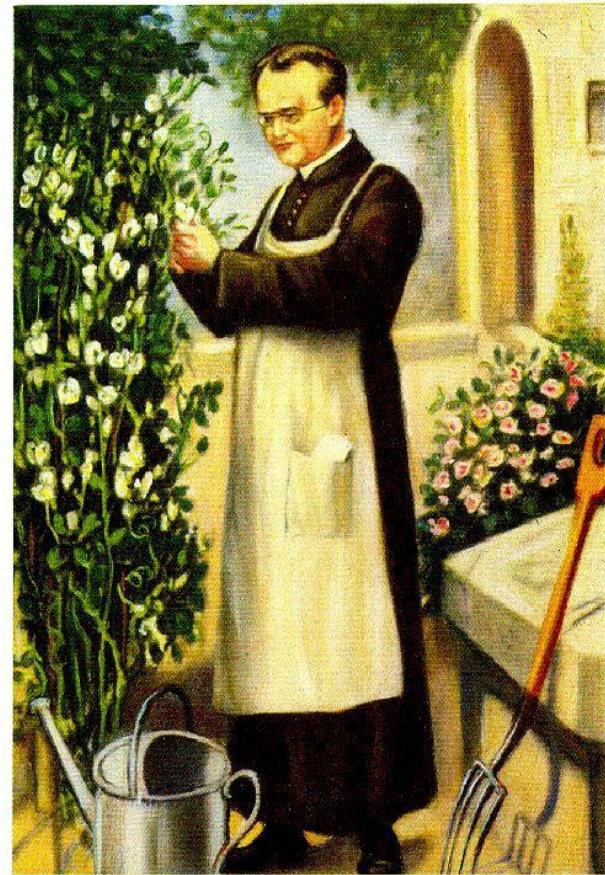


CHAPTER 2
MENDEL AND
MENDELISM
PART 1

JASMINE MARIYA A J
ASSISTANT PROFESSOR ON CONTRACT
LITTLE FLOWER COLLEGE GURUVAYUR

Gregor Johann Mendel (1822-1884)

- Father of **modern Genetics**
- Conducted legendary experiments in **pea plants (*Pisum sativum*)**
- Published his findings in **1866** in the journal 'Transactions of Natural History Society' with title 'Experiments in Plant Hybridisation'



GREGOR MENDEL

- Mendel **did not know anything about Chromosomes** ,their structure and behaviour and how they are connected with transmission of hereditary traits.



- The terms **DNA and Gene** were unknown during that time.

- He carried out extensive ,patient and pain taking **hybridisation experiments** on garden pea to understand the secret of hereditary.

‘Mendel –An unrecognized and bitterly disappointed man’

- Mendel's ideas were far ahead of his time
- scientific world was seriously involved with Darwin's theory of evolution and Natural selection
- The journal in which Mendel published his work was almost obscure
- The statistical knowledge of biologists were poor

Mendel's selection of material

- Mendel selected *Pisum sativum* (Garden pea) as an experimental material because:

















- Its life cycle is very short ,many generations of it can be raised within small period of time
- It has alternative forms of several traits
- They have perfect bisexual flowers with male and female parts .they were self pollinating in nature
- Floral structure was ideal for cross pollination
- Due to self pollination progenies were true breeding in nature so, new gene combinations can be studied
- The hybrids obtained by crossing were fertile
- Being an herbaceous plantit can conveniently handled

Mendel's selection of traits

Mendel selected **7 pairs** of contrasting traits

Contrasting characters selected by Mendel

	<i>Character</i>	<i>Dominant</i>	<i>Recessive</i>
Plant characters	1. Height of stem	Tall	Dwarf
	2. Position of flowers and pods	Axial	Terminal
Pod characters	3. Pod shape	Inflated	Constricted
	4. Pod colour	Green	Yellow
Seed characters	5. Seed coat colour	Coloured	White
	6. Seed form (shape)	Round	Wrinkled
	7. Cotyledon colour	Yellow	Green

	Dominant traits		Recessive traits
I. Seed characters	(1) Round		 Wrinkled
	(2) Yellow cotyledons		 Green cotyledons
	(3) Gray coat (violet flowers)		 White coat (white flowers)
II. Pod characters	(4) Inflated		 Constricted
	(5) Green		 Yellow
III. Stem characters	(6) Tall stem		 Dwarf stem
	(7) Axial pods and flowers along stem		 Terminal pods and flowers on top of stem

Seven pairs of characteristics that Mendel observed in peas









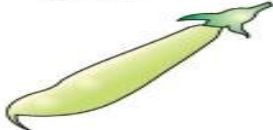



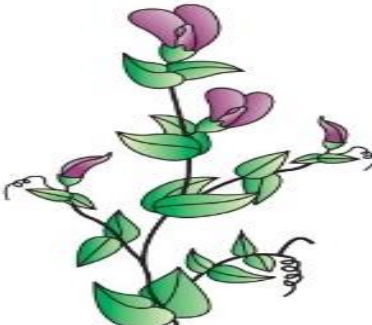

Character	Dominant trait	Recessive trait
Seed shape	 Round	 Wrinkled
Seed colour	 Yellow	 Green
Flower colour	 Violet	 White
Pod shape	 Full	 Constricted
Pod colour	 Green	 Yellow
Flower position	 Axial	 Terminal
Stem height	 Tall	 Dwarf

