Kansas Corn: Corn Genetics and Statistical Analysis

Grade Level: Middle School

2. If this hypothesis is correct, how many kernels out of 100 should be blue? How many should be yellow?

   ½ x 100 = 50 blue and ½ x 100 = 50 yellow

3. If the kernels were counted and 44 were yellow and 56 were blue, conduct a chi-square test on your hypothesis.

$$x^2 = \sum \frac{(O-E)^2}{E}$$

$$x^2 = \sum \frac{(44-50)^2}{50} + \frac{(56-50)^2}{50}$$

$$x^2 = \sum \frac{(-6)^2}{50} + \frac{(6)^2}{50}$$

$$x^2 = \sum \frac{36}{50} + \frac{36}{50}$$

$$x^2 = \sum 0.72 + 0.72$$

$$x^2 = 1.44$$

Degrees of Freedom	Probability of exceeding critical value		
	0.10 or 10%	0.05 or 5%	0.025 or 2.5%
1	2.706	3.841	5.024
2	4.605	5.991	7.378
3	6.251	7.815	9.348
4	7.779	9.488	11.143

There are only two possibilities for kernel color, meaning there is 1 degree of freedom.
The agreed upon percentage of a Type I error is 5%, giving a critical value for this test of 3.841.

$$x^2 = 1.44 < 3.841$$

Thus we fail to reject the hypothesis.

Assessment

1. In performing a chi-square test for pest resistance that is found to be expressed in three forms, completely resistant, somewhat resistant, and not resistant, how many degrees of freedom should be used?

   3 possibilities -1 = 2 degrees of freedom

2. If a homozygous blue corn plant, BB, was crossed with a homozygous yellow plant, bb, what should be the predicted numbers of blue and yellow kernels if 100 kernels were counted on an ear of the plant produced?

   All offspring would be heterozygous Bb, having blue kernels
   100 blue, 0 yellow

Kansas Corn: Corn Genetics and Statistical Analysis
Grade Level: Middle School

3. A lab group in another section hypothesized the parents were heterozygous for kernel color, Bb. When they counted the kernels, they recorded the following results. Calculate the expected values for their hypothesis and perform a chi-square test on your hypothesis.

	Blue	Yellow
Observed	***80***	***20***
Expected	***75***	***25***

$$x^2 = \sum \frac{(80-75)^2}{75} + \frac{(20-25)^2}{25}$$

$$x^2 = \sum \frac{(5)^2}{75} + \frac{(-5)^2}{25}$$

$$x^2 = \sum \frac{25}{75} + \frac{25}{25}$$

$$x^2 = \sum 0.3333 + 1.000 = 1.333$$

Critical value for 1 degree of freedom, and Type 1 error probability = 3.841, so we fail to reject the hypothesis.

Science and Agriculture Careers

To learn more about agriculture careers, visit www.agexplorer.com. You can also find career profiles at www.kscorn.com.

Sources

- https://newonlinecourses.science.psu.edu/stat414/node/147/
- https://www.biologycorner.com/worksheets/corn_chi.html

Any educator electing to perform demonstrations is expected to follow *NSTA Minimum Safety Practices and Regulations for Demonstrations, Experiments, and Workshops*, which are available at http://static.nsta.org/pdfs/MinimumSafetyPracticesAndRegulations.pdf, as well as all school policies and rules and all state and federal laws, regulations, codes and professional standards. Educators are under a duty of care to make laboratories and demonstrations in and out of the classroom as safe as possible. If in doubt, do not perform the demonstrations.