

Topic : Hardy-Weinberg Law of Equilibrium
By Dr. V. Kumar
R.N. College, Hajipur

- The mathematical treatment of distribution of gene and genotype frequencies in the population was developed in 1929-30 mainly by R.A. Fisher and J.B.S. Haldane in England and Sewall Wright in United States.

- But the most fundamental idea of population genetics was offered by Englishman G.S. Hardy and German W. Weinberg simultaneously in 1908. It is known as Hardy-Weinberg Law of Equilibrium.

- This Law is foundation of population genetics of modern evolutionary history.

⇒ * Hardy Weinberg Law is defined as-

" The relative frequencies of various kinds of alleles in a large and randomly mating sexual panmictic population tend to remain constant from generation to generation in the absence of mutation-selection and gene flow.

* Implications :

- Hardy weinberg law describes a theoretical situation in which a population is undergoing no evolutionary change. It explains that if the evolutionary forces are absent, the population is large, its individuals have random mating, each parent produces roughly equal number of gametes and gametes produced by mates combine at random and the gene frequency remain constant due to evolutionary forces, then the genetic equilibrium of the allele in question is maintained and variability present in the population is preserved.

- The mathematical results of two allele A and a could be explained by theory of probability.

- In a population of large size

a) Probability of formation of AA individuals = $P \times P = p^2$

b) Probability of formation of a aa individual = $q \times q = q^2$

Page VI ①

c) Probability of formation of Aa individual = $2 \times P \times q = 2Pq$

- In the next generation the probability of frequency AA, aa and Aa individual will again be P^2 , q^2 and $2Pq$.

- The relationship between gene frequency and genotype frequency can be expressed as-

a) If gene frequencies of two allele 'a' gene are P and q, then $P + q = 1$

b) the genotype frequencies in the population will be

$$P^2 + 2Pq + q^2 = 1$$

$$(P + q)^2 = 1$$

- ~~relationship~~ This equation is called Hardy-Weinberg formula or Binomial expression.

- From this Binomial expression it is clear that in a large and randomly mating population not only gene frequencies but also the genotype frequencies will remain constant or tend to remain constant.

⊗ Significance of Hardy weinberg Law -

- The Hardy weinberg law is important because it describes situation in which there is genetic equilibrium and no evolution.

1. It provides a theoretical baseline for measuring evolutionary changes.
2. The equilibrium tend to conserve gains which have been made in the past and also to avoid too rapid changes.
3. Equilibrium maintains Heterozygosity in the population.
4. Equilibrium prevents evolutionary (changes) progress.