

B.Sc (Agriculture) - I Sem.
Sub - Elements of Genetics
Sub. Code- BSCAG-113

D+1

Introduction of Genetics:

What Genetics?

The genetics is the science of inheritance and variance, the inheritance means transmission of genes governing various characters from parents to parents.

Any part of plant, which is used for commercial production it called seed. But which used for consumption purpose, it does not seed it called grain.

Genetics is a branch of biology concerned with the study of genes, **genetic** variation, and heredity in organisms.

History of Genetics

- 1856–1863: Mendel studied the inheritance of **traits** between generations based on experiments involving garden pea plants. He deduced that there is a certain tangible essence that is passed on between generations from both parents. Mendel established the basic **principles of inheritance**, namely, the **principles of dominance**, **independent assortment**, and **segregation**.
- 1866: Austrian Augustinian monk **Gregor Mendel**'s paper, *Experiments on Plant Hybridization*, published.
- 1869: **Friedrich Miescher** discovers a weak acid in the nuclei of **white blood cells** that today we call **DNA**. In 1871 he isolated cell nuclei, separated the nucleic cells from bandages and then treated them with **pepsin** (an enzyme which breaks down proteins). From this, he recovered an acidic substance which he called "**nuclein**".
- 1880–1890: **Walther Flemming**, **Eduard Strasburger**, and **Edouard Van Beneden** elucidate chromosome distribution during **cell division**.
- 1889: **Richard Altmann** purified protein free **DNA**. However, the **nucleic acid** was not as pure as he had assumed. It was determined later to contain a large amount of protein.

- 1889: [Hugo de Vries](#) postulates that "inheritance of specific traits in organisms comes in particles", naming such particles "(pan) genes".
- 1902: [Archibald Garrod](#) discovered inborn errors of metabolism. An explanation for epistasis is an important manifestation of Garrod's research, albeit indirectly. When Garrod studied alkaptonuria, a disorder that makes urine quickly turn black due to the presence of gentisate, he noticed that it was prevalent among populations whose parents were closely related.
- 1903: [Walter Sutton](#) and [Theodor Boveri](#) independently hypothesizes that chromosomes, which segregate in a Mendelian fashion, are hereditary units, see the [chromosome theory](#). Boveri was studying [sea urchins](#) when he found that all the chromosomes in the sea urchins had to be present for proper [embryonic development](#) to take place. Sutton's work with grasshoppers showed that chromosomes occur in matched pairs of maternal and paternal chromosomes which separate during meiosis. He concluded that this could be "the physical basis of the Mendelian law of heredity."
- 1905: [William Bateson](#) coins the term "genetics" in a letter to [Adam Sedgwick](#)^[34] and at a meeting in 1906.
- 1908: [G.H. Hardy](#) and [Wilhelm Weinberg](#) proposed the [Hardy–Weinberg equilibrium model](#) which describes the frequencies of alleles in the gene pool of a population, which are under certain specific conditions, as constant and at a state of equilibrium from generation to generation unless specific disturbing influences are introduced.
- 1910: [Thomas Hunt Morgan](#) shows that genes reside on chromosomes while determining the nature of sex-linked traits by studying [Drosophila melanogaster](#). He determined that the white-eyed mutant was sex-linked based on Mendelian's principles of segregation and independent assortment.
- 1911: [Alfred Sturtevant](#), one of Morgan's collaborators, invented the procedure of linkage mapping which is based on the frequency of crossing-over.
- 1913: Alfred Sturtevant makes the first [genetic map](#), showing that chromosomes contain linearly arranged genes.
- 1918: [Ronald Fisher](#) publishes "The Correlation Between Relatives on the Supposition of Mendelian Inheritance" the modern synthesis of genetics and evolutionary biology starts. See [population genetics](#).

Before Mendelism Era:

J.B. Lamarck(1744-1829) – He believed that the characters which are acquired during the life time of an individual are inherited. This concept is known as Lamarkism or theory of inheritance of acquired characters.

Charls Darwin (1809-1882)- He suggested physiological basis of heredity and explain every part of body produces very small indivisible bodies called “gem mules” or pungen.

A. Weisman (1834-1914) – proposed “Germplasm” theory of account for heredity. According to this theory the body of an individual can be divided into types of tissues germplasm and somatoplasm.

Later Development of Mendelism:

In 1903, Johanssen were first used the term of gene, genotype and phenotype. Batson and Punnet observed linkage between two traits in pea, but they could not provide the correct explanation for the phenomenon of linkage, but give the term coupling phase and repulsion phase .

Yule (1906)- He proposed the multiple factors hypothesis, in order to explain the inheritance of quantities characters. According this hypothesis several genes govern the development of a single quantitative characters.

Book References:

1. Plant Biotechnology and genetics (2018), C. Neal Stewart Jr.
2. Principles of plant breeding and Genetics (2000) , B.D Singh and B.K Prasad
3. Genetics(2016), Omkar Singh, R.K PG, College of Shamali (U.P)