

Laboratory Work 6

Title

Determination of the mass fraction and quality of gluten in wheat flour.

Objective of the Work

- To determine the mass fraction of gluten in wheat flour.
- To assess the quality of gluten based on its elasticity and water absorption.
- To understand the role of gluten in flour quality and dough properties.

Theoretical Background

1. Gluten in Wheat Flour

Gluten is a protein complex in wheat flour consisting mainly of gliadin and glutenin. It forms a viscoelastic network when hydrated, providing dough with elasticity and strength.

Importance of Gluten:

- Affects dough elasticity and extensibility.
- Influences bread volume and texture.
- Serves as a key quality indicator for wheat flour.

2. Mass Fraction of Gluten

- Expressed as a percentage of the flour mass.
- Determined by washing out starch and soluble components from a known amount of flour, leaving gluten as residue.

3. Quality Assessment of Gluten

- Elasticity: ability to stretch without breaking.
- Water absorption: how much water the gluten can retain.
- Visual and tactile characteristics (color, stickiness, consistency).

Equipment and Materials

- Wheat flour samples
- Analytical balance
- Beakers and glass rods
- Sieves and muslin cloth
- Distilled water
- Stirring rod or spatula
- Measuring cylinder
- Timer
- Oven (optional for drying gluten)
- Protective gloves and goggles

Experimental Procedure

A. Determination of Gluten Mass Fraction

1. Weigh a known amount of wheat flour (e.g., 10 g).
2. Place flour in a beaker and add distilled water gradually to form a dough.
3. Knead the dough for 10–15 minutes under running water to wash out starch and soluble substances.
4. Collect the wet gluten remaining on the sieve or muslin cloth.
5. Weigh the wet gluten (m_{wg}).
6. Optional: dry the gluten at 105 °C until constant weight to determine dry gluten (m_{dg}).
7. Calculate mass fraction of gluten:

Wet gluten (%):

$$GF_{wet} = (m_{wg} / \text{mass of flour}) \times 100$$

Dry gluten (%):

$$GF_{dry} = (m_{dg} / \text{mass of flour}) \times 100$$

B. Assessment of Gluten Quality

1. Stretch the wet gluten to assess elasticity and strength.
2. Observe water absorption by noting the amount of water retained per gram of gluten.
3. Record visual and tactile properties (color, stickiness, cohesiveness).

Calculations

- Wet gluten fraction (%): $GF_{wet} = (m_{wg} / m_{flour}) \times 100$
- Dry gluten fraction (%): $GF_{dry} = (m_{dg} / m_{flour}) \times 100$

Results Presentation

Sample	Mass of flour (g)	Wet gluten mass (g)	Wet gluten fraction (%)	Dry gluten mass (g)	Dry gluten fraction (%)	Elasticity	Water absorption	Notes
Flour A								
Flour B								

Discussion

- Compare gluten fractions with standard wheat flour quality indicators.
- Discuss how gluten quality affects baking properties.
- Explain factors affecting gluten mass fraction and quality, such as wheat variety and flour type.

Conclusion

The laboratory work allowed determination of the mass fraction and quality of gluten in wheat flour. Gluten content and its characteristics are critical indicators of flour quality for baking and other food applications.