



## The Science of Bread Baking Unit

### **Lesson 1: Introduction to Wheat**

**Introduction:** Bread is known as the “staff of life,” a staple food for many civilizations, regarded highly because of its transformation through its rise. What are the ingredients in bread? (think – pair - share)

- Water: why?
  - When water is added to wheat flour, gluten forms. Flour has glutens precursors (gliadin and glutenin proteins) which, when mixed with water, create breads extensibility and elasticity (stretch and shape)
- Salt: why? For flavor
- Yeast: discuss kingdom, characteristics
  - As bread and dough ferments, the yeast produces CO<sub>2</sub> that causes the gluten network to expand
  - If gluten is too weak it can't stretch in thin films around the air bubbles, causing the loaf to lack volume. If gluten is too strong, then it won't stretch so the gas bubbles can't expand and cause a dense loaf.
- Flour:
  - Wheat makes glucose for energy. Excess is stored as polysaccharide starch.
  - It's starch (unlike others) can absorb water and won't disintegrate at higher temperatures
  - Amylase, a naturally occurring enzyme in the flour, breaks down starch polysaccharides into monosaccharide for the yeast
  - Baking: during baking, wheat starch absorbs more water, taking it away from gluten strands and making them more rigid so that the bread stands firm and doesn't collapse

#### **Activities:**

- Compare and discuss the difference between whole grain flour and white flour (show diagram of a wheat kernel)
- Make dough out of rice flour and wheat flour: compare the elasticity
- Thresh and winnow wheat

### **Lesson 2: Make a Starter Culture**

**Introduction:** Today we're going to focus on the yeast ingredient in bread. What is yeast? Where is yeast found?

- Pass around active dry yeast



- Pass around sourdough bread to taste: ask for student observations
- Discuss how sourdough is made from a starter culture that captures the yeast.
  - Somewhere in ancient Egypt, someone noticed that a forgotten bowl of porridge was bubbling and expanding – when it was heated in an oven it grew larger, trapping the bubbles in an airy yet stable structure that resembled a sponge.
  - Sourdough culture contributes not just air but texture and flavor. Wild yeasts and bacteria find their way into the batter, take up residence, and eventually organize themselves into a more or less stable microbial community.
  - A sourdough culture is made of specific yeast and bacteria strains suited to living together, each consuming different sugars. When the yeasts die, their proteins break down into amino acids that the lactobacilli need to grow. The lactobacilli produce organic acids that make the environment agreeable to the yeast we want but disagreeable to other yeasts and bacteria.

**Activity:** Make a sourdough starter

- Students should stir starter everyday to add in oxygen until the starter bubbles
- Once the starter shows vigorous bubbles, it needs to be fed every day. To feed it, take out 50% of it and feed it an equal mix of whole-wheat flour and white flour. Mix in water so that it is a moist dough consistency.

### **Lesson 3: Introduction to Bread Baking**

**Introduction:** Today we're going to make two simple doughs. One will be made with white flour and one will be made with a mix of white flour and whole wheat flour. As we work with these two doughs, what do you think will be different about them?

**Activity:** Make white dough and a whole-wheat dough with active dry yeast.

- Teach students to knead dough. Notice the differences in each as they are kneaded.
- Do the "window test" with both doughs.
- If possible: Let the dough ferment and bake to eat that afternoon or the next day!

**Lesson 4:** Bake with sourdough culture (ideally with school garden wheat!)