Unit 2 World Of Living

Chapter 8:

Heredity

➡ Accumulation of Variations During Reproduction

when organisms reproduce, the offsprings show minor variations due to inaccuracies in DNA coping. These variations are less in asexual reproduction and more in sexual Reproduction. some variations are useful variations and they help the organism to adjust to the changes in the environment. Some variations do not help the organism to adjust to the changes in the environment and they may die and become extinct.

Heredity

Both asexual and sexual reproduction facilitate heredity, which entails passing traits from one generation to another generation via genetic material called genes. Genetic transfer occurs randomly resulting in variation. This diversity within a population fosters genetic variation and the potential for evolution

Genes

Genes, fundamental to the heredity, are short segments of DNA encoding specific proteins or RNA molecules. They play a crucial role in preserving generational diversity and driving species evolution.

➡ Traits

Traits encompass observable characteristics of an organism, categorized into two types

Inherited traits: Passed from parents to offspring via genetic material like genes. For instance if both parents have brown and black hair, offspring may inherit either colour or blend of the two

Acquired traits: Developed due to environmental influences and are not encoded in DNA

➡ Mendel's Experiment

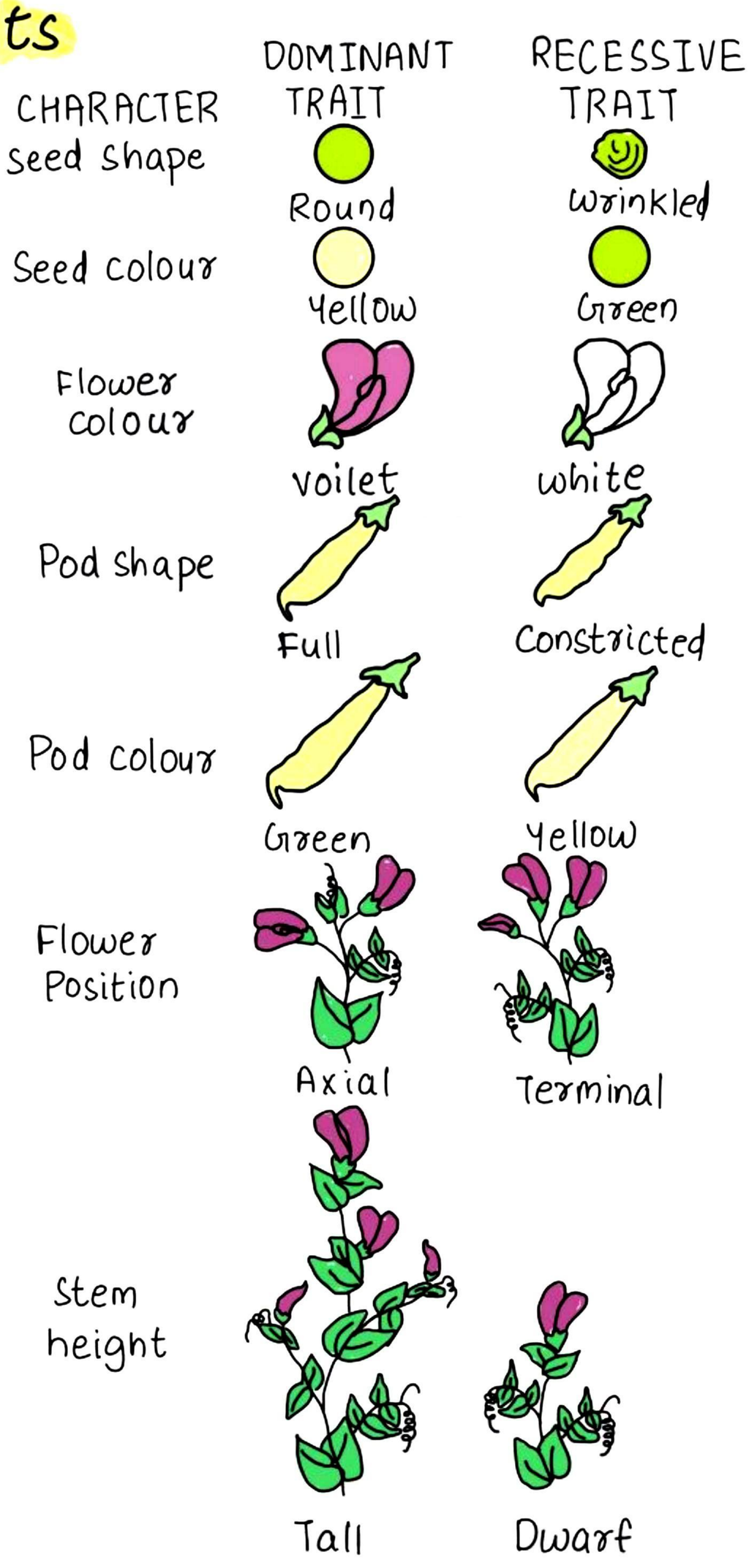
Mendel's research revealed that the rules of trait inheritance are based on the equal contribution of genetic material from both parents, resulting in offspring inheriting two alleles for each trait.

