UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Administration
U.S. Bureau of Agricultural and Industrial Chemistry.

ABSTRACT BIBLIOGRAPHY OF THE CHEMISTRY, PROCESSING, AND UTILIZATION OF RICE BRAN AND RICE BRAN OIL.

by

Josephine R. Loeb and Nelle J. Morris

SOUTHERN REGIONAL RESEARCH LABORATORY
2100 Robert E. Lee Boulevard
New Orleans 19, Louisiana

FOREWARD

This compilation[1/] of references and abstracts relating to the chemistry, processing, and utilization of rice bran and rice bran oil covers the period 1876 to 1951. The references are arranged alphabetically by author under each subject division listed in the table of contents. Subject and author indexes are provided.

The source of these references and abstracts are as follows:

Journal of the Chemical Society (London), 1876-1912
Chemical Abstracts, 1907-1951

The complete titles of the periodicals which are abbreviated in the references may be found in the List of Periodicals Abstracted by Chemical Abstracts, published by the American Chemical Society, Ohio State University Columbus 10, Ohio, 1946.

Microfilms or photostats of most of the publications cited in this bibliography may be obtained from the Library of the U. S. Department of Agriculture, Washington 25, D. C. Copying charges for each periodical article or book are:

MICROFILMS: $1.00 for each 50 pages or fraction thereof from a single article or book.

PHOTOPRINTS: $1.00 for each 10 pages or fraction thereof from a single article or book.

General information on rice and rice byproducts can be found in the following publications:

1/ Report of a study made under the Research and Marketing Act of 1946.

Corbett, C. L. P., and Boerner, E. G., The handling, grading, and uses of rice; abstracts and references. Washington, D. C., U. S. Bur. Agr. Econ., 1937. (USGSA-GI-38-Rev.)

Kik, M. C., and Williams, R. R., The nutritional improvement of white rice. 76 p. Washington, D. C., Pub. by the National Research Council, National Academy of Sciences, 1945. (Natl. Res. Council Bul. 112)

Kuilman, L. W., Rice during and after the war. A bibliography of the literature on rice during the period 1940-1947. 244 p. Buitenzorg, Java, General Agr. Research Sta., 1949. (Netherlands Indies Alg., Proefsta. v. Landb. Meded. no. 87)

McCall, E. R., Hoffpauir, C. L., and Skau, D. B., The chemical composition of rice; a literature review. New Orleans, Bur. Agr. and Indus. Chem., 1951. 49 p., mimeogr. (AIC-312)

Ward, Kyle, Jr., Reid, J. D., and Nicely, Dorothy, Rice hulls and rice straw; a list of references. Washington, D. C., U.S.D.A. Library, 1946. 28 p., mimeogr. (Library list no. 31)

The writers wish to acknowledge the helpful advice of K. S. Markley and F. G. Dollear; the assistance of Dorothy B. Skau in verifying the literature citations; of Sara P. Fore in collecting the abstracts.

CONTENTS

RICE BRAN

Composition and Analysis

Amos, A. J.
RICE HUSKS IN BRAN AND SHARPS.
Analyst 54, 332-333 (1929).
Rice husks are light brown in color; the outer surfaces are dull; the inner surfaces are shiny; their stiff and hard nature can be detected by scraping the outer surface with a needle. Boil a little of a suspected sample with a mixt. of 5 parts chloral hydrate and 2 parts water and exam. a drop of the liquid under the microscope. Rice husks consist of 4 layers of tissue with characteristic cells in the outer epidermis having a sinuous form. (C.A. 23, 4752).

Arbenz, E.
THE PHYTIN CONTENT OF FOODS.
Mitt. Lebensm. Hyg. 13, 45-52 (1922).
Finely pulverized foods (vegetables and fruits dried first at 36°) were extd. with definite quantities of 0.6% HCl until all phytin was removed. As many as 12 extns. were sometimes necessary. The phytin was detd. in the exts. by an adaptation of the method of Heubner and Stadler (C.A. 8, 3569). The % phytin as H_2O-free phytic acid, found resp. in fresh and dried foods was rice bran 3.801, 4.232; rice flour 0.192, 0.216; wheat bran 4.641, 5.073; whole-wheat flour 0.498, 0.572; white flour 0.184, 0.208; corn flour 0.764, 0.857; lentils 0.292, 0.326; peas 0.498, 0.561; oat flour 0.460, 0.506; cocoa 2.110, 2.230. No phytin was found in carrots, turnips, cauliflower, Brussels sprouts, kale, spinach, asparagus, apples, peaches, and figs. (C.A. 16, 2738).

Arnold, Aaron, Lipsius, S. T., and Greene, D. J.
RIBOFLAVIN DETERMINATION BY THE MICROBIOLOGICAL METHOD.
Food Research 6, 39-43 (1941).
The Snell and Strong microbiol method (C.A. 33, 6371) was used successfully to det. the riboflavin content of various food products. Av. values expressed in γ per g. are: brewers' yeast 45.3, dried skim milk 15.9-16.6, fuller's earth adsorbate from rice-bran concentrate with added whey adsorbate 81.3, liver ext. B 312, processed rice bran 2.85, rice bran 4.00. Agreement in duplicate assays was very good. (C.A. 35, 4105).

Bernardini, Luigi
CHEMICAL COMPOSITION OF THE EMBRYO OF RICE.
Atti R. Accad. Lincei, [5], 21, i, 283-289 (1912).
The author's analyses show that the rice embryo is very rich in phosphorus as compared with the rest of the seed, and the phosphorus is stated to be present chiefly in the form of phytin. The ash of the embryo had the following composition (referred to the original dried material): SiO_2 0.250%, Fe_2O_3 0.060%, MnO traces, CaO 0.279%, MgO 1.389%, K_2O 1.691%, Na_2O traces. The composition of the embryo resembles greatly that of the aleurone grains. [J. Chem. Soc. (London) 102 [2] 380].

Bertrand, Gabriel, and Benzon, Boje
THE ZINC CONTENT OF FOOD VEGETABLES.
Comp. rend. 187, 1098-1101;
Compt. rend. acad. agr. France 14, 1303-7 (1928).

Zn plays an important physiol. role, comparable to that of Fe, in living organisms. The Zn content of different plants as well as different part of the same plant is extremely variable. E. g., peach mesocarp or beet leaves contained from 0 to 0.2 mg. per kg., bean seeds and pine nuts approx. 50, and hemp seed 82. In general there is less than 1 mg. per kg. of Zn in the pulpy portion of peaches, plums, apricots, mandarin, oranges, strawberries, melons and in etiolated leaves; from 1 to 2 mg. per kg. in parenchymous roots such as carrot, turnip, radish, the flesh of orange, lemon juice, leaves of low chlorophyll content such as escarole, cabbage, romaine, in figs, raisins and chestnut; 2 to 3 mg. per kg. in celery, banana, cauliflower, salsify, sweetpotato, tomato and Jerusalem artichoke; 3 to 4 mg. per kg. in rutabaga, asparagus, Japanese artichoke, date and forage beet. As the chlorophyll content increases, the Zn increases also. In carrot leaves and alfalfa, 4 mg.; radish leaves, 4.5; head lettuce, 4.7; cress 5.6; spinach, 6.2; dandelions, 9.7; matured white potato, 4; mushrooms, 5.1-5.3; truffles, 2.8; yeast, 12.4; garlic, 10; onion, 13.1 in the watery tissues and 50 in the seed. In the grains, barley sorghum, wheat, millet and rye contain 12-19 mg.; soybeans, 20; vetch, 23; lentils, 24.5; peas, 44.5; beans, 52.5; buckwheat, coconut and fresh almonds, 10; peanuts, 16; sunflower seed, 17; dried almonds, 18; dried nuts, 20; pine nuts, 55; hemp seed, 82.6; polished rice, 2; rice bran, 30; white wheat flour, 6-7; whole wheat flour, 10-15. (C.A. 23, 1696).

Bodalski, Tadeusz
DETERMINATION OF PHOSPHORUS IN CALCIUM MAGNESIUM INOSITOLPHOSPHATE.
Wiadomosci Farm. 58, 683-834, 697-699 (1931).

Salts of inositolphosphoric acid are present in all part of plants, especially in seeds, and can be detd. as follows: Ground seeds are treated with an excess of 5% AcOH for 6 hrs., filtered and the inositolphosphates are pptd. with ammonia, washed with an Et_2O-EtOH mixt. (1:1) and finally with pure Et_2O. The following amts. in wt. % were found in the fat-free seeds: Sesamum indicum 1.40; Fagopyrum sagitattum 0.53; Lens esculenta 0.52; Avena sativa 0.23; Triticum vulgare 0.73; Panicum miliaceum 0.20; Zea mays 0.81; Hordeum vulgare 0.61; Vicia sativa 0.11; Phaseolus vulgaris 0.20; Pisum sativum 0.12; Lupinus luteus 0.16; Cannabis sativa (seeds with fat) 2.00; C. sativa (without fat, not sieved) 4.37; C. sativa (without fat, sieved through sieve no. 18) 6.19; C. sativa (without fat, sieved through sieve no. 60) 8.20; rice (bran) 1.53; sunflower (oil-cake sieved through sieve no. 60) 0.92. The content of P in the inositolphosphates depends on the plant from which the phosphate comes and is always lower than 22.8% (Posternak's demand). It is easily and exactly detd. by wet oxidation of the org. substance followed by pptn. of P as $MgNH_4PO_4$. Either the double pptn. with NH_4 molybdate or the citric acid method may be used. The latter is recommended. Ca Mg inositolphosphates contain the following amts. of P. in wt. %; rice (bran I) 20.35; rice (bran II) 20.68;

Cannabis sativa 18.87: Sesamum indicum 18.30: Fagopyrum sagitattum 21.50; Hordeum vulgare 21.87; Triticum vulgare 20.21: Zea mays 18.51; Lens esculenta 21.49; Helianthus annuus 16.79. Some inositolphosphates are acidic (rice and Cannabis), other slightly alk. Detn. of P in the ash after ingiting the substance gives too low results. (C.A. 26, 2767).

Borasio, L.

ENZYMES AND PANIFICATION.

Giorn. Risicoltura 22, 137-149 (1932).

A series of tables gives the results of detns. of the diastatic power (mg. maltose per 10 g.), lipase (g. butyric acid), phytase or glycerophosphatase (mg. P_2O_5), proteolytic activity (% protein rendered sol.), peroxidase (cc. $KMnO_4$ consumed) and catalase (cc. of O_2 evolved) for 6 varieties of wheat, 8 varieties of rice and flours and milling by-products therefrom. These show the enzymes to be mostly localized in the exterior layers of the seed. Enzyme content varies not only from cereal to cereal but also among the products from the same variety being influenced by chem. compn. which varies with climatic and cultural conditions. Phosphatase excites and increases the growth of yeast saccharomycetes, the proteolytic enzymes exert a harmful action by attacking the proteins, while the action of the oxidasesin leavening is still unknown. The best temperature to favor the development of useful microorganisms and most limit the protein-attacking enzymes is 28-30°. (C. A. 27, 346).

Borasio, L.

RICE BY-PRODUCT ANALYSIS (ITALY).

Risicoltura 36, No. 2, 35-40 (1948).

"The Carbone optical method for testing rice bran and meal (Riv. zootec. (Florence) 1932) was used as follows: A small quantity of material on a watch-glass was treated for a few min. with 95% alc., then, after removal of the latter, with a few drops of 1% phloroglucinol in alc. soln., and carefully heated over a naked flame. When nearly all the color has disappeared, a few drops of fuming HCl were added -- as in the usual phloroglucinol test for ligneous matter. Any chaff or husk present assumes a deep red color. This colored material was dried, a small quantity mounted in glycerin, and examd. under the microscope. The intense red color of the husk particles and the marked difference in structure between these, the bran, and the fine meal, permit easy differentiation even with low adulterations down to 1%. Chem. tests are briefly indicated for protein, fat, ash, sand, and SiO_2, including the rapid method of DiStefano and Muntoni for sand and SiO_2 (C. A. 35, 2618) with Kürschner and Hanak's reaction mixt. of AcOH and Nx HNO_3. (C. A. 25, 1601)." (C. A. 44, 8011).

Browne, C. A., Jr.

CHARACTERISTICS OF RICE OIL.

