Tutorial session 4: Dihybridism in diploid Organisms

Exercise 1

Three pea plants with yellow, full seeds, selected at random, were crossed with a pea plant having green, wrinkled seeds. The results, expressed as percentages, were as follows:

- Cross 1: 51% yellow, full seeds; 49% green, full seeds.
- Cross 2: 100% yellow, full seeds.
- Cross 3: 24% yellow, full seeds; 26% yellow, wrinkled seeds; 25% green, full seeds; 25% green, wrinkled seeds.

Questions:

1) Identify which of the four traits (yellow, full, green, wrinkled) are **dominant** and which are **recessive**.
2) Using appropriate symbols, determine the genotype of the three initial pea plants (parents) and construct a Punnett square for each cross. Compare the predicted results with the observed offspring.

Exercise 2

In lupins, the inheritance of two pairs of alleles is studied, one pair controls flower color (yellow or white) and the other pair controls pod dehiscence (opening) or indehiscence (non-opening). Two crosses are performed:

- ✓ **First Cross**: Plants with yellow flowers and dehiscent pods are crossed with plants with white flowers and indehiscent pods. All the resulting seeds grow into plants with yellow flowers and dehiscent pods.
- ✓ **Second Cross**: Plants from the F1 generation are crossed with plants with white flowers and indehiscent pods. The results are:
  - 135 plants with yellow flowers and dehiscent pods.
  - 138 plants with white flowers and dehiscent pods.
  - 140 plants with yellow flowers and indehiscent pods.
  - 133 plants with white flowers and indehiscent pods.

Questions

1) Is this monohybridism or dihybridism?
2) What traits are being studied?
3) Is the F1 generation pure-bred?

4) Which allele(s) is/are dominant?
5) How was the F2 generation obtained?
6) Do the F2 results suggest independent or linked genes? Justify your answer.
7) Explain the F1 and F2 results rigorously.