

Mendelian Genetics

Genetics



- The passing of traits to the next generation is called inheritance.
- Gregor Mendel is known as the father of genetics.
 - Mendel worked with pea plants to figure out how traits were inherited.
- Genetics: The science of heredity.

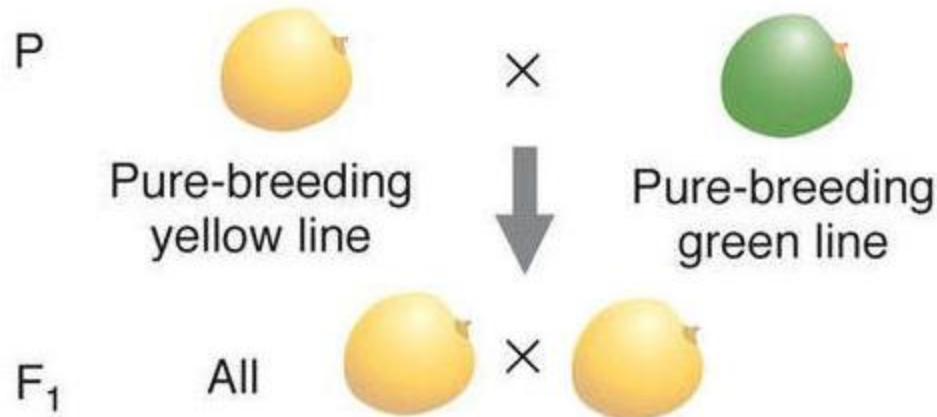
- Mendel used pea plants because they are easy to grow and many are true-breeding: they consistently produce offspring with only one form of a trait.
- He noticed that certain traits will form generation after generation.

- In order to understand how these traits are inherited, Mendel performed cross pollination between green and yellow seeded pea plants.
- In his first experiment, Mendel crossed a true-breeding yellow seeded pea plant with a true-breeding green seeded pea plant.

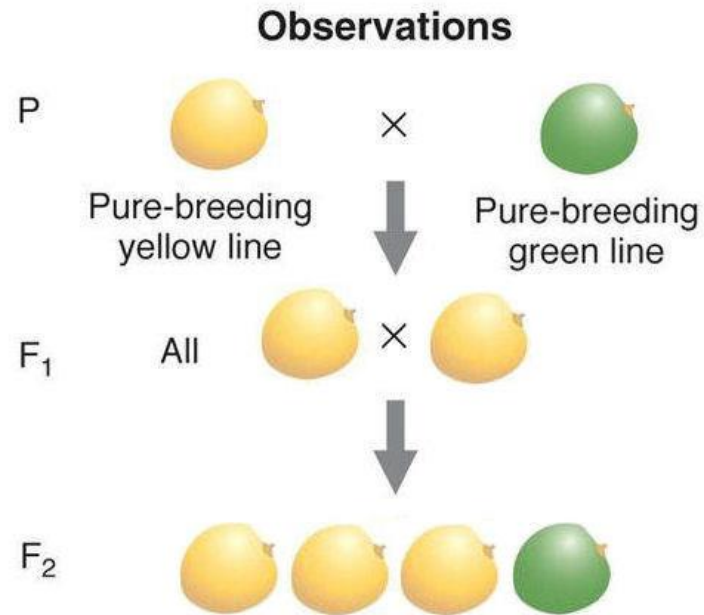


Results

- Mendel found that the first generation (F₁) were all yellow seed plants.
- He then decided to test whether the trait disappeared completely or was masked.
- To test, Mendel planted the F₁ generation of yellow seeds and allowed them to grow and self-fertilize.