J. Am. Chem. Soc. 25, 948-954 (1903).

Smetham (this Journal, 1893, 848) found that rice oil was characterized by the high percentage of fatty acids it contained. In investigating the cause of this, the author extracted samples of oil both from the rice itself and from the bran. The latter, including the gluten layer and germ of the grain, was found to contain nearly 15 per cent of oil.

The chemical and physical characteristics of an oil extracted from the bran were as follows: Sp. gr. (99°/99°C.), 0.8907; m. pt., 24°C.; acid value, 166.2; saponification value, 193.5; iodine value, 91.65; Reichert-Meissel value, 1.1; molecular equivalent of insoluble fatty acids, 289.3; and melting point of insoluble fatty acids, 36°C.

In warm weather the oil partially liquefies, forming a brown fluid, with a deposit of crystalline fats, which the author judged to be glycerides of acids of high molecular weight, such as arachidic or behenic acids. The oil only becomes perfectly clear and transparent at 47°C.

Lipase in Rice Bran - Oil from fresh rice bran was found to have only slight acidity, but, on standing, the proportion of free acid rapidly increased, whilst the oil became rancid. The rice bran was next tested for the presence of lipase by mixing 20 cc. of a 20 per cent cold aqueous extract with an equal volume of castor oil, and rendering the mixture faintly alkaline to litmus. After 24 hours, the emulsion had become acid, and after a week the oil extracted with ether had an acid value of "29.7", indicating that about 16 per cent had been hydrolysed.

In experiments on the action of the lipase upon rice oil under natural conditions, freshly ground rice bran was divided into two portions, one of which was heated to 99°C. to destroy enzymes. Both were then tied up in sacks and left for a month, after which the oil was extracted and examined. The following results were thus obtained:

	Free Acid as Oleic Acid
	Per Cent
Raw rice (stored many months)	6.9
Fresh bran (six hours after grinding)	12.5
Bran one month old, unheated	62.2
" " " " heated	24.0

From these results the author concludes that the development of acidity in rice oil may be due in some degree to oxidation, but is mainly caused by enzymic action. Attention is called to the practical application of the results in checking or preventing rancidity in rice meal or similar products, the material being heated, immediately after grinding, to a sufficient temperature to destroy the enzyme.

Digestibility of Rice-Oils. Practical experiments on two steers fed upon rice oil showed that on the average 54.8 per cent of oil in the former and 73.6 per cent in the latter was digested. The unsaturated fatty acids and those of lower molecular weight were most readily assimilated. [J. Soc. Chem. Ind. (London) 22, 1137].

Chen, Chao-Yu

DETERMINATION OF THE VITAMIN B_1 CONTENT OF BEEF WHEN PICKLED WITH SALT AND RICE BRAN.

Nutrition Bull. (China) 1, 16-18 (1941).

Expts. with pigeons show the presence of vitamin B_1 in beef which has been pickled with salt and rice bran. (C. A. 36, 1688).

Conner, R. T., and Straub, G. J.

COMBINED DETERMINATION OF RIBOFLAVIN AND THIAMINE IN FOOD PRODUCTS.

Ind. Eng. Chem., Anal. Ed. 13, 385-388 (1941).

A rapid and accurate method has been developed for detn. of thiamine (I) and riboflavin (II) on the same sample, which gives results in close agreement with biol. assays when applied to grains, milk products and fresh and frozen vegetables. The following ranges of II in γ per g. were detd. in wheat 0.89-2.03, yellow corn 0.83-2.02, white corn 1.27-2.29, rice polishing 2.52, rice bran 2.41, wheat germ 3.78-5.56, wheat bran 3.17, skim-milk powder 19.00-29.00, whey powder 59.00, frozen peas 1.90, frozen broccoli 2.00, fresh spinach 1.17-1.47, fresh lima beans 1.35-1.56, fresh broccoli 1.76, and fresh string beans 1.61. Rapid destruction of II occurred in H_2O at pH 2-8 in diffused daylight, irrespective of the pH. The destruction on exposure to artificial light appeared to be dependent on the pH. The procedure of Ferrebee (C.A. 34, 5104) for the adsorption of II on Supersorb has been modified to use a smaller extn. column. In the fluorometric detn. of II Corning glass filter 511 is suitable for the transmission of incident light and 351 for that of the fluorescent light. (C.A. 35, 5193).

Di Stefano, F., and Muntoni, F.

DETECTION AND DETERMINATION OF RICE HUSK IN BRAN, BY A RAPID SILICA DETERMINATION.

Ann. chim. applicata 30, 527-533 (1940).

The av. content of SiO_2 in bran is 1%, that in rice husk is 18% on the dry basis; the av. content of cellulose in bran is 14% and in rice husk 40% on the dry basis. SiO_2 is detd. by treating the bran with the Kurschner and Hanak mixt. (C.A. 25, 1601); the residue, collected in a fritted glass crucible, contains cellulose and SiO_2, and by ashing this residue, SiO_2 is detd. (C.A. 35, 2618).

Dodd, F. R.
CLASSIFICATION OF RICE BRANS
Analyst 64, 187 (1939).
Since parboiled rice bran after the usual grinding and sieving is bulkier than ordinary bran, the wt. of a given bulk is a good confirmatory test. The wetting test (See Page 14) is very useful. (C. A. 33, 3476).

Engel, Chr., and De Vries, A. M.
THE TOCOPHEROL (VITAMIN E) CONTENTS OF DIFFERENT FOODS FROM THE DUTCH EAST INDIES.
Z. Vitaminforsch. 18, 89-90 (1946) (in English).
Tocopherol contents in mg. per 100 g. food were found as follows: rice 0.4, unpolished rice 2.9, rice bran 3.0, peanut 11.9, soybean 18.8, leaves of Ipomoea reptans 11.8, leaves of Sauropus androgynes 5.9, leaves of Moringa oleifera 7.4, leaves of Amaranthus spp. 2.6, leaves of Carica papaya 36.0, leaves of Ipomoea batatas 8.1, coconut 0.2, capsicum 2.4, cassava 0.2, coconut oil from various districts 3.6, 5.0, 4.7, and 0.0. (C.A. 41, 5643).

Fontillas, S. M.
DETERMINATION OF FURFURAL FROM SOME FARM BY-PRODUCTS.
Philippine Agr. 30, 300-313 (1941).
Furfural obtained from corncobs amounted to 25.45% (dry basis), from new rice bran 17.25%, from rice bran stored 10 months 10.55%, from rice hulls mixed with broken kernels 17.05%, from rice straw with rachis 16.58%, from whole rice hulls 13.79%, from "Kiskis" rice bran 9.83% and from Cono rice bran 6.32%. Gatterman's method of manuf. furfural (150 ml. concd. H_2SO_4 in 800 ml. H_2O for hydrolysis of 300 g. bran) gave yields varying from 0 to 23% of the theoretical. The excess Br titration method was equally applicable to all materials studied and the results on corncob indicated that the method is at least as accurate as the present pptn. method. A statistically significant neg. correlation existed between the furfural and crude protein content and between the furfural and Et_2O ext.; a pos. correlation existed between the furfural and total carbohydrate contents. 21 references. (C.A. 36, 2347).

Fonzes-Diacon
DETECTION OF THE ADULTERATION OF BRAN WITH RICE HULLS.
Ann. fals. et fraudes 17, 528 (1924).
The ratio of ash to silica is 8.0 for pure bran and 1.05 for rice hulls. Adulteration of bran with 50% of rice hulls brings it down to 1.4 and with 5% brings it to 4.5. (C.A. 19, 1168).

Frankel, S., and Hager, J.
VITAMINS. V. FURTHER ON THE CHEMISTRY OF VITAMINS.
Biochem. Z. 126, 269-280 (1921-22).
By the general procedure already reported (C.A. 15, 1545) an attempt was made to ext. vitamin from rice bran and yeast exts. Free choline is a constituent of the end product of the treatment of rice bran exts. after the elimination of the greater part of the

inactive material. This product is ineffective in stimulating yeast growth as is choline from lecithin. In yeast ext. choline was also found as an accompaniment of the vitamin. The active substance gave no Molisch reaction and hence cannot have a glucoside structure. (C.A. 16, 1603).

Fraps, G. S.
COMPOSITION OF RICE BY-PRODUCTS.
Texas Agr. Expt. Sta. Bull. 73, 14 pp. (1904).
The composition of rice hulls is similar to that of wheat straw. The bran, consisting mainly of the seed-skin without much of the hulls, should contain at least 10 per cent of proteids and not more than 20 per cent of crude fibre. Addition of hulls lowers the value. The mixture of bran, meal, and hulls, in the proportions present in the whole seed contains about 7.5 per cent of proteids and 28 per cent of crude fibre; its value is about half that of the pure bran. (J. Chem. Soc. 88, II, 114).

Fujita, Shinzaburo
BIOCHEMICAL STUDIES ON PITYROL. II. DISTILLATION OF RICE BRAN.
Mem. Coll. Sci. Kyoto Imp. Univ. Ser. A., 11, 497-503 (1928).
Rice bran was heated to 80° for 1 hr. to destroy the enzymes; it was divided into 2 parts (A and B) and 1 part (B) was extd. with petr. ether; analysis of A gave C 46.2, H 7.4, N 2.4, S 1.5, H_2O 14.7, ash 9.3, fat 22.4, protein 12.9, cellulose 11.4, pentosan 8.7, reducing sugar 1.3, sucrose 10.6%. The acid and I nos. of the fat were 160 and 118, resp. Analysis of B gave C 39.9, H 6, N 3, S 2, H_2O 14.1, ash 12, fat 0.7, protein 16.5, cellulose 14.6, pentosan 11.1, reducing sugar 1.5, sucrose 13.6%. Dry distn. of A and of B gave, resp., tar 24, 15; coke 28, 31; aq. liquor 36, 40; gas 12, 14%; 13% of the tar from A is volatile with steam, having d_4^{25} 0.967, and 87% is non-volatile with steam, having d_4^{25} 0.871; similarly from B, 17% volatile, d_4^{25} 0.981, 83% non-volatile, d_4^{25} 0.919; the aq. liquor A, d. 1.021 with 22% org. matter; aq. liquor B, d. 1.035 with 19% org. matter; the compn. of the gas from A and from B was, resp., 22%, 23% bases; 25.4%, 17.4% C_nH_{2n}; 0.4%, 0.4% C_2H_4; 2%, 3% C_nH_{2n+2}; 17.3%, 20.6%, CO; 31.8%, 31.6% CO_2. (C.A. 23, 1613).

Funk, Casimir
OBTAINING VITAMINS FROM YEAST, RICE BRAN, ETC.
U. S., 1,162,908 (Dec. 7, 1915).
Phosphotungstic acid is added to yeast ext. and the ppt. formed is treated with acetone and then decomposed with Pb acetate and the excess of the latter removed with H_2S. The filtrate is evapd. in vacuo and white needles, m. 223°, and probably having the formula $C_{29}H_{23}O_9N_5$ are obtained. (C.A. 10, 372).

Georgi, C. D. V.
STORAGE OF OIL CAKES.
Malayan Agr. J. 22, 63-68 (1934).

The change of oil content on storage (12 weeks) of rice-milling by-products, coconut, gingelly and groundnut cake was relatively small, but the acidity of the extd. oil increased notably, except in the case of the by-products of milling of parboiled paddy. (C.A. 28, 5898).

Goudswaard, Arie
DETERMINATION OF BRAN IN RICE.
Pharm. Weekblad 70, 770-774 (1933).
Partially polished rice takes on a double stain when immersed in dil. $K_4Fe(CN)_6$ + AcOH, thoroughly rinsed and then immersed in dil. $FeCl_3$ (prussian blue stain), then rinsed and stained with carbol-fuchsin. The application to detn. of bran content is not stated. (C.A. 27, 4594).

Greene, R. D.
PREPARATION OF VITAMIN B_6 FROM NATURAL SOURCES.
J. Biol. Chem. 130, 513-518 (1939).
Rice-bran exts. contain large amts. of substances which are readily adsorbed by fuller's earth and so interfere with the adsorption of vitamin B_6. Extn. with Et_2O, PrOH or BuOH yields concentrates that are more favorable for the adsorption step since some of the interfering substances are less readily extd. by these solvents than the vitamin. After the solvent purification purines and nicotinic acid can be removed by treatment with Ag or Cu salts; thus the adsorption is made still more specific. Yields of 10-15% of the vitamin calcd. to be present are obtained by the procedure described. The fact that solvents never remove more than 50-60% of the vitamin from rice-bran sirup indicates the possibility of the existence of the vitamin partly in a bound form. (C.A. 33, 9380).

