

Monohybrid & Di-hybrid Crosses

Packet #13

Introduction

- For any given gene, geneticists refer to prevalent alleles in a natural population as wild-type alleles.
- In large populations, more than one wild-type allele may occur.
 - A phenomenon known as genetic polymorphism.

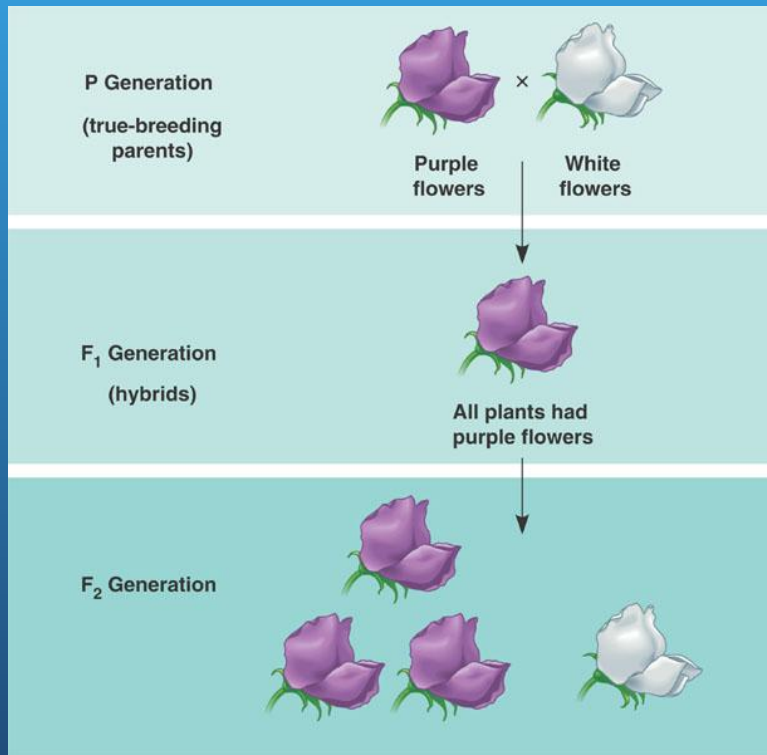


Introduction II

- Random mutations occur in populations and alter preexisting alleles.
- Geneticists sometimes refer to those kinds of alleles as **mutant alleles**.
 - **This is done in order to distinguish them from the wild-type alleles.**
- Since random mutations are more likely to disrupt gene function, mutant alleles are often defective in their ability to express a functional protein.
- **These “mutant” alleles, although rare in natural populations, are typically inherited in a recessive fashion.**



Generations...

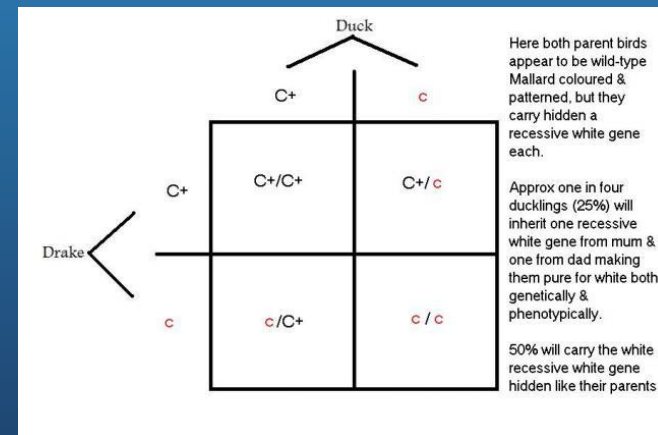
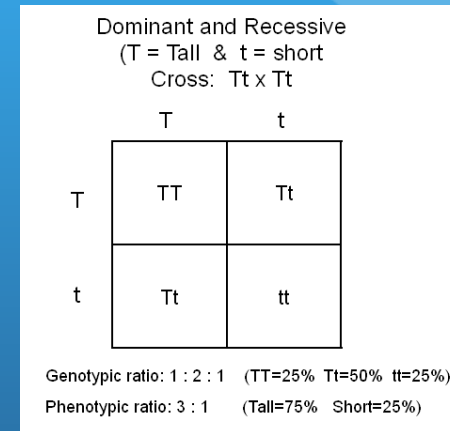


