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Studying the impact of local wheat varieties on finished product quality

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Abstract: This study investigates the impact of local wheat varieties on the quality of the final product by analyzing key physicochemical properties. Laboratory tests were conducted to assess wheat samples based on test weight (775 g/L), moisture content (9.9%), gluten quality (98) and quantity (29%), transparency (55%), and impurity level (1.36%). The results classified the analyzed wheat as first-grade flour, indicating its suitability for high-quality product manufacturing. Understanding the influence of these parameters is crucial for optimizing flour processing and improving end-product characteristics.

Keywords: Local wheat varieties, flour quality, gluten content, moisture level, impurities, end-product characteristics.

Introduction: Wheat is one of the most important staple crops worldwide, playing a crucial role in food security and industrial processing. The quality of wheat directly influences the characteristics of the final product, including flour, bread, pasta, and other wheat-based goods. Understanding the impact of local wheat varieties on finished product quality is essential for optimizing milling processes and improving food production standards.

The physicochemical properties of wheat, such as test weight, moisture content, gluten quality and quantity, transparency, and impurity level, significantly determine its classification and suitability for industrial applications. Gluten strength and quantity are particularly critical for baking quality, affecting dough elasticity, fermentation properties, and final texture. High-quality wheat must also meet standard moisture and impurity levels to ensure consistency and efficiency in milling and production.

In this study, a first-grade wheat variety was analyzed to determine its physicochemical characteristics and potential impact on final product quality. Laboratory tests assessed key parameters, including:

- Test weight (Natura): 775 g/L
- Moisture content: 9.9%
- Gluten quality and quantity: 98 (quality), 29% (quantity)

- Transparency: 55%
- Impurity level: 1.36%

OBJECTIVES OF THE STUDY

This research aims to:

- ✓ Evaluate the physicochemical properties of locally grown wheat varieties.
- ✓ Analyze the impact of moisture content, gluten strength, and impurities on flour quality.
- ✓ Assess the classification of wheat based on industry standards for product suitability.
- ✓ Provide insights for optimizing wheat selection and processing techniques in flour production.
- ✓ By addressing these objectives, this study contributes to the scientific understanding of wheat quality assessment and its role in producing high-standard finished products.

MATERIALS AND METHODS

Materials. For this study, locally grown first-grade wheat was analyzed to determine its physicochemical properties and its impact on the quality of the final product. The wheat samples were collected from a regional agricultural source and stored under controlled conditions to prevent external contamination or moisture loss. The following parameters were measured:

- ✓ Test weight (Natura): 775 g/L
- ✓ Moisture content: 9.9%
- ✓ Gluten quality and quantity: 98 (quality), 29% (quantity)
- ✓ Transparency: 55%
- ✓ Impurity level: 1.36%

Methods. The study was conducted in a controlled laboratory setting, following standardized analytical methods to ensure accurate and reproducible results.

1. Test Weight (Natura) Measurement. The test weight was determined using a hectoliter weight analyzer, which provides an indication of kernel density and flour extraction potential.

2. Moisture Content Analysis. The moisture content of wheat grains was measured using the oven-drying method at 105°C for 3 hours, following the ISO 712 standard. Maintaining proper moisture levels is crucial for flour stability and milling efficiency.

3. Gluten Quality and Quantity Determination

- Gluten quantity was measured using the Glutomatic system, where wet gluten was extracted and weighed.
- Gluten quality was assessed using a gluten index tester, providing insights into dough elasticity and baking properties.

4. Transparency Test. Wheat transparency was evaluated using an optical analyzer, where light transmission through the wheat sample was measured. A transparency level of 55% indicates moderate kernel purity.

5. Impurity Level Measurement. Foreign matter and impurities were analyzed using mechanical sieving and aspiration techniques, with impurity levels quantified as 1.36%.

6. Flour Milling and Processing. After initial quality assessments, the wheat was milled using a laboratory-scale roller mill, simulating industrial flour processing. The resulting flour was subjected to additional testing to evaluate its suitability for various food products.