György, Paul, and Tomarelli, Rudolph.
ANTIOXIDANT ACTIVITY IN SOURCES OF THE B VITAMINS.
J. Biol. Chem. 147, 515-524 (1943).
The coupled oxidation of butter yellow (N, N-dimethyl-p-phenylazoaniline) proceeds more slowly in the heterogeneous system consisting of cornstarch, methyl linoleate and butter yellow than in a system in which linoleic acid is substituted for its Me ester. Grains (oats, wheat, corn) and the com. oat flour prepn. Avenex exhibited high antioxidant activity in the linoleic acid-butter yellow system. Aq. rice bran ext. contains a very potent antioxidant. Other sources of the vitamin B complex such as yeast, yeast ext., liver ext., molasses and milk-sugar residue have also shown antioxygenic properties. The antioxidants in rice (polished or unpolished), rice bran ext., Avenex, and yeast are heat-labile. In yeast ext. or in rice bran ext. no destruction by autoclaving at pH 10 was observed. The antioxidant of rice bran ext. is dialyzable and partially sol. in linoleic acid. Of all the known B vitamins only p-amino-benzoic acid (I) has proved to be significantly antioxygenic under the exptl. conditions chosen. The antioxidant of rice bran ext. and of potent liver fractions is not identical with I. Vitamin E and hydroquinone are only moderately active antioxidants for the system under investigation. (C.A. 37, 6349).

Hand, W. F., et al.
INSPECTION AND ANALYSES OF COMMERCIAL FEEDING STUFFS.
Mississippi Agr. Exp. Sta. Bull. 123, 3-61 (1909).
Analyses are reported of rice, bran and polish, wheat by-products, corn chops and mixed feeds. The text of the feeding stuff law is given and commented on. (C.A. 4, 1329).

Hari, Susumu
THE FATTY OIL OF THE RICE EMBRYO
Acta Schol. Med. Univ. Imp. Kioto 7, 515-525 (1925).
Rice embryo, freed from polishings and other adhering substances, yields a fatty oil (I) by extn. with Et_2O. By sapon. with alc. KOH I was sepd. into fatty acids II, glycerol, and so-called unsapon. matter, III. II was further separable into (II a), the saturated, and (II b), the unsatd., fatty acids. II a was composed mostly of palmitic acid, II b of linolic and oleic acids. On oxidation II b yielded dihydroxystearic acid, as well as sativic and azelaic acids, m. 128.2° and 158°, resp. The formation of azelaic acid may be ascribed to the decompn. of dihydroxystearic acid, by the rupture of the group -CHOH-CHOH-, though the attempt at the isolation of the mono-basic acid, regarded as a cleavage product, failed. Phytosterols melting at 137° and 144° were isolated from III. Both yielded acetates having the same m. p. (123°). It is of interest to note that the chem. constitution of the fatty oil from the rice embryo, so far studied, is essentially the same as that of the fatty oil from rice polishings. (C.A. 20, 3243).

Hermano, A. J., and Fé Anido
CHEMICAL AND BIOLOGICAL ANALYSES OF TIKITIKI EXTRACTS.
Philippine J. Sci. 50, 189-195 (1933).
There is considerable variation in the vitamin content of different tikitiki (rice bran) prepns. (C.A. 27, 2983).

Hidaka, Tei.
RICE BRAN AS A RAW MATERIAL OF OIL. I.
J. Soc. Chem. Ind. Japan 42, Suppl. binding 219-220 (1939).
Rice bran from a horizontal cleaning and from a vertical cleaning mill had the following av., resp., compn. moisture 10.64, 11.81%, oil 20.38, 15.21%, protein 14.04, 13.57%, starch 13.95, 24.03%, ash 10.23, 7.80%. Eight samples of rice-bran cake collected on the market in 1938 had the following av. compn.: moisture 8.00, oil 8.70, starch 18.00, protein 15.81, ash 11.00, P_2O_5 4.1%. (C.A. 33, 8430).

Hidaka, Tei.
RICE BRAN AS A RAW MATERIAL OF OIL. II.
J. Soc. Chem. Ind. Japan 42, Suppl. binding 237-239 (1939).
Tests have shown that the increase in free fat acids in the oil of rice bran is far greater than in the case of the ground castor bean, but if sufficient moisture is added to the castor bean, then the oil in the castor bean is changed to fat acids to the extent of 95% as against 23% for rice bran oil. After storing rice bran for 4 months the fat acids of the oil increased from 3.94 to 9.36%. The free fat acids in crude pressed oil increased in a period of 300 days from 8.15 to 13.00%. (C.A. 33, 8431).

Hirohata, Ryúzó, To, Tokuwa, and Pin, Enshin.
BIOCHEMICAL STUDIES ON RICE. I. CHANGES OF THE CHEMICAL CONSTITUENTS OF RICE BY POLISHING.
J. Japan Soc. Food Nutrition 1, 93-100 (1948).

The rice studied is of Japanese origin cultivated in Formosa in 1942. As the degree of polishing increases, crude fat, crude protein, ash, crude fiber, vitamin B_1 and total calories decrease. The crude fat, crude protein, and vitamin B_1 of bran increase gradually up to 6% polishing, but then decrease up to final 8% polishing (8% polishing gave completely white rice, and complete bran). The crude fiber and ash of bran decrease rapidly up to 6% polishing: these constituents are contained especially in the outermost part of rice. Oryzenin and albumin are comparatively richer in the hull than in the embryo, while globulin is richer in the embryo. The d_4^{25} (0.9205-0.9278), n_D^{30} (1.4681-1.4746), acid value (15.34-22.44), sapon. value (133.68-162.42), Reichert-Meissl value (2.14-3.82), and I value (Hubl) (93.37-115.37) of bran oil had no significant differences according to varieties, period of harvesting, time of analysis, and degree of polishing. (C.A. 44, 5024).

Hofmeister, F.
THE ALKALOIDAL CONSTITUENTS OF RICE BRAN.
Biochem. Z. 103, 218-224 (1920).

H. isolated an alkaloid from rice bran, which he has named oridine, by triple extn. of the raw material with 80% alc. The ext. freed from alc. by vacuum distn. is acidified with HCl to a 3% acid content and the pptd. fats are removed with Et_2O and the residual solvent is evapd. off at a low temp. Colloidal contaminants are removed by several treatments with 80% alc. which is expelled, leaving a clear H_2O soln. This soln. is made slightly alk. with Na_2CO_3 and pptd. with I_2-Bi-K soln., acidified and after 5 hrs. the ppt. (choline fraction) filtered off by suction, the filtrate treated with 0.1 vol. 20% HCl and again pptd. with the I_2-Bi-K soln. The residual powder (oridine fraction) is filtered off by suction, carefully mixed with Ag_2CO_3 and immediately filtered. The slightly alk. filtrate is at once made weakly acid with HCl, filtered after sedimentation of the AgCl, and the filtrate dried in vacuum at low temp. when the product is obtained as a lightly colored mass of fine radial crystals. 5 to 10 mg. doses of the substance quickly relieve the convulsive seizures of beri-beri in pigeons for 8 to 10 days. The $AuCl_3$ compd. $C_5H_{11}NO_2$. $HCl.AuCl_3$ crysts. readily from hot H_2O in plates and flat prisms, m. 277° on purification. The free base after drying over H_2SO_4 forms a white powder somewhat hygroscopic and of a very weak acid reaction. It is easily sol. in H_2O, slightly sol. in cold but quite sol. in hot alc. and is crystd. from the alc. soln. by Et_2O. When heated on Pt it melts and decomps., giving off fumes of alk. reaction and having the odor of C_5H_5N. The H_2O soln. gives a ppt. with phosphotungstic acid, phosphomolybidic acid, I_2-Bi-K, $AuCl_3$; but not with Br-H_2O, $PtCl_3$, or HgCl. The phosphotungstic acid ppt. is barely sol. in hot H_2O, but easily in acetone. No isonitrile reaction is given. It is isomeric with betaine and valine. It probably is related to C_5H_5N and piperidine. It maybe a dihydroxypiperidine. The purified compd. has lost the antineuritic property observed in the first cryst. product which may have been due to a contaminant lost during purification,

or it may be that this function resides in the antineuratine hydrochloride: cf. C.A. 10, 2354. (C... 14, 2934).

Fukagawa, K., and Ri, S.
EFFECT OF HEAT ON COMPOSITION OF RICE BRAN DURING STORAGE.
Bull. Inst. Phys. Chem. Research (Tokyo) 17, 547-552 (1938).
Rice-bran oil of acid value 49.27 when heated for two hrs. at 50°, 80°, 100°, 120° and 150°, and when stored (unheated) for 100 days, changes its acid value to 151, 149, 123, 87, 63 and 66, resp. Heating caused no change in fat or protein content. (C.A. 33, 5215).

Itano, ..., Tuzi, Y., Hasegawa, T., and Moriya, T.
INFLUENCE OF SEA WATER ON THE IODINE CONTENTS OF RICE, RICE BRAN, AND WHEAT.
Ber. Ohara inst. landw. Forsch. Japan 8, 103-106 (1938).
Sixteen samples each of rice and wheat were collected from farms along an irrigation canal extending 16 km. inland from a sea-water bay. The I content of rice gradually decreased from 44.3γ% near the bay to 11.4γ% in those samples harvested farthest inland. The I content of wheat, 11.4-17.0γ%, did not seem to vary much with regard to distance from the sea. More than 65% of the I in whole rice was found in the bran fraction of the grain. (C.A. 33, 2557).

Jansen, B. C. P.
THE VITAMINE CONTENT OF EXTRACT OF RICE BRAN, AND THE METHODS OF ESTIMATING IT.
Med. geneesk. lab. Weltevreden, Java [3] A4, No. 1-3, 22-49 (1920).
Physiol. Abstracts 5, 361.
0.3% HCl, 70% alc. and 96% alc. contg. HCl were used to ext. rice bran. The exts. were dried on to washed white rice, and the resultant product was given to cocks and doves. The diff. methods of extn. all gave the same result, and the vitamine is quantitatively extd. Doves are slightly more susceptible than cocks to lack of antineuritic vitamine. Chem. methods for estg. vitamines are not yet trustworthy: the biol. method is the only safe one at present. "Nonnetjes" (Munia maja) are more susceptible than the other birds used: therefore they are suitable animals for estg. antineuritic vitamine. (C.A. 15, 2659).

Jao, S. G.
THE VITAMIN B_1 POTENCY OF TIKI-TIKI EXTRACT, CPUP BRAND.
Acta Med. Philippina 1, 153-169 (1939).
The prepn. of tiki-tiki ext., CPUP brand (made by the College of Pharmacy, Univ. of the Philippines), as described by Santos in 1936, is given in detail. One cc. of the ext. contained 12.5 I.U. vitamin B1 or approx. 50 Sherman units, when assayed by the rat growth method recommended by the U.S.P. XI Vitamin Committee. (C.A. 34, 3013).

Joachim, A. W. R., and Kandiah, S.
CHEMICAL NOTES. XVII. THE ANALYSIS OF SOME MANURES, FODDERS AND FEEDING STUFFS.
Trop. Agr. (Ceylon) 94, 282-289 (1940).

Results are given for H_2O and volatile matter, org. matter, ash, N, P, K, and Ca on 7 samples of bat guano, cacao shell and waste, cotton waste and paddy husk; H_2O org. matter, ash and N on 20 samples of different leguminous and nonleguminous green manures and composting materials; and H_2O, proteins, fats, carbohydrates, fiber, ash, Ca and P on 19 samples of different fodders and feeding stuffs such as hays, leaves and loppings of the Nelu (S) plant which is a species of Strobilanthes, cacao shell and waste, kapok seed, rice bran and meal, palmyra leaf and tapioca cattle feed. (C.A. 35, 263).

Karon, M. L., and Adams, M. E.
HYGROSCOPIC EQUILIBRIUM OF RICE AND RICE FRACTIONS.
Cereal Chem. 26, 1-12 (1949).

Rough rice, head rice, bran, polish, and hulls obtained from com. milling of an artificially dried rice and a naturally dried rice were used for the detn. of the rate of sorption and desorption of moisture and hygroscopic equil. over the range of 11-93% relative humidity at 25°. Their moisture contents at 25° and from 10 to 90% relative humidity were as follows: rough rice 4.4-17.6%, polished rice 5.2-18.8%, bran 5.0-18.0%, polish 5.3-18.0%, and hulls 3.7-15.3%. (C.A. 43, 2707).

