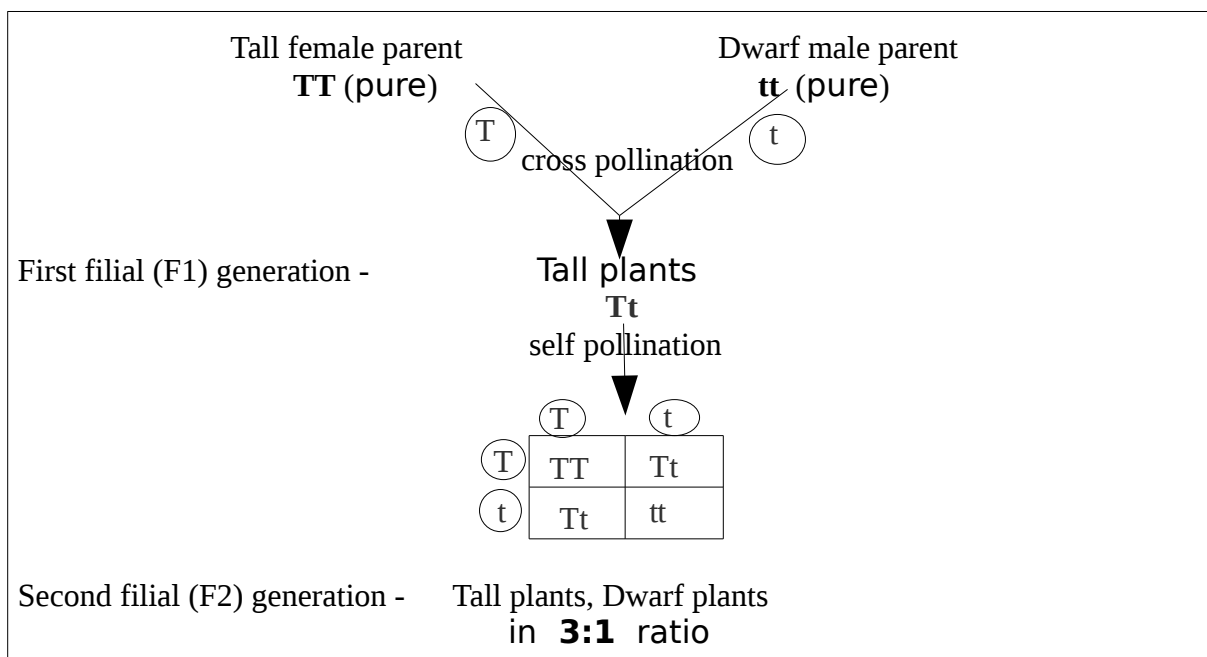


7. HOW WE BECAME WHAT WE ARE

MAJOR IDEAS

- There are similarities and variations among parents and their offsprings. Transmission of characters from parents to offsprings are through genes.
 - Gregor Johann Mendel formulated the laws of inheritance through conducting experiments in pea plants. Others who contributed much in the emergence and development of Genetics include deVries, Tschermak, Correns, Sutton, Boveri, Bateson, Johannsen, Avery, Watson, Crick, Nirenberg and Khorana.
 - The hereditary factors are located in the DNA molecules of chromosomes inside the nucleus.
 - DNA and RNA are the two types of nucleic acids. They are made up of nucleotides having 4 types of nitrogen bases, sugar and phosphate.
 - Variations occur due to the crossig over during meiosis (for gametes formation) or due to the mutation in chromosomes.
 - Out of the 44 chromosomes, sex chromosomes in male will be XY and that in females XX. Sex chromosomes in males play a major role in sex determination.
 - Genetic engineering caused tremendous changes in different fields like agriculture, medicine, disputes and environmental protection. We should use this technology for the benefit of mankind.
1. Gregor Johann Mendel is known as 'Father of Hereditary Science [Genetics]'. Why ?
From his experiments in pea plants, Mendel(1822-1884) formulated the laws of inheritance, which later grew in to the emergence of the branch of science, Genetics.
 2. Scientists, who reformulated Mendel's Laws of Inheritance ?
Hugo de Vries, Erich Tschermak and Carl Correns (1900)
 3. Gregor Mendel's experiments in pea plants

Experiments considering 1 pair of contrasting characters (Tallness-Dwarfness)



