CALIFORNIA SCIENCE & ENGINEERING FAIR
2018 PROJECT SUMMARY

Name(s)	Project Number
Emily A. Hsi	**J2011**

Project Title

A Scientific Method for Choosing Sweet Grapes: An Evaluation of 12 Characteristics

Abstract

Objectives/Goals

Evaluate 12 grape characteristics to identify useful attributes for choosing the sweetest grapes in the store without tasting them.

Methods/Materials

663 grapes from 100 bunches, ruler, beaker, refractometer, and Color Name App. Power calculations were done on the bunch and individual grape level. A sample size of 50 bunches per dichotomous characteristic (red/green, organic/non-organic) would detect a 2% difference in Brix Score (1%=1g sugar/100g solution) with 92% power, and a sample size of 600 grapes would detect a 1% Brix difference with 98% power based on two-tailed, t-tests at a significance level of $P<=0.05$. Univariate analyses were conducted using proportions (categorical variables) and mean and standard deviations (continuous variables). Bivariate analyses were conducted by 1) creating scatter plots for visual associations between grape characteristics and sweetness, and 2) entering variables one-by-one into a generalized linear mixed model predicting sweetness, accounting for clustering at the bunch level. Lastly, multivariable analyses were conducted by entering multiple variables into the same model to evaluate the independent association of each variable with the outcome while simultaneously controlling for other variables and accounting for clustering at the bunch level.

Results

Bivariate models found that red, non-organic, low-volume, shorter, and bigger-bunch grapes were sweeter. Using exact hues, less red, less green and less blue, but more yellow predicted sweeter grapes. In multivariable models, red grapes were sweeter by 3.3 Brix %, non-organic grapes were sweeter by 1.2 Brix %, and shorter grapes were sweeter by 0.95 Brix % per cm. A similarly fitting model replaced the visually red grape variable with the exact red and green hue colors, and found a 0.01 Brix % increase per unit red hue (decimal code), and a 0.02 Brix % decrease per unit green hue (decimal code). Clustering at the bunch level had a small effect.

Conclusions/Discussion

There is a pragmatic way to choose sweet grapes in the store without tasting them. Small, non-organic, red grapes are significantly sweeter. For highly discriminating consumers or colorblind individuals, a color app can identify the exact color of the grape, with redder and less green hues predicting sweeter grapes. Thus, easily distinguishable characteristics can lead to the selection of sweeter grapes for millions of people who consume grapes each year.

Summary Statement

Choosing bunches of small, red, non-organic grapes is the most pragmatic way to select sweet grapes in the store without tasting them.

Help Received