

Experiment no. 3: Experiments on monohybrid, dihybrid, trihybrid cross, test cross and back cross

Aim: To know about different types of crosses and calculation of genotypic and phenotypic ratio.

The term genetics was first given by Bateson in 1906. It is often described as a biological science which deals with heredity and variation. Gregor Johann Mendel is known as the father of genetics with the help of experiment on garden pea, He is able to formulate laws which explained the manner of inheritance of characters. He presented his findings before the Natural History Society of Brunn in 1865.

Mendes described his result in 1866, his work was recognized in 1900 when his laws were discovered by Hugo devries, E. V. Tschermak and Correns, Mendel's original paper was republished in 1901 in the journal Flora.

LAWS OF MENDEL:

1. Law of Segregation
2. Law of Independent assortment


1. The laws of segregation:

It states that when a pair of alleles or allelomorphs is brought together in a hybrid (F1) they remain together without contaminating each other and they separate or segregate from each other in to a complete and pure form during the formation of gamete.

Explanation of laws of Mendel:

Monohybrid ratio: Mendel's law of segregation explains the monohybrid ratio. "The two alleles present in (F1) don't contaminate each other; they separate and pass into different gametes in their original form producing two different types of gametes in equal frequencies". It can be explained by an example

In a pea plant, Round seed shape is dominant over wrinkled seed shape.

Parental generation	Female	×	Male
Phenotype	Round	×	wrinkled
Genotype	RR	×	rr
Gametes	R		r
			
F1 Generation	Rr (Heterozygous) All round		

On selfing:

Parents Female × Male
Phenotype Round × Round
Genotype Rr × Rr
Gametes Rr Rr

↓

Generation F2

	R	r
R	RR (Round)	Rr (Round)
r	Rr (Round)	rr (Wrinkled)

Genotypic ratio- 1RR :2Rr: 1rr

Phenotypic ratio - 3round :1wrinkled

Test cross: Crossing of F1 hybrid with recessive parent

Rr X rr

	R	r
r	Rr (Round)	rr (wrinkled)

Genotypic ratio-1:1 (RR : rr)

Phenotypic ratio- 1:1 (Round : Wrinkled)

Dihybrid Ratio

Mendel's second law i.e. Law of independent assortment can be explained by Studying the inheritance of two characters at a time simultaneously.

Parents Female X Male
Phenotype Yellow Round X Green Wrinkled
Genotype YYRR X yyrr
Gametes YR X yr

↓

F1generation YyRr (Yellow Round) (Heterozygous)

On selfing / Inter-mating (F2)

Parent Female × Male

♂ ♀	YR	Yr	yR	yr
YR	YYRR Yellow Round	YYRr Yellow Round	YyRR Yellow Round	YyRr Yellow Round
Yr	YYRr Yellow Round	YYrr Yellow Wrinkled	YyRr Yellow Round	Yyrr Yellow, Wrinkled
yR	YyRR Yellow Round	YyRr Yellow Round	yyRR Green Round	yyRr Green Round
yr	YyRr Yellow Round	Yyrr Yellow wrinkled	yyRr Green Round	yyrr Green Wrinkled

Phenotypic ratio- 9 (Yellow round):3(yellow wrinkled):3(Green round):1(Green Wrinkled)

Genotypic ratio-1 YYRR: 2YYRr: 1YYrr: 2YyRR: 4YyRr: 2Yyrr: 1yyRR: 2yyRr: 1yyrr

CLASS WORK:

1. Work out of given problem based on monohybrid, dihybrid, trihybrid cross, test cross and back cross

