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Linkage

A few years after the rediscovery of Mendel's Law of inheritance, Bateson and Punnett (1905) observed in sweet pea that two pairs of alleles do not assort independently. Morgan (1910) found the same phenomenon in *Drosophila* and Hutchinson observed a clearest case of linkage in maize. All these ~~or~~ researchers found that genes inherit in groups rather than individually. This tendency of two or more genes to remain together in the same chromosome during inheritance is referred to as linkage.

Phase of Linkage

There are two phases of linkage, viz. Coupling phase and repulsion phase.

Coupling - The linkage between two or more either dominant (AB) or recessive (ab) alleles is referred to as coupling.

Repulsion - The linkage of dominant allele with that of the recessive allele (Ab or aB) is known as repulsion.

Types of Linkage

Linkage is generally classified on the basis of three criteria, viz, (1) presence or absence of crossing over, (2) genes involved, and (3) the chromosome involved. These are briefly described below:-

(1) Based on crossing over

(i) Complete Linkage :- Linkage in which crossing over does not occur is known as complete linkage or absolute linkage.

(ii) Incomplete Linkage :- If some frequency of crossing over also occurs between linked genes, it is known as incomplete linkage.

(2) Based on Genes Involved

(i) Coupling Linkage :- It refers to linkage either between dominant genes or between recessive genes. Such linkage has been reported in pea, maize and several other crops.

(ii) Repulsion Linkage - It refers to linkage of some dominant genes with some recessive genes. This type of linkage has also been observed in pea, maize and several other crops.

(3) Based on chromosome involved

(i) Autosomal Linkage - It refers to linkage of such genes which are located in other than sex chromosomes (autosomes).

(ii) X-chromosomal Linkage - It refers to the linkage of genes which are located in sex chromosomes.

Linkage Groups

Linkage group refers to a group of genes which are present in one chromosome.

In other words, all those genes which are located in one chromosome constitute one linkage group. The number of linkage groups is limited in each individual.

The maximum number of linkage groups is equal to the haploid chromosome number of an organism.