

Dough Balls

Introduction

In this activity we will explore the effect of gluten content on the leavening of bread dough using flour with varying gluten content.

Material

All purpose flour
Whole wheat flour
Gluten flour
Gluten free flour
Active dry yeast
Sugar
Water
4 small bowls or cups
Spoon
4 clear plastic cups
Measuring cup
Measuring spoons
Permanent marker



To Do and Notice

Measure $\frac{1}{4}$ teaspoon active dry yeast into 4 small bowls or cups. Add 2 tablespoons warm water ($\sim 110^{\circ}\text{F}$) to each cup to resuscitate the yeast. Add 1 Teaspoon sugar or one sugar cube to each cup and stir until dissolved. Wait a few minutes to see if the yeast starts to bubble. The yeast ferments the sugar to create carbon dioxide gas. If the yeast doesn't bubble, the yeast is over the hill, or the water temperature is not right.

To each bowl add $\frac{1}{3}$ cup of one type of flour and label the cup with the type of flour used. Mix until blended with a spoon then remove each mixture and knead for approximately 50 strokes. Place the kneaded dough into 4 clean plastic cups and label each cup with the type of flour used. Draw a horizontal line on the side of each cup with a permanent marker to record the initial height of the dough. Finally place the four cups in a warm area to allow the dough to rise ($\sim 80^{\circ}\text{F}$). The top of an overhead projector works nicely. Allow the dough to rise for one hour, noting the height of the dough in 10-minute intervals.

Which dough ball was the quickest to rise?

Which dough balls have a rubbery texture?

Which type of flour trapped the most carbon dioxide gas?

What's going on?

A leavening agent is a substance that produces fermentation or gas to separate the proteins in dough and batters. A leavening agent helps introduce air, steam, or carbon dioxide bubbles into dough allowing the final product to be light and fluffy.

Yeast is a live, single-celled fungus, which feeds on starches and sugars, producing carbon dioxide gas and alcohol as by-products. After resuscitating dry yeast with warm water and giving it sugar to feed on, kneading the dough helps develop elasticity in the flour, strengthening the dough enough to trap the gases produced by the yeast. Dough is then left to rise at an optimum temperature of 80°F (27°C).

Flour contains two proteins, *glutenin* and *gliadin*, which, when combined with water, form gluten. As dough is kneaded, the gluten becomes more elastic ensuring that the carbon dioxide gas remains trapped as the bubbles enlarge.

High protein flours will produce dough with a strong gluten structure trapping many bubbles of carbon dioxide producing hearty breads. Low protein flours produce a very delicate structure, ideal for pastries.