CALIFORNIA STATE SCIENCE FAIR
2008 PROJECT SUMMARY

Name(s)
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Project Number
J0412

Project Title
Got DNA? Investigating the Effect of Temperature on DNA Extraction

Abstract

Objectives/Goals
The purpose of my experiment is to investigate the effect of temperature on DNA extraction from bananas. My hypothesis is that the amount of DNA extracted will increase as the temperature of the banana is decreased.

Methods/Materials
A mixture of banana (250g), salt (5g) and water (500 ml) was blended and strained to yield a banana solution. This solution was separated into seven containers and each container was heated or cooled to a different temperature, which was measured with a temperature probe. Liquid detergent was added to each container to lyse the cells and release the DNA. After letting the solution sit for 10 minutes, equal amounts of the solution were poured into four different test tubes, in order to conduct four extractions at each of seven temperatures. Meat tenderizer (which contains papain, an enzyme used to separate nucleic acid from proteins) was added to each test tube. Then, cold ethanol was poured slowly down the side of the test tube. The DNA precipitated from the banana solution into the alcohol layer and was removed using a glass rod. The extracted DNA was put into a pre-weighed microcentrifuge tube and this tube (containing the DNA) was then weighed, thereby obtaining the weight of the extracted DNA.

Results
The amount of DNA extracted increased as the temperature of the banana was decreased. The rate of increase was not constant, with the amount of DNA increasing rapidly as the temperature was decreased below 65°F. The greatest amount of DNA was obtained at the lowest temperature studied, 32°F. However, even at the highest temperatures studied, namely 95°F and 105°F, it was possible to extract DNA from the bananas.

Conclusions/Discussion
Temperature has a significant effect on the amount of DNA that can be extracted: the lower the temperature, the greater the yield of DNA. Hence, whenever possible, specimens should be kept at cold temperatures, preferably frozen. However, the results also suggest that even if a sample has been exposed to temperatures as high as 105°F, one can still extract DNA from it and use available technology (such as polymerase chain reaction) to obtain sufficient quantities of DNA for research and other purposes.

Summary Statement
My experiment demonstrated that cold conditions are ideal for DNA preservation and storage.

Help Received
My mother assisted me with the blending.