		Father's Genes	
M o t h e r ' s G e n e s			

Monohybrid Cross

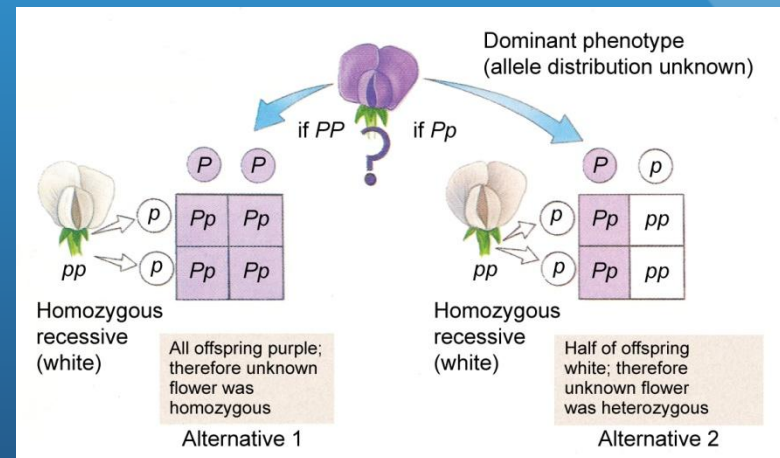
Monohybrid Cross—General

- This type of cross involves a cross among two individuals.
- Only one type of allele is being investigated.



Monohybrid Cross—Test Cross

- A test cross, which is a type of monohybrid cross, is a cross between two parents has one parent being phenotypically dominant and the other parent being homozygous recessive.
- The F1 generation will provide one of two results.



Di-hybrid Cross

Dihybrid Cross

- A dihybrid cross involves an investigation of two alleles at the same time.

		<i>Parent 1</i>			
		F E	F e	f E	f e
<i>Parent 2</i>	F E	FFEE	FFEe		
	F e				
	f E				
	f e				

