

Corn Genetics Cross

The F2 results of an unknown cross are: 208 yellow
48 purple
256 total

The simplest explanation for these phenotypes is a single mutation in either the C or R gene

Since there are more mutant phenotypes than wild-type, it seems reasonable to suppose that we are dealing with the dominant C mutation, Ci.

Therefore, the provisional genotypes of the F2 progeny are:

208 yellow = Ci
48 purple = C C
256 total

The cross, therefore would be:

 x
Ci C x C

#1 C1 C x C1 C = #2 C1 C x C C =

If this is true, then the cross is either

3Ci = 3 yellow
1 C = 1 purple

1Ci = 1 yellow
1 C = 1 purple

The results are clearly not 1:1, so cross #2 can be rejected outright
The results are close to 3:1 so we must perform a X2 test to be sure:

	Obs	Exp	O - E	(O-E) ² / E
yellow	208	192	16	1.33
purple	48	64	-16	4.00

degrees of freedom = 1
probability = 0.05
critical X2 = 3.841

X2 = 5.33 > 3.841
reject null hypothesis

The next simplest explanation is that there are two genes. Since there is only one mutant phenotype, yellow, then both C and R must be involved.

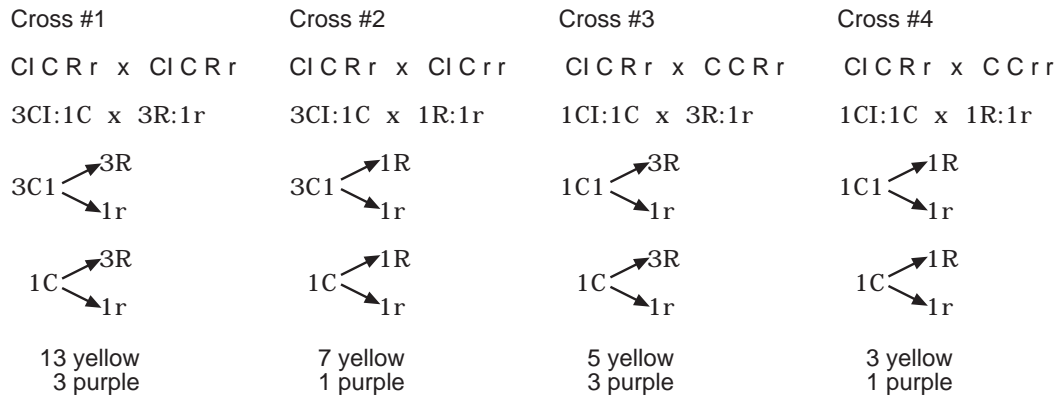
Since the mutant phenotype is the greatest number, then most likely it is the Ci allele that is involved.

Therefore, the provisional genotypes of the F2 progeny are:

208 yellow = Ci r r
48 purple = C C R
256 total

The cross, therefore would be:

 x
Ci C R r x C r



We can summarily rule out cross #2.

We can rule out cross #4 because X2 analysis showed that the data do not fit a 3:1 ratio.

X2 analysis would show rule out the 5:3 ratio of cross #2.

X2 analysis would show that the 13:3 ratio of cross #1 is correct!

note: this font denotes phenotype