From this experiment, Mendel formulated the following laws,

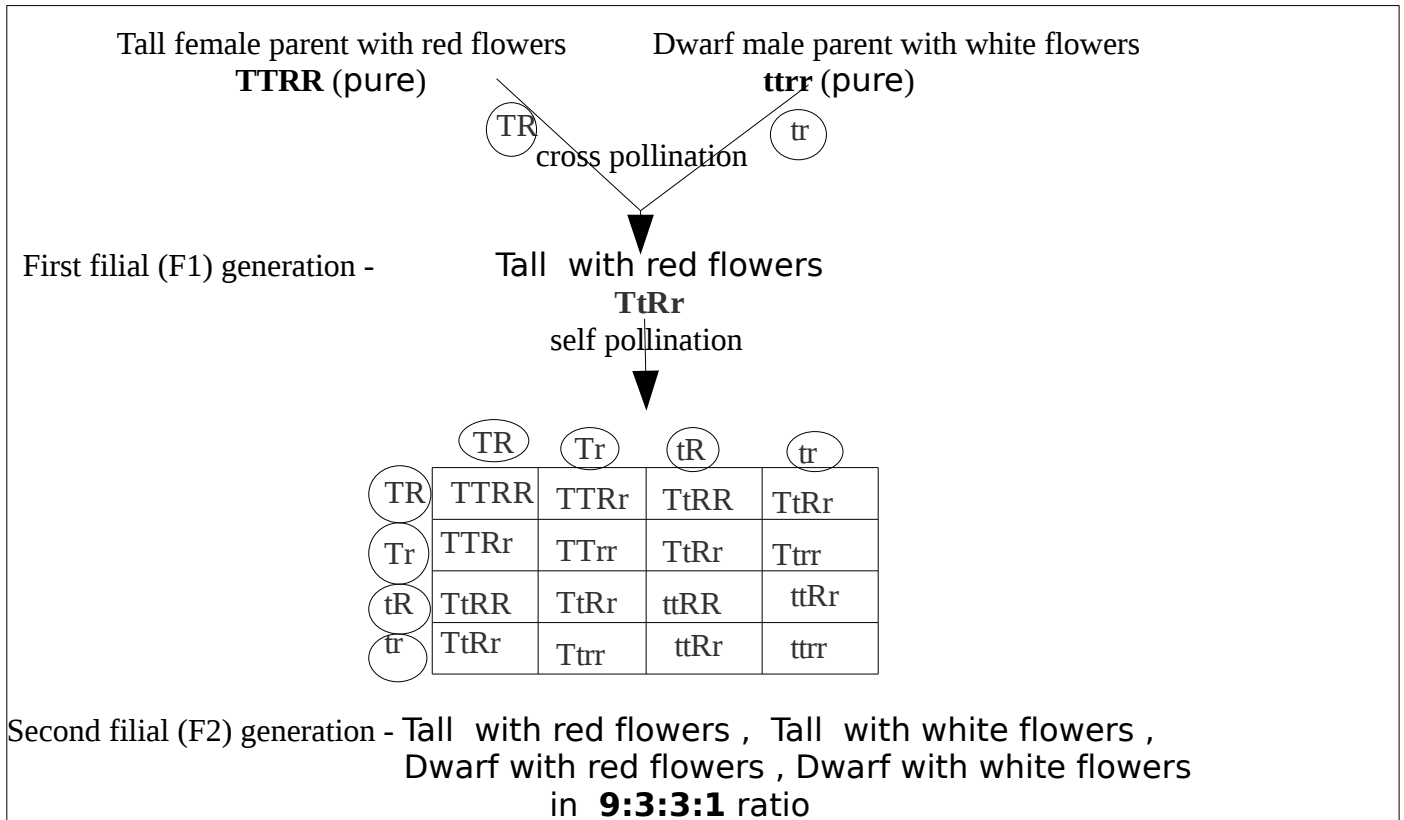
A – **Law of Dominance**

When a pair of contrasting characters combines, only one character is expressed, while the other remains hidden. (The expressed is called as dominant character and the hidden as recessive character)

B – **Law of Segregation**

During gametogenesis, the pair of hereditary factors segregate from each other and only one factor enters each gamete.

Experiments considering 2 pairs of contrasting characters (Tallness-Dwarfness , Red flower-White flower)



From this experiment, Mendel formulated the following law,

C- Law of Independent Assortment

When two or more pairs of contrasting characters combine, factors of each pair segregate and pass independently to the next generation.

