



Try This at Home Science: Fruit DNA Extraction

Activity Overview:

Extract, isolate, and observe genetic material from fruit.

Materials:

- Fruit: 2 kiwi, 3 strawberries, or ½ banana
- Ziploc bag
- Bowl
- Glass cup
- Coffee filter or metal sieve
- Filter – if using coffee filter
- 1-tbsp dish soap
- 1/2 tsp salt
- 1/3 cup water
- 1/2 cup of cold isopropyl alcohol (71% or 90% strength)
- Fork or pipette
- Nitrile gloves (optional)

Advance Preparation:

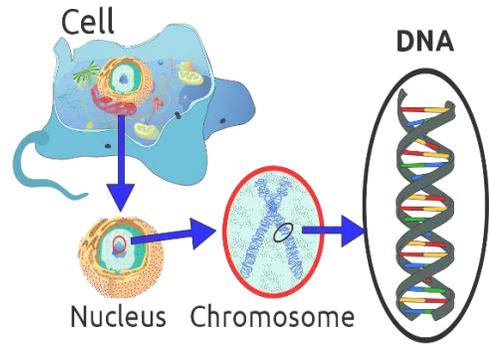
Place the isopropyl alcohol in the fridge for at least 2 hours. It will need to be cold.

Try this:

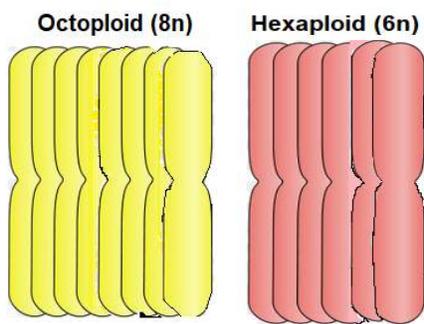
1. In a bowl, combine the water, salt, and dish soap. Do so gently, trying not to create soap bubbles. This lysis buffer will serve as an extraction solution for your DNA.
2. Take the fruit of your choice and dice into small pieces. Be sure to remove any peel, rind, or leaves from the fruit before adding to the mixture.
3. Place the fruit into a Ziploc bag; squeeze all the air out and seal.
4. Mash up the fruit in the bag with your fingers.
5. Once fully mashed, reopen the bag and add 3 tbsp of your lysis buffer.
6. Again, remove all the air from the bag, reseal it, and gently mix together the buffer and fruit mash.
7. Now, filter out your fruit mixture through a fine sieve or coffee filter, then collect the liquid in a glass cup. Use a spoon to push the mixture through the sieve or coffee filter.
8. Remove the alcohol from the fridge and very carefully pour it down the side of the glass cup, into your fruit mixture. The alcohol should float on top of the mixture.
*Tip: Tilt the glass of your fruit mixture to add alcohol.
9. You need approximately equal parts fruit mixture (DNA solution) and isopropyl alcohol.
10. At the interface of the two, there should be a white, cloudy substance that forms. Let sit for about 10 minutes.
11. Use a fork or pipette to draw out the cloudy substance. The cloudy material is DNA that has been extracted from your fruit!

What's happening?

In order to get to the DNA, we need to first break down the plant matter, which was done by mashing up the fruit. Soap is added to the lysis buffer to break down the fatty cell and nuclei membrane, releasing the DNA strands. Salt is capable of breaking apart the bonds between nucleic acids that normally hold together the two strands of DNA. Finally, DNA is water soluble, so to keep the strands from dissolving, cold isopropyl alcohol is used to collect the genetic material in the cup.



How does this relate to humans?



Deoxyribonucleic acid, or DNA, is a long molecule and also the carrier of genetic information and can be extracted from any plant, fungi, or animal. DNA is located in the nucleus of all cells and tells each one how to develop and what its function is. DNA is what makes a strawberry a strawberry, a cheetah a cheetah, and a brain cell a brain cell.

DNA is packed into chromosomes, to make sure that it is capable of fitting inside the nucleus of a cell. Strawberries are octoploid (8n), meaning they have 8 copies of each chromosome. Kiwis are hexaploid (6n) and humans are diploid (2n). Why might a DNA extraction be easier on an octoploid or hexaploid organism than a human? Because there is 3 or 4 more times as much genetic material packed into each and every cell!

Now try...

- Experiment using other types of DNA sources - different fruit, or maybe oatmeal. Are you able to extract more or less DNA? Can you extract your own DNA by swabbing your cheeks with a cotton swab?
- Experiment using different detergents to break down the cell walls. Are you able to get a higher yield of DNA based on this factor?

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