

ABSTRACT

The process of parboiling of paddy includes soaking, and steaming of the soaked paddy followed by drying prior to milling. Soaking and steaming harden the rice kernel and prevent breakage during milling. In the current practice of parboiling, paddy is soaked for 3.5h - 4.5h at soaking temperature of 70°C and steamed in the same tank for 30 minutes by passing steam at a pressure of 4 bars. Since prolonged soaking influences the quality of the parboiled product, any measure towards reducing the soaking time, which still seems somewhat long, is likely to be beneficial from the point of product quality as well as consumption of energy. Therefore, a comprehensive study was undertaken to accelerate the moisture uptake of the paddy grain and thereby reduce the soaking time and energy requirement, by application of heat, pneumatic pressure, rupturing of the husk cover and dehusking. The effects of soaking temperature, pneumatic pressure and husk rupturing, in various combinations, on hydration behaviour of paddy were investigated.

The major observations of the various experiments conducted under the study are the following.

- (1) About 10 - 15 min of soaking time could be reduced for every 1°C increase in soaking temperature in the range of 60 - 80°C.
- (2) About 22 - 26 min of soaking time could be reduced by every 1 bar increase of pneumatic pressure in the range of 1 - 4 bar.
- (3) Husk rupturing reduced the soaking time by approximately 50 - 60 min depending upon the hydration temperature.
- (4) Dehusking reduced the soaking time by approximately 120 - 215 min depending upon the soaking temperature.
- (5) The combined effect of temperature, pneumatic pressure and husk rupturing was more pronounced than the effect of the individual variables.
- (6) Soaking under a linearly increasing temperature profile gave satisfactory quality with respect to milling yield, cooking characteristics, degree of gelatinization and grain colour, besides resulting in approximately 10% saving in specific energy consumption as compared to normal method of soaking that is soaking at 70°C for 4h.
- (7) The specific thermal energy requirement during soaking was estimated to be 319kJ, 254kJ, 190kJ and 231kJ per kilogram of paddy respectively at soaking temperatures of 80°C, 70°C, 60°C and @ 0.5°C/min increment. Application of pneumatic pressure, rupturing and dehusking reduced the thermal energy required for soaking considerably.

Keywords : Hydration - Resistance to hydration - husk and bran covers - forced diffusion by pressure application - thermal energy requirement for hydration.
