HERDY- WEINBERG LAW : EQUILIBRIUM

Topic ⇒ Hardy - Weinberg Law: equilibrium.

Hardy - weinberg law states that the relative frequencies of various kinds of gene alleles remain constant from generation to generation if Population is large, mating is at random and any kind of evolutionary force such as mutation, natural selection or migration is absent. This law is expressed by the algebraical equation:

$$p^2 + 2pq + q^2 = 1$$

Where, p = frequency of dominant allele.
q = frequency of recessive allele.
pq = frequency of the heterozygote.

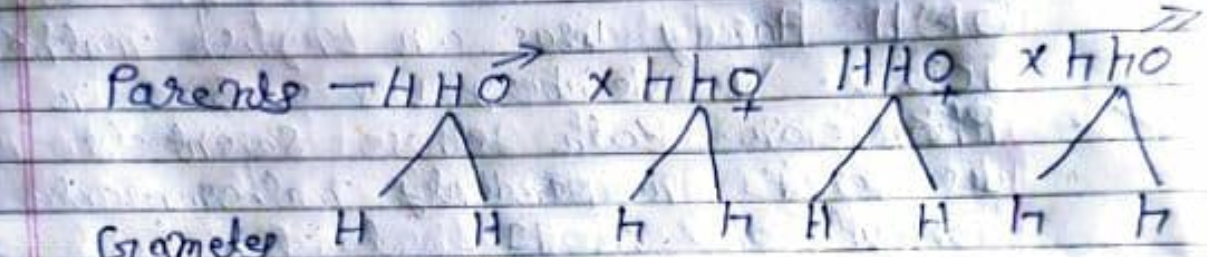
It is also called Hardy-Weinberg equilibrium because the gene frequencies in a population are maintained in a certain equilibrium. Due to this genetic changes are stopped. It results in non-occurrence of evolution. Hence when a population follows the Hardy-Weinberg equilibrium, the

rate of evalution is zero. So evalution occurs only when the Hardy-Weinberg equilibrium is disturbed.

This law can be explained by citing example of a hypothetical large population which contains equal number of individuals with black (HH) and grey (hh) hairs which interbreed at random. Possibility of types of matings among them is of following three types.

(i) HH X HH
(ii) hh x hh
(iii) HH X hh

If they are 50% males and 50% females. Then F individuals are produced in the ratio of 1:2:1



Frequency of each H or h gene = 50% = 0.5

On representing their matings in checker board we find following result:

male gamete / Female gamete	0.5 H	0.5 h
0.5 H	0.25 HH	0.25 Hh
0.5 h	0.25 Hh	0.25 hh

If H is represented by P and h by q. then HH = P×P = P^2 = 0.25

hh = q×q = q^2 = 0.25

Hh = P×q = Pq = 0.25

Hh + Hh = 2Pq = 0.5

Hence $P^2 + 2Pq + q^2 = 0.25 + 0.5 + 0.25 = 1$

* Importance of Hardy-Weinberg law:

(i) It emphasizes that in the absence of an evolutionary force all the genotypes in a population reproduce equally successful.

(ii) In the absence of all evolutionary forces, the mating is a completely at random phenomenon in a population.

(iii) It relates simply to statistics of a large Mendelian population.

(iv) It provides basis for calculation if the recessive homozygous is harmful.

(v) It provides basis to examine the trends of gene frequencies in large populations.

(vi) It acts as a guide to indicate whether evolution is occurring or not.

(vii) It concludes that the rate of change of gene frequencies is a function of the speed of evolution.

(viii) The equilibrium maintains heterozygotes in the population.

(ix) It tends to conserve pairs of characters once they have been made in the past.