Kida, Y.
INFLUENCE OF RICE BRAN UPON THE MANURIAL VALUE OF PHOSPHORIC ACID CONTAINED IN OIL CAKES.
J. Coll. Agr. Imp. Univ. Tokyo, 1, 367-379 (1911).

The phosphoric acids contained in oil cakes are chiefly in 3 forms: lecithin, nuclein and phytin. Phytase which splits phytin with the production of a sol. inorganic P compd. and inosite have been found. The existence of phytase both in rape-seed cake and soy-bean cake is certain, but its action in each case is small. In rice bran phytase exists in larger quantities or in a more active state. Expts. in which rice bran was mixed with the H_3PO_4 compounds contained in pressed cakes showed that the organic H_3PO_4 compds. in the cakes were transformed to simple inorganic, sol. ones, when mixed under suitable conditions; thus the manurial value of the pressed cake was enhanced. The above results can be obtained not only in the pressed cakes freed from fatty matters, but also in the raw state. (C.A. 6, 1800).

Kihara, Yoshijiro
CHEMICAL COMPOSITION OF RICE. I. CARBOHYDRATES IN RICE BRAN AND GERM.
J. Agr. Chem. Soc. Japan 19, 465-466 (1943).

Carbohydrates extd. from fat-free bran (H_2O 11.1%) with hot 95% EtOH and cold, hot, and superheated H_2O in succession were mainly starch (superheated and sol. in hot H_2O 8.96 and 1.79%, resp.), the residue contg. chiefly pentosan (7.82% probably araban). Similarly from fat-free germ (H_2O 16.12%) were obtained chiefly sucrose (sol. in hot EtOH 14.35%) and a small amt. of starch (3.29%). (C.A. 43, 1117).

Kihara, Yoshijiro
CHEMICAL COMPOSITION OF RICE. III. A NEW GLUCOSIDE FROM RICE BRAN.
J. Agr. Chem. Soc. Japan 19, 658-660 (1943).
From the aq. ext. of bran a ppt. formed with Pb subacetate was removed. The filtrate upon addn. of NH_3 formed a ppt. from which a light yellow powder swelling at 120° and decompg. at 215° was sepd. (yield 1%). This is a new glucoside; it was hydrolyzed by heating with a weak acid to glucose and yellow crystals and was named nukaine (from nuka, rice bran). The algycone was named nukagenine, has the formula $C_{12}H_{11}NO_5$, is acid in reaction, contains probably a quinoline nucleus, but no MeO- or CHO-, and seems to promote alc. fermentation in a dil. soln. (C.A. 43, 1117).

Kihara, Yoshijiro, Kawaguchi, Taketoyo, and Kaneko, Shinji
CHEMICAL COMPOSITION OF RICE. IV. UTILIZATION OF RICE BRAN IMPORTED FROM FRENCH INDO-CHINA.
J. Agr. Chem. Soc. Japan 19, 727-731 (1943).
The yield of oil was small and its acid no. high and hence is unsuitable for table oil. The starch content was high and deterioration slight. (C.A. 43, 1117).

Kihara, Yoshijiro, Kawaguchi, Taketoyo, and Kaneko, Shinji
CHEMICAL COMPOSITION OF RICE. V. UTILIZATION OF RICE BRAN IMPORTED FROM FRENCH INDO-CHINA.
J. Agr. Chem. Soc. Japan 20, 1-2 (1944).
The bran contains H_2O 10.71, N 1.94, crude protein 12.10, total sol. carbohydrates 44.09, crude fat (13.4 oil by pressing and extn., acid no. 162) 13.05, ash 8.92, and pentosan 5.94%, and vitamin B_1 453 γ/100 g. (C.A. 43, 1117).

Koch, D. E. V.
FOODSTUFFS [ANALYSES OF RICE BRANS, OLU SEEDS (NYMPHAEA LOTUS), MANIOC FLOUR (CASSAVA) AND ARROWROOTS]
Trop. Agr. (Ceylon) 87, 296-298 (1936).
Brans from raw and parboiled rices, rice bran contg. much husk and Philippine rice bran were compared with respect to content of H_2O, fat, protein, carbohydrate, fiber and ash. Raw polished rice, parboiled, polished rice and olu seeds were likewise compared. Olu seeds contained more fiber and less ash than the rices. Domestic and imported arrowroots were compared with respect to content of H_2O, fat, protein, carbohydrate, fiber and ash. The domestic sample contained more protein and ash and was of coarser texture. The food value of manioc flour was 88.8 and it had a nutritive ratio of 1:47. (C.A. 31, 1510).

Komatsu, Shigeru
BIOCHEMICAL STUDIES ON PITYROL. I. INTRODUCTION TO THE BIOCHEMISTRY OF PITYROL.
Mem. Coll. Sci. Kyoto Imp. Univ. Ser. A, 11, 481-495 (1928).
The tar which is obtained on the destructive distn. of rice bran is said to possess curative properties in cases of eczema; this tar has been called pityrol. Bran from the rice named "Shinriki" and

grown near Osaka was subjected to dry distn. in an Al retort; a colorless oil begins to distil with some water at about 200°, the color of the distillate becoming darker with rise in temp.; the largest fraction b. 350-400° and the distn. is ended at 450°; the yields were 24% tar, 28% coke, 36% aq. liquor, 12% gas; the tar is sol. in EtOH, Me_2CO or PhH; about 15% of the tar is volatile with steam and consists of 4% basic, 29% acidic and 67% neutral compds.; 85% of the tar is non-volatile with steam and consists of 3% basic, 29% acidic and 68% neutral compds. The hydrocarbons in pityrol are similar to those in Russian or Japanese petroleum and low temp. coal tar, appearing mostly as members of the polymethylene series with a mol. wt. equiv. to $C_{20}H_{40}$ and with also a few aromatic hydrocarbons. The non-volatile neutral fraction, b_{10} above 250°, when applied to the inner surface of a rabbit's ears produces first malignant epithelioma which finally terminates in true cancer; this production of cancer is never observed with pityrol. Previous workers have shown that true cancer can be produced by an unknown and unstable compd. which occurs in the fraction of coal tar b. 250-500° and which is removed by purification of the tar. The cancer-producing principle of the tars, therefore, seems to bear the same relationship to the tar as a vitamin does to a food material. The difficulty often encountered in isolating an enzyme or a vitamin in a pure state gives support to the belief that the behavior, particularly the biol. actions of a compd., would not be the same in every respect when it is employed in assocn. with other substances with which it occurs in nature. (C.A. 23, 1612).

López Borges, Hady
STUDY OF VITAMIN B_1 IN SOME CUBAN FOODSTUFFS.
Salubridad y asistencia social (Havana) 46, 140-183 (1943).
Vitamin B_1 was detd. according to U. S. P. XII by observation of the increase in weight of rats. Rice bran contained 1,297.3 γ thiamine per 100 g., green bananas 164.75, ripe bananas (2 varieties) 105.0-122.0, avocados 318.75, potatoes 245.0 and sweet potatoes 430.0 γ. (C.A. 38, 5013).

Louden, C., and Kinsella, F. L.
A PROPERTY OF RICE BRANS.
Analyst 64, 186-187 (1939).
The milling of rice gives either rice bran or parboiled rice bran according to whether the grain is milled raw or previously soaked in hot water. In rice bran there is 10-18% oil and in parboiled rice bran 16-28% oil. Parboiled rice bran or a mixt. of the 2 kinds of bran begins to sink very soon when placed on the surface of water, whereas the unparboiled bran will float unwetted for many hrs. In practice, it is convenient to grind 2 g. of the bran in a morter with an equal wt. of silver sand and ext. with petr. ether to det. oil. Then the residue is freed from the petr. ether and poured on the surface of some water in a beaker. If any considerable quantity of the bran sinks within 3 hrs. it indicates that either parboiled bran or sweat-damaged bran is present. In tests on 685 samples, 81 sank in less than 3 hrs. and it is believed that all but a few of these, which were probably sweat-damaged, contained parboiled bran although no way of absolutely proving this is known. (C.A. 33, 3476).

Marañon, Joaquin, and Cosme, Luz
NITROGEN DISTRIBUTION AND CARBOHYDRATE PARTITION IN PHILIPPINE RICE BRAN.
Philippine J. Sci. 57, 289-294 (1935).
High-grade Philippine rice bran that contained no hulls was analyzed and the compn. ascertained. The bran contained a considerable amt. of carbohydrates (44.50%). The N in the bran (2.264%) corresponded to 14.15% protein by calcn. Investigation of the N distribution showed that the major portion of the nitrogeneous substances in rice bran consisted mostly of protein, which is composed largely of non-basic N. The bran had a rather high content of starch (24.16%) and, in addn., contained small amts. of other carbohydrates such as pentosans, nonreducing sugars, gums and also crude fiber. Fourteen references. (C.A. 30, 167).

Masumoto, Bunkichi
BIO-CHEMICAL STUDIES ON PITYROL. IV. ACIDIC CONSTITUENTS OF PITYROL.
Mem. Coll. Sci. Kyoto Imp. Univ. Ser. A., 11, 517-519 (1928).
The acidic constituents from 20 lbs. of pityrol were isolated by extn. with 5% NaOH and gave 90 g.; it is a dark brown oil with phenolic odor, partly sol. in H_2O. After drying with Na_2SO_4 80 g. were fractionally distd. at 19 mm. and gave 35.1 g. b. 30-120°, 32.1 g. b. 120-50°, 12.8 g. b. above 150°. Further treatment with Me_2SO_4 and fractional distn. gave evidence of a compd. $C_{10}H_{15}OMe$. (C.A. 23, 1613).

Nishiyama, Harutoshi
STUDIES ON RICE CLEANING. I. THE CHANGES IN THE CHEMICAL COMPOSITION OF RICE BRAN WITH REPEATING THE RICE CLEANING.
Bul. Sci. Fakult. Terkult, Kyushi Imp. Univ. Fukuoka, Japan 9, 455-466 (1941).
The changes by repeated washing in the chem. compn. of bran from non-glutinous rice Asahi (I), Sakitori (II), and glutinous Tarobei (III) are detd. Crude protein of I and II increased with repeated washings and did not change in III. Crude fat gradually increased in I and increased then decreased in II and III. Crude fiber decreased. Protein N, N-free ext., P_2O_5, and K_2O did not change. Pentosan in I and II decreased and in III first increased then decreased. (C.A. 43, 5126).

Otake, Satoru
ISOLATION OF ORYZANIN, ANTINEURTIC VITAMIN, AS A CRYSTAL. I.
J. Agr. Chem. Soc. Japan 7, 775-808 (1931).
Rice bran was extd. with 0.2% H_2SO_4. The ext. was purified with fuller's earth and phosphotungstic acid. Thirty-three g. active oryzanin was obtained from 100 kg. of the rice bran. Active oryzanin was dissolved in H_2O and H_2SO_4 was added till the pH of the soln. became 2.6. It was pptd. by $AgNO_3$. From the ppt. adenine and hypoxanthine were isolated. $Ba(OH)_2$ was added to the filtrate till the pH of the soln. became 2.5-4.5. From the $AgNO_3$-$Ba(OH)_2$ ppt. nicotinic acid and adenine were isolated. $Ba(OH)_2$ was further added to the filtrate till the pH became 4.5-6.8. The ppt. obtained was purified

with phosphotungstic acid and H_2PtCl_6, and treated with abs. alc. and acetone. Nicotinic acid, an unknown base (HCl salt), $C_3H_6N_2.HCl$ (I), m. 262°, and the crystals of active constituent (oryzanin-HCl) were obtained. The yield of crude oryzanin-HCl was 1.31 g. from 2 kg. of active oryzanin or 6000 kg. of the rice bran. It was recrystd. from alc. and acetone as colorless monoclinic plates, m. 250°, formula $C_6H_8N_2O_2$-HCl. The aq. soln. gives the Pauly diazo reaction. It is easily sol. in H_2O, scarcely sol. in abs. alc. and insol. in acetone, benzene and ether. It resembles Jansen's vitamin B crystals. 0.02 mg. of the hydrochloride obtained was sufficient to cure polyneuritic pigeons. From the $AgNO_3$-Ba $(OH)_2$ ppt. at pH 6.8-9.0, nicotinic acid and I was obtained. Phosphotungstic acid was added to the filtrate and choline and an unknown base, $C_8H_{10}NO_3$-HCl (II), m. 204-5° (decompn.), were isolated. I and II were found to be inactive for animals. (C.A. 26, 1323).

