type, walnut comb. When the walnut of F_1 are crossed the two genes (P and R) interact in different ways and produce the four types in the ratio walnut: ^{Rose} rose: pea: single = 9:3:3:1

$RRPP$ (rose) $\times$ $pprr$ (pea) — P_1 generation

$\downarrow$ $\downarrow$
 Rp pr — Gametes

$\swarrow \searrow$ — F_2 generation

$RrPp$
 (walnut)

$\swarrow \searrow \swarrow \searrow$
 RP rP Rp rp — Gametes of F_1

phenotypic ratio:-

walnut (9) rose (3) pea (3) single (1) = 9:3:3:1

$\delta \backslash q$	RP	rP	Rp	rp
RP	$RRPP$ (walnut)	$RrPP$ (walnut)	$RRPp$ (walnut)	$RrPp$ (walnut)
rP	$RrPP$ (walnut)	$rrPP$ (pea)	$RrPp$ (walnut)	$rrPp$ (pea)
Rp	$RRPp$ (walnut)	$RrPp$ (walnut)	$RRpp$ (rose)	$Rrpp$ (rose)
rp	$RrPp$ (walnut)	$rrPp$ (pea)	$Rrpp$ (rose)	$rrpp$ (single)