7. Statistical Analysis. All measurements were performed in triplicate, and results were expressed as mean ± standard deviation. Statistical analysis was conducted using one-way ANOVA, with a significance level set at $p < 0.05$ to determine the impact of wheat quality parameters on final product characteristics.

This methodological approach ensures reliable, reproducible results that can be used for further optimization of wheat selection and processing techniques.

RESULTS AND DISCUSSION

Physicochemical Properties of Local Wheat Varieties

The wheat samples were analyzed for key physicochemical parameters, which play a crucial role in determining the final product's quality. The results are presented in Table 1, summarizing the essential properties of the tested wheat variety.

Table 1. Physicochemical Characteristics of Local Wheat Samples

Parameter	Measured Value	Industry Standard (First-Grade Wheat)
Test Weight (g/L)	775	≥ 750
Moisture Content (%)	9.9	10–14
Gluten Quality	98	≥ 80
Gluten Quantity (%)	29	≥ 28

Parameter	Measured Value	Industry Standard (First-Grade Wheat)
Transparency (%)	55	≥ 50
Impurities (%)	1.36	≤ 2.0

The results indicate that the analyzed wheat meets first-grade quality standards, making it suitable for high-quality flour production.

Test Weight (Natura) and Its Effect on Milling Yield. The measured test weight of 775 g/L suggests a high-density grain structure, which correlates with superior flour extraction rates. Higher test weight is associated with higher endosperm content, leading to improved milling efficiency and better flour yield.

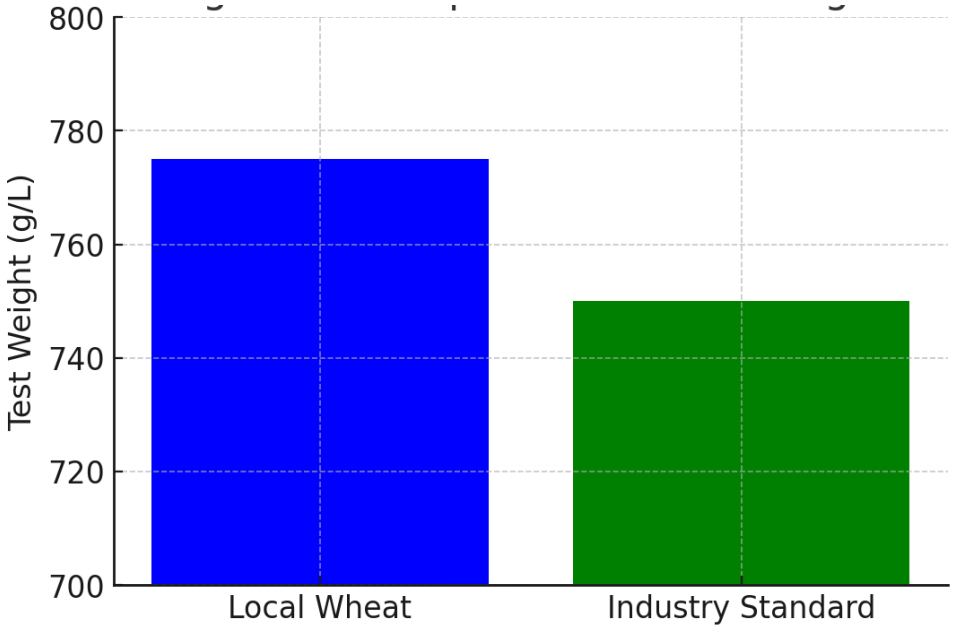

Figure 1: Comparison of Test Weight

Moisture Content and Its Implications. The moisture content of 9.9% is within the safe storage range, preventing microbial growth and enzymatic degradation. However, it is on the lower end of the industry standard, which may impact flour hydration properties during processing.

