

What is biodiversity?

Biodiversity is the variety of life that exists on Earth, including plants, animals, all living organisms.



Why is biodiversity important?

- It gives us a wide variety of nutritious (and delicious) foods
- It's the source of our medicines, clothing, shelter, even our air
- Diversity is especially important to farmers: being able to grow many crop varieties makes it more likely that some will survive if the weather is bad or the crop is attacked by diseases or pests

So what's the problem?

Biodiversity is being lost every minute! Many species are being lost due to their habitats being destroyed to make way for cities, farms, and houses. Many farmers are replacing their traditional crop varieties with just a few modern ones. For example, out of the hundreds of thousands of plant species on the Earth, humans use just 30 of them for food.

What is DNA?

DNA is present in all living organisms. It holds the instructions necessary for the organism to grow and function, and is passed on from generation to generation through heredity.

How can DNA help save biodiversity?

Scientists use many laboratory procedures to help study biodiversity. Using biotechnology equipment like that in this laboratory, they can look at DNA to see exactly how organisms are different, and find out how they work. Living organisms each have unique DNA 'fingerprints'. The process of extracting DNA is the first step in many of these procedures.

Here's what we'll need to extract DNA from our bananas:

At each station:

2 5 oz cups

50 ml tube, 1.5 ml tube

Spoon

#2 cone coffee filter

Plastic transfer pipette

To share:

Blender

Bananas

Clear shampoo

Salt (NaCl)

DNA extraction procedure:

1. In a blender, mix a ratio of one banana per one cup (250ml) of distilled water. Blend for 15-20 seconds, until the solution is a mixture.
2. In one 5 oz cup, make a solution consisting of 1 teaspoon of shampoo and two pinches of salt. Add 20 ml (4 teaspoons) of distilled water or until the cup is 1/3 full. Dissolve the salt and shampoo by stirring slowly with the plastic spoon to avoid foaming.
3. To the solution you made in step 2, add three heaping teaspoons of the banana mixture from step 1. Mix the solution with the spoon for 5-10 minutes.
(The detergent dissolves the lipids that hold the cell membranes together, which releases the DNA into the solution. The detergent causes lipids and proteins to precipitate out of the solution, leaving the DNA. The salt enables the DNA strands to come together.)
4. Place a #2 cone coffee filter inside a second 5 oz cup. Fold the coffee filter edge around the cup so that the filter does not touch the bottom of the cup.
5. Filter the mixture by pouring it into the filter and letting the solution drain for several minutes until there is approximately 5 ml (covers the bottom of the cup).
6. Obtain 20 ml of cold alcohol in a 50 ml tube.
7. Fill the plastic pipette with the filtered banana solution 2-3 times and add it to the alcohol.
(DNA is not soluble in alcohol. When alcohol is added to the mixture, the components of the mixture, except for DNA, stay in solution while the DNA precipitates out into the alcohol layer.)
8. Let the solution sit for 2- 3 minutes without disturbing it, then gently invert the tube several times. It is important not to shake the tube. You can watch the white DNA precipitate out into the alcohol. When good results are obtained, there will be enough DNA to spool on to a rod or a plastic loop. DNA has the appearance of white, stringy mucus.

Turn the page for directions on how to use the rest of our bananas for Banana Smoothies and some facts about bananas!



Banana Smoothies:

To the remaining banana mixture in the blender, add the following ingredients and blend until smooth.

- Frozen yogurt
- Package of frozen strawberries, partially thawed
- 1 ripe banana (cut up into pieces)
- 1 cup of orange juice (add more for a thinner consistency)



Did you know....?

- In many parts of the world bananas are cooked and eaten as a vegetable; in fact, in many countries, bananas are eaten at almost every meal!
- The banana and its close relative, the plantain, are grown in 120 countries
- Banana is the 4th most important crop in developing countries (after rice, wheat and maize).
- Bananas leaves are also used for shirts, paper, to eat off, fishing nets and roofs!
- Bananas, and its relative, plantains, are part of the genus *Musa*, in which there are 40 species and hundreds of varieties!

Interested in biodiversity and conservation?

Just a few of the many possible careers available to you include:

Scientist, including molecular genetics, plant breeder, environmental conservation, natural resources; teaching or public awareness; national parks; governmental policy

For another DNA extraction procedure you can do at home, see “How to Extract DNA from Anything Living”, from the Genetic Science Learning Center at Utah University, <http://gslc.genetics.utah.edu/basic/howto/>

Workshop hosted by:

Institute for Genomic Diversity, Cornell University

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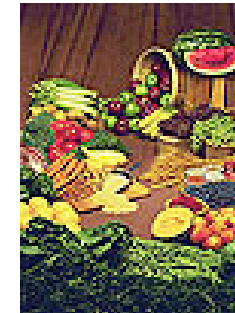
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Using DNA technology in biodiversity conservation and plant genetics



Sources:

Office of Biotechnology, Iowa State University <http://www.biotech.iastate.edu>

International Plant Genetic Resources Institute (IPGRI) (2001) “GeneFlow Junior”

Images from the USDA-ARS photo gallery & International Inst. Tropical Agriculture