Raunier, C., and Pau, H.

DETECTION AND DIFFERENTIATION OF RICE HULLS AND SAWDUST IN BRAN AND MIDDLINGS.

Ann. fals. 23, 229-33 (1930).

For the qual. detection of these adulterants treatment with 0.15% I soln. and washing with water leave them uncolored, while the starch of the brans and middlings is colored deep blue. Treatment with freshly prepd. 0.1% dimethyl-p-phenylenediamine sulfate immediately colors sawdust violet red: rice hulls are colored more slowly and not as deeply, while brans and middlings are unaffected: the colors should be observed not later than 4-5 min. after adding the reagent. The modified Leroy reagent (95% alc. 15cc., H_2O 15cc., phosphoric acid 20 cc., phloroglucinol 1g.) gives a deep blood red in 1-2 min. with sawdust and in 4-5 min. with rice hulls (not as deep as with sawdust). For the differentiation between sawdust and rice hulls and their approx. detn. the total ash and SiO_2 may be detd., the following av. values being used for total ash, SiO_2 and the ratio (10 x ash)/SiO_2, resp.; pure bran 5.45%, 0.7%, 77.80; white wood sawdust 2.25%, 1.00%, 22.50; rice hulls 16.35%, 15.60%, 10.50. (C.A. 24, 4095).

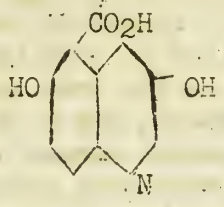
Sahashi, Y.

THE OCCURRENCE OF DIHYDROXYQUINOLINECARBOXYLIC ACID (THE β-ACID OF SUZUKI) IN RICE BRAN.

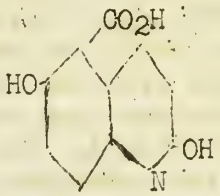
Biochem. Z. 159, 221-234 (1925).

The β-acid of Suzuki (I) (C.A. 6, 2774) has been obtained in large amts. (300 g.), and its properties and chem. structure have been detd. On heating I at 100°, an indefinite amt. of H_2O is lost, but at 150°, 1 mol. is driven off, giving the anhyd. acid, $C_{10}H_7NO_4$ (II) which changes at 150° to orange-yellow and at 300° to brown, but does not change again up to 315°. It burns with partial sublimation. The following salts are prepd.: $(C_{10}H_6NO_4)_2Cu.2H_2O$, $(C_{10}H_6NO_4)_2Ba.2H_2O$, $C_{10}H_6NO_4Na$, $C_{10}H_6NO_4K$, besides basic salts of Ag, Na, NH_4 and Ca. It gives a mono-Et or Me ester, a diacetate, and a tri-Bz deriv. One of the Bz groups is present as an anhydride, so that the acid is monobasic and contains 2 groups which are phenolic. Bromination of the Cd salt gives a salt $(C_{10}H_5NO_2Br.HBr)_2.CdBr_2$. By the action of HNO_3

on II, is obtained dinitro-3-hydroxybenzene-1,2-dicarboxylic acid (juglone acid), and $(CO_2H)_2$ while distn. with Zn dust gives quinoline. Therefore, I is either



or



(C.A. 20, 1083).

Sakami, Saburo

BIOCHEMICAL STUDIES ON PITYROL. III. NEUTRAL CONSTITUENTS OF PITYROL.

Mem. Coll. Sci. Kyoto Imp. Univ. Ser. A., 11, 505-515 (1928).

The tar obtained on destructive distn. of rice bran when steam distd. gave 12% of volatile material; the volatile (A) and non-volatile (B) portions were sepd. into neutral, acidic and basic fractions by treating with 7% NaOH and 10% H_2SO_4, successively. Analysis of the neutral fraction gave b. p. up to 150°, paraffin 8, aromatic 13, unsatd. hydrocarbons 79%; b. 150-80°, paraffin 9, aromatic 5, unsatd. hydrocarbons 86%; b. 180-210°, paraffin 13, unsatd. hydrocarbons 87%; b. 210-40°, paraffin 14, unsatd. hydrocarbons 86%; b. 240-70°, paraffin 24, unsatd. hydrocarbons 76%. The following were isolated and identified; octane, nonane, decane, undecane, dodecane, tridecane, tetradecane, and pentadecane; the principal parts of the neutral oil are the C_{10}, C_{11}, C_{12} and C_{13} paraffins. The unsatd. hydrocarbons were sepd. by treatment with concd. H_2SO_4 and then distd. in vacuo; hydrocarbons of the mol. formulas $C_{16}H_{26}$, $C_{18}H_{30}$, $C_{20}H_{34}$, $C_{24}H_{38}$, and $C_{28}H_{46}$ were identified; it is believed that these are polymers formed by the action of H_2SO_4 on the compds. C_nH_{2n} or C_nH_{2n+2} and that C_9H_{16}, $C_{10}H_{18}$, $C_{12}H_{20}$ and $C_{14}H_{24}$ are the main constituents of the volatile neutral oil. The neutral non-volatile part of pityrol is composed mostly of hydrocarbons of the polymethylene series C_{10}, C_{11}, C_{14} and C_{15}. (C.A. 23, 1613).

Scudi, J. V.
CONJUGATED PYRIDOXINE IN RICE BRAN CONCENTRATES.
J. Biol. Chem. 145, 637-639 (1942).
The detn. of pyridoxine (I) in urine (C.A. 34, 2007, 6979; 35, 167, 4792; 36, 2313) has shown that I occurs in conjugated as well as free form. The same methods applied to rice bran ext. have shown that both free and combined I occur in the bran ext. Concentrates were obtained from the ext. contg. 56-66 γ per g of free I and 100-141 γ of total I. The colorimetric method agreed with the bioassay only after hydrolysis. Added I was recovered nearly quantitatively. The combined form is a H_2O-sol. conjugate of low mol. wt. possibly contg. phosphoric acid. (C.A. 37, 1478).

Shearon, W. H., Jr.
RICE AND THE CHEMICAL LABORATORY.
Chem. Eng. News 27, 3278-3279 (1949).
Control methods used in the Malek process and the Huzenlaub process are described. Each shipment must be tested in pilot plant runs in the lab. because of the differences in kernel compn., ease of hydration and dehydration, color, and other properties. Tristimulus photoelec. colorimetry is used for color control. The degree of milling is detd. by means of a 10-min. fat extn. test, based on the fact that the fat is removed with the bran. A dielec. type of meter for the detn. of moisture has been developed in which the rice acts as a dielec. in a condensor. The continuous solvent extn. of rice bran oil and methods of controlling the operation are described. (C.A. 44, 765).

Silberberg, B. H.
MICROSCOPIC METHOD FOR THE QUANTITATIVE DETERMINATION OF RICE HULLS IN RICE BRAN.
J. Assoc. Official Agr. Chem. 6, 71-72 (1922).
Results on official samples of the U. S. Bur. Chemistry by the microscopic method (C.A. 16, 597) for rice hull in rice bran uphold the previous conclusion. It is recommended that the method be retained for tentative adoption. (C.A. 17, 1514).

Silberberg, B. H.
STOCK FEED ADULTERATION.
J. Assoc. Official Agr. Chem. 5, 77-78 (1921).
Excess rice hulls in rice bran can be detd. by the microscope by a method proposed by S. Place 4 mg. of a small portion of sample ground to pass 60-mesh sieve on a slide ruled in parallel lines 1/20 in. apart, add chloral hydrate soln. (1:1) to fill under sq. (22 mm.) cover glass. Warm, do not boil. Count the particles of hull tissue with a magnification of 90 diam. (6 compensating ocular and 16 mm. apochromatic objective). The high refraction and yellowish green color of hull will aid in distinguishing small pieces where structure is not easily recognizable. Comparison with standards allows estn. of approximate amount of hull. Collaborative results while meager justified the recommendation for tentative adoption of the method. (C.A. 16, 597).

Stechow, N., and Wamoscher, L.
ISOLATION OF THE ANTINEURITIC VITAMIN.
Arch. Pharm. Inst. Univ. Berlin 13, 145-147 (1927).
In expts. with rice bran, pptn. with K Bi iodide, but not that with $Pb(AcO)_2$, afforded active prepn. (C.A. 25, 2461).

Stieltjes, A.
RESIDUES FROM THE TREATMENT OF RICE AND RICE OIL.
Bull. mat. grasses inst. colonial Marseille 1922, 201-206.
Rice bran contains H_2O 9.8-11, nitrogenous matter 11.5-15, fat 12.7-15.4, amylaceous matter 40-50, cellulose 5-12 and ash 8-10%. The oil is removed by pressing, 8 to 9% remaining in the cake. Extn. gives better results. An extd. oil had the following consts.: sp. gr. 0.918, free fatty acids 7.0%, sapon. no. 179.4, Hehner no. 94.3, glycerol 9.03%, unsapon. 0.7%. (C.A. 17, 1344).

Suzuki, Shigekiyo
BIOCHEMICAL STUDIES ON PITYROL. V. BASIC CONSTITUENTS OF PITYROL.
Mem. Coll. Sci. Kyoto Imp. Univ. Ser. A., 11, 521-532 (1928).
The basic fraction by extn. with dil. H_2SO_4 is a dark brown viscous liquid with a pyridine odor; it was purified by steam distn. giving 460 g. insol. in H_2O and 190 g. sol. in H_2O. These 2 fractions were further sped. by fractional distn. and conversion to salts with picric acid, HCl and $HgCl_2$. The following were isolated and identified in the basic fractions: 2- and 3-methyl-,2,4- and 2,6-dimethyl-, and 2,4,6-trimethylpyridine, aniline and quinoline, there is also some evidence for the presence of 2,5-dimethyl-and tetramethylpyridine and an unknown base, 47% C and 3.5% H. (C.A. 23, 1613).

Suzuki, Bunsuke, and Hamamura, Yasuji
BIOS. VIII.
Proc. Imp. Acad. (Japan) 6, 337-340 (1930).
The details of the sepn. of an active fraction of bios from rice bran by extg. with 2% NaOH, pptn. with basic Pb acetate and extn. of the residue from the filtrate with MeOH, EtOH, pyridine, AmOH and EtOH are given, the yield being 10% of a compd. which was 10 times as reactive as the crude biose. It is a very hygroscopic amorphous powder, insol. in Et_2O, $CHCl_3$, and C_6H_6 and giving a yellow color with $FeCl_3$. An Ac deriv. could not be prepared but BzCl gives a benzoate which was inactive: purification by fractional pptn. from decalin gives fractions m. 116-8°, 105-7°, and 99-100°, contg. 3 Bz groups. This indicates that the compd. does not contain N and that 1 or more of the HO groups are in a ring formation. (C.A. 25, 555).

Suzuki, U., and Matsunaga, S.
PRESENCE OF NICOTINIC ACID IN RICE BRAN.
J. Coll. Agr. Imp. Univ. Tokyo 5, 59-61 (1912).
Nicotinic acid was obtained from rice bran, freed from fat, by extracting with 80-85% alcohol. The acid had not previously been found in any vegetable substance. The yield of picrote amounted to about 1 gram from 1 kilo. of bran. (J. Chem. Soc. 104, I, 235).

Suzuki, U., Yoshimura, K. and Fugi, S.
ON THE PROTEIN MATTER OF RICE.
J. Coll. Agr. Imp. Univ. Tokyo 1, 77-88 (1909).

The authors found amino acids and bases as the components of the protein matter according to the analytical method mentioned in the article on silk. As the preparatory step, they have found, in the whitened rice and the bran respectively: N soluble in distilled water, 0.07%, 0.65%; N sol. in 60% alc., 0.11, 1.16; in 10% NaCl, 0.17, 1.37; in 0.2% NaOH, 0.85, 1.51; in 0.3% NaOH, —, 2.36; in 0.4% NaOH, —, 2.49. The protein dissolving in 0.2% solution of NaOH was especially prepared after Ritthausen's method and subjected to hydrolysis to determine amino acids and bases. The nos. of grams per 100 g. protein from whitened rice and from bran resp. are: glycocoll, present (?), —; alanine, 3.7, (?): leucine, 14.3, 8.6: proline, 3.3, —; phenylamine, 2.0, —; aspartic acid, 0.4, —; glutamic acid, 14.5, 4.7; tyrosine, 0.5, 0.3; lysine, 0.86, —; histidine, 0.81, 0.88; arginine, 1.60, 3.40; ammonia, 2.33, 1.13. (C.A. 4, 213).

