PHENOTYPIC EXPRESSION OF GENETIC BARLEY

Introduction

Barley shoots demonstrate a dominant / recessive pattern of inheritance, where green pigment is dominant to no pigment (yellow / white). Scientific companies have undertaken genetic crosses to cultivate the seeds of heterozygous parents. All seedlings should conform to the phenotypic ratios expected of a cross between two heterozygous parents. However, environmental factors may also influence the phenotypic expression of colour. The green pigment produced by the dominant allele is used to absorb light for the purpose of photosynthesis. It is expected that seedlings grown in the dark will not produce this pigment in order to conserve energy (this is called phenotypic plasticity).

Aim

To investigate the effect of environment (light exposure) on the phenotypic ratios of genetic barley.

Hypothesis

Complete a Punnett grid to determine the expected ratio of green and white shoots grown in light.

Alleles: G = green g = white / yellow

P generation: Gg × Gg (green × green)

Predicted Phenotypic Ratio:

Suggest what will happen to this phenotypic ratio if the seedlings are grown in the absence of light.

Methodology

1. Place a circular piece of filter paper inside two petri dishes.
2. Into each petri dish, place ten genetic barley seeds.
3. Add water to each dish until paper is moist (but not soaked).
4. Place one dish under a light source (lamp or by a window).
5. Place the other dish in a cupboard or box (no light present).
6. Leave seedlings to germinate (will typically take 3 – 5 days).
7. Count the number of green vs white shoots on each plate.

Results

Phenotypic Ratios for Barley Shoots in **Light** Conditions:

	Group 1	Group 2	Group 3	Group 4	Group 5	Total	Ratio (%)
Green							
White							

Phenotypic Ratios for Barley Shoots in **Dark** Conditions:

	Group 1	Group 2	Group 3	Group 4	Group 5	Total	Ratio (%)
Green							
White							

Discussion

1. Define genotype and phenotype.

2. Explain the different phenotypic outcomes between the barley in light versus dark conditions.