NOTE

Applicability of the Rapid Gel Test for Indicating the Texture of Commercial Parboiled Rice

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The palatability of cooked parboiled rice is governed primarily by its texture. However, cohesiveness is of little importance in parboiled rice because it is narrowed down to moderately to well separated. The texture of cooked rice is generally scored by sensory panelists (Juliano et al 1965). Because small differences in cooked rice are difficult to detect and because only a few samples can be handled at one time, special tests were developed to assess the texture of parboiled rice. These tests include the extrusion test (Mohandoss and Pillaiyar 1980a), the pressing-device test (Pillaiyar and Mohandoss 1981a), and the dropping test (Pillaiyar and Mohandoss 1983). Bhattacharya and Ali (1976) proposed a sedimentation test that used $0.05N$ HCl as the medium for pregelatinized rice products. The degradation pattern of parboiled rice kernels immersed in dilute alkali was somewhat different (Ali and Bhattacharya 1972). This reaction was quantified to indicate the hardness of parboiled rice (Mohandoss and Pillaiyar 1980b). In the above sedimentation and alkali tests, a reaction time of 4 hr was indicated. Recently, a rapid (8 min) gel test that indicates the texture of parboiled rice, without the rice being cooked, was developed.[1] The applicability of this test to different commercial samples was studied, and the results are indicated.

MATERIALS AND METHODS

Fresh (within two months from harvest) and old milled raw and parboiled rice samples were collected. The samples had been parboiled in the home (Pillaiyar 1981), in a conventional mill (double-steaming process) (Pillaiyar 1980), and in a modern rice mill (hot soaking at 65°C for 4 hr, steaming for 1–2 min while discharging paddy from soaking tanks and hot-air drying (120°C) for 3.5 hr in an LSU dryer). Laboratory samples were prepared by parboiling the fully soaked paddy by closed heating at 80 and 100°C for 10 min and autoclaving at 5 psig (108°C) and 10 psig (115.2°C) for 10 min (Pillaiyar and Mohandoss 1981b). Another lot of paddy was open-steamed for 10 min at 0 psig and then soaked by immersion in water for 30 min. After the water was drained, the paddy was autoclaved, first at 5 psig (108°C) for 20 min and then at 25 psig (130.4°C) for 10 min (designated as PP for pressure parboiling). The laboratory-parboiled samples were shade-dried, dehulled in a Satake grain-testing mill, and milled in a McGill miller no. 3 to 6 ± 0.1% degree of milling. All the samples pertain to variety IR-20.

One hundred milligrams of 50-mesh flour made from the above samples was reacted with 4 ml of 1.25% (by titration) KOH, manually shaken for 5 min, centrifuged for 3 min at 1,000 rpm, and the gel length measured.[1]

RESULTS AND DISCUSSION

Gel length was the least for fresh raw rice samples and greatest for parboiled rice samples. Length increased with the degree of parboiling. Depending upon the gel length (Table I), the samples

[1]P. Pillaiyar. 1983. Unpublished data.

TABLE I
Mean Gel Length of Different Raw and Parboiled Rice Flours While Reacting with 1.25% KOH

Samples	Gel Length (cm)
Raw, fresh	0.80
Raw, old	0.90
Home-parboiled (Tirunelveli Dt.), fresh	1.10
Home-parboiled (Tirunelveli Dt.), old	1.23
Home-parboiled (Thanjavur Dist.), old	1.43
Conventional-mill (I), fresh	1.30
Conventional-mill (II), fresh	1.30
Conventional-mill (III), fresh	1.26
Conventional-mill (IV), old	1.40
Modern rice mill, fresh	1.20
Modern rice mill, old	1.23
Laboratory-parboiled (80°C), fresh	0.80
Laboratory-parboiled (100°C), fresh	1.26
Laboratory-parboiled (100°C), old	1.30
Laboratory-parboiled (108°C), fresh	1.83
Laboratory-parboiled (115.2°C), fresh	2.16
Laboratory-parboiled (130.4°C), fresh	2.53
Standard error	0.037
Coefficient of deviation ($P = 0.05$)	

can be classified into several categories: fresh, raw or parboiled at 80°C; old, raw; fresh, home-parboiled; parboiled at or below 100°C; parboiled at 108°C; parboiled at 115.2°C; and PP. These groupings illustrate the following textural classification of parboiled rices, namely, tender (parboiled at 70 and 80°C for 5 or 10 min); moderately tender to slightly tough (parboiled at 90 and 100°C for 5 or 10 min); and very tough (parboiled at 110 and 120°C for 5 or 10 min) (Mohandoss and Pillaiyar 1980a). The PP sample was classified as well separated and very tough (Mohandoss and Pillaiyar 1982). The gel length of parboiled rice correlated positively with the values for equilibrated moisture content upon soaking in water at room temperature, absolute cooking time (time required to cook the rice to the desired softness, and cohesiveness, and correlated negatively with tenderness.[1] The values for equilibrated moisture content and water uptake at 60°C correlated positively with the temperature of parboiling, and the linear elongation of cooked grains correlated negatively with the temperature of parboiling (Pillaiyar and Mohandoss 1981c). The pressing-device values (Pillaiyar and Mohandoss 1981a) and the dropping-device values (Pillaiyar and Mohandoss 1983) also indicated a similar textural pattern for parboiled rices (soft to hard from 70–120°C parboiled) as in this study.

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