Takahashi, Katsumi
FATTY OIL FROM RICE BRAN.
J. Tokyo Chem. Soc. 40, 191-232 (1919).

Rice bran is known to contain fatty substances (20-30%), the amt. varying according to kind and quality of the plant. By comparing chem. compns. of rice kept for 280 yrs. and 160 yrs. with that of fresh crop, T. found that rice undergoes practically no changes in contents of H_2O, solid, ash, fiber, carbohydrates, and protein, but decreases in fat content from 2.2 to 0.17% of whole rice. Since he believes this change in fat content to be the important factor in detg. the quality of rice, he further investigated the nature of the fatty oil in the bran. The four distinct types of the fresh new rice are used for prepn. of oil: (A) native rice from Northern Japan; (B) native rice from Southern Japan; (C) Korean rice; and (D) Formosa rice. The $d_{15.5}$ of oil (A) is 0.92356, d_{15} of (B) 0.92538, d_{15} of (C) 0.92758, d_{15} of (D) 0.92084; (D) solidifies at -5.6° (av.) m. -5° (av.), n of (A) is 67.0 (using 20° butyrorefractometer), (C) 68.5, (B) 1.4565 (with Abbe 60° refractometer). Heat of combustion is 9439 cal. (av.). All are sol. in ether, petroleum ether, $CHCl_3$, CS_2. CCl_4, and benzene. Sapon. no. is 189.91 for (A), 183.79 for (B), 183.54 for (C), 192.19 for (D): I no. for (A) is 105.84, for (B) 104.73, for (C) 108.63, for (D) 103.07. Hehner value in 96.58 for (A), 95.96 for (B), 92.13 for (C), 94.05 for (D): R.-M. no is 0.59 for (A), 0.73 for (B), 1.21 for (C), 1.75 for (D); acid no. is 122.19 for (A), 14.36 for (B), 11.94 for (C), 81.31 for (D). (A) contains 3.72% of unsapon. matter, (B) 3.96%, (C) 4.24%, (D) 3.912%. The unsapond. substance contains both satd. and unsatd. fatty acids in the following amt.:

	Source of the Oil	A	B	C	D
Sat'd acids	Palmitic acid	+	18.95%	18.76%	20.00%
	Arachidic acid	+	3.84%	3.5%	4.35%
	Behenic acid	+	0.54%	0.62%	0.64%
	Myristic acid	+	+	+	+
	Stearic acid	?	+	+	+
Unsat'd acids	Linoleic acid	31.48%	31.48%	34.83%	30.00%
	$C_{16}H_{28}O_2$	+	?	?	?
	Oleic acid	47.22%	46.08%	42.57%	45.00%

Only 30% of the unsapon. portion is crystallizable and is pure phytosterol, although its m. p. is slightly lower than ordinarily reported (136°). The uncrystallizable portion is very difficult to purify. It contains no N or P; and analysis shows it to be $C_{26}H_{44}O$, which probably is either impure phytosterol admixed with coloring matter, or some other impure compd. of the sterol group. In general the oil in rice bran belongs to the cottonseed-oil group. It is mixed with some coloring matter, possibly chlorophyll. Ageing of bran produces more free fatty acids, rendering the oil unsuitable for table. But if fresh bran is used for prepn. of this oil a good substitute for peanut oil could be obtained. On account of the ease with which the coloring matter will sep. out on sapon., T. suggests that bran oil be used for soap. The high solid fatty acids also might be used for oleomargarine manuf. (C.A. 13, 1536).

Uzawa, Shuichi

THE PHOSPHORESTERASES OF BRAN. I.

J. Biochem. (Japan) 15, 1-10 (1932).

The enzyme is prepd. by digesting 50 g. rice bran at 37° for 2 days with 10 vols. of H_2O, preserved with toluene and $CHCl_3$. The filtered ext. is dialyzed 2 days against distd. H_2O. This dialyzed prepn. can be used directly or it may be purified by treating 100 cc. with 95 cc. 0.5 M AcOH + 0.5 cc. 0.5 M AcONa and 5 g. purified kaolin; and keeping this for an hr. at 37°. The kaolin is filtered off, washed twice with H_2O and then leached with a phosphate mixt. of pH 6.8, made by dilg. 50 cc. of a mixt. of equal parts of 0.1 M primary and secondary phosphates with 300 cc. H_2O. The soln. is then dialyzed to free it from inorg. P. This enzyme soln. can be kept in the ice box for months, preserved with toluene. The splitting off of H_3PO_4 at various pH values was detd. with the following substrates: β-glycerophosphate, phenyl phosphate, cyclohexyl phosphate, glycophosphate, p-nitrophenyl phosphate, monoethyl phosphate, and methylcyclohexyl phosphate, all in M/250 soln. It opt. activity is at pH 5.4-5.6. (C.A. 26, 2994).

Uzawa, Shuichi
THE PHOSPHORESTERASES OF BRAN. II.
J. Biochem. (Japan) 15, 11-17 (1932).
In these expts. diphosphate esters were employed, diethyl phosphate, diphenyl phosphate, and phenylethyl phosphate. The phosphoresterase from bran does not seem to have an opt. pH for the hydrolysis of H_3PO_4 from the di-esters, but the higher the substrate concn. and the more easily it is hydrolyzable the nearer does it tend to come to pH 5.5. (C.A. 26, 2994).

Uzawa, Shuichi
THE PHOSPHORMONOESTERASE AND THE PHOSPHORDIESTERASE.
J. Biochem. (Japan) 15, 19-28 (1932).
The expts. were made with phosphatases derived from taka-diastase, rice bran and kidney, and each enzyme was found to possess a characteristic pH opt. A pyrophosphatase was isolated free from the other phosphoresterases. The hydrolysis of the diphenyl pyrephosphate requires 2 enzymes, the pyrosphosphatase and the phosphormonoesterase. The hydrolysis of the di-esters is much more difficult to accomplish and it is known to result in H_3PO_4 and an alc. The monophosphatase was prpd. best by adsorption with kaolin in a soln. acidified with AcOH from a dialyzed taka-diastase soln. This hydrolyzes energetically phenyl phosphate at pH 5.6 (up to 96%) but does not attack diphenyl phosphate. Various attempts to obtain the diphosphatase were unsuccessful but the venom from the snake, Trimeresurus flavoviridis, was found to split off a mol. of phenol from diphenyl phosphate without attacking monophenyl phosphate. The opt. activity of this enzyme from snake venom is at pH 8.6, but it is still active in an acid medium; its hydrolysis of phenol from diphenyl phosphate depends, however, upon the presence of the isolated phosphomonoesterase. (C.A. 26, 2994).

Van Veen, A. G.
THE ANTINEURITIC VITAMIN. VI. PROPERTIES OF THE ANTINEURITIC VITAMIN OF RICE BRAN.
Rec. trav. chim. 51, 279-83 (1932).
The HCl salt of the vitamin retains addnl. HCl tenaciously. The vitamin gives no color reaction with $FeCl_3$, or picric acid and soda. The biuret reaction is neg. There is no color formation with glyoxylic acid and H_2SO_4 or with Na nitroprusside and acetone, CH_2O or alkali. With freshly pptd. $Cu(OH)_2$ or $Cu(OAc)_2$ no difficulty sol. Cu salt. is formed. Acidified tungstic acid solns. give a ppt. with solns. of the hydrochloride as dil. as 1:10,000. No characteristic grouping (such as MeO, active CH_2, basic, acid, etc., group) could be detected. p-Nitrophenylhydrazine in slightly acid soln. gives a red ppt. of undefined compn. Most chem. reagents cause resinification and loss of the physiol. curative properties. (C.A. 26, 2768).

Voelcker, A.
ANALYSES OF MANURES AND OF CATTLE FOODS.
J. Roy. Agr. Soc. Eng., 1880, 311.
Rice meal consists chiefly of the external layers of rice, which are separated in dressing. The mean of five analyses was as follows:—

Water	Albuminoids	Fat	Carbohydrates	Fibre	Ash
11.46	12.47	11.61	49.66	6.79	8.00

[J. Chem. Soc. (London) 38, 678]

Weinhagen, A. B.
VEGETABLE AND ANIMAL FATS AND WAXES. I. FAT FROM RICE BRAN.
Z. physiol. Chem. 100, 159-166 (1917).
Rice bran contains 10.94% of fatty substances sol. in Et_2O. They can be sepd. into a liquid oil (73%) and a solid fat. The oil contains 5.3% of phytosterol and 91% of fatty acids, of which 59% is oleic and 31.8% palmitic acid. The solid portion consists of 4.7% of phytosterol and 90.6% of fatty acid, which is practically pure palmitic acid. A substance is also present which can be sepd. from the phytosterol by fractional crystn. from alc., in which it is only slightly sol. It is found to be a satd. hydrocarbon, $C_{27}H_{48}$, m. 79.5-80.5°. Rice bran does not contain any glycerol nor any phosphoric compds. sol. in Et_2O, and only a trace of alc.-sol. phospholipoids. (C.A. 12, 1004).

Wingard, M. R., and Shand, W. C.
THE DETERMINATION OF THE RATE OF EXTRACTION OF CRUDE LIPIDES FROM OIL SEEDS WITH SOLVENTS.
J. Am. Oil Chemists' Soc. 26, 422-426 (1949).
Two basic methods are presented for measuring the rate of extn. of crude lipides from oil-bearing materials with solvent. In one the extn. is carried out by percolating fresh solvent through the sample and measuring the oil recovered at time intervals. In the Batch Co-current method samples of miscella are removed at intervals from an agitated batch of known quantities of oil seed and solvent and analyzed for lipides. Oil-bearing materials studied by these methods include: soybeans, cottonseed, peanuts, flaxseed, corn germ, castor beans, wheat germ, rice bran, mowrah seeds, tung nuts, grain sorghum, and expeller and press cakes. (C.A. 43, 7720).

Winter, O. B.
THE MICROSCOPIC IDENTIFICATION AND DETERMINATION OF THE SPECIFIC INGREDIENTS IN STOCK FEED.
Michigan Agr. Expt. Sta. Spec. Bull. 120, 3-31 (1923).
A table is included showing the principal macroscopic and microscopic characteristics of material commonly found in stock feed. Methods are given for detg. the adulteration of rice bran with rice hulls, the estn. of the percentage of locust bean meal in mixed feed, the amt. of grit in ground poultry feed, and the estn. of percentages of bone in meat scraps. The microscopic appearance of a no. of materials used in mixed feeds is given, together with references giving detail description of such material. (C.A. 18, 3236).

Wooley, D. W.
ISOLATION OF URACIL FROM LIVER.
Science 88, 239 (1938).
A com. alc.-sol. fraction of pork liver ext. was dissolved in water, concd. in vacuo, adjusted to a pH between 6 and 7 and extd. continuously with Et_2O for 75 hrs. A pale yellow cryst. deposit slowly formed in the boiling flask during this time. These crystals were filtered off, recrystd. from water, and identified as uracil by means of the 5-phenylhydrazine uracil deriv., m. 250°. Uracil was also isolated from rice bran ext. (C.A. 32, 8466).

Yamasaki, Seiko
BIOCHEMICAL STUDIES ON THE TASTE OF KOREAN RICE.
J. Chem. Soc. Japan 62, 1235-1242 (1941).
In order to reveal the relation between the quality and the fat content of rice, the fat of unpolished and polished rice and rice-bran has been studied. The rice having the good taste in the newly dried-up rice field has a lower I value and a higher sapon. value than the rice in the old dried-up rice field. The fat of unpolished rice has the same property as that of rice-bran, but differs from that of polished rice. (C.A. 41, 3226).

