

Heredity

Heredity the process of passing down traits and characteristics from parents to their offspring through genes

Variation The difference between individuals in a species or group of organisms

Environment variation
Genetic Variation

Importance of Variation

- Variation helps organisms adapt to changing environments.
- It drives the evolution of new, better-adapted species.

Accumulation of Variation During Reproduction

- Asexually**
- Variation are fewer.
 - Occurs due to small inaccuracies in DNA
- Sexually**
- Variation are large.
 - Occurs due to crossing over, separations of chromosomes.

The biological science, which deals with the mechanism of heredity and causes variation called genetics. "genetics" was coined by English biologist William Bateson

Father of Genetics (Gregor Johann Mendel)



DNA: deoxyribonucleic acid, is a molecule that contains genetic information for the development and functioning of an organism.

Chromatin: refers to a mixture of DNA and proteins that form the chromosomes found in the cells of humans and other higher organisms

Chromosomes: is a DNA molecule that consists of a part or all of the genetic material of an organism

Dominant allele

- The dominant allele is the stronger of the two alleles.
- Represented by a capital letter, it determines the dominant traits.
- Dominant traits manifest in both homozygous and heterozygous conditions.

Recessive allele

- The recessive allele is the weaker of the two alleles.
- Represented by a lowercase letter, it remains suppressed in the presence of a dominant allele.
- Recessive traits are expressed only in the homozygous condition.

-Genotype: The unique DNA sequence or allele combination inherited from parents.

- Phenotype: Observable traits like appearance and behavior, influenced by genotype and environment.

Homozygous Condition:

Inherits identical alleles of a gene from both parents

Heterozygous Condition:

Inherits different alleles of a gene from each parent

Gregor Mendel's experiment

Plant selected by Mendel: Pisum sativum(garden pea) . used a number of contrasting characters for garden pea

Mendel's rules for the inheritance of traits.

- Law of Dominance:** In heterozygous pairs, the dominant allele masks the recessive one.
- Law of Segregation:** Traits have two alleles that separate during gamete formation; one from each parent combines during fertilization.
- Law of Independent Assortment:** Alleles of different genes assort independently into gametes

Genes: a segment of DNA that is the basic unit of heredity and is passed from parent to child, is a molecule that contains genetic information for the development and functioning of an organism.

Acquired Traits	Inherited Traits
a) Do not change germ cells	Bring changes in germ cells
b) Cannot be passed on to future generations	Can be passed on to their progeny
c) Do not lead to evolution	May lead to evolution
Example: Losing limbs due to an accident	Example: Deformed limbs at birth due to a genetic defect

Alleles: a pair of genes that occupy a specific location on a particular chromosome and control the same trait

Haploid cells contain a single set of chromosomes (n) and are formed through meiosis. They are primarily involved in sexual reproduction, with examples including sperm and egg cells.

Diploid cells, on the other hand, have two sets of chromosomes (2n) and divide through mitosis. These cells make up most of the body's tissues, such as nerve and muscle cells.

Rules of inheritance

Inheritance in humans is influenced equally by paternal and maternal genes.

Traits in children follow Mendel's rules of inheritance.

Each child inherits one version of a trait from each parent.

Why only pea plant?

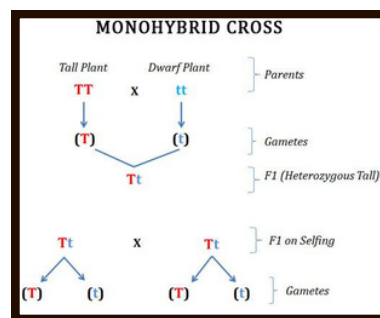
Large no. of offsprings

Short Life Cycle

Annual Plant

7 pairs of allelic characteristics

Monohybrid Cross Cross between two pea plants with one pair of contrasting characters



	(T)	(t)
(T)	TT Homozygous Tall	Tt Heterozygous Tall
(t)	Tt Heterozygous Tall	tt Homozygous Dwarf

Monohybrid Cross Ratio
Phenotypic ratio : 3 : 1 (3 Tall : 1 Dwarf)
Genotypic ratio : 1 : 2 : 1 (1 TT : 2 Tt : 1 tt)

Characters/traits like T are called dominant trait (because it express itself) and t are recessive traits.

