CALIFORNIA STATE SCIENCE FAIR
2014 PROJECT SUMMARY

Name(s)

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Project Number

34912

Project Title

A Physical and Chemical Analysis of the Nutritional and Caloric Content of GM vs. non-GM Papayas

Abstract

Objectives/Goals

The objective of this experiment was to determine the nutritional and caloric differences in GM vs. non-GM papayas. With population set to drastically expand by 2050, and GM crops as the projected future of agriculture, research must be done to verify whether they meet certain requirements such as adequate nutritional levels and caloric content.

Methods/Materials

To conduct the calorimetric experiment, an insulated homemade food calorimeter was made to test the energy content of the different papayas. The papaya was dried and a controlled amount of starter-wood and lighter fluid was added so that the papaya would become more flammable. The papaya/starter-wood/lighter fluid was burned and the energy content was measured by the temperature it raised 150mL of water. The formula Q=M*C*(delta)T was used to quantify the data.

To test Vitamin C, Lugol's Iodine and UV Spectroscopy was used. A redox reaction using Lugol's was used on a Vitamin C standard solution and then the papaya samples themselves. A ratio was then used to quantify the data. For UV Spectroscopy, papaya samples were run in a UV Spectrophometer. Beer-Lambert's Law was used to quantify the data.

To test simple sugar content, a redox titration using Benedict#s Quantitative Reagent and Sodium Carbonate was used on a glucose standard solution and papaya. A ratio was used to quantify the data.

Carotene levels were also qualitatively tested by using Ascending Layer Chromatography.

To minimize testing error, six papayas were chosen. Three were the same non-GM Hawaiian brand, bought at the same store; other three are the same GM Hawaiian brand, bought at the same store.

Results

GM papayas had 68% more calories than non-GM papayas, averaging 48.57 and 28.92 calories per 100g of dried papaya. Lugol#s Reagent showed that GM papayas had 10% less Vitamin C than non-GM , averaging 75.98mg and 68.41mg per 100g of papaya. UV Spectroscopy was performed after 2 weeks of storage resulting in a decrease of Vitamin C levels. Non-GM papayas and GM papayas had 54.33mg and 57.32mg of Vitamin C per 100g of papaya. GM papayas had 7.20g of sugar, whereas non GM papayas had 6.55g of sugar, a 10% difference. GM and non GM papayas showed no difference in Carotene levels through ALC.

Summary Statement

The focus of this experiment was to determine the nutritional and caloric differences between genetically modified and non-genetically modified papayas.

Help Received

Used UV Spectroscopy Lab at University of California Irvine under supervision of Dr. Fishamn; parents helped obtain materials and edit drafts; Alexander Huszagh, PHD student at UCI, helped provide guidance