RICE BRAN

PROCESSING AND UTILIZATION

Arnold, Aaron, and Schreffler, C. B. (to National Oil Products Co.).
DEBITTERIZED VITAMIN B CONCENTRATES.
U. S. 2,390,679 (Dec. 11, 1945).
The vitamin concentrate is extd. with a water-immiscible solvent to remove the bitter-tasting matter. Prep. and aq. ext. of rice bran by a suitable extn. process involving removal of inert materials by pptn. and filtration. Adjust to a sp. gr. of 1.3, place in a continuous-extn. app. and ext. with ethylene dichloride overnight. Remove the solvent and adjust the pH to 4.0. A rice-bran concentrate (sp. gr. 1.15) was extd. with Et_2O for 4 hrs. then concd. to a sp. gr. of 1.35. Heptane was also used as a solvent. Tartaric acid was used to adjust the pH to about 4. (See Colman, H. B., U. S. 2,369,775, Feb. 20, 1945) (C.A. 40, 1286).

Burns, H. L. and Cassidy, M. M.
METHOD OF TREATING RICE BRAN AND RICE POLISH.
U. S. 2,563,798 (Aug. 7, 1951).
The authors claim "The method of treating material consisting of rice bran and/or rice polish to retard fatty acid development of the oils present in the material and to stabilize the oils therein comprising the steps of treating the material with live steam at a temperature of approximately 212° F. to heat and increase the moisture content thereof and thereafter further heating the material externally at a temperature in excess of 212° F. to insure thorough penetration of all of the particles of the material by a minimum temperature of 212° F., the overall minimum heating time to obtain said thorough penetration being about 4.5 minutes.

Colman, H. B. (to National Oil Products Co.)
VITAMIN B CONCENTRATES.
U. S. 2,369,775 (Feb. 20, 1945).
A high yield of vitamin B complex factors is obtained by extg. a natural vitamin B source first with a water-miscible fat solvent, such as iso-PrOH (91-100%) contg. less than 4% of moisture. Mix and agitate 100 parts of rice bran with 300 parts of iso-PrOH (99% by vol.) then filter off the solvent. Repeat the treatment with iso-PrOH. Add to the residual bran enough water and iso-PrOH to make 300 parts of a mixt. contg. 40% of the alc., mix and agitate, then filter. Treat the residual bran with 300 parts of 40% iso-PrOH soln., filter, and repeat the treatment. Combine the water-iso-PrOH solns. and evap. in vacuo until the d. of the soln. is 1.35. The concentrate contains about 63% of all the vitamin B_1 present in the original bran. Addn. of 3% H_2SO_4 to two portions of water-iso-PrOH soln. used for extn. removed 61% of the vitamin B_1. Aq. solns. contg. 20% acetone extd. 45% of the vitamin B_1, and aq. solns. contg. 20% of dioxane extd. 37% of the vitamin B_1. (C.A. 39, 4726).

deLuynes, M. (Report by)
AMYLACEOUS SUBSTANCES, THE ECONOMIC TREATMENT OF THE BY-PRODUCTS OF DISTILLATION OF.
Bull. Soc. encour. ind. Natl. 96, II, 161-166 (1897).
MM. Dónard and Boulet, at their works situated at Bapeaume-les-Rouen have treated during the last seven years about 13,000,000 kilos of maize cake from which 3,500,000 kilos of oil were extracted. Incidentally they have also produced in one year 20,000 kilos of wheat oil, 7,000 kilos of rye oil, and more than 200,000 kilos of rice oil. They avoid the resinification of the oil, and obtain complete extraction from the cake, by —

1. Drying at a low temperature under a pressure of 40 mm. in a rotatory apparatus.
2. Extracting the oil with boiling petroleum spirit.

[J. Soc. Chem. Ind. (London), 16, 550].

Donelson, E. V.
IMPROVEMENTS IN RICE-PRODUCT AND PROCESS FOR PREPARING SAME.
Eng. Pat. 15,959, November 5, 1888.
The rice grain is submitted to a moist heat to loosen the outer covering of cellular tissue, and afterwards passed through a pair of ordinary "buhr" stones which remove the outer casing without breaking the grain. The grain is now again subjected to a straining process to thoroughly develop the soluble starch, dextrin, and sugar, still without destroying the form of the grains. Immediately on completion of this cooking process the hot grains are suddenly cooled by cold water or a blast of cold air to harden the outside of the grain. The cold grains are now "subjected to the treatment of rolls or mill," and the product dried. The product is wholly soluble, may be kept for any length of time, and is easily handled. It is useful for brewers and as an alimentary substance. [J. Soc. Chem. Ind. (London), 8, 301].

Fukagawa, K. and Ri, S.
EFFECT OF INORGANIC ACIDS ON SACCHARIFICATION OF RICE BRAN.
Bull. Inst. Phys.-Chem. Research (Tokyo) 17, 239-245 (1938).
With the same concn. and duration of heating, saccharification takes place more rapidly with HCl than with H_2SO_4, and max. saccharification is attained with 3% HCl. With 1% HCl saccharification increases with time of heating, but with concns. more than 2% it reaches a max. in 2-3 hrs. With H_2SO_4 max. saccharification is attained in 3 hrs. whatever the concn. (C.A. 32, 8820).

Jarowski, C. I., Stiller, E. T., and Williamson, M. B. (to Wyeth, Inc.)
ANTIOXIDANT FROM RICE BRAN.
U. S. 2,455,255 (Nov. 30, 1948).
An antioxidant material capable of retarding oxidative deterioration in medicinals and foods contg. fats or oils is extd. from rice bran concentrate by use of a halogenated hydrocarbon solvent. (C.A. 43, 2340).

Kazita, Syunzi, and Inoue, Ryōhei (to Syōwa Sangyō K. K.)
ARTIFICIAL FIBERS FROM BRAN.
Japan. 132,664 (Oct. 13, 1939).
Bran or hulls of rice, wheat, etc., are treated with dil. alkali, the ext. is treated with acid or salts sol. in alkali, to ppt. proteins, the ppt. is washed with water, dissolved with alkali, treated with stabilizing agents, such as sugar, tartaric acid or salicylic acid, and extruded into a coagulating bath contg. acid with or without org. coagulating agent. (C.A. 35, 3456).

Kazita, Syunzi, and Inoue, Ryōhei (to Syōwa Sangyō K. K.)
ARTIFICIAL FIBERS FROM SOYBEAN PROTEINS, RICE BRAN, WHEAT BRAN AND OTHER PRESSED CAKES OF GRAINS.
Japan. 133,912 (Dec. 18, 1939).
Brans or cakes are extd. with alkali soln., and proteins in the ext. are pptd. by adding acid or salt, washed with water, and dissolved in alkali soln. with stabilizing agents. The residue after extn. of oil from soybeans is extd. with dil. alkali, coagulated by adding acid or metal salts, washed with water, dissolved in alkali soln. with stabilizing agents, and ripened. These 2 prepns. are mixed and extruded into a coagulation bath contg. acid with or without org. coagulation agents. (C.A. 35, 4221).

Kihara, Yoshijiro, and Sato, Tomotaro.
STUDIES ON THE PREPARATION OF TABLE YEAST FROM BRAN. I.
J. Agr. Chem. Soc. Japan 20, 131-135 (1944).
Barley bran (H_2O 10.74, crude protein 14.19, total sol. carbohydrates 37.33, pentosan 24.94, fat 1.45, ash 5.74, and fibers 17.58%) immersed in H_2O at room temp. or 70° for 4 hrs., or boiled in H_2O 30 min. gave an ext. contg. 1-2% sugar, from which yeast was prepd. by inoculating with Torula utilis but without adding N and phosphates (yield of dry yeast 50% in 2 days). The yeast contained 3188γ/100 g. vitamin B_1. The residue could be easily dried and, as fodder, retained as much nutritional value as the original bran. Similarly yeast was prepd. from rye bran (H_2O 12.79, crude protein 16.75, total sol. carbohydrates 44.00, fat 5.95, and ash 3.90%) and from rice bran (H_2O 13.51, crude protein 15.19, total sol. carbohydrates 24.38, fat 17.47, and ash 9.74%, extd. in warm H_2O only). The yeast from rice bran contained 9235γ/100 g. vitamin B_1. (C.A. 43, 778).

Loeb, J. R., Morris, N. J., and Dollear, F. G.
RICE-BRAN OIL. IV. STORAGE OF THE BRAN AS IT AFFECTS HYDROLYSIS OF THE OIL.
J. Am. Oil Chemists' Soc. 26, 738-743 (1949).
Bran oil when stored under natural conditions is subject to rapid hydrolysis and increase in fatty acids to a point where economical refining is not possible. Data are presented showing the effects of storing for 5 hrs. at temps. of 70, 85, 100, and 110° at different humidities. Decreasing the storage temp. retards the formation of free fatty acids. With regular rice bran deterioration during storage occurred fairly rapidly at 3°. The effect of heating or drying and of

different relative humidities on the storage of rice bran indicates that both regular and "converted" rice can be stored for 4 months, without excessive increase in fatty acid content provided the bran is dry and kept at a low-moisture content. The effect of chem. inhibitors and of inert atm. on the rate of free fatty acid formation of regular rice bran indicated that they were ineffective in preventing deterioration. (C.A. 44, 1723).

Markley, K. S.
RICE BRAN OIL. VI. SOME ASPECTS OF PROCESSING AND UTILIZATION OF RICE BRAN OIL.
The Rice Journal 52 (10), 14, 30-5 (1949).
The economic importance of rice is reviewed with emphasis upon the advantage to this country of developing new markets for all the byproducts of the rice milling industry. One of these byproducts, rice bran, is a potential source of about 50 million pounds of high quality edible oil a year, but its use for this purpose presents a number of problems not usually encountered by the oil processing industry. The Southern Laboratory's attack on these problems includes research on the extraction, composition, utilization, and stability of rice bran oil, and on the rate of deterioration of the oil in the bran after separation of the latter from the brown rice. The status of these investigations in October, 1949, and some of the results obtained, are summarized. (List of Publications and Patents of the Southern Regional Research Laboratory, July-December 1949).

Meinke, W. W., Holland, B. R., and Harris, W. D.
SOLVENT EXTRACTION OF RICE BRAN. PRODUCTION OF B-VITAMIN CONCENTRATE AND OIL BY ISOPROPANOL EXTRACTION.
J. Am. Oil Chemists' Soc. 26, 532-534 (1949).
Freshly milled rice bran was extd. with hot 91 and 95% isopropanol to obtain the oil, sugars, and a considerable portion of the B-complex vitamins. After concn. of the micella a sugar-sirup phase sepd. from the oil. This contained most of the extd. vitamins. Yields of oil and sirup were observed and vitamin assays made on the sirup and bran before and after extn. The vitamins measured were biotin, folic acid, riboflavin, panthothenic acid, pyridoxine, thiamine, niacin, and inositol. (C.A. 44, 239).

Morris, Nelle J., Swift, C. E., and Dollear, F. G.
RICE BRAN OIL. VII. THE "FINES" FRACTION OF RICE BRAN.
The Rice Journal 53, (9), 6-7, 10 (1950).
Rice bran has been subjected to sieve analyses and the oil content of the various fractions as a function of particle size has been determined. The "fines" produced during pilot-plant extraction of rice bran consisted of 67.5 percent of material that will pass a 400-mesh sieve. Data indicated that the tendency of fines to become suspended in the miscella is dependent appreciably on the moisture content of the bran, fewer fines passing into the miscella when bran of 15.6 percent moisture was extracted with commercial hexane. Increasing the moisture content to about 16 percent had no adverse effect on the yield of oil recovered by solvent extraction. (List of Publications and Patents of the Southern Regional Research Laboratory, July-December 1950).

Nishimura, Minoru, and Nishimoto, Yoshitsugu.
CAGE PRESSING OF RICE POLISHINGS.
J. Nippon Oil Technol. Soc. 1, No. 3, 39-45 (1948).
The preheating treatment is best done when the product contains 7.5-8.5% H_2O and at a temp. of 90° for 3-4 min. at low pressure then at high pressure for 12-15 min. (C.A. 43, 5610).

Okada, K.
STUDIES ON RICE BRAN.
Münch. Med. Wochschr. 86, 290-292 (1939).
Production and uses of rice bran are discussed. (C.A. 34, 180).

Ozai-Durrani, A. K.
METHOD OF PROCESSING RICE BRAN AND RICE POLISH.
U. S. 2,448,729 (Sept. 7, 1948).
Rice bran and rice polish (approx. 15% oil content) shortly after removal from the grain are mixed with sufficient H_2O to form a binder with the H_2O-sol., natural sugars, starches, and proteins. This doughhy plastic mass is agglomerated into porous aggregates, dried at about 140° F., broken up into fragments, oil extd. by solvent (hexane), excess solvent is removed, the aggregates are crushed to a fine powder and toasted. The oil-free bran and polish are an edible food product rich in vitamin and in natural sugars, starches, and protein. It is stable against deterioration in the atm. over extended periods of time. (C.A. 42, 8997).