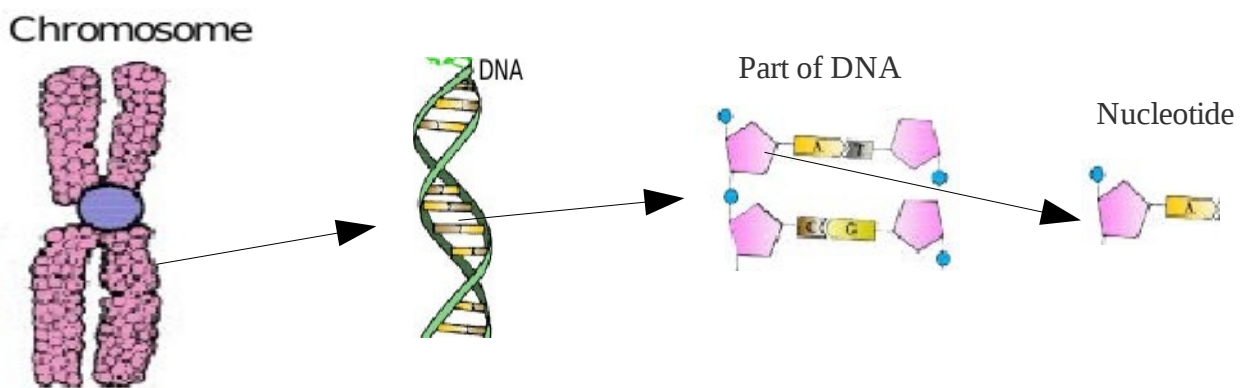
- The contrasting characters that Mendel analysed in details through his experiments ?
Stem height (tall-dwarf), flower colour (red-white), seed colour (yellow-green), seed shape (round-wrinkled) etc. (7 pairs)
- During his experiments, Mendel collect pollengrains from dwarf plant and cross pollinated with tall female so as to get first generation with only tall plants. What happen when we collect pollengrains from tall plant and cross pollinated with dwarf male ?
We will get the first generation with only tall plants. [because, tallness is dominant in pea plants]
- According to Mendel, Which among the following are pure plants ?
TTRR, TtRr, TTRr, Ttrr, Ttrr, ttrr, ttRR, ttRr
(Only TTRR and ttrr)
- The scientist who coined the term '**gene**' to the hereditary factors explained by Mendel ?
Johannsen (1909)
- Who gave the term '**Genetics**' to the branch of science which deals with the study of heredity and variations ?
Bateson (1905)
- Who discovered that the hereditary factors are located in the chromosomes ?
Walter S. Sutton and Theodor Boveri (1902)
- The leader of scientists, who identified DNA as the genetic material ?
O. Avery (1943)

11. Different types of nucleic acids ? Table showing their comparison.

DNA – deoxyribonucleic acid	RNA – ribonucleic acid
<ul style="list-style-type: none"> - Double stranded molecule - Spiral helix structure - Deoxyribose sugar. - Adenine, Thymine, Guanine, Cytosine are nitrogen bases -Control all cellular activities and heredity 	<ul style="list-style-type: none"> - Single stranded molecule - Elongated - Ribose sugar - Adenine, Uracil, Guanine, Cytosine are nitrogen bases - Protein synthesis according the information of DNA

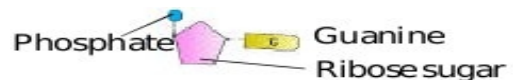
12. Who proposed the spiral helix model of DNA molecule ?
James Watson and Francis Crick (1953)

13. **Structure of DNA**



14. Define nucleotide.
A nucleotide is made up of a single nitrogen base , sugar and phosphate.

15. Recognize DNA nucleotide and RNA nucleotide from the following.



16. Base pairing of nitrogen bases in DNA

Adenine – Thymine
Guanine – Cytosine

Nitrgen bases in RNA

Adenine , Uracil,
Guanine ,Cytosine

17. Protein synthesis by the DNA

- DNA unwinds to form a particular RNA
- RNA goes out through the nuclear membrane
- RNA reaches ribosomes to link amino acids
- Protein is synthesized in ribosomes.

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18. What is a gene ?

Gene is a specific part of the DNA responsible for regulating metabolism and effecting hereditary characters.

19. Discoverors of the Genetic Code ?

Marshall Nirenberg and Har Gobind Khorana (1970)

20. Human chr ?

46 [44 Autosomes + 2 Sex chromosomes]
(44+XY in males, 44+XX in females)

21. Y chromosome in male gametes : Male child ;

X chromosome in male gametes : ----- ?

22. How do variation occur in living organisms ?

During meiosis, when gametes form, the homologous chromosomes received from both parents exchange chromosome material. This is **Crossing over**, which is a reason for variations.

Spontaneous changes occur in the chromosomes (**Mutation**) also causes variations.

23. Genetic disorders [chromosomal abnormalities]

Turner Syndrome	Down Syndrome
44 + X (one sex chromosome absent)	45 + XX or 45 + XY (one autosome is more- in 21st)
- Deficient female - sterility - dwarfness	- mental retardation - sterility - low immunity

24. What is **Recombinant DNA technology** (Genetic engineering) ?

Technology that is used to make desired changes in the genetic structure.

25. Define **moleculer scissors** and **moleculer glues** in Genetic engineering.

The enzymes which are used to cut DNA at specific sites are called molecular scissors.

(Eg:- Restriction endonuclease)

The enzymes which are used to bind genes are called molecular glues. (Eg:- Ligase)

26. Examples for merits of Genetic engineering.

- Bacteria that manufacture human insulin with out any side effects
- Super bugs that eat and destroy petroleum products and there fore protect the environment
- High yielding plant varieties having pest control with in them (Eg :- Bt Cotton, Bt Brinjal)
- New organisms with desirable features
- DNA Finger printing for proving disputes and investigations
- Treatment

27. The scientist behind the discovery of super bugs. ?

Dr. Anand Mohan Chakrabarthy

28. Genetic engineering is a technology which should be used carefully for the benefit of mankind.

Express your opinion.

