Experiment with Flour

After making some loaves of bread, try this food science experiment and explain the results. If you need help understanding the results, refer back to the Yeast Breads section beginning on page 21. Your Project Helper can help you understand the results too.

Purpose: To determine how different flours affect the taste, texture, and volume of yeast breads.

Materials Needed

Ingredients and equipment to prepare one recipe of Basic Bread and variations with different flours such as, wheat, rye, bread flour, etc.

Procedure

1. Prepare Basic Bread recipe as directed (refer to page 41).
2. Prepare at least two variations of the recipe substituting whole wheat, rye, bread, or other flour for one-half of the all-purpose flour.
3. When completely cooled, compare the loaves of bread and record what you observe.

- What do you observe about the volume of each loaf of bread?

_____

_____

_____

_____

- Use a bread knife to slice each loaf in two. What do you observe about the texture of each loaf?

_____

_____

_____

_____

- Taste each loaf. Do you taste any differences between the loaves? _____
  Explain.

  _____

  _____

  _____

- What effect, if any, does the type of flour have on the volume of bread?

  _____

  _____

  _____

- What effect, if any, does the type of flour have on the texture of bread?

  _____

  _____

  _____

- What effect, if any, does the type of flour have on the taste of bread?

  _____

  _____

  _____

- Which loaf of bread do you prefer? _____
  Why?

  _____

  _____

  _____

- How will you apply this information when making bread in the future?

  _____

  _____

  _____

Experiment with Kneading

Many home bakers enjoy kneading dough because it can be very relaxing. Whether you enjoy it or not, kneading is an important part of making yeast breads. Do you know why? This food science experiment will help you understand how kneading affects yeast breads. If you need help understanding the results, refer to the Yeast Breads section beginning on page 21 or ask your Project Helper for help.

Purpose: To determine how kneading affects the texture, volume, and taste of yeast breads.

Materials Needed

Ingredients and equipment to prepare one recipe of Basic Bread, 3 small mixing bowls, nonstick cooking spray, 3 clean and damp dishtowels, 3 small baking pans

Procedure

1. Prepare Basic Bread recipe as directed (refer to page 41), but before kneading bread, divide it into 3 equal portions.
2. Lightly coat 3 small mixing bowls with nonstick cooking spray. Label bowls #1 through #3.
3. In bowl #1, place one portion of unkneaded dough. Lightly coat dough with nonstick cooking spray, cover bowl with dishtowel, and set in warm place until dough has doubled in size.
4. Knead one portion of dough for 4 minutes. Place dough in bowl #2. Lightly coat dough with nonstick cooking spray, cover bowl with dishtowel, and set in warm place until dough has doubled in size.
5. Knead last portion of dough for 10 minutes. Place dough in bowl #3. Lightly coat dough with nonstick cooking spray, cover bowl with dishtowel, and set in warm place until dough has doubled in size.
6. When each portion of dough has doubled in size, follow directions in Basic Bread recipe for shaping, rising, and baking bread. Remove loaf from baking pan, place on cooking rack, and label with #1, #2, or #3.
7. When completely cooled, compare the three loaves of bread and record what you observe.
    - What do you observe about the volume of each loaf of bread?

      _____

      _____

      _____

- Use a bread knife to slice each loaf in two. What do you observe about the texture of each loaf?

_____

_____

_____

- Taste each loaf. Do you taste any differences between the loaves?

_____

_____

_____

- What effect, if any, does kneading have on the volume of bread?

_____

_____

_____

- What effect, if any, does kneading have on the texture of bread?

_____

_____

_____

- What effect, if any, does kneading have on the taste of bread?

_____

_____

_____

- How will you apply this information when making bread in the future?

_____

_____

_____

Experiment with Yeast

After reading about the bread making process, try these food science experiments and explain the results for each experiment. If you need help understanding the results of an experiment, refer to the Yeast Breads section beginning on page 21. Your Project Helper can help you understand the results too.

Experiment 1

Purpose: To determine the effects of temperature on yeast growth

Materials Needed

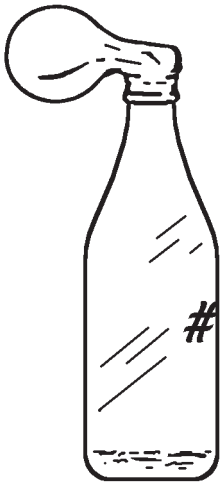
Small funnel, yeast, sugar, water, 4 clean bottles with narrow tops, food thermometer, balloons, pencil, and paper (Note: if you don't have a small funnel, roll a plain piece of paper into the shape of a funnel. Place the narrow end into the bottle.)

Procedure

1. Use the funnel and pour 1 teaspoon of yeast and 1 teaspoon of sugar into each bottle.
2. Label the bottles #1 through #4.
3. Add 2 tablespoons water to each bottle as follows.

   Note: rather than heating the small amount of water needed, you may want to heat about 1/2 cup of water to 105 degrees F to 115 degrees F in the microwave. After measuring out the needed 2 tablespoons, return remaining water to microwave and heat to boiling.

   - Bottle #1 — water heated to 105 degrees F to 115 degrees F
   - Bottle #2 — boiling water
   - Bottle #3 — cold water
   - Bottle #4 — cold water



4. Cover the bottles with balloons and shake gently to mix the ingredients.

5. Leave bottles #1, #2, and #3 at room temperature.

6. Place bottle #4 in the refrigerator.

7. Let bottles stand for 30 minutes. As the yeast begins to grow, it consumes the sugar and releases carbon dioxide and alcohol. The balloon with expand as the carbon dioxide is released. Observe the formation of carbon dioxide in each bottle and answer the following questions.

   - What do you observe about each bottle and balloon?

