

Gluten Content in Different Types of Wheat Flour

Science Research Project
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Background information

Gluten gives wheat flour the properties of making dough plastic and elastic. Wheat flours differ because they are made from different parts of the wheat kernel or because they are from different types of wheat. These can be categorized into 'hard' and 'soft' wheat. Hard wheat contains more gluten and protein and is good for breads and cakes because it doesn't form large air pockets, while soft wheat flours are starchier (contain less gluten and protein) and are better for soft breads. Stirring and kneading strengthens and organizes the gluten mesh. It can be easily separated from the other water-soluble elements in flour by rinsing with water.

Experimental Variables

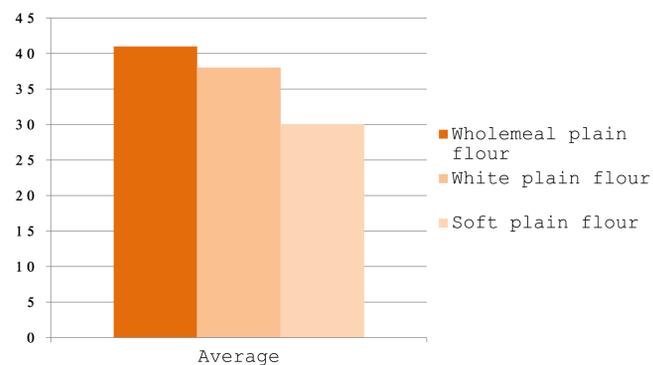
Independent variable - the type of wheat flour (wholemeal plain, white plain, soft plain)
Dependant variable - the weight of each gluten ball
Controlled variables - quantity of flour and water, temperature, bowls, time spent kneading, tap water and resting time.

Observations

The wholemeal plain flour feels rough, has little yellow bits of roughage in it and is overall darker than the other flours. The white plain flour feels soft and is white with no bits. The soft plain flour feels even softer and is the whitest of the three. After kneading for a minute, the dough grew more elastic and bounced back when poked.

When rinsing, the soft-flour dough lost its white and was similar to the wholemeal gluten ball in colour. This might be due to bleach in the flour draining away. The final gluten balls can be stretched a lot. They feel sticky and bounce back when touched.

Average Grams of Gluten in 1 Cup of Wheat Flour



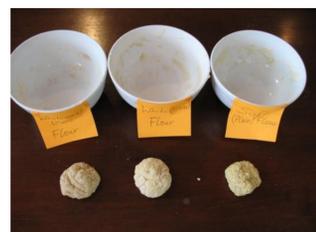
The dry flours, sorted in their labelled bowls



Stirring in the water



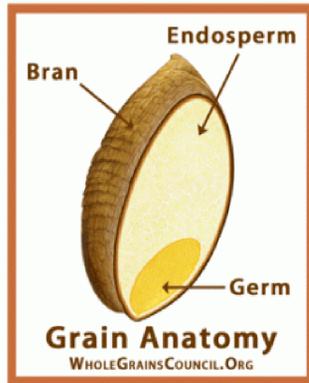
Resting the dough



The final gluten balls

Introduction

When we heard that there is an easy way of separating gluten from flour we knew we would do this experiment. Our families have a history of gluten intolerance and so the subject of gluten has always interested us. Also when baking, it is good to know whether or not the types of flour you use are any different.



Materials and Equipment

Wholemeal plain flour, white plain flour and soft flour.
3 small mixing bowls
Measuring cup, 1-cup size
Fork
Work surface
Clock or watch
Strainer with small holes
Scale (g)

Results

Flour type	Weight (g)		
	Wholemeal plain flour	White plain flour	Soft plain flour
Trial 1: Gluten Ball	41	36	29
Trial 2: Gluten Ball	32	37	30
Trial 3: Gluten ball	50	40	32
Average Gluten Ball	41	38	30



Kneading the dough to develop gluten



Dissolving the starch in the dough

Aim

To find out whether different types of wheat flour contain differing quantities of gluten.

Hypothesis

The different types of wheat flour will contain differing amounts of gluten. The wholegrain flour will contain the most, the plain flour less and the soft flour the smallest amount of gluten.

Risk Assessment

There is a risk for people with gluten intolerance. Cleaning the experiment workplace very thoroughly after completion of the experiment is a good measure if people with gluten intolerance are around.

Method

1. Label each bowl with the type of flour being placed in it.
2. Measure out a cup of each flour into a bowl. Note any differences in colour and feel of the flours.
3. Select one bowl and slowly add 1/2 of a cup of tap water while mixing with the fork until a rough ball has formed.
4. Dust work surface and hands with the flour used and knead the dough for 5 minutes, using a stopwatch.
5. Place the dough back into its bowl and let it rest for ten minutes.
6. Repeat steps 3 - 5 for the other bowls.
7. Take one of the balls of dough to the sink and cup it in your hands over the strainer. Let cold water run on it and gently pull and stretch it apart. This will wash away all water soluble elements in the dough, leaving the gluten.
8. Continue rinsing the dough until very little milky liquid (starch) runs out and only a sticky, stringy ball remains, then place back into its bowl.
9. Rinse off the strainer to remove any of the old flour and repeat steps 7 and 8 for each dough. The results are three balls of gluten.
10. Weigh each gluten ball on a scale (in grams) and record the results in a table.
11. Repeat steps 1- 10 two more times for three trials of the experiment.
12. Average the weights for each type of flour and record in the table.

Data Analysis

Although the average of the wholemeal flour exceeded the other flour's quantity of gluten, trial two brought up some confusing results. While the white and soft gluten balls had slightly higher weights than in trial one, the wholemeal gluten ball's weight was much lower. We can't explain this except that we must have made a mistake in timing. Though we know we had the exact same amounts of flour for each trial due to careful measuring, the resting period of the wholemeal dough might have been shorter than the other ones. That would explain the sudden drop in gluten content, as the gluten protein requires some time to develop

Discussion

It was surprising how much gluten is present in one cup of flour: about a quarter of a cup. The differences in gluten content show us that there is a difference when using different flours for baking. Using wholemeal flour will result in stronger dough because it contains more gluten.

It will also make dough more plastic and elastic. An error in this experiment might be that the wholemeal flour contains a lot of roughage; hence less actual flour contributes to the total of the gluten ball. Considering this, there must be even more gluten in a cup of wholemeal flour where roughage is filtered out.

Conclusion

The results prove that we were right in our hypothesis: different types of wheat flour do contain differing quantities of gluten.

Further Research

Our next step now could be to try the experiment again, but this time filtering out the large bits in the wholemeal flour for more accurate results. To further broaden my research we could next try to add different ingredients like sugar, oil and salt to the flours and then reduce it to the gluten ball. This would let us see how different additives affect the gluten content in baking.

References

http://www.sciencebuddies.org/science-fair-projects/project_ideas/FoodSci_p040.shtml#background
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<http://wholegrainscouncil.org/whole-grains-101/what-is-a-whole-grain>
http://archive.gramene.org/species/triticum/wheat_intro.html