

Monohybrid Crosses

Mendel began his studies with 34 varieties of peas and spent 2 years in selecting varieties for his experiments. He verified that each variety was genetically pure (homozygous for each of the traits that he chose to study) by growing the plants for two generations and confirming that all offspring were the same as their parents. He then carried out a number of crosses between the different varieties.

Although peas are normally self-fertilizing, Mendel conducted crosses between different plants by opening the buds before the anthers were fully developed, removing the anthers, and then dusting the stigma with pollen from a different plant (artificial cross-fertilization).

Mendel performed artificial pollination or cross-pollination experiments using several true-breeding pea lines. A true breeding line is one that, having undergone continuous self-pollination, shows the stable trait inheritance and expression for several generations. Mendel selected 14 true-breeding pea plant varieties, as pairs, which were similar except for one character with contrasting traits. Some of the contrasting traits selected by Mendel were smooth or wrinkled seeds, yellow or green seeds, smooth or inflated pods, green or yellow pods and tall or dwarf plants.

Selection of true breeding varieties

Mendel started his experiment with 34 varieties of garden peas (*Pisum sativum*). He spent 2 years to select 7 varieties for his experiments. He grew the pea plants for two generations to confirm the purity of the offspring. He then carried out numerous crosses between these pure lines. Seven characters selected by Mendel is described in figure 1.

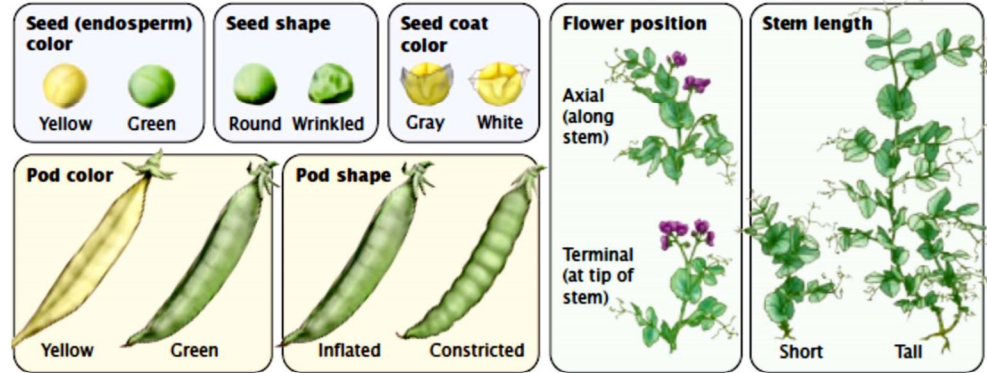


Figure 1.. 7 Characters chosen by Mendel

Characters Studied by Mendel

S.No.	Characters	Contrasting Traits
1.	Stem height	Tall/dwarf
2.	Flower colour	Violet/white
3.	Flower position	Axial/terminal
4.	Pod shape	Inflated/constricted
5.	Pod colour	Green/yellow
6.	Seed shape	Round/wrinkled
7.	Seed colour	Yellow/green

Pisum sativum is typically self-fertilizing; Mendel conducted cross-fertilization between different plants. The process of cross-fertilization is shown in figure 2.

Mendel conducted his artificial cross pollination experiments using 14 true-breeding pea plant varieties.

Monohybrid cross

Mendel crossed round seeded and wrinkled seeded pea plants. He collected the seeds and grew them to generate next generation plants, first hybrid generation (Filial₁ progeny or F₁).

Observation: all the F₁ progenies produced were round seeded; none were wrinkled seeded.

In F₂ generation, both the traits from the P₁ generation emerged in the F₂.

Mendel counted 5474 round seeds and 1850 wrinkled seeds in the F₂. He noticed that the number of the round and wrinkled seeds constituted approximately a 3 to 1 ratio; that is, about $\frac{3}{4}$ of the F₂ seeds were round and $\frac{1}{4}$ were wrinkled. Mendel conducted monohybrid crosses for all seven of the characteristics that he studied in pea plants, and in all of the crosses he obtained the same result: all of the F₁ resembled only one of the two parents, but both parental traits emerged in the F₂ in approximately a 3:1 ratio.