Gregor Johan Mendal widely acclaimed as the "Father of Genetics". Conducted Pioneering experiments on pea plant to elucinate the principles of heredity.

Through his experiments, Mendel proposed three fundamental laws of inheritance, which laid the foundation for understanding genetic inheritance and introduced the concepts of dominant and recessive traits.

➡ Dominant And Recessive Traits

In genetics, a dominant traits manifests when at least one copy of the dominant allele is present in an organism's genotype. For instance, in Mendel's investigation height represents the dominant trait. Conversely, a recessive trait is only evident when an organism's genotype contains two copies of the recessive allele. As illustrated by Mendel's pea plant experiment, short height serves as a recessive trait.



Seven Pairs of contrasting trait in pea plant studied by Mendal

➡ Monohybrid Cross

In a Monohybrid Cross, the focus lies solely on one trait when breeding two organisms. The resulting ratio of traits observed in F2 generation is termed the monohybrid ratio. For instance, crossing a tall plant (TT) with a dwarf plant (tt) yields a ratio of 3 tall to 1 short plant in the F2 generation represented as 3:1. In this example, only the plant's height is considered during the cross.

A cross between a pea plant that is homozygous for yellow seeds (YY) and a pea plant that is homozygous for gree seeds (yy) will produce only yellow heterozygous offspring (Yy)

Possible gametes from each parents

yy

YY
(Homozygous dominant)

	Y	y
Y	YY	Yy
y	Yy	yy

➡ Dihybrid Cross

A cross between two organisms that involves two characters is referred as a Dihybrid cross. Mendel selected two traits of pea plants, seed colour, and seed shape and conducted a cross between two purebread plants with contrasting allels for both traits. One parent exhibit round, yellow seeds (RRYY) while the other parent displayed wrinkled green seeds (rryy). The resulting offspring known as the F1 generation uniformly. The seeds exhibited a round, yellow phenotype with the genotype RrYy, showing dominant over the wrinkled shape (r) and the yellow colour (Y) is dominant over the green colour (y), resulting in the observable characteristics of round and yellow seeds.

➡ Law of Inheritance

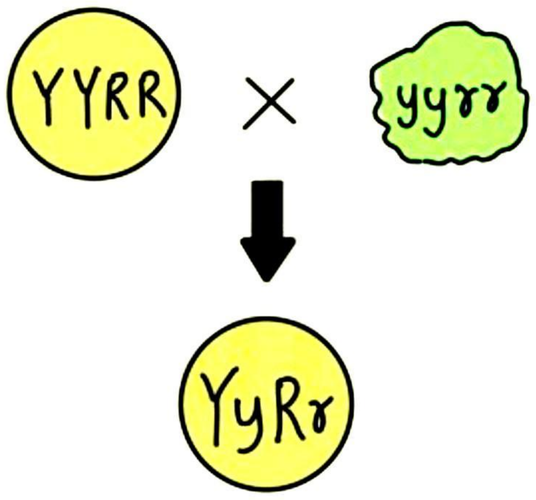
Mendel formulated the laws of Inheritance to elucidate the transmission of traits from parents to offspring, detailing genetic process like segregation and independent assortment

- Mendel's Law encompass three principles

The Law of Dominance asserts that a gene possess two alleles, with one always exerting its influence, known as dominant allele. This dominant allele expresses itself in any combination

The Law of segregation stipulates that traits segregate entirely during gamete formation, with no blending of alleles occuring.

The Law of Independent Assortment states that traits can segregate independently of each other during gamete formation, regardless of their association with different characteristics.



P Generation

F1 generation

Phetotype :

Gametes from heterozygous parent

	YR	yR	Yr	yr
YR	YYRR	YyRR	YYRr	YyRr
yR	YyRR	yyRR	YYrr	Yyrr
Yr	YYRr	YyRr	YYrr	Yyrr
yr	YyRr	yyRr	Yyrr	yyrr

F2 generation

Phenotype

9 : 3 : 3 : 1

Dihybrid Cross

➡ Sex determination

- Sex determination : This is how we figure out whether some one is male or female based on their genes.
- In humans : In humans, its determine by whether they have an X or Y chromosome. XX usually mean a person is female, while XY usually means male.
- How It works : when an egg (which always has an X chromosome) join with a sperm carrying Y chromosome, it results in a boy. If it joins with a sperm carrying an X chromosome, it results a girl.