



## Hardy-Weinberg Equilibrium

$p$  = the frequency of the dominant allele

$q$  = the frequency of the recessive allele

For a population in genetic equilibrium:

- $p + q = 1.0$  (The sum of the frequencies of both alleles is 100%)
- $(p + q)^2 = 1$ , so  $p^2 + 2pq + q^2 = 1$
- The three terms of this binomial expansion indicate the

frequencies of the three genotypes:  $p^2$  = frequency of homozygous dominant,  $2pq$  = frequency of heterozygous, and  $q^2$  = frequency of homozygous recessive.

### TA Expectations:

- Give a review of Hardy-Weinberg and how we can use that in a bi-allelic scenario to determine allele frequency in a random mating population. The TAs should probably work through an example in lab.
- Review the phenotypes of the mutants involved and the possible epistatic interactions that were observed from Lab 3 and how those interactions need to be dealt with when determining allele frequency.

### Materials & Supplies:

- There are ~130 ears that are part of a "large breeding population" of maize, which has been "randomly mated". Each lab section will have ~12 ears that need to be phenotyped. Each ear will be segregating for up to 4 kernel traits and 2 maternal traits. It is important to note that not all ears will be segregating for the same kernel traits.
  - The genotype of the original cross was: (R1/r1 C1/c1 Su1/Su1 Pr1/pr1 Y1/y1) x (r1/r1 c1/c1 Pr1/Pr1 su1/su1 Y1/Y1). In other words, there are 5 genes segregating in this population that control the 4 kernel characteristics.
  - The following recessive genotypes and their corresponding phenotypes are segregating in the population: white ( $p1/p1$ ) vs. red cob ( $P1/-$ ), sugary kernel ( $su1/su1$ ) vs. normal ( $Su1/-$ ), colored ( $C1$ ) vs. colorless ( $c1$ ) kernels, blue ( $Pr1/-$ ) vs. red kernels ( $pr1/pr1$ ), yellow ( $Y1/-$ ) vs. white endosperm ( $y1/y1$ ).
  - Note that all loci are unlinked.
  - Starting allele frequency of population should be  $q=0.5$  for  $su1$ ,  $q=0.25$  for  $pr1$  &  $y1$ , and  $q=0.75$  for  $c1$  &  $r1$ .

# Hardy Weinberg Study Guide

**Roman Wölfel**



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