Prof ANIL KUMAR Zoology
B.Sc HONS Part-III Paper-VII
Topic:- Write short Notes on:
(A) Genetic Population or Mendelian Population
(B) Genetic drift
(C) Gene Pool
(D) Gene Frequency
(E) Genotype Frequency
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Q. 9. Write short notes on the following :

(A) Genetic population or Mendelian Population

(B) Genetic drift

(C) Gene Pool

(D) Gene Frequency

(E) Genotype Frequency

Ans. (A) Genetic population or Mendelian population–In a broad sense a population may be defined as an sum of total living being that presents a closely interacting system. Provided there is no influence that would differentially affect gene frequencies, a population may have any proportion between members of a pair of alleles. The races of mankind are natural populations and human marriages are nonselective for most genetic characteristics. To study a natural population, a past or sample is taken at random.

Population genetics involves application of Mendelian principles to populations, especially as to gene frequencies and the proportions of genotypes under various mating system. Consider the case of a pair of autosomal alleles, D (dominant) and d (recessive) of equal occurrence. Matings between homozygous parents results as follows :

Parent genotype	DD	dd
gametes	D	d
F_1 genotypes	Dd	Dd
gametes	D d	Dd
F_2 genotypes	DD + Dd + dD + dd or 1/4 DD + 1/2 Dd + 1/4 Dd	

Thereafter random mating between the three genotypes of such a population will maintain them in the same proportions is succeeding generations.

Result of Random Matings

Parents	**Offspring**		
	DD	**Dd**	**dd**
$\frac{1}{4}$DD	1/16		
$\frac{1}{4}$DD × $\frac{1}{2}$Dd	1/16	1/16	
$\frac{1}{4}$dd		1/16	

	DD	Dd	dd
$\frac{1}{4}$DD	1/16	1/16	
$\frac{1}{2}$Dd × $\frac{1}{2}$Dd	1/16	1/8	1/16
$\frac{1}{4}$dd		1/16	1/16
$\frac{1}{4}$dd	1/16		
$\frac{1}{4}$dd × $\frac{1}{2}$Dd		1/16	1/16
$\frac{1}{4}$dd			1/16

Ratio of offspring $\frac{1}{4}$DD + $\frac{1}{2}$Dd + $\frac{1}{4}$dd

(B) Genetic drift In the study of population genetics the finding of Mendelian heredity are applied to population phenomena under the Hardy Weinberg law. This applies to large and freely interbreeding populations where there is genetic equilibrium and variability usually remains constant. Under such conditions evolution does not occur. It is the deviations from this norm, the mutations, selective mating and survival of desirable traits that result in change. Changes are more rapid in small isolated populations such as occur in times of stress or when a few individuals reach a new habital or remote island. Under these conditions variability is reduced rapidly or abruptly and the genotype tends to become homozygous, Purely by chance such populations come to differ from the original populations in slight way distinct stocks or races. This process is known as Genetic drift.

(C) Gene Pool Gene pool is sum total of genes of all the individuals of a Mendelian population. A mendelian population is any array of gene which is incorporated in individuals temporarily. They combine and recombine and recombine by the process of sexual reproduction. A population with completely described gene pool tells us about the kind of genes and whose kind is distributed among the individuals of the population.

Suppose, if we want to know the genetic information about the smoothness and wrinkling of the pea seeds in the gene pool of a pea population, it is possible to know exactly the proportions of the smooth alleles and the wrinkled alleles and how these alleles are distributed among the individuals i.e. the proportion of homzygous smooth, heterozygous smooth the homozygous wrinkled pea plants. Suppose if these are present in equal proportions i.e. half

the genes are for smoothness and half for wrinkled characteristic and these genes are represented by W and w, the gene pool in the state of equilibrium will contain 1/4 ww. 1/2 WW, 1/4 Ww and this will be a mintained as long as random mating occurs.

(D) Gene Frequency-It refers to the proportion of an allele in the gene pool as compared with other alleles at the same locus, with no regards in their distribution in organisms.

The gene frequency can be calculated by dividing the number of a particular gene in question with the total number of genes present on that locus in the population.

If frequency of gene A is represented by P and that of gene a by q and at gene equilibrium condition their total frequency is represented by 1,

then at equilibrium

$$P+q = 1$$

Or, $p = 1-q$

Or, $q = 1-p$

(E) Genotype Frequency-If is the total number of a kind of individuals form a population all of which exhibits similar character with respect to the locus under consideration.

Suppose in a population there are two alleles at one gene locus (A and a) and they are related as dominant and recessive. Naturally, three kinds of in dividuals homozygous dominant, heterozygous and homozygous recessive will occur in the population.

If N = Total number of individuals in the population.

D = Number of homozygous dominants

H = Number of heterozygous.

R = Number of homozygous recessives

The genotype frequency of AA individuals =D/N

genotype frequency of Aa individuals = H/N

genotype frequency of a individual = R/N

It means genotype frequency for a particular type of gene combination on the same locus can be determined by dividing the number of individuals with the genotype by the total number of individuals in the population.