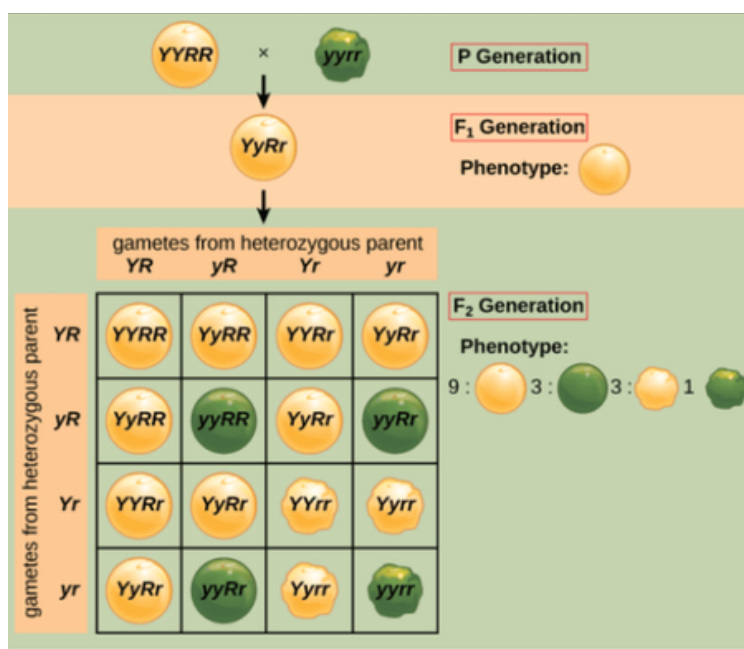
Dihybrid Cross A cross between two plants having two pairs of contrasting characters.

Phenotypic Ratio

Round, yellow : 9
Round, green : 3
Wrinkled , yellow: 3
Wrinkled, green : 1

Parents-> Round green x wrinkled yellow

- Self-pollination of F1 plants resulted in parental phenotypes and two new mixtures.
- Round and yellow seeds are dominant traits.
- New phenotype combinations indicate that genes for round and yellow seeds are inherited independently.

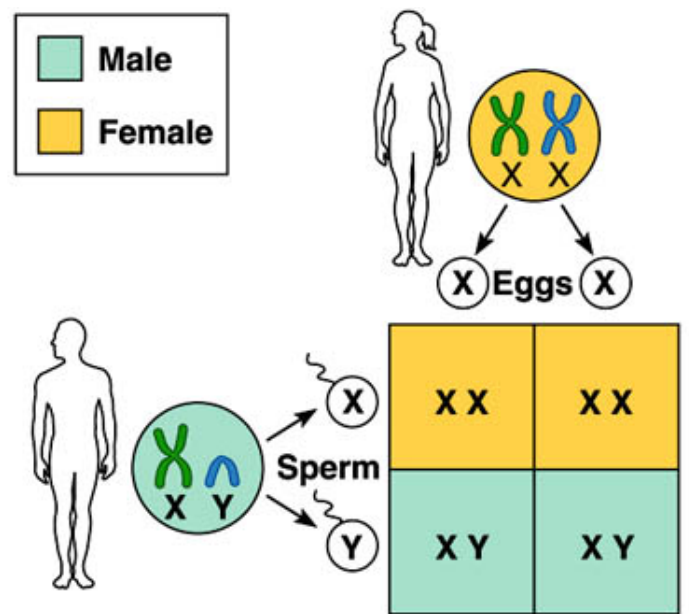


Sex Determination the process through which the sex of a newborn individual is established.

Factors affecting the sex determination

Environmental In certain animals, like turtles, the temperature at which fertilized eggs are kept determines the gender.

Genetic In humans and other animals, gender is determined by a pair of sex chromosomes. Humans have 23 pairs of chromosomes



Chapter ka KAZAANA:

- Definition of 3 Laws of Mendel
- Monohybrid Cross (Numerical on F₂ generation)
- Difference in Acquired and Inherited traits

