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Unit 2 – Topic 3

Quality characteristics influencing final milled products of rice

Quality problems in milling

There are numerous factors that determine the final quality of rice produced by the rice mill. These factors relate to what extent the rice is milled (i.e. low milling degree), the level of grain breakage, level of impurities, color, and presence of off-type kernels such as chalky or damaged kernels. Some of these problems can be solved at the rice mill, whereas others are related to the way rice is grown and handled after harvest.

Undermilled rice

Under-milled rice is under-polished rice, or rice with bran streaks left in it. The bran contains much of the desired nutritious elements. Under milling will also yield higher milling recoveries. However, under-milled rice does not store well because of the high oil content of the bran. In addition, rice consumers almost universally desire well-milled rice because of its better appearance. Related to milling degree is the occurrence of red-streaked kernels; rice with part of the bran layer still sticking to the surface.

Broken grains

Grain breakage is a result of fissuring, or the formation of cracks in the endosperm prior to milling. To a certain extent, fissuring in rice grain occurs naturally in the field due daily changes in temperature and relative humidity. More importantly, fissuring can be caused by improper management of grain at all post-harvest operations from harvesting through to milling. Improper drying techniques often lead to fissuring in grain, or rewetting of stored paddy, and \improper milling techniques. Finally, not all fissured grain will break during milling, and medium or long grain varieties are more prone to breakage than short grain varieties.

Discoloration

Although whiteness is a varietal characteristic, the natural color of white rice can be affected by post-harvest discoloration. A general discoloration of the entire rice kernel occurs if wet paddy is left undried for extended periods (i.e. days). The wet grain will heat up, causing the grains to turn yellow or tan.

Chalkiness

If part of the milled rice kernel is opaque rather than translucent, it is characterized as chalky. Chalkiness disappears upon cooking and has no effect on taste or aroma, however it downgrades milled rice. Chalky grains are more brittle than non chalky grains and can break more easily during milling. Cause of chalkiness is interruption during the final stages of grain filling.

Damaged kernels

Damaged rice kernels are those which are fully or partially darkened as a result of insect , mold, water, or heat damage. The presence of even a few damaged grain kernels can severely downgrade rice.

Impurities

Impurities in milled rice are a sign of improperly cleaned paddy (picture) prior to milling, or contamination of rice during milling.

The quality characteristics of milled rice are influenced by a variety of factors, each affecting different aspects of the final product. Here's a breakdown of the key characteristics and how they impact the final milled rice:

1. **Grain Size and Shape**:
    - **Length and Width**: The size of rice grains can affect cooking characteristics. Long-grain rice typically remains separate and fluffy, while short-grain rice tends to be more tender and sticky.
    - **Shape**: Different varieties (e.g., long, medium, short) have unique shapes that impact texture and cooking qualities.
2. **Milling Degree**:

- **Degree of Polishing**: Rice can be milled to different degrees, from brown rice (minimal milling) to white rice (highly polished). The degree of milling affects the texture and nutritional content.
- **Broken Grains**: The presence of broken grains can reduce the overall quality and market value of the rice. Ideally, rice should have a low percentage of broken grains.

3. **Moisture Content**:
   - **Storage Stability**: Optimal moisture content (usually 12-14%) ensures that rice remains stable during storage. Excess moisture can lead to mold growth and spoilage, while too little moisture can cause the rice to be brittle and break during processing.
4. **Color**:
   - **Appearance**: The color of milled rice can indicate its quality. Ideally, rice should have a uniform, bright white color. Any discoloration or off-color can be a sign of poor processing or storage conditions.
5. **Texture and Cooked Quality**:
   - **Texture**: The texture of cooked rice (e.g., fluffy, sticky, or firm) depends on the variety and milling process. The final texture should meet consumer expectations for different types of rice dishes.
   - **Cooking Characteristics**: Factors like water absorption, cooking time, and stickiness affect the final product. These characteristics are influenced by the type of rice and its milling degree.
6. **Aroma and Flavor**:
   - **Varietal Characteristics**: Certain rice varieties, like Basmati or Jasmine, have distinctive aromas and flavors. The milling process should preserve these attributes without introducing off-flavors.
7. **Nutritional Content**:
   - **Vitamin and Mineral Retention**: Milling removes the bran and germ, which contain essential nutrients. The extent of nutrient loss depends on the degree of milling and the specific rice variety.

- **Protein and Fiber**: Brown rice retains more protein and fiber compared to white rice due to less processing.

8. **Impurities and Foreign Matter**:
   - **Cleanliness**: The final milled rice should be free of impurities like stones, dust, and other foreign matter. Effective cleaning and sorting processes are crucial for ensuring quality.
9. **Uniformity**:
   - **Consistency**: High-quality milled rice should have uniform grain size and quality. Variability can affect cooking performance and appearance.

These characteristics are interrelated and collectively determine the quality of the final milled rice product. Ensuring optimal quality involves careful management of each aspect throughout the cultivation, harvesting, milling, and storage processes.