Gluten 101

What are the differences in gluten between different types of flour?

Background

Gluten is a general name for the proteins found in wheat, barley and rye. Why is gluten so important in baked goods? Without it, there would be nothing to hold the gas that makes bread rise. Think of gluten like the rubber of a balloon: the stronger it is, the more gas it can hold. However, stronger isn't always better. For many baked goods, like pastries and pie crusts, it's important to avoid gluten development to achieve a light and airy structure. That's why different types of flour contain different amounts of protein depending on how they are meant to be used.

Materials

Bread flour (ex. Gold Medal, Pillsbury, King Arthur)
Cake or pastry flour (ex. Swans Down, King Arthur, Bobs Red Mill)
Whole wheat flour (ex. Bobs Red Mill, King Arthur)
Gluten-free flour (ex: rice flour, corn flour)
Water
Small bowls labeled with each flour type (4 per group)
Measuring cups
100mL beaker or graduated cylinder
scales

Procedure

*****DO NOT CONSUME ANY RAW FLOUR OR DOUGH DURING THIS EXPERIMENT*****

1. Measure ½ cup of each flour type into separate labeled bowls.

    a. If scales are available, weigh 60g of bread flour, 53g of cake/pastry flour, 57g of whole wheat flour, 71 g of rice flour or 60 g of corn flour into separate labeled bowls. (These measurements are taken from https://www.kingarthurbaking.com/learn/ingredient-weight-chart)

2. In a 100mL graduated cylinder, measure 75mL of water and slowly pour it into the bowl containing the bread flour.
3. Knead the flour & water mixture until it becomes a soft, rubbery ball of dough.
4. Let the dough ball sit for ~10min.
5. In the sink, run cold water over each dough ball to isolate the gluten network. Cup your hands around the dough ball and gently squeeze it to remove the starch. Be careful not to let the dough disintegrate!

    a. Notice what happens with each different flour type and record your observations in the table below

6. The water turns milky as it washes away the starch in the dough. Keep rinsing until the water runs clear and you have a gummy/slimy network of gluten strands leftover.

    a. Notice how much smaller and more elastic each dough ball becomes once it is pure gluten. Record your observations in the table below.

7. Repeat steps 2-6 for the cake/pastry flour, the whole wheat flour and the gluten-free flour.

Observations

1. Record your observations for each flour type in the boxes below as you form each dough, wash the starch away, and evaluate the gluten network left behind.
2. How does the texture and elasticity of each dough ball differ as you wash away the starch?
3. How long did it take to rinse the starch from each dough ball? Was one shorter or longer than the others?
4. Which gluten network was the smallest after washing the starch away? Which was the biggest? Why do you think that is?
5. What happened to the gluten-free flour?

	Bread flour	**Cake/pastry flour**	**Whole wheat flour**	**Gluten-free flour**
Texture/elasticity				
Time to rinse away starch				
Size of gluten/protein network				