

Mutation Pressure :-

Mutation pressure is the change in allele frequencies due to the repeated occurrence of the same mutations. There are not many biologically realistic situations where mutation pressure is the most important evolutionary process while random drift will usually be more important. However, sometimes the mutation rate is high enough that mutation pressure need to be considered in addition it provides a simple illustration of a population genetic equilibrium.

Mutation pressure is a factor that tends to decrease the average fitness of populations because of the continuous appearance of injurious hereditary changes. The mutation pressure contributes to the general genetic load of deleterious genes in a population. Besides being influenced by the mutation pressure, the fitness of populations is affected by immigration from neighbouring populations of individuals with genotypes less suited to the new conditions than the indigenous inhabitants, dissimilar fitness of homozygotes and heterozygotes and the other factors.

Mutation Pressure Theory:

A quantitative theory of directional mutation pressure proposed in 1962 explained the wide variation of DNA base composition observed among different bacteria and its small heterogeneity within individual bacterial species. The theory

was based on the assumption that the effect of mutation on a genome is not random but has a directionality toward higher or lower guanine plus cytosine content of DNA and this pressure generates directional changes more in neutral parts of the genome than in functionally significant parts. Now that DNA sequence data are available, the theory allows the estimation of the extent of neutrality of directional mutation pressure against selection. Analysis of DNA sequence revealed that practically organisms are subjected to directional mutation pressure. The theory also offers plausible explanation for the large heterogeneity in guanine plus cytosine content among different parts of vertebrate genome.

For example,

Let us suppose a population in which all individuals have the same allele (black) but there is a high rate of mutation to second allele (blue). At each generation, some black alleles will mutate and will become blue alleles. The frequency of the blue alleles will therefore increase over time.

The process under which allele frequencies change solely due to the same mutations occurring over and over is known as mutation pressure. For most kinds of genetic variation in most populations, random drift is more important than mutation pressure, the changes in allele frequency from one generation to the next due to random drift will be much larger than the changes due to mutation pressure.