

QUALITY PARAMETERS OF WHEAT FOR INDUSTRIAL USES AND ITS AGRONOMIC IMPROVEMENTS

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ABSTRACT

Wheat is an important staple crop of the country with diversified uses, starting from wheat flour, biscuits, cakes, pasta, wheat germ, wheat bran, Maida and other end products. Even wheat straw is used in bio-ethanol production as feeding material for livestock. The composition of wheat flour varies for the production of various end products. Therefore, the physical and nutritional aspect of grain quality is critical. The quality parameters are protein content, falling number and test weight. Proper agronomic measures may improve wheat quality suitable for producing various industrial products.



INTRODUCTION

Wheat (*Triticum* sp.) is one of the most consumed cereals in the Globe and the second most important staple crop of the nation. It belongs to the Poaceae family and is cultivated in the Rabi season. The total wheat area in India is about 29.8 million hectares, with a production of 94.88 million tonnes. Wheat is also called the king of cereals. Wheat is generally eaten in the form of chapatti, a staple food. Apart from this, various other preparations of wheat are famous such as halwa, Dalia, sweet meals etc. Wheat is also known for its industrial uses. It is used in making flakes, cakes, biscuits, pasta etc. It contains more protein than other cereals. The wheat protein called "Gluten" is essential for the bakery industry. Gluten provides the structural framework for the familiar spongy, cellular texture of bread and other baked products. Wheat is largely exploited in flour-making, biscuit-making, and even in the cosmetic industry.

QUALITY OF WHEAT FOR INDUSTRIAL USE

The criteria of quality differ from person to person. The farmer always expects a high yield, the miller expects good milling quality, and the baker expect flour suitable for the end products he desires to produce. The physical and nutritional aspects of wheat grain determine its quality.

PHYSICAL ASPECT OF GRAIN: The physical aspect of grain is determined by purity, moisture content, appearance (colour, size and plumpness) and hardness of the kernel.

- ✓ **The purity of grains** is measured by determining the percentage of pure wheat grains in a bulk sample.
- ✓ **The moisture content** of wheat is crucial from a storage and milling point of view. 12% is the optimum moisture content in the grain.
- ✓ **Appearance-wise**, large, plumed grain of amber in colour is considered better.
- ✓ **Pearling Index** judges the hardness of kernels. A higher value of the pearling index indicates less kernel hardness.

$$\text{Pearling Index} = \frac{x - y}{x} * 100$$

Where x is the initial sample weight, and y is the weight of the material left on a 30-mesh sieve.

- ✓ **The nutritional aspect of grain:** Generally, chemical analysis is done to determine the nutritional aspect of wheat grain.

Table 1: Nutritional aspect of wheat grain

| Chemical constituents | Amount in percentage |
|-----------------------|----------------------|
| Starch | 60-68% |
| Protein | 8-15% |
| Fat | 1.5-2% |
| Cellulose | 2-2.5% |
| Minerals | 1.5-2% |

MILLING QUALITY:

The following standards judge the milling quality.

1. The maximum yield of flour is free from germ and bran.
2. The relative ease with which a high turnover of flour is obtained.
3. The low ash content indicates a thorough separation of bran from flour is obtained.

Chapatti-making quality: It comprises dough colour, water absorption, dough properties (mixing and handling), puffing, texture, preservation quality, taste and aroma. Bread-making quality is determined by high water absorption, gas-production capacity and retention capacity.

Biscuit-making quality: Soft and poor wheat flour having a low water-absorption capacity and high protein content is considered suitable for biscuit making. Gluten should have plasticity so the flour can be stretched without much shrinkage.

Macaroni-making quality: Wheat for macaroni products should have excellent grain qualities like bold and pulp grains, low yellow berries, and high carotene content.

QUALITY REQUIREMENTS FOR DIFFERENT WHEAT PRODUCTS ARE AS FOLLOWS:

Chapati: It requires a hard or medium grain structure with 10-13% protein and medium and extensible gluten strength.