Results

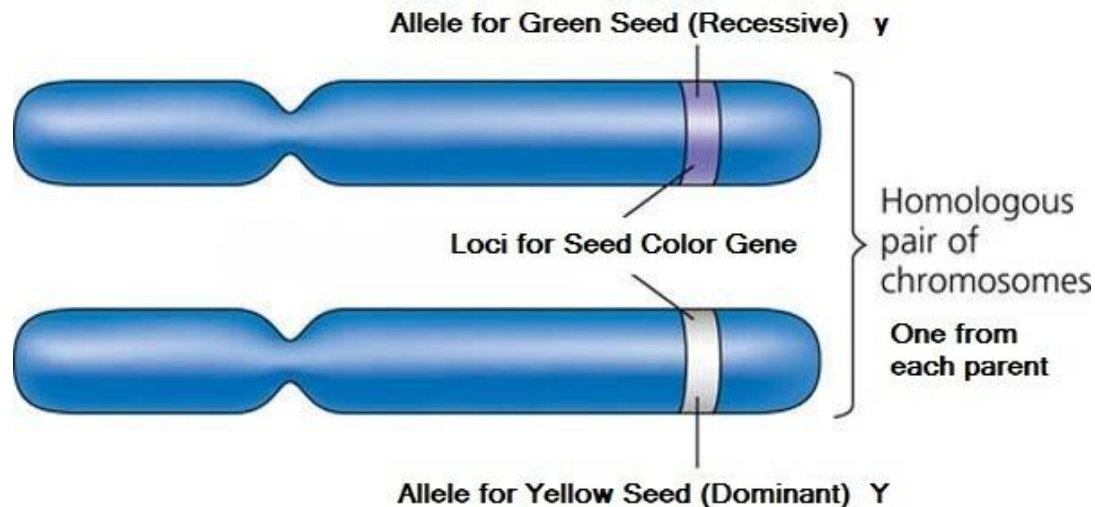


- In the second generation (F₂), 6022 were yellow seeds and 2001 were green.
- Mendel concluded that there must be 2 forms of the seed trait in the pea plants: yellow-seed and green-seed.

Conclusion

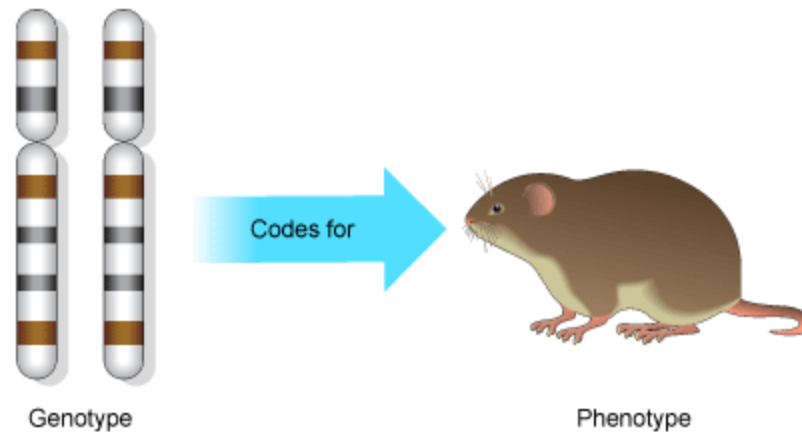
- Mendel concluded that the green-seed form of the trait that did not show up in the F1 generation was because the yellow-seed form of the trait was dominant.
- The green-form that was masked in the F1 generation is known as a recessive trait.

- Allele: An alternative form of a single gene passed from generation to generation.
- The allele for the yellow-seed dominant form would be represented by a capital Y.
- The allele for the green-seed recessive form would be represented by a lowercase y.



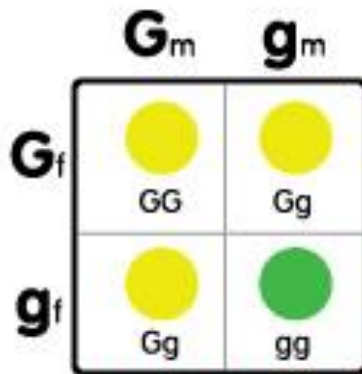
- Homozygous: An organism with 2 of the same alleles for a particular trait.
 - Ex: YY or yy
- Heterozygous: An organism with different alleles for a particular trait.
 - Ex: Yy
 - When alleles are present in the heterozygous state, the dominant trait will be observed.
 - Therefore, **Yy would be what color??**
 - Heterozygous organisms are called hybrids.

- Genotype: The organism's allele pairs.
 - YY or Yy
- Phenotype: The observable characteristic of an allele pair.
 - The phenotype of the YY and Yy plants are yellow-seeds.



Monohybrid Cross- Punnett Squares

- Method of determining the inheritance pattern of a trait between two single organisms.
- Cross that involves hybrids for a single trait.



