E You can also test bread for carbon dioxide.

Materials

2 Test tubes
A friend to help
3 tablespoons Limewater
1 Straw that can be bent or a Glass tube with a bend in it
1 Clamp
2 teaspoons Bread crumbs
1 Cork or Rubber sealer with a hole in the middle

Method:

Place the bread crumbs in one test tube and seal with the cork or rubber sealer. Push the shorter end of the straw through the hole in the cork and rest the other end in the test tube with the limewater. You will need a friend to help you with the next part. Ask your friend to hold the test tube with the limewater. Now clamp the other test tube and hold it over a low Bunsen burner flame. Burn the bread slightly. Make sure the gases produced are bubbled through the limewater.

Did the limewater turn milky?

E How do you know there is water in bread?

This simple test will tell you.

You need the following materials:

2 Test tubes
Clamp
White anhydrous copper sulphate
1 tablespoon Bread crumbs
Bunsen burner

Put the bread crumbs in a test tube. Using a clamp hold the test tube over a low Bunsen burner flame, Slightly burn the bread. When you notice droplets of liquid forming at the top of the test tube remove it from the heat. Now add a small amount of white anhydrous copper sulphate to the liquid. If the white anhydrous copper sulphate turns blue there is water present.

NEW ZEALAND BREAD & FLOUR INFORMATION CENTRE

activities

The Science behind bread making

Have you ever wondered why some foods don't taste good together-like jam and onion on toast? Why do some foods taste delicious together-like a cheese and marmite sandwich? Ask a Food Technologist! A Food Technologist who specialises in baked goods will research and test all types of foods for the baking industry. He/she would know all about flour and how it works with other ingredients. You will too, after doing these experiments and activities. Have fun and learn heaps!

E Thirsty Experiment

Aim

To see how much gluten protein there is in different kinds of flour.

Materials

1 cup Wheat flour
Tap water
1 cup Rye or Barley flour

Method

Mix enough water with the wheat flour to make a smooth dough like clay. You will need to measure the amount of water used. Mix exactly the same amount of water used for the wheat flour with the rye flour.

Results

Gluten which is present in wheat soaks up a lot of water because it is a 'thirsty' protein. The second mixture will stay sticky and wet because there is not enough gluten in rye or barley flour to soak up all that water. Not all wheat flours contain the same amount of gluten. Hard wheats, which are high in protein, contain the most gluten. Bread made out of hard wheat flour such as bread flour will rise the most. Soft or low protein wheats such as cake flour contain the least amount of gluten and therefore will rise the least. All purpose flour is a blend of hard and soft wheats and will produce a medium sized loaf of bread.

E What happens when carbon dioxide from yeast is not used in making bread?

To find out you need 50 grams of plain flour and cold water. Put the flour in a bowl and gradually add the water, mixing all the time. Add water until you have a stiff paste or dough. Roll the dough into a ball on a floured surface. Place in a greased baking tin and bake at 230°C (450°F) for 10 to 15 minutes or until golden brown.

This bread is called unleavened bread. What do you notice about the colour, texture, mouth feel and taste? Can you name five types of unleavened bread from around the world?

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The Gluten Washing Experiment

Aim

To separate and measure the gluten (protein) part of flour from the starch part. The starch is the milky-white substance washed away.

Materials

Several different brands of white flour
Tap water
Measuring equipment
Bowls
Spoons

Method

Take one flour at a time and weigh 20 grams of the flour to be tested and place it in a clean bowl. Add 10 millilitres of tap water and mix into a dough with a spoon, taking care that none of the flour or water is spilled during this procedure. Cover the piece of dough with cold water from the tap and leave it for about 30 minutes. Tip the dough into a sieve. Turn the cold water tap onto a very slow flow and wash the dough. You will need to work the dough all the time (kneading with your fingers) until the water running from it is clear and no longer a "milky" white. It is important to collect all the lumps. You can easily add them back to the ball of dough you are working with. Once the water is clear, squeeze the gluten ball with your fingers to get rid of as much water as possible, and put it aside on a smooth surface for about 10 minutes. More water will settle out. Weigh the gluten ball and round the weight to the nearest whole number. To estimate how much dry gluten you have, multiply the weight of the gluten ball by 5 and divide the result by 3. For example: from 20 grams of flour, you may have a gluten ball that weighs 9 grams.

Multiply by 5	9 x 5 = 45
Divide by 3	45 ÷ 3 = 15% gluten

Results

Using the example above, 15% of the flour you started with is protein. The remaining 85% is starch and other substances. Different flours will produce different amounts of gluten. Test each one to find out and record on a line graph. Remember to always:

1. Mix each sample for the same amount of time
2. Soak the dough ball for exactly 30 minutes
3. Keep the temperature of the water the same for all samples
4. Keep the rate of flow of the washing water, and the amount of washing time the same
5. Make sure you collect all the dough pieces in the sieve and add them to the dough.

For fun just get gluten (it's like chewing gum) out of the flour. Use 100 grams of flour and 56 millilitres of water. Make a big thoroughly mixed dough. Soak this, under water, for 30 minutes and then wash it under a constant flow of water in the same way as in the previous experiment.

Find out what happens when gluten is baked. Weigh then place some of the gluten ball on a greased oven tray. Bake it in a hot oven (220°C/425°F) for about 20 minutes. You will see it blow up into a big ball and then turn golden brown. Let it cool and weigh it again. Break it in half. What do you notice?

Stretch that dough!

Aim

To test dough's extensibility, elasticity, and stability during fermentation.

Method

Prepare a yeast dough and divide it into five or more portions. Leave these portions to ferment or rise in a warm place. Make up a time schedule, e.g. at zero time, and then every 30 minutes thereafter. At each time interval, test a portion of dough for its extensibility, elasticity, and stability.

The tests are as follows

Extensibility: Lengthen the dough by stretching it with your fingers.

Elasticity: Stretch the dough and wait for it to return to its original shape.

Stability: Round the dough up and put it on a table. If the dough spreads or flattens it has little stability.

Results

You will find that the stability increases with fermentation time. Elasticity, or 'spring' also increases with fermentation but beyond a certain point the dough will stay elastic for a small amount of stretching only. A dough's extensibility is lost if during stretching it begins to snap. The baker describes this as being 'short', which is a sign of too much fermentation.

If you have read the information sheet called 'What goes on when bread is made' you will know how carbon dioxide gets into bread. Carbon dioxide can be found in other places. Can you think of them? To help you out try this fun experiment.

You will need to make some limewater. Limewater is a good indicator that carbon dioxide is present. To make limewater mix 2 tablespoons of hydrated lime with 2 litres of water and let it stand for a day. You can get hydrated lime from a garden centre. Put 50 millilitres of limewater into a glass. With a drinking straw blow bubbles in the limewater. What happens? Try this experiment with friends. Does the same thing happen? The limewater turns milky because your breath contains carbon dioxide (CO_2). What you see are very fine white particles. These are made when carbon dioxide reacts with the lime in the limewater.