The National Center for Agriscience & Technology Education

# Learning Activity Lesson Plan

**Author Name: Michael Loftice**

| | |
|---|---|
| **Activity Title:** | DNA Extraction from Kiwi |
| **Goals/ Objectives:** | Students will understand and perform laboratory protocol for extracting DNA from kiwi fruit. |
| **Brief Overview:** | In this lab, students will extract DNA from kiwi fruit using common household products. DNA will be extracted, spooled onto a glass rod. The DNA can be dyed with methylene blue and observed under a microscope, if desired. |
| **Type of course this activity would be best suited for:** | I use this lab in my Agricultural Biotechnology class. |
| **Prerequisite knowledge:** | • Laboratory Safety.<br>• Cell components; cell organelles<br>• Basic principles of genetic transfer |
| **Time Required:** | One class period; approximately 50 minutes. |
| **Materials:** | • 1 – teaspoon measure<br>• 1 – ¼ teaspoon measure<br>• 1 – glass measuring cup<br>• 1 – plastic spoon & knife<br>• 1 – small plastic plate<br>• 2 – small plastic cups<br>• 1 – #2<br>• coffee filter<br>• 2 – plastic transfer pipettes<br>• 1 – graduated cylinder<br>• 1 – test tube<br>• table salt<br>• Distilled water<br>• Clear shampoo without conditioner or clear dish washing detergent<br>• Alcohol; 95% Ethanol preferred, but can use 95% Isopropyl (COLD)<br>• ½ kiwi fruit, peeled<br>• Hot water bath 50-60$^0$C<br>• Ice water bath |
| **Methods:** | 1. Place alcohol in ice bath at least one hour before lab<br>2. Prepare hot water bath / Cold water bath<br>3. Prepare solution of shampoo (1 tablespoon) and table salt (¼ teaspoon.) Add enough distilled water to make 100 ml. Stir slowly to dissolve the salt – avoid making foam. (This is enough solution for about 3 student stations.)<br>4. Peel and cut ½ kiwi into small pieces.<br>5. Place the kiwi pieces into a plastic cup. Cover with 30 ml of the solution made in step #3. Mash the kiwi against the side of the cup with the spoon. (The detergent dissolves the cell membranes and releases the DNA into the solution)<br>6. Place the cup into the hot water bath for about 10 minutes. (This further helps to |

| | |
|---|---|
| | precipitate the fats and proteins out of the solution, leaving the DNA.)<br>7. Cool the mixture in the ice water bath for about 5 minutes.<br>8. Using the #2 coffee filter, strain the mixture over the 2nd plastic cup. Filter until you have collected about 5 ml of liquid in the bottom of the 2nd cup.<br>9. Using a transfer pippette, add about 1 cm of alcohol into the test tube. (Alcohol should be as cold as possible.)<br>10. Using the 2nd transfer pippette, add 1 ml of the prepared kiwi liquid to the test tube. (DNA is not soluble in alcohol. The DNA will precipitate out into the alcohol layer.)<br>11. Let the solution in the test tube sit for about 5 minutes. DO NOT shake or stir the test tube! The white, stringy DNA will precipitate out into the alcohol layer. It has the appearance of white mucus. |
| **References :** (Copyright Free) | Introduction to DNA Extractions<br>Lana Hays<br>Access Excellence Fellow (Activities Exchange)<br>Simon Kenton H.S.<br>11132 Madison Pike<br>Independence, KY 41051<br>AELHays@aol.com |
| **Extension Activities:** | 1. DNA can be spooled onto a glass rod, placed on a slide, stained with methylene blue, and observed under a microscope.<br><br>2. Students may also:<br>• Explain why the kiwi needed to be mashed.<br>• Explain the role the detergent played in this experiment.<br>• Explain the role salt played in this experiment. (Salt enables the DNA strands to come together.)<br>• Describe the appearance of the DNA extracted in this experiment.<br>• Identify the role of biotechnology in agriculture.<br><br>3. Students can try to improve on the protocol for this experiment OR they may try to develop a new protocol for extracting DNA from another source. |
| **Standards:** | Texas Essential Knowledge and Skills (TEKS)<br><br>§119.68<br>(c)(2)(A) Identify the role of biotechnology in agriculture.<br>(c)(2)(B) Identify fundamental principles of cell biology and molecular genetics<br><br>(c)(3)(B) Examine laboratory techniques for manipulating Deoxyribonucleic Acid (DNA) in genetic engineering.<br>(c)(3)(D) Apply scientific measurements and calculations. |