SINGLE-TRAIT CROSS
G=YELLOW, g=GREEN

Monohybrid Cross

Dominant and Recessive

(T = Tall & t = short)

Cross: Tt x Tt

	T	t
T	TT	Tt
t	Tt	tt

Brown eyes (B) is dominant to Blue eyes (b)-
Solve the following Monohybrid cross:

B

b

b

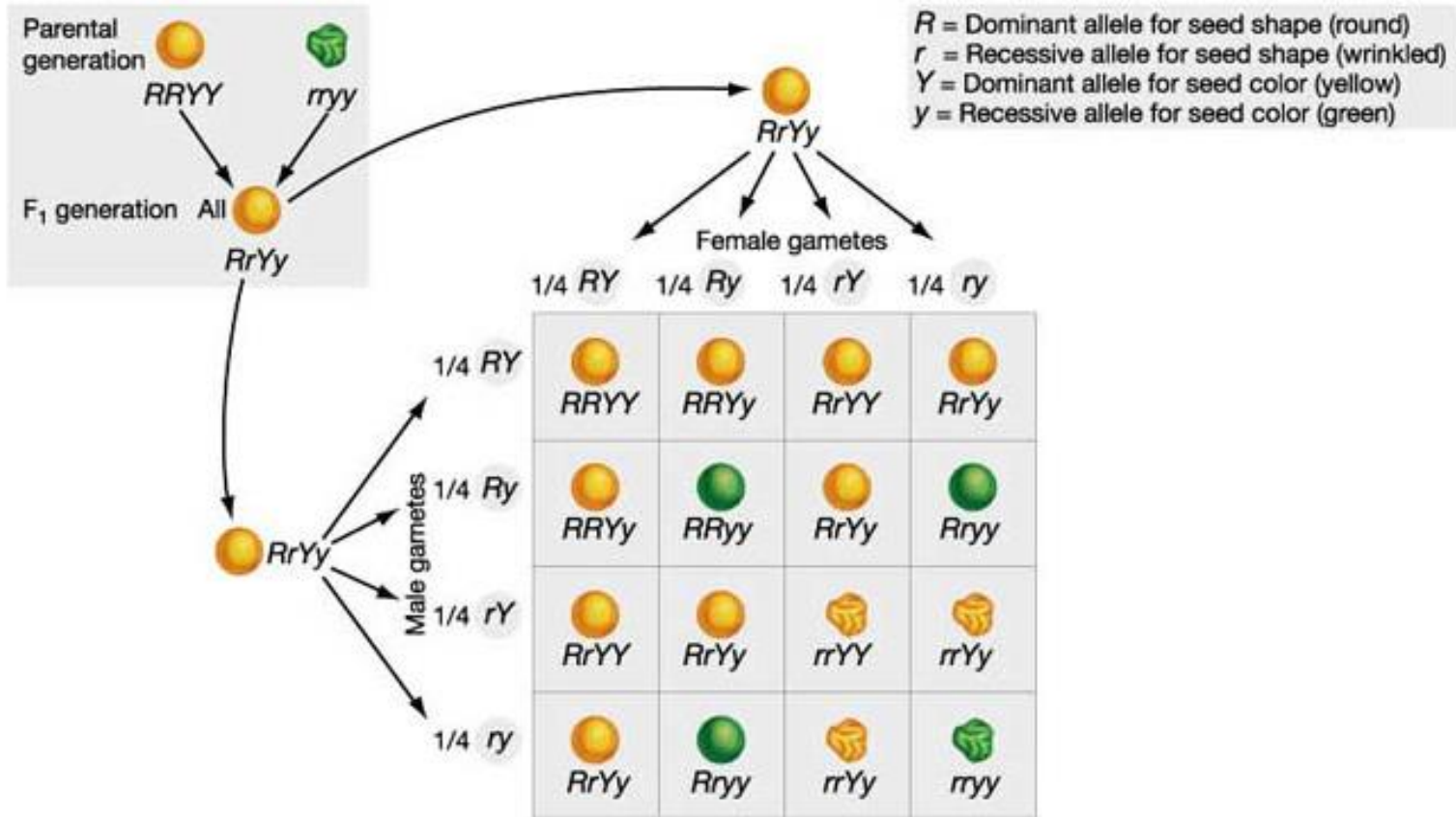
b

- What is the chance for having a child with brown eyes?
- Blue eyes?

Dihybrid Cross

- Examining simultaneous inheritance of two or more traits in the same plant.
- Mendel examined round seeds (R) which were dominant to wrinkled seeds (r), and yellow seeds (Y) which were dominant to green seeds (y).

Dihybrid Cross



Resulting genotypes: $9/16 R-Y-$: $3/16 R-yy$: $3/16 rrY-$: $1/16 rryy$
 Resulting phenotypes: $9/16$ (yellow round) : $3/16$ (yellow wrinkled) : $3/16$ (green round) : $1/16$ (green wrinkled)

- Law of Independent Assortment: Random assortment of alleles results in four possible gametes.
- The results of Mendel's dihybrid cross included 9 different genotypes.
- The dihybrid cross results in a phenotypic ratio of approximately 9:3:3:1

Law of Independent Assortment

Fig. 8-16-3

