meal glue compares favorably with commercial casein glue and peanut meal glue, each glue mix and glue line being prepared as recommended to give maximum shear strengths. Lower values of shear strength and wood failure of glue joints containing hydraulic- and screw-pressed meals, as compared to hexane-extracted meal, were reported.

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Lipide Content of Rice Bran

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RICE BRAN is reported to contain from 15 to 18% lipides (3, 4, 6) and to represent a minor though potential source of vegetable oil. Little information is available regarding the variations of the bran content of rough rice and of the amount of lipides in rice bran as influenced by variety and by environmental conditions under which it is grown. Consequently samples of mature rough rice of eight standard varieties from experimental plantings at Stuttgart, Ark., Crowley, La., and Beaumont, Tex., were obtained through the cooperation of the Bureau of Plant Industry, Soils, and Agricultural Engineering for investigation. The varieties were Magnolia, Bluebonnet, Blue Rose, Zenith, Caloro, Fortuna, Early Prolific, and Prelude.

Portions of 600 grams each of the rough rice samples were milled, using laboratory equipment (8), so that the three fractions, hull, bran, and polished rice, were obtained quantitatively. The hull and bran fractions were essentially free of each other. All three fractions were analyzed for moisture (7), and the bran and polished rice fractions were analyzed for lipides (1).

A small amount of endosperm was unavoidably present in each of the bran fractions as a consequence of the milling operation. Starch was determined polarimetrically (2) on the polished rice and colorimetrically (5) on the bran, and the values so obtained were used to calculate the amount of endosperm in the bran fractions. Thus the percentages of the true pericarp plus germ fractions in the rough rice were determined, assuming that the endosperm occluded in the bran fractions had the same composition as the polished rice.

Starch cells have not been found in the pericarp layer (9). The aleurone layer was occluded with the pericarp. In calculating the lipide contents of the true pericarp plus germ fractions, the lipide contents of the polished rice were taken into account.

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Results

The yields of hulls obtained on milling the rough rice samples, calculated to a moisture-free basis, ranged from 20.8 to 26.2 and averaged 23.7% while the yields of polished rice ranged from 66.8 to 73.8 and averaged 70.2%. The yield data for bran on the individual samples are given in Table I, columns 1, 5, and 9. The yields of bran ranged from 4.0 to 7.5 and averaged 6.0%, as compared to an average commercial milling yield of 8.5% (6). The variations are attributed mainly to the influence of variety and environment of production, with some caused by variations in milling. The averages indicate that the rice produced at Stuttgart gave the lowest yields of bran on milling. Rice of the Bluebonnet variety had the lowest average yield of bran (5.0%) and of Prelude the highest (7.1%).

The calculated yields of the true pericarp and germ fraction tabulated in Table I, columns 3, 7, and 11, are lower than the yields of the bran fraction. However the relative position of varieties and locations with respect to bran yield are about the same.

The lipide contents of the bran fractions on a moisture-free basis (Table I, columns 2, 6, and 10) varied from 15.3% for Prelude, produced at Stuttgart, to 23.0% for Blue Rose from the same location and averaged 19.5%.

The calculated lipide contents of the true pericarp and germ fraction (Table I, columns 4, 8, and 12) are somewhat higher than the lipide contents determined on the bran as milled from the corresponding rice samples. However the range in values is less, from 18.4% for the Prelude variety of rice produced at Crowley to 24.6% for the Bluebonnet variety from Beaumont. It appears that the variation in the lipide content of the true pericarp and germ fraction is attributable more to the influence of variety than to the environment of production.

TABLE I

Yields and Lipide Contents of Bran Fractions and True Pericarp and Germ Fractions (Moisture-Free Basis)

Variety	Stuttgart, Arkansas				Crowley, Louisiana				Beaumont, Texas			
	Bran		True Pericarp and Germ		Bran		True Pericarp and Germ		Bran		True Pericarp and Germ	
	Amount m.f.b.	Lipide Content m.f.b.	Amount m.f.b.	Lipide Content m.f.b.	Amount m.f.b.	Lipide Content m.f.b.	Amount m.f.b.	Lipide Content m.f.b.	Amount m.f.b.	Lipide Content m.f.b.	Amount m.f.b.	Lipide Content m.f.b.
	%	%	%	%	%	%	%	%	%	%	%	%
Magnolia	6.4	21.0	5.9	22.7	5.4	21.2	4.9	23.2	6.1	22.2	5.8	23.4
Bluebonnet	4.0	20.1	3.4	23.8	6.0	17.4	5.1	20.3	5.0	22.2	4.5	24.6
Blue Rose	5.0	23.0	4.8	23.9	5.8	20.9	5.3	22.8	6.7	19.3	6.1	21.3
Zenith	5.4	19.7	4.8	22.1	6.5	20.2	5.7	23.1	6.8	20.4	6.1	22.6
Caloro	5.4	21.2	5.1	22.6	6.4	20.2	5.8	22.4	6.2	18.0	5.5	20.2
Fortuna	5.1	16.0	4.1	19.6	6.4	18.5	5.3	22.1	5.6	20.6	5.1	22.7
Early Prolific	6.2	19.3	5.7	20.8	7.1	16.9	5.9	20.1	6.3	19.7	5.7	21.5
Prelude	7.5	15.3	6.2	18.5	7.0	16.1	6.1	18.4	6.8	18.7	6.2	20.4
Average	5.6	19.5	5.0	21.8	6.3	18.9	5.5	21.6	6.2	20.1	5.6	22.1

Summary

The examination of rough rice of eight varieties grown in three locations each showed variations in milling yields and lipide contents of bran and of the true pericarp and bran fraction which are attributable to the influence of variety and environment of growth. The average values found on the moisture-free basis were 6.0% bran and 5.4% true pericarp and germ fraction for the rough rice and 19.5 and 21.8% lipides in the bran and the true pericarp and germ fraction, respectively.

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Fatty Acid Compositions of Lipids From Corn and Grain Sorghum Kernels

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OIL from corn germ has been the subject of several fatty acid composition studies (1, 2, 3, 4) and one investigation of glyceride composition (5). Analyses (6, 7, 8, 9) of the fatty acids associated with corn starch have indicated a much higher percentage of saturated acids than are present in germ oil. However no comparison of the lipids from all portions of the corn kernel has been made. The present study includes fatty acid analyses of the lipids associated with the four main fractions (germ, starchy endosperm, horny endosperm or gluten, and fiber which is mainly cell walls and epidermal tissue) obtained in the wet milling of commercial yellow hybrid corn.

Grain sorghum is assuming an ever-increasing role in the grain processing industry. Plants are in operation for both the dry and wet milling of the grain, and oil is being produced in tank car quantities. Analyses reported (4, 10) for the fatty acid composition of the germ oil indicate that it is similar to corn germ oil. A starch fat analysis has been reported recently (9). The grain contains a wax coating which is mainly absent from corn kernels (4). The present report also describes lipids obtainable from the wet milling of grain sorghum and compares them with the corresponding materials from the processing of corn.

Isolation and Preparation of Lipid Samples

A brief description of the essential features of the wet milling industry is necessary in order to provide a more complete picture of the type and source of samples used in this study. Grain, after removal of foreign materials, is steeped in dilute aqueous sulfur dioxide solution (approx. 0.2%) for about 48 hours at 130°F. This steeping operation removes most of the water solubles, such as sugars, some proteins, and minerals. The grain is then roughly ground in a Foos mill to liberate the germ which is separated by flotation. After washing, the germ is dried and the oil is recovered by expelling and/or solvent extraction. The samples used for analyses were crude expelled oils.