CALIFORNIA STATE SCIENCE FAIR
2017 PROJECT SUMMARY

Name(s)
Stephany R. Brundage

Project Number
S0508

Project Title
Definite and Random Theoretical Probability when Determining a 10-Locus Genotype for Color on a Rabbit

Abstract

Objectives/Goals
Test breed theoretical rabbits to determine their 10-locus genotype for color through the phenotype of the offspring. Look at differences in results when using definite and random theoretical probability when breeding to a specific set of test rabbits and when breeding any random pairing of rabbits together.

Methods/Materials
A random number generator and virtual rabbit genotypes were used to determine the number of test breedings needed to determine the full genotype for color. Random rabbit genotypes were crossed to specific test rabbits to determine the genotype by using the phenotypes of the offspring. Three different variations of this idea were used, one with random theoretical probability, one with definite theoretical probability, and one that is tested with a random genotype using random theoretical probability. Virtual rabbits were crossed with test rabbits until the full genotype was determined.

Results
After 15 tests, it took an average of 1.93 test breedings to determine the entire genotype for color on a rabbit using definite theoretical probability. Within those 15 tests, when using random theoretical probability, there was 100% accuracy with an average of 1.93 test breedings. In the procedure where two random rabbits were crossed, an average of 31% of alleles were undetermined before the breeding, and 25% of alleles were undetermined after one test breeding. Of the undiscovered portions of the genotype, there was an average of 20.38% determined from one test breeding.

Conclusions/Discussion
Results of this experiment showed that it can take approximately 2 test breedings in real life breeding to determine the rabbits entire genotype. This is the first step to expanding genetic testing to a real-life scenario without the cost of laboratories. This project gives a better understanding of the interactions of the alleles present in rabbit color genetics and how they present themselves.

Summary Statement
Using definite and random theoretical probability with specific test rabbits, I determined how many test breedings were needed to determine the entire genotype for color on a rabbit, and worked with applying that to a real life scenarios.

Help Received
I designed my experiment and crossed the alleles myself, however, my science teacher Erin Vaccaro helped me to narrow down my topic.