



Soy in Food: What is that doing in there?

Macromolecules

1. Name the FOUR cellular macromolecules. Circle the THREE, which are most relevant to food composition.

2. List which macromolecules you think are present in the following field crops:

Corn:

Wheat:

Soybeans:

3. If we are not able to DETECT the presence of a given macromolecule in the above crops, does that mean it is not PRESENT in the crop?
Be sure to discuss the concept of detection limits in the context of analytical methods

Obtain materials from your teacher to test.

Protocol 1: Isolation of gluten

4. What is gluten and which crop do you believe will have the most gluten?

5. If you are not able to detect gluten in your product, does that mean that it does not contain protein (why/why not)?
 - a. For each flour, measure 1 cup flour into each bowl and add 1 cup of water.
 - b. Mix vigorously with a spoon until well-dissolved. Continue to mix as gluten-containing flours will become more sticky and thick. Eventually you may need to knead some of these mixtures or mix with your hands.
 - c. Transfer mixture to cheesecloth and wrap the cheesecloth around the solids. Your goal is to squeeze out the liquid portion.
 - d. Rinse the cheesecloth bag of flour in water, working it with your hands. Gluten will be retained in the cheesecloth, while soluble proteins and starch will be washed away.
 - e. Record in the table below which of the flours had any gluten remaining within the cheesecloth.



Protocol 2: Starch detection

6. Starch is a complex form of what macromolecule?
7. Give an example of a simple version of this macromolecule:
8. Which of the flours tested do you believe will test positive for starch?
 - a. For each of the three flours, add 0.5 g flour to 5 ml water
 - b. Transfer 1 ml of mixture of flour and water to 9 ml of water (diluting by a power of ten each time). Repeat this step until you have 5 total dilutions.
 - c. Repeat for each flour type.
 - d. Dip a starch strip into each tube for 1-2 seconds. Let the strip sit for 1 min.
 - e. Compare the strips to the chart provided. Using the strip from the highest dilution that still gives a positive result, record the approximate concentration of starch in solution.
 - f. In the table below, calculate the amount of starch in the original flour using the value estimated from your starch strip and the number of dilutions used.

Protocol 3: Oil Extraction

9. Why is water not used as an extraction solvent for oil?
10. Which of the flours tested do you believe will have detectable oil?
 - a. For each of the three seeds, grind 5 g of flour using a mortar and pestle
 - b. Add 3 ml of acetone to the seeds and continue to grind
 - c. Carefully decant the liquid portion into a separate container
 - d. Allow the liquid to evaporate overnight so that only the oil remains
 - e. The following day, record the approximate volume of residual oil

Table of Results

	Gluten? (y/n)	Total Protein	Starch	Oil
Corn				
Wheat				
Soybeans				