

General Genetics

Chapter 14

Mendel and the Gene Idea

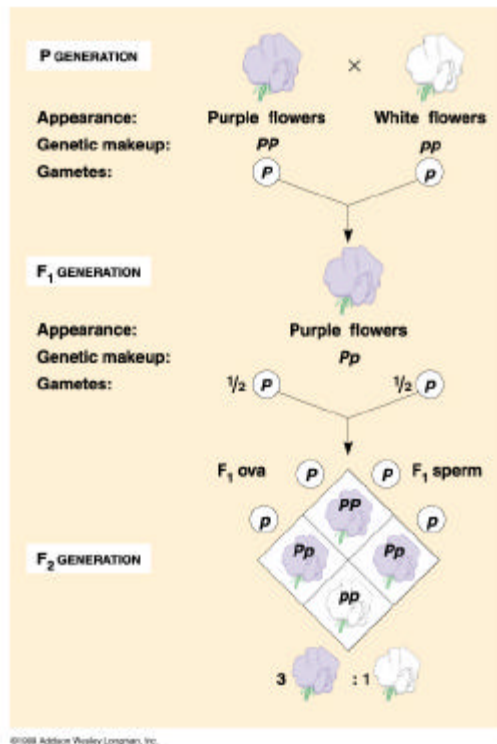
Objectives

- Understand Mendel's three Laws governing genetics
- Understand the meaning of the relevant vocabulary discussed in class
- Be able to predict the results of a mono & dihybrid cross using a Punnett square
- Be familiar with special situations regarding genotype/phenotype predictions

Descriptors

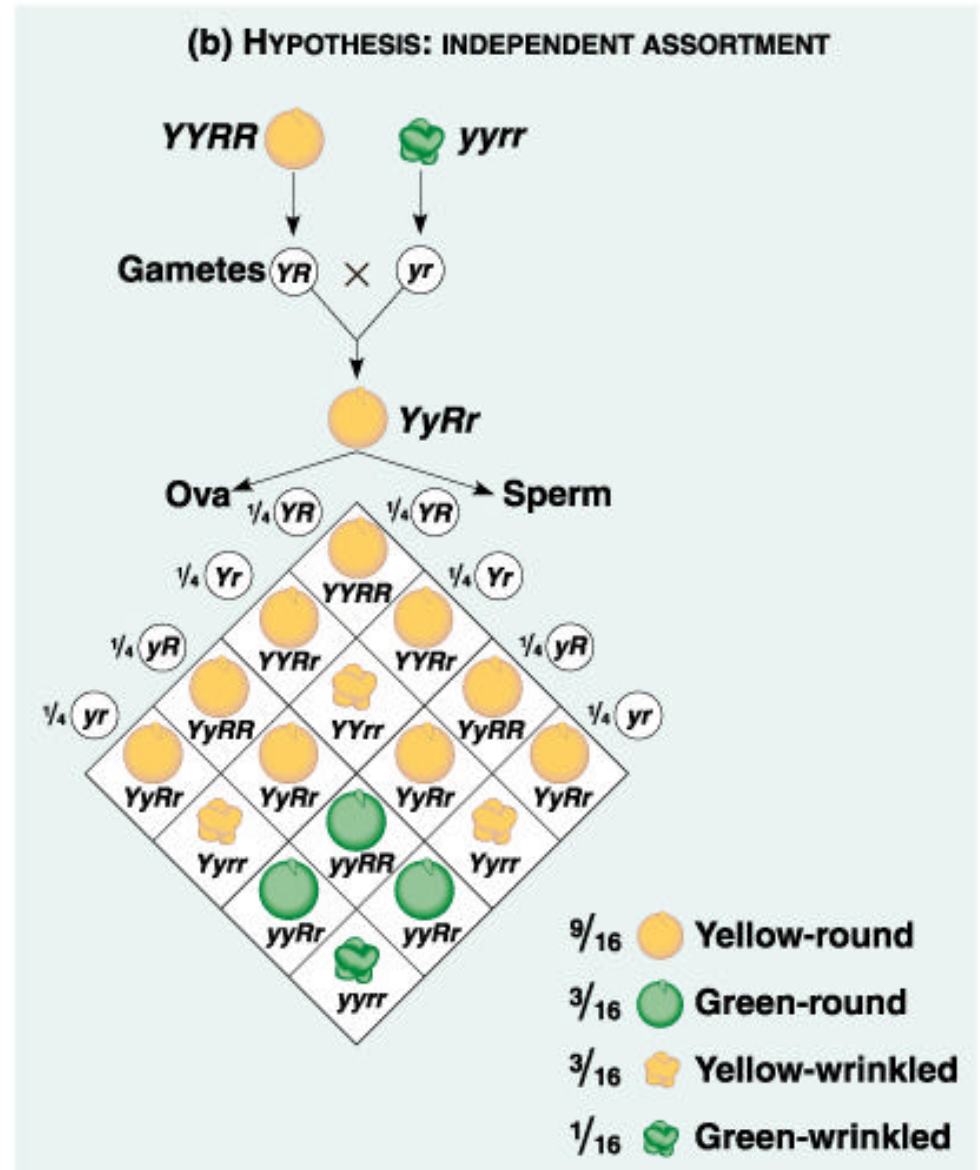
- The physical appearance of an organism reflects its genetic makeup
- Each gene codes for a different polypeptide
- Polypeptide combinations may alter the appearance of an organism
- **Gene** (Character): is a feature that is heritable
- **Locus**: specific area on chromosome where the gene is found
- **Allele** (Trait): is a variation of a character
- **Genotype**: the genetic makeup of an organism (combination of genes in its nucleus)
- **Phenotype**: the physical appearance of an organism

