NOTE ON A METHOD OF DETERMINING THE DEGREE OF MILLING OF WHOLE MILLED RICE[1]

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In conventional rice milling practice, the degree of bran removal is estimated by visual observation. A more reliable and consistent means of measurement is desirable, however, in order to obtain quantitative results in rice milling research. Commercial rice bran consists of the outside layers of the rice kernel removed during milling and is composed of the pericarp, testa, perisperm, most of the aleurone layer, some starchy endosperm, and the whole of the embryo. The protein content, fat or oil, and soluble carbohydrates of the bran are derived from the inner aleurone cells and the embryo; whereas the starch content is derived from the endosperm cells which adhere to

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the outer bran layers and are removed in the milling (3).

Autrey and others (2) demonstrated in 322 tests of Zenith (medium-grain) and Rexark (long-grain) rices that the amount of fat extracted from whole milled rice was in linear relationship to the amount of bran removed up to about 6% of the original rice. They further showed that, for a given variety, the relationship between the percentage of bran removed and the percentage of fat remaining on the milled rice is constant from year to year. These studies indicate that reliable and consistent results can be obtained by using the extractable fats of the whole milled rice as a measure of the degree of milling. It serves as an approximate measure of the amount of inner bran (the aleurone layer) remaining on the milled rice.

The purpose of this communication is to report the details of a procedure for determining the extractable fats of whole milled rice. This procedure was used in the evaluation of some 600 samples of rice of different varieties and geographical origin. It varies in manipulative technique from that of Autrey *et al.* (2) and employs a petroleum solvent rather than diethyl ether. As pointed out by Shearer and Carson (4), petroleum solvents, as fat extractants, are preferable to anhydrous ether in many respects. Technical grades require no preparation before use; they have higher flash points, are not subject to oxidation, are not hygroscopic, and cost less.

Methods

Approximately 20 g. of a well-mixed sample of whole milled rice are weighed accurately into a 125-ml. flat-bottomed boiling flask. Twenty-five milliliters of petroleum ether, boiling range 35°–38°C. (AOCS (1) specification H2-41) are added to the flask containing the rice. The reflux apparatus, consisting of the 125-ml. flask and a West condenser, with standard-taper glass joints, is assembled, and the solvent is heated to boiling on a hot plate and refluxed for 25 minutes. After refluxing, the solvent is decanted from the flask (taking care to retain the rice in the flask) onto a folded filter (Whatman No. 12) held in a funnel placed in the mouth of a tared 100-ml. flat-bottomed extraction flask. Fifteen milliliters of petroleum ether are then added to the flask containing the rice. The solvent is allowed to come to a boil and decanted immediately onto the same filter previously used, again with care to retain the rice in the flask. The latter step, i.e. addition of 15 ml. of petroleum ether to the extraction flask, etc., is repeated, except that the rice and solvent are completely transferred to the filter. When the solvent flow ceases, the solvent is evaporated from the tared flask on a steam bath until no odor of solvent re-

mains, and the flask is placed in a forced-draft oven for 30 minutes at 101–104°C. The flask is removed from the oven, cooled in a desiccator, and weighed. The percentage of fats extracted is calculated on the basis of the dry weight of milled rice used.

Results

As an illustration of the application of the method, four samples of Century Patna 231 variety, foundation seed stock grown at the Rice Pasture Experiment Station, Beaumont, Texas, were each subjected to a different degree of milling with standard laboratory milling equipment (5,6,7,8). The whole milled rices were evaluated in duplicate by the above procedure. Table I presents the details of milling and the extractable fats of the whole milled rices.

TABLE I

THE EXTRACTABLE FATS OF WHOLE MILLED RICE AS RELATED TO THE DEGREE OF MILLING

SAMPLE	DESCRIPTION OF MILLING	EXTRACTABLE FATS
		%
1	Milled for 30 seconds without weight	0.60
2	Same as for sample 1	0.62
3	Milled for 30 seconds with 2-lb. weight	0.47
4	Same as for sample 3	0.44
5	Milled for 30 seconds with 2-lb. weight plus	0.39
6	an additional 30 seconds without weight	0.37
7	Milled for 30 seconds with 2-lb. weight plus 1 g. of Carbotex[a]; plus an additional milling for 30 seconds without weight	0.32
8	Same as for sample 7	0.29

[a] Carbotex, a natural pulverized limestone.

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