

# Chemical Characteristics of Milled Rice

## Why measure chemical characteristics?

The chemical characteristics of milled rice indicate how the rice will cook, as well as the texture and kernel strength when eaten.



## What are the chemical characteristics used for milled rice?

### 1. Gelatinization temperature

The time required for cooking is determined by gelatinization temperature. Gelatinization temperature is estimated by the extent of alkali spreading. The degree of spreading is measured using a seven-point scale as follows:

1. grain not affected
2. grain swollen,
3. grain swollen, collar incomplete and narrow,
4. grain swollen, collar complete and wide,
5. grain split or segmented, collar complete and wide,
6. grain dispersed, merging with collar; and

7. grain completely dispersed and intermingled.

Alkali spreading value corresponds to gelatinization temperature as follows:

- 1-2 high (74.5-80°C),
- 3, high intermediate,
- 4-5, intermediate (70-74°C), and
- 6-7, low (<70°C).

In Asia there is normally a preference for rice with intermediate gelatinization temperature.

### 2. Amylose content

Starch makes up about 90% of the dry matter content of milled rice. The amylose content of starches usually ranges from 15 to 35%. High amylose content rice has high volume expansion (not necessarily elongation) and high degree of flakiness. The grains cooked dry, are less tender, and become hard upon cooling. In contrast, low-amylose rice cooks moist and sticky. Intermediate amylose rice is preferred in most rice-growing areas.

Based on amylose content, milled rice is classified as:

- waxy (1-2% amylose),
- non-waxy (>2% amylose),
- very low (2-9% amylose),
- intermediate (20-25% amylose) and
- high (25-33% amylose).

The colorimetric iodine assay indexes the amylose content of milled rice

### 3. Gel consistency

Gel consistency measures the tendency of the cooked rice to harden on cooling. Gel consistency is determined by heating a small quantity of rice in a dilute alkali. This test differentiates the consistency of cold 5.0% milled rice paste. Within the same amylose group, varieties with a softer gel consistency are preferred, and the cooked rice has a higher degree of tenderness. Harder gel consistency is associated with harder cooked rice and this feature is particularly evident in high-amylose

## For more information contact

Agricultural Engineering Unit  
IRRI, DAPO Box 7777, Metro Manila, Philippines  
Tel.: (63-2) 580-5600, Fax.: (63-2) 580-5699  
Email: M.Gummert@cgiar.org  
J.Rickman@cgiar.org

**IRRI** INTERNATIONAL RICE RESEARCH INSTITUTE