     _____

     _____

     _____

   - What caused the differences you see, if any?

     _____

     _____

     _____

   - What effect does temperature have on yeast?

     _____

     _____

     _____

   - How will you apply this information when using yeast in recipes?

     _____

     _____

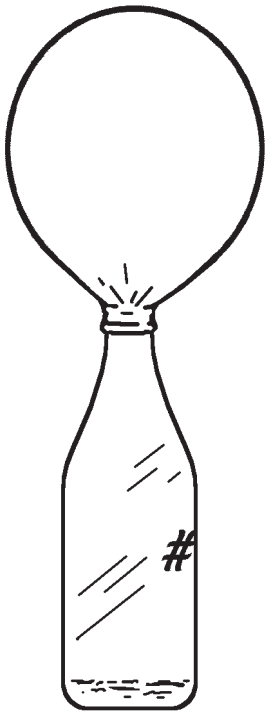
     _____

     _____

     _____

     _____

     _____



Experiment 2

Purpose: To determine the effects of sugar and salt on yeast growth

Materials Needed

Yeast, flour, water, sugar, salt, 3 cups, pencil, paper, and measuring spoons

Procedure

1. In each cup, place 1 teaspoon of yeast and 2 tablespoons flour; stir. Add 1 tablespoon water to each cup and mix thoroughly.

2. Label the cups #1 through #3.
3. Add 1 tablespoon sugar to cup #2 and mix thoroughly.
4. Add 1 tablespoon sugar and 1 teaspoon salt to cup #3 and mix thoroughly.
5. Let all three cups sit at room temperature for 20 minutes. Compare the mixture in the cups and record what you observe.

- What do you observe about the mixture in each cup?

_____

_____

_____

- What caused the differences you see, if any?

_____

_____

_____

- What effects do sugar and salt have on yeast?

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_____

- How will you apply this information when using yeast in recipes?

_____

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_____

Experiment with Butter

Making butter was a fun chore for young people when more families lived on small farms and kept dairy cows to provide milk for the family. The rich cream from the fresh milk was removed and then churned to make butter. Children enjoyed cranking the butter churn used to make the cream into butter.

Making butter at home is still a fun project, even if you don't have cows to provide the fresh milk. You can use whipping cream, which has a high fat content, to make homemade butter. Let's experiment!

Ingredients: 2 cups whipping cream (available at grocery stores in the dairy section), 1/4 teaspoon salt, yellow food coloring (optional)

Equipment needed: measuring cups and spoons, mixer, beaters, mixing bowl, rubber spatula, colander, storage container

Procedure

1. Pour whipping cream into mixing bowl and let it sit for about 15 to 20 minutes to reach room temperature.
2. To prevent the cream from splattering during mixing, you may want to make a cover for the mixing bowl from a paper plate. Cut into the center of the plate and then cut a circle just large enough to fit around the stems of the beaters. Slide the cover around the beaters and rest the outer edge of the plate on the rim of the mixing bowl.
3. Set the mixer to a high speed and beat the cream until it is light and creamy in color and the liquid separates. This will take about 8 to 10 minutes. Place the cream mixture in a colander to drain off liquids. Gently rinse the butter mixture with cold water. Return butter mixture to mixing bowl.
4. Use the rubber spatula to press the butter and remove remaining liquids — a combination of water and buttermilk. Drain well.
5. Add salt to the butter and a drop of yellow food coloring, if desired. Mix to combine.
6. Spoon the butter into a measuring cup. Press the butter firmly into the measuring cup to remove any air pockets. Record the amount of butter you made:

   _____

7. Place the butter in a serving dish and refrigerate until thoroughly chilled.
8. Spread butter on crackers or bread for tasting and answer the following questions.

   - Did you enjoy making your own butter?_____ Why or why not?

     _____

     _____

     _____

   - How did the taste of the homemade butter compare to purchased butter?

     _____

     _____

     _____

   - Compare the cost of the ingredients to make butter to the cost of purchasing the same amount of butter. Record those amounts and costs:

     _____

     _____

     _____

     Is it less expensive to make or purchase butter?_____

   - Normally, fat does not mix well with other liquids — think about making salad dressing. You have to stir or shake it before each use to mix the oil and vinegar. Why do you think the fat and buttermilk stayed together in the whipping cream?

     _____

     _____

     _____

   - What do you think caused the fat and buttermilk to separate? Why?

     _____

     _____

     _____

You may not be able to answer the last two questions without a little more information. The fat in cream is in very tiny pieces that are surrounded with a protein coat — much like the candy coating on pieces of chocolate. The protein coating is an emulsifier. An **emulsifier** keeps the fat dissolved in the liquid milk or cream. When the cream is beaten or shaken, the protein coat is broken. The fat comes together and separates from the liquid.

Experiment with Cheese

A cheese tasting is a fun way to sample new cheeses. You can invite some friends and make it a party. Start with two to three new cheeses. Include one favorite cheese for comparison. List the cheeses you will taste and record your findings in the table below.

About 30 minutes before the cheese tasting, remove the cheeses from the refrigerator. Place half of each cheese on a serving tray. Return remaining cheese to the refrigerator until time for tasting. This will allow you to compare the flavors of cold and room temperature cheese.

Type of Cheese	Flavor	Comments
	Room temperature: Cold:	
	Room temperature: Cold:	
	Room temperature: Cold:	
	Room temperature: Cold:	

Did the temperature of the cheese affect the flavor of the cheese? _____

If so, how?

_____

_____

_____

How did the flavor of the new cheeses compare to your favorite cheese?

_____

_____

_____

Which cheese did you prefer? _____

How might you serve this cheese in the future?

_____

_____

_____

What did you learn about trying new foods?

_____

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