Effect of Milling on Cooking Time of Sorghum Grain

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ABSTRACT

Three cultivars of hybrid sorghum grain of the hetero-yellow type were milled in an abrasive mill for varying lengths of time to remove different amounts of the outer layer of grain. The intact grain from each milling time was cooked to a soft, edible stage in water at 98°C. For all cultivars, cooking times decreased as the outer layers were removed, with the greatest decrease from removal of the first 10% of the grain. When about 20% of the grain had been removed, constant cooking times were attained for all cultivars. The minimum cooking times (46–49 min) were substantially longer than that for rice (about 25 min).

Sorghum is an important dietary item in many parts of Africa and Asia, particularly in dry and semi-arid regions because it is more drought resistant than wheat and rice. In a number of countries in Africa and Asia, grain is commonly milled and boiled in water, and the cooked grain is consumed like rice (Hsu and Hsu 1977, Vogel and Graham 1979). Boiled sorghum grain is said to have appearance and taste similar to those of rice (Hutton 1974). Because the price of sorghum is about one-third that of rice, greater use of sorghum as a rice substitute should be feasible. The cooking time for sorghum is much longer than for rice, however, (Badi et al 1978; Viraktamath et al 1971, 1972) and would be a deterrent to such usage. The bran layer has been reported to hinder the absorption of water; hence removal of the outer layers would be expected to reduce the time required to produce a soft, cooked grain (Desikachar 1974). Removal of the bran layer is also desirable to remove the pigments from the grain. The aim of the work reported in this paper was to examine the effect of the removal of outer layers on the cooking time of three cultivars of sorghum.

MATERIALS AND METHODS

Seed Characteristics

Three cultivars of hybrid sorghum grain of the hetero-yellow type (Dorado, SM8, and F64A) were obtained from the Hermitage Research Station, Warwick, Queensland, Australia, and stored at 20°C to allow a uniform moisture content. Each cultivar was size-graded with a set of sieves; the most common size (3.35–3.99

<table>
<thead>
<tr>
<th>TABLE I</th>
<th>Description of Sorghum Cultivars</th>
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<tr>
<td>Cultivar</td>
<td>Seed Weight (g/100 grains)</td>
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<tr>
<td>---------</td>
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<tr>
<td>Dorado</td>
<td>3.3</td>
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<tr>
<td>(Asgrow)</td>
<td></td>
</tr>
<tr>
<td>F64A</td>
<td>3.3</td>
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<tr>
<td>(Dekaib)</td>
<td></td>
</tr>
<tr>
<td>SM8</td>
<td>3.2</td>
</tr>
<tr>
<td>(Yates)</td>
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</table>

*Texture rating scale: 1 = 100% corneous endosperm, 5 = 100% floury endosperm.
RESULTS AND DISCUSSION

Figure 1 shows that for all varieties, cooking times decreased as the outer layers were removed. The greatest decrease in cooking time occurred from the removal of the first 10% of the grain. When about 20% of the grain had been removed, the cooking time was not reduced by further milling. Milling was not continued beyond 70% extraction because of excessive breakage of the grain. The minimum cooking times of 46 min for F64A and SM8 and 49 min for Dorado were, however, still substantially longer than that for rice (about 25 min).

The initial rapid decrease probably occurred during the removal of the pericarp layer, and the minimum cooking time was probably attained when the corneous endosperm was fully exposed. Thus the structure of the corneous endosperm seems to ultimately determine the longer cooking time of sorghum. If the cooking time of sorghum is to be reduced to an acceptable length similar to that of rice, not only must the pericarp be removed but some simple method must be found to partially disrupt the structure of the corneous endosperm to allow rapid absorption of water.

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REFERENCES


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