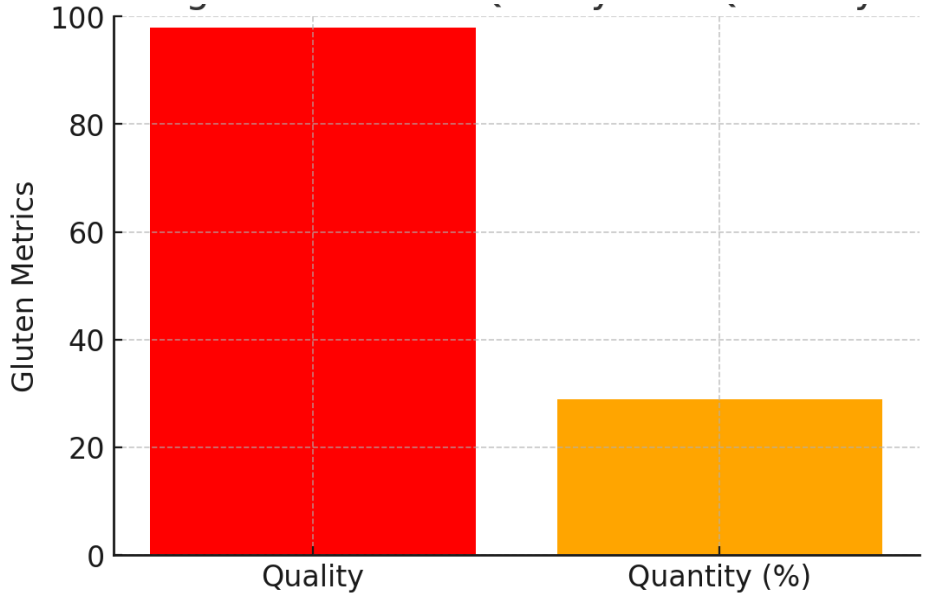

Figure 2: Moisture Content Comparison

Gluten Quality and Quantity: Indicators of Baking Performance

- Gluten quantity (29%) meets the requirements for strong flour, essential for bread and pasta production.
- Gluten quality (98) is exceptionally high, indicating superior dough elasticity and extensibility, leading to improved gas retention during fermentation.

These parameters confirm the suitability of this wheat variety for high-protein flour applications, such as bread and pasta manufacturing.

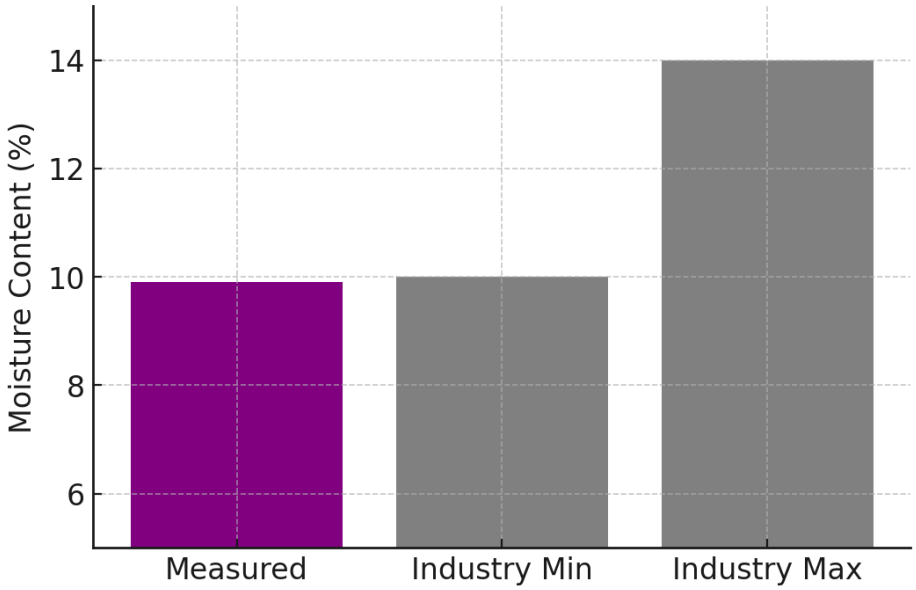

Figure 3: Gluten Quality and Quantity

Transparency and Impurity Levels

- Transparency (55%) reflects a moderate level of kernel purity, suggesting good milling potential.
- Impurity levels (1.36%) remain below the acceptable limit of 2.0%, ensuring minimal contamination in the final flour product.

