HARDY-WEINBERG THEOREM

This is a mathematical expression, which shows that the allelic frequencies and the resulting genotype-frequencies in a population remains essentially unchanged or conserved from one generation to the next, under certain conditions (hardy-weinberg limitations), that include:

a.Population is panmictic (Randomly mating) and infinitely large.

b.No selection is operative in the population. Like, no differential reproduction (i.e; each genotype is equally efficient in progeny productions); no differential mortality (i.e; each genotype is equally viable with the others); no preference of mating.

c.Population must be closed (*no immigration of individuals from another population, nor emigration from the population under consideration is allowed*).

d.No mutation from one allele state to the other (mutation, however may be allowed if forward and backward mutations are equivalent.)

e.Meiosis is normal; so that chance is the only factor operate in gametogenesis.

Comment— This theorem is hardly applicable in natural populations, because various natural forces like mutations, selection etc are always playing there over on the population, which is not closed also.

ALGEBRIC EXPRESSION:

Following Hardy-Weinberg principle, the relationship between gene-frequencies and genotype frequencies in a panmictic population can be expressed in algebraic terms, considering one gene locus no more than one loci at a time.

A.For a single autosomal locus with two allele:

Suppose 'A' and 'a' are the two alleles of a locus. Let 'p' be the frequency of 'A' gene and 'q' be the frequency of it's allele 'a'. Then p + q = 1 [*as there only two allele*].

With these allele frequencies of p and q, the resulting genotype frequencies become equivalent to the zygotic frequencies produced by all the possible unions of gametes (as gametic frequencies equivalent to allelic- frequencies) between two-sexes of the population under consideration; as presented in the following checker board:

♀ \ ♂	(A)	(a)
(A)	(AA)	(Aa)
(a)	(Aa)	(aa)

Therefore, the resulting genotype frequencies are-

Genotype	**Frequencies**	
AA—	p^2	
Aa—	$pq + pq = 2pq$	
aa—	q^2	Total= $p^2 + 2pq + q^2$