

Fundamental laws of genetics

Also known as Mendel's Genetic Laws. Mendel described the basic pattern of inheritances before the Mechanism for Inheritance (genes) was even discovered.

He stated 3 Major Laws: 1. Law of Dominance 2. Law of Segregation 3. Law of Independent Assortment

1. Law of Dominance

While crossing/reproducing pea plants he discovered something interesting. When he crossed yellow peas with green peas the offspring (F1) would only consist of yellow peas. The same results occurred when he crossed round one with wrinkled ones. He referred to the properties as factors and stated that some factors are dominant over others. Nowadays we call those "factors" alleles. The dominant allele is expressed by a capital letter and the recessive allele by a small letter.

Example of crossing: (dominant allele)T= the colour yellow (recessive allele)t=colour green Considering purely(homozygous) yellow and purely(homozygous) green the genotype of the parental generation would be TT and tt. When crossed the genotype of the whole offspring would be Tt. Since T is dominant over t they would all be yellow. So their phenotype would also be the same.

2. Law of Segregation

Instead of crossing homozygous pea plants the 2nd law refers to the crossing of the heterozygous F1 Generation. When crossing 2 heterozygous pea plants we can expect the following:

T= the colour yellow t=colour green Parents: Tt x Tt Offspring (genotype): TT;Tt;Tt;tt (ratio 1:2:1) Offspring (phenotype): three yellow one green (ratio 3:1)

3. Law of Independent Assortment

So far we've been dealing with one trait at a time. For example seed shape (round or wrinkled) or color (green or yellow). Mendel noticed during all that the shape of the plant and the color had no impact on each other. The different traits seem to be inherited INDEPENDENTLY. This Law describes the crossing between 2 pea plants who are heterozygous for 2 properties, in this case shape and colour.

AaBb x AaBb

A = dominant allele for yellow a = recessive allele for green B = dominant allele for round seeds b = recessive allele for wrinkled seeds

The Offspring Results in 16 different Genotypes. 9/16 show dominant phenotype for both traits (round & green), 3/16 show dominant phenotype for first trait & recessive for second (round & yellow), 3/16 show recessive phenotype for first trait & dominant form for second (wrinkled & green) 1/16 show recessive form of both traits (wrinkled & yellow).

Ratio 9:3:3:1 (Table can be found on google for better understanding)