

Scientific Skills Exercise 1

$$1. C^Y C^Y = q^2 = \frac{56}{216} = 0.259$$

$$q = 0.51$$

$$p + q = 1$$

$$p + 0.51 = 1$$

$$p = 0.49$$

$$2. C^G C^G = p^2 = 0.24 = 24\%$$

$$C^Y C^Y = q^2 = 0.259 = 26\%$$

$$C^Y C^G = 2pq = 2(0.51)(0.49) = 0.5 = 50\%$$

3. Observed: Day 7

$$C^G C^G = 49/216 = 23\%$$

$$C^G C^Y = 111/216 = 51.4\%$$

$$C^Y C^Y = 56/216 = 26\%$$

It's pretty close.

4. Observed: Day 21

$$C^G C^G = 47/173 = 27\%$$

$$C^G C^Y = 106/173 = 61.27\%$$

$$C^Y C^Y = 20/173 = 11.56\%$$

Seems like something is up here... one way to find out if this difference is just by chance... everyone's favorite... chi square

4. (cont)

	O	e	$(O-e)^2$	$\frac{(O-e)^2}{e}$
$C^G C^G$	47	$(.23)(173)$ 39.79	51.98	1.31
$C^G C^Y$	106	$(.514)(173)$ 88.92	291.7	3.28
$C^X C^Y$	20	$(.26)(173)$ 44.98	624	13.87

$$\Sigma = 18.46$$

Null: The difference in observed frequencies of plants is due to chance (population is in H-W equilibrium)

Alternate: The difference in observed is due to something other than chance

Degrees of freedom = 2 (3 possible outcomes minus one = 2)

Since 18.46 is larger than 5.99, reject the null

Appears environment is selecting against yellow seedlings.

→ Further develop an alternative:

The frequency of the C^Y allele is decreasing in this population and it is not in H-W equilibrium (it's evolving)

5. Since having yellow seeds limits chlorophyll production, photosynthesis would decrease, lowering fitness. Therefore, the number of C₁C₁ over time would continue to decrease.