BISC 104
Principles of Biology

MENDELIAN GENETICS LAB

Gregor Mendel (1822-1884)

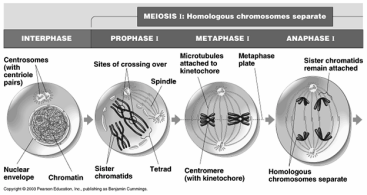
- Augustinian monk
- Lived and worked in Brunn, Austria
  - (Brno in Czech Republic)
- Studied inheritance of 7 different traits in pea plants
- Published “Experiments in Plant Hybrids” in 1866

The questions

- Do both parents contribute equally to the traits of the offspring?
- Are the traits present in the offspring a result of the blending of parental traits?

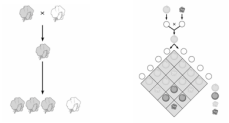
The challenge

- Nothing was yet known about chromosomes, mitosis, meiosis or DNA

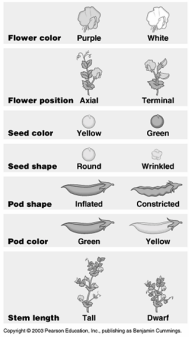


Mendel's approach

- Started with true-breeding parents of opposite phenotypes
- Studied traits (phenotypes) with distinct forms
- Initially studied one trait at a time (monohybrid cross),eventually followed two traits simultaneously (dihybrid cross)



Mendel's approach (cont'd)



- Followed plants over several generations over several years
- Used statistics and principles of probability to analyze data (large sample sizes)

Mendel's explanation

- Organisms carry 2 genes for each trait, one from each parent
- Only one of these genes is packaged into each gamete (the 2 alleles of a gene separate from each other during gamete formation)

Mendel's explanation (cont'd)

- The inheritance of one trait does not influence the inheritance of a second trait (if the genes for the two traits are on different chromosomes)

What are we doing in lab?

- A dihybrid cross using Wisconsin Fast Plants
- We will examine the inheritance of 2 traits:
  - Stem color: Anthocyanin pigment production (purple stems); no anthocyanin pigments (green stems)
  - Leaf color: green leaves; yellow-green leaves

Week 1: Planting seeds

How were the seeds obtained?

True-breeding parents of opposite phenotypes were crossed

P PPGG (Purple stems, green leaves) X ppgg (Green stems, yellow-green leaves)

↓

F_1

The seeds you plant represent the F_1

Expectations

- *What do you expect the phenotype of the F_1 plants to be ?*
  - *Will the stems be green or purple, or will we see some of both?*
  - *Will the leaves be yellow-green or green, or will we see some of both?*
- *The genotype?*

The F_1 plants

- Mendel's work showed us that the F_1 offspring receive genes from each parent and will exhibit the dominant traits.
  - Genotype: PpGg
  - Phenotype: purple stems and green leaves

The F_1 X F_1 cross

PpGg X PpGg

Purple stems, green leaves | Purple stems, green leaves

F_2

Expectations

- The seeds produced in the F_1 X F_1 mating represent the F_2 offspring.
- What phenotypes and genotypes do you expect to observe in the F_2 seedlings?

Acknowledgments

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