Name(s)	Project Number
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Project Title

Statistics on a 611-Tree Data Set

Abstract

Objectives/Goals

I had seven different hypothesis, six of which were that a certain environmental factor, diameter of trunk for example, causes spiral grain in Bristlecone Pine trees. The seventh hypothesis is that spiral grain is due to genetics. Using statistics I tested each of the hypothesis, except for the seventh which is the null hypothesis, and if each of the hypothesis involving environmental factors were rejected the null hypothesis would be accepted.

Methods/Materials

Using a 611-tree data set that included the diameter of the trees, whether the tree stands or has fallen, the species of the tree, etc., I used the chi-square test of independence to conclude if there is a relationship between any of the environmental factors and spiral grain. A few of the factors in the data set were categorical, including the spiral grain, so the chi-square test was accurate. I also used a correlation test to see if this resulted in no relationship between environmental factors and spiral grain as well. The correlation test needs to have all factors as numerical so this test can't be accurate until the degree of spiral grain is recorded and tested. I changed the values of spiral grain from left twist, no twist, and right twist to -1, 0, and 1. This allowed me to do the test, but not accurately.

Results

The chi-square test for each of the numerical factors was rejected. The chi-square value for each test was greater than the critical value found from a distribution table using the degrees of freedom appropriate for that test and a .05 level of significance. The correlation tests for the environmental factors and spiral grain, although not completely accurate without recording and testing the degree of spiral grain which we do not have, also showed that there is no relationship between spiral grain and the environmental factors.

Conclusions/Discussion

The null hypothesis is accepted because the other hypothesis were rejected. This means that spiral grain is random and due to genetics. There will always be more environmental factors to test but at this moment in time we can accept that spiral grain is due to genetics.

Summary Statement

Using statistics to test the relationship of environmental factors and spiral grain has concluded that spiral grain is not due to environmental factors, but genetics.

Help Received

My science teacher, Michael Wing, allowed me to use his data set of the Bristlecone Pines. My AP Statistics teacher advised that I use the chi-square test but I taught myself how to do the test.