Physicochemical Tests

California is fortunate to produce and market a very broad range of types of high quality rice. These varieties include all the major U.S. market types as well as many special purpose types with distinct cooking and processing characteristics. With support from the California Rice Commission, the Rice Experiment Station (RES), Rice End-Use Quality Research Laboratory at the USDA-ARS-Rice Research Unit (REQL) in Beaumont, Texas, and Department of Food Science at UC Davis performed a battery of physicochemical test on public California rice varieties grown at RES. Results for the samples collected from three crop seasons have been compiled in rice quality characterization sheets. The laboratory tests are summarized below.

Apparent Amylose Content was determined at the REQL using a colormetric method which is based on the ability of amylose to bind to iodine. To solubilize a sample, rice flour is first wet with ethanol then digested with sodium hydroxide. An auto-analyzer then used to adjust the sample's pH by adding acetic acid. Next, iodine is added and the color change measured. A sample's apparent amylose content is calculated by comparing its color to that of several standards analyzed using the same method. The amylose content predicts the firmness of the cooked rice.

Alkali Spreading Value measures the gel type of the rice, which allows and estimate of the gelatinization temperature. Six milled kernels of each variety are soaked overnight in 10 ml of potassium hydroxide at concentrations of and 1.7%. The next day, the kernels are evaluated visually and given scores ranging from 2 to 7, two being no reaction (high gel temperature) and seven being mostly dissolved (low gel temperature). The six kernels are averaged to give the final score. Long grain, with an intermediate to high gel type, tend to have a firm texture when cooked. Short and medium grain rice have a low gel type resulting in a softer, stickier cooked rice. The test was conducted at the REQL.

Grain Dimensions were measured at RES using a flat bed scanner and Windseedle software developed by Regent Instruments Incorporated. Grain dimensions are used to separate the rice into the U.S. market classes (short, medium, or long grains). These market classes are associated by selection and breeding to specific quality characteristics. Measurements are in millimeters.

Protein Content was measured at the REQL with a Leco FP-2000, which uses the combustion method. A dry flour sample is incinerated, producing various gases. A thermal conductivity cell detects the amount of gaseous nitrogen concentration measurement. Protein content is thought by some to impact rice texture such as tenderness, cohesion and flavor. Low protein rice is preferred in the Japanese market. Long grains typically have higher protein values.

Rapid Visco Analyzer (RVA) uses a cycle of precise temperature and a stirring velocity cycles to measure rice flour pasting viscosities. This information is used to estimate the cooking and processing characteristics of the rice. A computer regulates the cycles of the RVA units developed specifically for the RVA machine. Because the RVA uses a smaller sample size (3g) and a shorter cycle (13 min.), it has replaced the Brabender Visco-Amylograph as an industry standard for measure pasting properties. The RVA AACC method 61-02 was performed in duplicate at RES and REQL and results averaged.

DISCLAIMER—*Each data value was determined on one sample of rice grown at RES. The years analyzed among different varieties may be different. Thus, it does not represent absolute values for any of these measurements nor the range of variation. Environmental factors including variation in temperature and weather conditions, different locations, and pre- and post-harvest management will affect rice characterization quality characteristics. The summary sheets do provide a general profile of the rice varieties that indicate their cooking and processing attributes.*