Mendelian Genetics

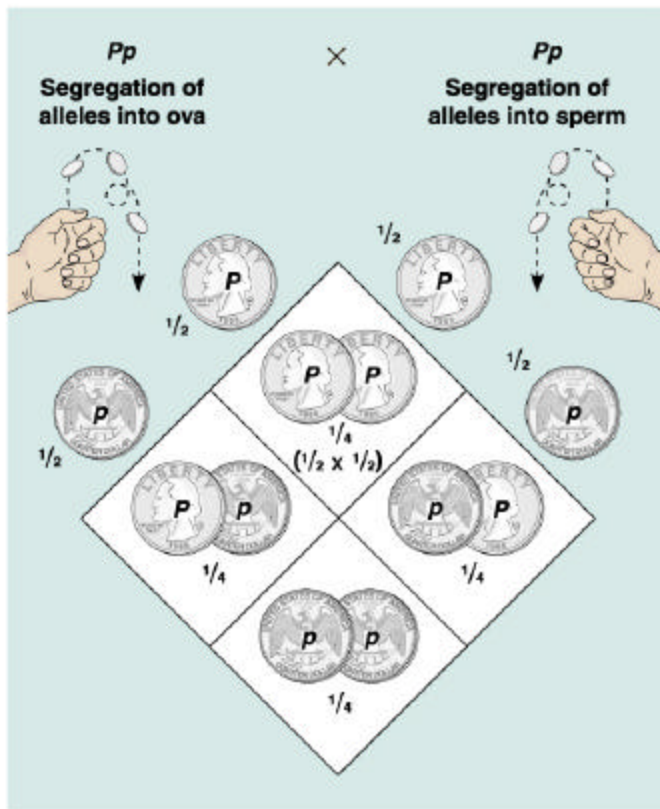


- Gregor Mendel described three Laws of Genetics
- **Law of Segregation:** each parent has two copies of a gene but only one is passed to the offspring via the gametes (separation of homologous pairs)
- Three possible genotypes for each gene in the diploid cell
- **Homozygous dominant:** both alleles of a gene are of the “Dominant” variety
- **Homozygous recessive:** both alleles of a gene are of the “Recessive” variety
- **Heterozygous:** the diploid cell has one dominant and one recessive allele for each gene

- **Law of Independent Assortment:** genes residing on different chromosomes separate without regard for one another
 - describes the broad range of variation seen in organisms
- **Law of Dominance:** some alleles for a gene are fully expressed if present (**dominant**) in the phenotype while others have no affect (**recessive**)
 - hierarchy of alleles



Genetics is Probability



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- In a diploid organism (2n), each allele has a 50:50 chance of being found in a particular gamete ().
- To calculate the likelihood of two alleles recombining during fertilization, we must multiply our probability together (\times =)

Punnett Square

- Device used to predict potential genotypes of offspring
- Along each axis are placed the gamete possibilities for each parent
- Internal boxes represent union of genotypes for offspring produced by the union of the corresponding axial gametes
- Phenotypes can be determined for each potential zygote

Special Situations

- **Incomplete dominance:** the phenotype of a heterozygous genotype is intermediate in appearance
- **Codominance:** each allele in the genotype for a particular gene will be expressed in the phenotype
- **Pleiotropy:** the ability of a gene to affect an organism in many ways
- **Epistasis:** gene at one locus influences the expression of a gene at another locus (different gene)
- **Polygenic Inheritance:** additive effect of 2 or more genes on a phenotypic character