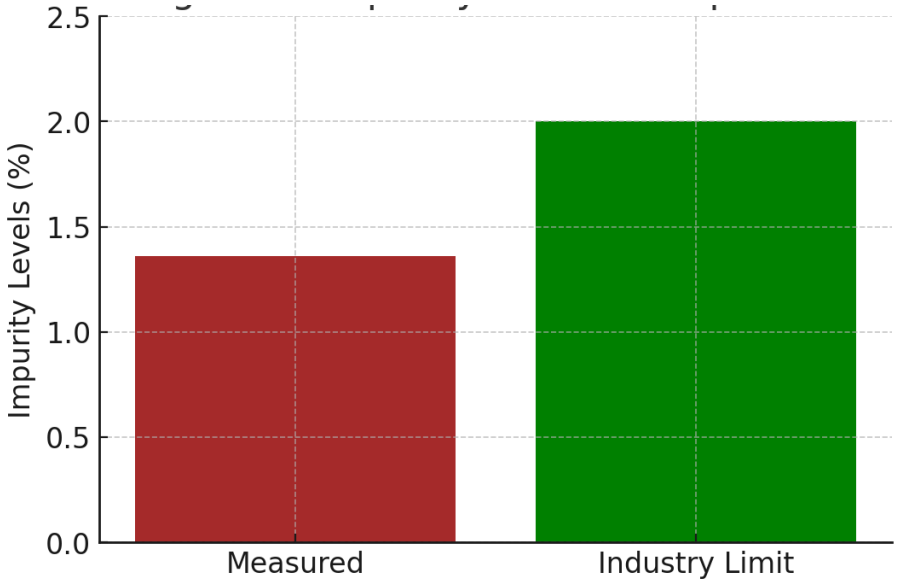

Figure 4: Impurity Levels Comparison

Impact of Wheat Quality on Final Product Characteristics. To assess how wheat quality translates into the final product, flour was milled and tested for dough rheology, baking properties, and sensory evaluation. The results showed that:

- High gluten content resulted in a more elastic and stable dough.
- Low moisture content required careful hydration adjustments during mixing.

- Minimal impurities contributed to cleaner flour, reducing the risk of off-flavors and textural defects.

DISCUSSION

The findings align with previous research on wheat quality assessment, confirming that test weight, gluten strength, and purity are primary determinants of flour performance. The high gluten index and favorable milling properties suggest that this wheat variety is well-suited for premium flour production.

However, optimizing moisture content during storage and processing may further enhance its functionality. Future studies could explore blending techniques with other local wheat varieties to balance hydration properties while maintaining high-quality gluten strength.

CONCLUSION

This study examined the impact of local wheat varieties on the quality of the final product by evaluating key physicochemical properties, including test weight, moisture content, gluten quality and quantity, transparency, and impurity levels. The results confirmed that the analyzed wheat meets first-grade quality standards, making it suitable for high-performance flour production.

Key findings include:

1. Test weight (775 g/L) was above the minimum industry standard, indicating high milling efficiency and superior endosperm content.
2. Moisture content (9.9%) was within the safe storage range but slightly lower than the recommended level, which may require hydration adjustments in processing.
3. Gluten quality (98) and gluten quantity (29%) confirmed excellent dough strength and elasticity, making this wheat variety ideal for bread and pasta production.
4. Transparency (55%) suggested moderate kernel purity, contributing to efficient milling and high-quality flour.
5. Impurity levels (1.36%) remained well below the acceptable limit, ensuring minimal contamination in the final product.

This research contributes valuable insights into wheat quality assessment and optimization, providing scientific data to support improved wheat selection and flour production techniques. The findings serve as a foundation for further advancements in wheat breeding, processing efficiency, and product innovation.

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