Biscuit and Cake: It requires a soft or very soft grain structure with 8-10% protein and weak and highly extensible gluten strength.

Pav bread: It requires a hard grain structure with more than 13% protein content and strong and extensible gluten strength.

Noodle: It requires a soft or medium grain structure with 10-13% protein and medium gluten strength.

IMPORTANT WHEAT QUALITY PARAMETERS

- 1) **Test Weight:** It indicates the density of wheat kernels. Kernels with more density will yield more flour, making them more profitable for the millers. Stress factors during the grain-filling stage may result in low test weight. These factors are waterlogging, drought, low or high temperature, nutrient deficiency, insect damage, and weather damage.
- 2) **Falling Number:** Wheat flour contains protein and starch. Starch plays a massive role in bread structure, and sprouting occurs if it rains on ripe wheat and favourable environmental conditions follow. Starch is broken down by an enzyme named alpha-

amylase, and excessive sugar forms. Excessive sugar leads to the sticky, runny dough, making it challenging to handle. Bread will also have a dark crust, a coarse texture, poor structure and become difficult to cut mechanically. Wet weather and day temperature has a big effect on pre-harvest sprouting.

- 3) **Protein Content:** The wheat protein, Gluten is suitable for bread. Due to genetic background, different cultivars will exhibit other loaf volumes at the same protein levels. Nitrogen fertilizer leads to higher protein content. Moisture stress leads to an increase in protein content as less starch is formed.



A field view of Wheat crop

AGRONOMIC MEASURES TO IMPROVE THE WHEAT QUALITY

- 1) **Selection of suitable variety and clean seed:** Varieties should be selected based on the end product the farmer wants. The seeds should be purchased from authentic certified sources. The seed should be treated before sowing to reduce insect and disease attacks.
- 2) **Choosing appropriate field and crop rotation:** For producing good quality grains, select a site with suitable soil with low disease and weed pressure. In addition, crop rotation should be encouraged. Crop rotation reduces the infestations of disease and pests and considerably increases the quality of the produce.

- 3) **Proper Nitrogen scheduling:** The amount and timing of nitrogen application affect the grains' protein level. The right quantity of nitrogen must be applied at the critical stages to increase wheat gluten percentage, which is essential for the bakery.
- 4) **Early harvesting:** The timely crop harvest is crucial for getting good quality. Once the crop reaches maturity, delayed harvesting leads to pre-harvest sprouting and weed growth, increasing the risk of DON levels.
- 5) **Proper cleaning, drying and storing of grains:** Wheat quality must be protected post-harvest by proper cleaning, drying and storing. The grain must be dried to 14% moisture for better storage. In addition, fumigation may be done to prevent the stored grain pest attack.

CONCLUSIONS

Wheat is used in industries to produce diversified products like biscuits, breads, pasta, semolina, cakes, etc. It is even used in bioethanol production and the cosmetic industry. Diversification has led to an increase in the returns from wheat production. Wheat quality is essential, as good quality is the prerequisite for producing various end products and getting higher returns. Hence, adopting adequate agronomic management practices may help to maintain the wheat crop's physical and nutritional quality.

BIBLIOGRAPHY

<https://extension.umaine.edu/publications/1019e/>

<https://arc.agric.za/arcsagi/News%20Articles%20Library/Wheat%20quality%20and%20the%20ofactors%20affecting%20it.pdf>

<https://ecourseonline.iasri.res.in/mod/resource/view.php?id=5913>

Patel, A., Devraja, H. C., Sharma, P., & Singh, R. R. B. Food Technology II.

Kanojia, V., Kushwaha, N., Reshi, M., Rouf, A., & Muzaffar, H. (2018). Products and by-products of the wheat milling process. *International Journal Chemical Studies*, 6, 990-993.

Mallory, E., Bramble, T., Williams, M., & Amaral, J. (2012). Understanding wheat quality- What bakers and millers need and what farmers can do. *Bulletin*, 1019.

Prasad, R. 2021. "Quality: Wheat" *In: Textbook of field crop production, food grains crops*, ICAR, pp 91-93.