Figure 5.1 Seven pairs of contrasting traits in pea plant studied by Mendel

Mendel's Experiments

First stage:

- Selected 14 varieties of true breeding pea plants possessing 7 pairs of contrasting characters and ascertained that they were true breeding
- To make sure that each variety was true breeding he carried out repeated self fertilization for several generations

Second stage:

- Cross pollination of two true breeding varieties with contrasting traits of a particular character
- Those true breeding plants were later named as parental generation (P1) ,process of crossing was termed as Hybridisation, The first generation of hybrids were known as First filial generation (F1)

Third stage

- Selfing of F1 Hybrids to produce F2 and subsequent generations .
- Back crossing and reciprocal crossing

Parental Generation



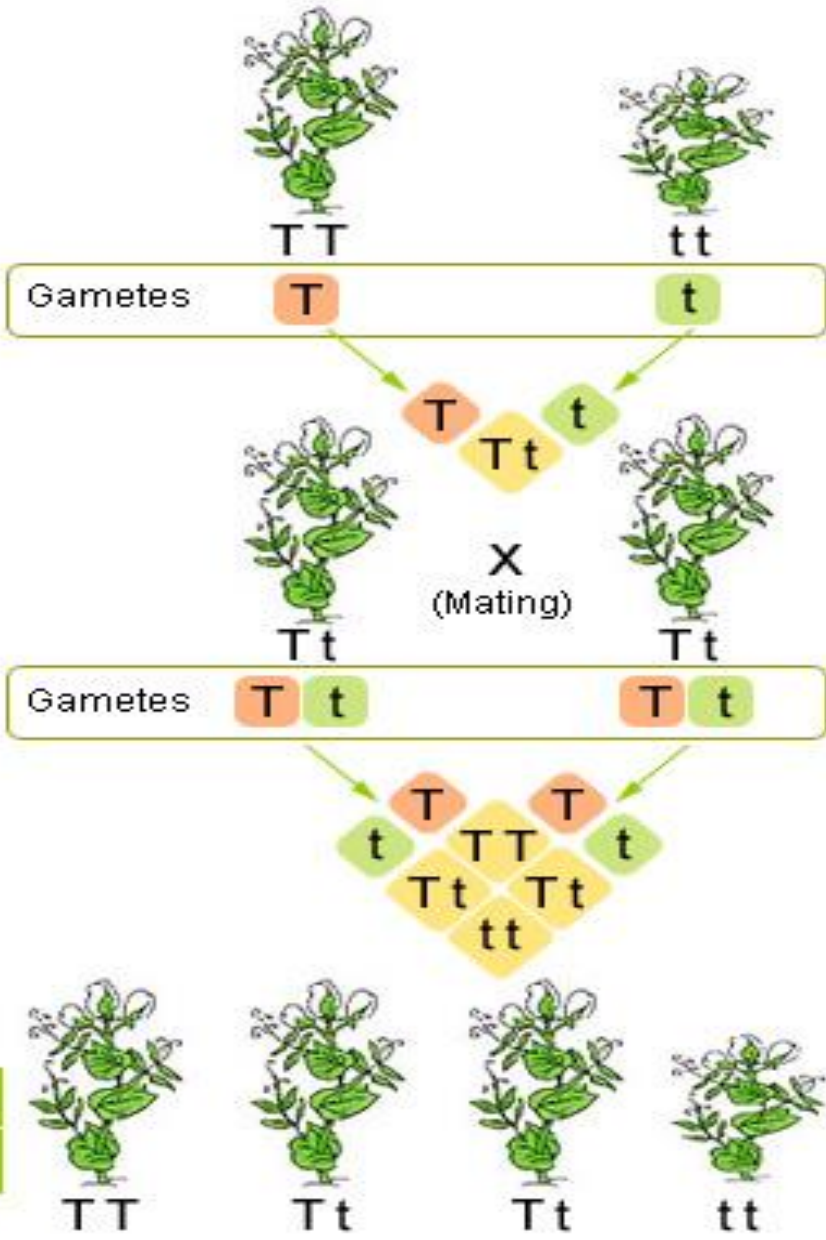
F1 Generation

Genotype	All are Tt.
Phenotype	All are tall



F2 Generation

Genotype	TT : Tt : tt = 1 : 2 : 1
Phenotype	Tall : Dwarf = 3 : 1



Results of Mendel's experiments

- In the F1 generation ,the characters of only one parent would be expressed ,and those of the other would be suppressed. Mendel termed the expressed character as Dominant and suppressed character as recessive.
- In F2 both dominant and recessive traits would be expressed.
- In F2 75% hybrids are dominant and 25% hybrids are recessive

Conclusions of Mendel

- Every heritable trait is an independent unit, governed by two alternative forms of a hereditary factor
- One of the two alternative form is dominant over the other
- Hereditary factors are particulate units
- In somatic cells factors occur in pairs ,and the members of each pair come from two different parents
- They segregate during gamete formation so gametes will get only one of them.

- In some cases companion factors are identical known as homozygosity and in some other cases they are different known as heterozygosity
- The factors of different pairs behave as independent units ,assort independently and then form random combination.