



MECHANISM OF EVOLUTION

Population selection and change

OVERVIEW OF THIS SECTION

1. Population, genepool, specie.
2. Hardy-Weinberg theorem
3. Mutation
4. Source of variation in gene pool
5. Gene flow
6. Source of gene flow
7. Gene drift
8. Balanced polymorphism
9. Species and Speciation

POPULATION, GENE POOL AND SPECIE

- **Population:** *In a specie, a community of individuals where mates are usually found.*
- **Gene pool:** *All the alleles in a population.*
- **Specie:** *A population of organism whose members can interbreed under natural circumstances reproduce fertile offsprings.*
 - . *The species is a basic unit of all breeding populations.*



HARDY- WEINBERG THEOREM

“The frequencies of alleles and genotypes in a population’s gene pool remain constant over the generations unless acted upon by agents other than sexual recombination.”



HISTORY

- This theorem was represented by two scientists Hardy and Weinberg in 1908.
- The shuffling of alleles due to meiosis and random fertilization has no effect on overall genetic structure of population.

HARDY WEINBERG EQUATION

- $p^2 + 2pq + q^2 = 1$
- This equation is infact binomial expansion.
- i.e;
• $(p+q)^2 = p^2 + 2pq + q^2$
- This equation is used for calculating the frequencies of alleles and genotypes in population at equilibrium.
- In a population where only two alleles occur for a gene
 p for one allele and q for other.



MUTATION

- Change in the structure of a gene or chromosome.
- Mutation is the origin of all new gene.
- Mutation is the source of variation.
- These variation allow a group to survive in future environmental strokes.
- Mutation may be neutral or harmful or deleterious in one environment.

SOURCE OF VARIATION IN GENE POOL

- **Mutation:** change in DNA structure.
- **Segregation:** separation of the DNA strands in sex cells at meiosis.
- **Independent assortment:** It occurs when genes on different chromosomes segregate to gametes independently of one another.
- **Recombination:** The exchange of genetic material between pairs of chromosomes during the first stage of meiosis.

GENE FLOW

- Change in gene frequency due to migration of individuals called gene flow.
- Immigration and emigration causes change in gene frequency .
- Natural population not have significant gene flow.
- Low gene flow increase the chance that two population will evolve different species.

SOURCE OF GENE FLOW

- Migration of new population into existing ones.
- Interbreeding without migration.
- Removal of natural barriers between populations.
- Removal of reproductive barriers.



GENE DRIFT

- It is a change in frequency of allele at the locus that occur by chance.
- In small population such fluctuations may lead to the loss of a particular allele.
- It reduce genetic variation.
- It is more significant in a small population.



BALANCED POLYMORPHISM

“When a gene and their alleles are balanced or approximate an equilibrium state ,e.g., due to interplay of mutation and selection.”



EXAMPLE:

- Sickle cell anemia is an example of balanced polymorphism.
- A change in the structure of the hemoglobin causes sickle cell anemia.
- The quantities of normal and sickle cells are roughly equal in heterozygous state.

SPECIES AND SPECIATION

SPECIES:

- Species is a group of population in which genes are actually or potentially exchanges through interbreeding.
- SPECIES is the basic unit of classification and taxonomic rank of an organism as well as a unit of biodiversity.
- Specie may be endangered , invasive or speciation etc.

SPECIATION:

“The formation of a new species called speciation.”

- Speciation are of following types
 1. *Allopatric speciation.*
 2. *Parapatric speciation.*
 3. *Sympatric speciation.*