POPPY SCHOLARS · BIOLOGY: THE LIVING EARTH

Home lab 9 · Unit 9 · about 45 minutes

If both parents are Aa, does the offspring ratio come out near 3 dominant to 1 recessive?

Name _____ Date _____

MATERIALS

You supply everything. Tick each item as you gather it.

- ☐ Two cups, bags or jars (labeled Parent 1 and Parent 2)
- ☐ 20 beans or buttons of one color (allele A) and 30 of another color (allele a)
- ☐ Paper, pencil and a calculator

SAFETY

No special safety concerns. Do not put small beans or buttons in the mouth, and keep them away from young children and pets.

PROCEDURE

1. Put 10 A beans and 10 a beans in each cup. Each cup is a parent, and each bean is a gamete carrying one allele.
2. Without looking, take one bean from each cup, record the pair (AA, Aa or aa), and put the beans back. Shake the cups. Do this 80 times.
3. Tally AA, Aa and aa. Combine AA and Aa as the dominant phenotype, and call aa the recessive phenotype.
4. Compute the expected counts for a 3:1 ratio out of 80 (60 dominant and 20 recessive), and compute chi-square: for each group, (observed minus expected) squared divided by expected, then add the two groups.
5. Now run a test cross. Make Parent 2 all a (20 a beans). Parent 1 stays 10 A and 10 a. Draw 40 times and tally the offspring (Aa or aa).
6. Compare your chi-square with the cutoff value 3.84, the usual cutoff for 1 degree of freedom: a number below it means the data are consistent with the 3:1 prediction.

RECORD YOUR DATA

Genotype	Observed (80 draws)	Expected
AA		20
Aa		40
aa		20

Phenotype	Observed	Expected	$(O - E)^2 \div E$
Dominant (AA + Aa)		60	
Recessive (aa)		20	
Chi-square (sum)			

Test cross	Observed (40 draws)	Expected
Aa		20
aa		20

LAB REPORT

Write a report that gives your three tables, shows the chi-square calculation, and decides whether your results are consistent with the model. Explain why a test cross is used to find out whether a dominant-looking organism is AA or Aa, and use your test-cross counts to show what you would see if the unknown parent were AA instead.

Report the numbers you actually got, even when they disagree with the lesson. Write on the lines, or type your report on the website and send it to a teacher there.

Question and hypothesis *State the question in your own words, what you expect to happen, and why you expect it.*

Method *What you changed, what you measured, what you kept the same, and how many trials you ran.*

Observations *Describe what you saw, including anything unexpected. Your data tables are added to the report automatically.*

Calculations *Show each calculation step by step, with units.*

Claim and reasoning *Answer the question using your numbers, then explain why, using the biology from the unit.*

Limits and next step *What could have affected your results, and one change you would make next time.*