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ZO 354: Genetics

Semester V

By

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Introduction of genetics

1.1 classical modern concept of gene, cistron, muton, recon

Gene : It is a particular segment of DNA which is responsible for the inheritance and expression of that character.

a) **Cistron**: - It is the segment of DNA that contains all the information necessary for the production of a single polypeptide and includes both the coding sequences and regulatory sequences that are transcription start and stop signals. The alleles exhibit the cis-trans phenomenon.

b) **Muton:** - This term was coined by Benzer. It describes the smallest mutable site within a cistron. It is the smallest part of a gene that can be involved in a mutation event. It is mostly to be a single nucleotide pair. Sometimes a muton can be a normal nucleotide or it might be a radioactive element and sometimes muton might consist of 3 to 4 nucleotides.

c**) Recon**: - Recon is a unit of recombination. This term was coined by Seymour Benzer for the smallest recombinant unit. Recon is a part or segment of the present cistron sequence. It is a region of a gene in which there can be no crossing-over, now known to be a single nucleotide pair.

Mendel's Laws of Inheritance: Mendel proposed three basic postulates on the basis of which three laws were formulated. These are described below:

1. Law of Dominance :

In monohybrid and dihybrid crosses, the phenotypic characters are controlled by discrete units, called factors. In a dissimilar pair of factors, one member of the pair dominates (i.e. dominant) over the other (i.e. recessive). The law of dominance is used to explain the expression of only one of the parental characters of a monohybrid cross in F_1 and the expression of both in F_2.

Statement of Law of Dominance : "When two homozygous individuals with one or more sets of contrasting characters are crossed, the alleles (characters) that appear in F_1 are **dominant** and those which do not appear in F_1 are **recessive**".

2. Law of segregation (Law of purity of gametes) :

This law is based on the fact that the alleles do not show any blending/ mixing and both the alleles (characters) are recovered as such in the F_2 generation, though one of these is not seen at the F_1 stage. During formation of gametes, these two alleles (factors) obviously separate or segregate, otherwise recessive type will not appear in F_2.

The gametes which are formed are always pure for a particular character (trait). A gamete may carry either dominant or recessive factor but not both. That's why it is also called as law of purity of gametes.

Statement of Law of Segregation : The law states that "When hybrid (F_1) forms gametes, the alleles segregate from each other and enter in different gametes". The gametes formed are pure in that they carry only one allele each (either dominant allele or recessive allele). Hence, this law is also described as "**Law of purity of gametes**".

3. Law of Independent Assortment :

This law is based on dihybrid cross. It is basic principle of genetics developed by a Mendel. It describes how different genes or alleles present on separate chromosomes independently separate from each other, during formation of gametes. These alleles are then randomly united in fertilization. In dihybrid cross, F_2 phenotypic ratio 9:3:3:1 indicates that the two pairs of characters behave independent of each other. It can be concluded that the two characters under consideration are assorted independently giving rise to different combinations.

Statement of Law of Independent Assortment: The law states that "When hybrid possessing two (or more) pairs of contrasting factors (alleles) forms gametes, the factors in each pair segregate independently of the other pair".