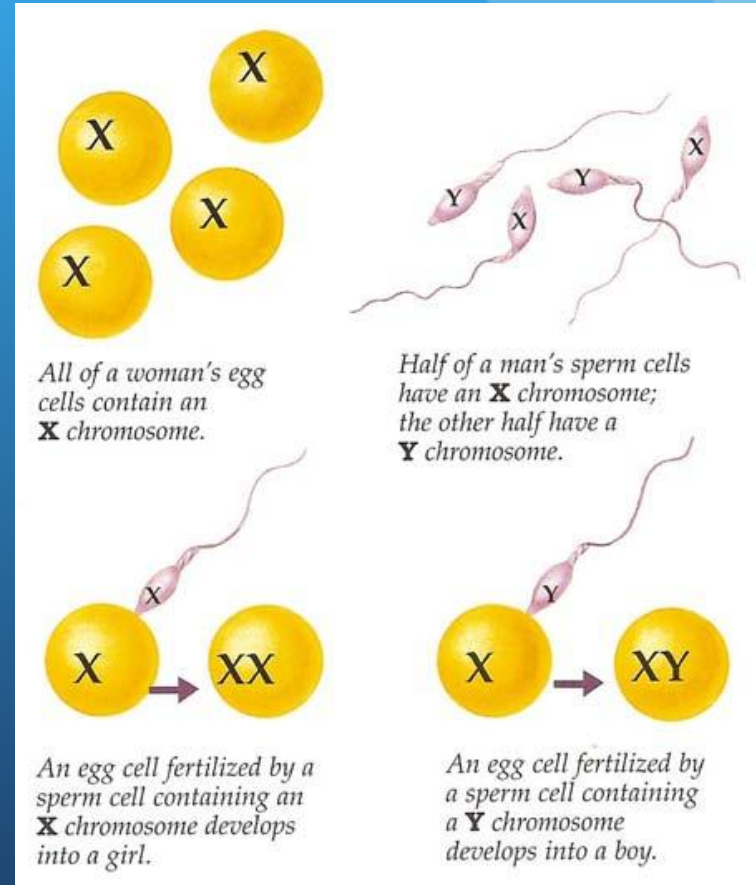
Examples

Monohybrid Crosses

Example #1

Sex Determination

- Calculate the probabilities of the possible genotypes and phenotypes of the children from the following two individuals
 - Male = xy
 - Female xx



Example #2—Flower Petal Color Incomplete Dominance

Problem

- Calculate the probabilities of the possible genotypes and phenotypes of the children from the following two individuals
 - Male = $c^R c^W$
 - Female = $c^R c^R$

Important Info

Genotype	Phenotype
$c^R c^R$	Red petals
$c^R c^W$	Pink petals
$c^W c^W$	White petals

Example #3

Baldness {X-linked Dominant Disorder}

Problem

- Calculate the probabilities of the possible genotypes and phenotypes of the children from the following two individuals
 - Male = x^By
 - Female = x^Bx^B

Important Info

Genotype	Phenotype
x^Bx^B	Bald female
x^Bx^b	Non-bald female
x^bx^b	Non-bald female
x^By	Bald male
x^by	Non-bald male

Example #4

Baldness {X-linked Recessive Disorder}

Problem

- Calculate the probabilities of the possible genotypes and phenotypes of the children from the following two individuals
 - Male = x^Hy
 - Female = x^Hx^h

Important Info

Genotype	Phenotype
x^Hx^H	Normal female
x^Hx^h	Normal female
x^hx^h	Hemophiliac female
x^Hy	Normal male
x^hy	Hemophiliac male

Example #5—Blood types with Rhesus Factor

**Genotypes & Phenotypes not Provided on Exam

Problem

- Calculate the probabilities of the possible genotypes and phenotypes of the children from the following two individuals
 - Male = i^A+i
 - Female = i^A+i^{B+}

Important Information

Genotypes	Phenotypes
$i^A i^A$	Blood type A ⁻
i^A+i^A	A ⁺
i^A+i^{A+}	A ⁺
$i^B i^B$	B ⁻
i^B+i^B	B ⁺
i^B+i^{B+}	B ⁺
$i^A i^B$	AB ⁻
i^A+i^B	AB ⁺
i^A+i^{B+}	AB ⁺
i^A+i^{B+}	AB ⁺
ii	O ⁻
$i+i$	O ⁺
$i+i^+$	O ⁺

Example #6

Wings of Fruit Flies

Problem

- Calculate the probabilities of the possible genotypes and phenotypes of the children from the following two individuals
 - Male = b^+b^+
 - Female = bb

Important Info

Genotypes	Phenotypes
b^+b^+	White wings {Wild type}
b^+b	White wings {Wild Type}
bb	Black wings

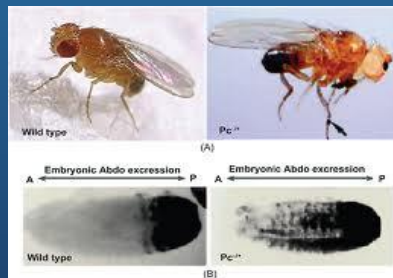
Examples

Di-hybrid Crosses

Example #7

Problem

- Calculate the probabilities of the possible genotypes and phenotypes of the children from the following two individuals
 - Male = $b^+b^+vg^+vg$
 - Female = $b^+b\ vg\ vg$



Important Info

Genotypes	Phenotypes
b^+b^+	White wings {wild type}
b^+b	White wings {wild type}
bb	Black wings
vg^+vg^+	Normal wings {wild type}
vg^+vg	Normal wings {wild type}
$vg\ vg$	Vestigial wings

Review