Pattee, E. C. (to National Distillers' Products Corp.)
APPARATUS SUITABLE FOR SOLVENT EXTRACTION OF RICE BRAN, OLEAGINOUS SEED MATERIALS, DISTILLERS' GRAINS, CALICHE, WOOD CHIPS, ETC.
U. S. 2,187,890 (Jan. 23, 1940).
An app. for continuous extn. comprises an extg. vessel for commingling an extg. solvent and material to be extd., the vessel having inlets for the solvent and the material and having a discharge outlet at its lower portion, an expressing chamber above the extg. vessel, a vertically extending housing encircling the extg. vessel and the expressing chamber connecting with the discharge outlet in the extg. vessel, an opening in the housing above and connecting with the expressing chamber, an endless conveyor within the housing for raising the material from the discharge outlet to the expressing chamber, a conduit leading from the expressing chamber to the housing on the side on which the endless conveyor descends, and an outlet from the expressing chamber for carrying off the extd. material. (C.A. 34, 3547).

Pattee, E. C. (to National Distillers' Products Corp.)
SOLVENT EXTRACTING APPARATUS.
U. S. 2,345,626 (April 4, 1944).
Apparatus for continuous solvent extraction of grains, rice, bran, oleaginous seeds or their flakes, wood chips, etc., is illustrated and described. (C.A. 38, 4476).

Patterson, W. I., and Williamson, M. B. (to S.M.A. Corp.)
ANTIOXIDANTS [FROM RICE BRAN CONCENTRATES].
U. S. 2,380,546 (July 31, 1945).

Commercially available rice-bran concentrate (usually in aq. or aq. alc. medium) is extd. with an equal wt. of $CHCl_3$, halogenated hydrocarbon solvent boiling below 100°, or Et_2O. The antioxidant present in the latter medium is brought into aq. soln. by extn. with dilute alkali and after adjustment of the pH within the range 3 to 6 is again extd. with the above org. solvents. After removal of the solvent, a potent antioxidant product is obtained by fractional distn. under high vacuum at bath temps. of 100 to 200°. The product is insol. in petroleum ether and completely sol. in Na_2CO_3 soln. Incorporation of the antioxidant with fats in medicines and foods is suggested. (C.A. 39, 4999).

Patterson, W. I., and Williamson, M. B. (to Wyeth, Inc.)
ANTIOXIDANT FROM RICE BRAN.
U. S. 2,455,088 (Nov. 30, 1948).

The antioxygenic potency of aq. exts. of rice bran is increased 9-fold by pptn. of inert material by MeOH followed by ether extn. An aq. rice bran concentrate is poured in a thin stream into vigorously stirred MeOH in the ratio of 1 lb. to 2 gal. After standing overnight, the MeOH soln. is sepd. by decantation and filtration, and concd. by vacuum distn. in an atm. of N. The sirupy residue is about twice as potent as the original concentrate. It is extd. with ether and the ext. concd. by distn. at below 50°. The residual sirup has about 9 times the potency of the original. For further concn., the material is dissolved in sufficient aq. alkali so that the pH of the soln. is about 12 and again extd. with ether. The ext. is discarded, the extd. soln. acidified to between pH 3.0 and 6.5, the antioxidant extd. with ether and the ether ext. concd. in vacuum. (C.A. 43, 1586).

Pominski, Joseph, Molaison, L. J., Crovetto, A. J., Westbrook, R. D., D'Aquin, E. L., and Guilbeau, W. F.
SOLVENT EXTRACTION OF COTTONSEED AND PEANUT OILS. IV. PILOT PLANT BATCH EXTRACTIONS.
Oil Mill Gaz. 51, No. 12, 33-39 (1947).

A portable batch solvent-extn. plant and app. used at the authors' lab. are described in detail. Some data on the use of this plant for extn. of cottonseed, okra seed, and rice bran oil are tabulated. Hexane and Et ether were the solvents used. (C.A. 41, 6067).

Roberts, R. L., Van Atta, G. R., Hunter, F. R., Houston, D. F., Kester, E. B., and Olcott, H. S.
STEAM BLANCHING OF FRESH ROUGH RICE CURBS SPOILAGE BY FATTY ACIDS.
Food Inds. 21, 1041 (1949).

Lipase activity in undried, rough rice was inhibited by blanching in steam for 1 min. This treatment stabilized the oil in the bran against fatty acid development and allowed recovery of high-grade edible oil. (C.A. 44, 2660).

Samaniego, Ramon, and de Leon, A. I.
ACTIVATED CARBON FROM SOME AGRICULTURAL WASTE PRODUCTS.
Philippine Agr. 29, 275-295 (1940).

The waste products rice bran, rice hulls, coconut shells, corncobs, lumbang nut shells and pili nut shells were carbonized to produce raw carbon and activated carbons. The activated carbons were produced by carbonization of the raw material followed by impregnation and further carbonization or by impregnation of the raw material followed by carbonization. In general the first method gave best results. H_3PO_4, HCl, HNO_3, NaOH, $ZnCl_2$ and $FeCl_2$ were good activators for carbon intended for I adsorption. The best carbon for I absorption was obtained from coconut shells and impregnated with H_3PO_4, second best from corncobs with the same treatment and third best from coconut shell treated with H_2SO_4. The 3 best carbons for Cl gas absorption were obtained by impregnating pili nut shell, coconut shell carbon and lumbang nut shell carbon with NaOH. The best activator for carbon intended for Cl gas absorption was NaOH; second best was H_3PO_4. $SnCl_2$, $MnSO_4$ and $MnCl_2$ invariably decreased the adsorptive power of the carbons for both I and Cl except that of coconut shell carbon treated with $SnCl_2$. Indifferent results were obtained with some other salts. All materials except rice bran carbonized at 427°. Rice bran carbonized at 516°. The yields of raw carbon obtained were rice bran 29.57, rice hulls 57.48, corncobs 35.20, coconut shells 36.88, pili nut shells 41.21 and lumbang nut shells 54.43%. Of the raw carbons that from corncobs had the greatest absorption capacity for both water and I. App. and methods are given in detail and the literature is reviewed with 15 references. (C.A. 35, 599).

Savage, J. de La M.
RICE BRAN AS A LARVICILE.
Malaria Sect. Assam Med. Research Soc.
Rept. of 1933; U. S. Pub. Health Eng. Abstracts 14, Ma, 36(Oct. 13,1934).

In water and ditches near rice mills mosquito larvae were not found. Expts. made adding rice bran to waters contg. many anopholene larvae showed the latter suffered death from suffocation in 24-72 hrs. The percentage kill was very high. The rice bran is cheaper in Assam than imported soft stone which is used as diluent for Paris green used in antimalarial operations. (C.A. 29, 1189).

Shedlock, W.
AN IMPROVED METHOD OF TREATING RICE AND OTHER GRAIN FOR REMOVING THE OUTER SKINS OR COVERINGS THEREOF.
Eng. Pat. 15,499, October 27, 1888

For the purpose of removing the outer skins or coverings from rice and other grain, the grain is usually submitted to a process of mechanical rubbing, known as the "attrition process". The object of this invention is to facilitate the above process by the simultaneous action of suitable gases such as, for instance, superheated or dry steam. Apparatus suitable for carrying on the improved process is described in the specification with reference to drawings. /J. Soc. Chem. Ind. (London), 8, 911/.

Shishido, Toshio
PRESSING OF RICE OIL AS AN INDUSTRY IN VILLAGES.
Nogaku (Sci. of Agr.) 3, 611-614 (1949).
Pressing of rice oil as an industry in villages. (C.A. 44, 11123).

Soloveichik, I. Ya.
FOOD CONCENTRATE CONTAINING VITAMIN B COMPLEX.
U.S.S.R. 65,874 (Feb. 28, 1946).
A mxt. of defatted wheat germs, rice bran, and rice hulls is extd. with acidulated H_2O contg. alc. and $CHCl_3$. The ext. is neutralized with chalk and filtered, and the filtrate is evapd. to a sirupy consistency. (C.A. 41, 5232).

Takahashi, K.
RICE-BRAN OIL.
Japan 35,263 (Nov. 4, 1919).
Lipase in the rice-bran is destroyed and the bran is bleached by treating it with 5-15% SO_2 for 5-10 hrs. in a closed vessel and drying in the sunlight or with 3-10% bleaching powder and H_2O in the sunshine for 10-20 hrs. The bran is neutralized with lime and extd. with CS_2, CCl_4, or gasoline. The oil is agitated with 5-10% Japanese white clay for 1 hr. and filtered. It contains but small amts. of free fatty acids and is of excellent quality. (C.A. 14, 2560).

Takeshita, Yasuhiko, and Maruyama, Seichi.
THE EFFECT OF HEATING AND AGITATION OF SOLVENT DURING THE EXTRACTION OF RICE POLISHINGS.
J. Nippon Oil Technol. Soc. 2, No. 1, 27-29 (1949).
Rice polishings contg. 7.5-8.5% H_2O and 20% total oil were extd. with solvent (1 l. for 100 g.). The yield of oil was 17.9% in 60 min. without agitation at room temp., while with agitation 17.8% was obtained in 10 min.; when heated at 30-50° without agitation 19.0% was obtained in 10 min. (C.A. 43, 5610).

Takeshita, Yasuhiko, Maruyama, Seichi, and Ono, Yoshiki.
IMPROVEMENT OF EFFICIENCY OF EXTRACTION OF OIL FROM RICE POLISHINGS.
I. THE EFFECT OF DRYING ON THE YIELD OF OIL.
J. Nippon Oil Technol. Soc. 2, No. 1, 9-26 (1949).
Lab. expts. with 200-g. samples and 1 l. of solvent indicated that the extn. of oil was increased linearly with the decrease in moisture content (10-0.78%). The rate of drying can be expressed in an equation of the 1st order. (C.A. 43, 5610).

Tsuchiya, Tomotaro.
THE CHANGE OF OIL DURING THE STORAGE OF RICE POLISHING.
J. Nippon Oil Technol. Soc. 1, No. 4, 1-6(1948).
Analysis after storage from April 14 to Aug. 16 indicated that there was a gradual decrease in I no. and oil content and an increase in acid no. of the oil. The content of unsatd. fat acid increased, while that of satd. acid decreased in comparison with oil obtained before storage. The oil having acid no. 138 obtained after storage of rice polishing was refined; it showed a content of unsaponifiable substance as high as 24.3%. (C.A. 43, 5609).

Weizmann, Charles.
PRODUCTION OF ACETONE AND BUTYL ALCOHOL BY FERMENTATION.
U. S. 2,377,197 (May 29, 1945).
A fermentation process is described for producing BuOH (I) and acetone (II) from molasses mashes contg. rice bran (an initiator of molasses fermentation) utilizing the mass-inoculation principle. I bacteria such as Cl. acetobutylicum degrade rice protein, liberating amino acids, especially suitable nutrient for the organism. The starch of the rice bran and also hemicellulose constituents are fermented. The yield of solvents is higher than usual, being as high as 33% of the sum of the starch, sucrose, and monosaccharides. Vitamin B_2 is synthesized and B_1 present in the rice bran is a valuable product. The spent mash is an important food since vitamins B_1 and B_2 and amino acids are recoverable. The max. concn. of neutral solvents obtained is 2.1%, consisting of 8% EtOH, 28-32% II, and the remainder I. Five examples of various mashes with yields are given. Some idea of the mass-inoculation principle may be realized by an example: 100 parts rice bran in 900 of H_2O was inoculated with Cl. acetobutylicum and after 24 hrs. this was added to a mash of 60 parts sugar (6% soln. prepd. from blackstrap molasses). After 48 hrs. fermentation was complete. 47.2 l. gas was formed, 28.8 parts neutral solvent and 4.6 parts acid (as acetic); 2.6 parts nonfermented sugar remained. Emphasis is placed on the procedure overcoming a lack of degradable protein and presence of inhibiting toxic substances in molasses. A table describing raw materials and final products of 4 tests is included. (C.A. 39, 3623).

West, A. P., and Cruz, A. O.
PHILIPPINE RICE-MILL PRODUCTS WITH PARTICULAR REFERENCE TO THE NUTRITIVE VALUE AND PRESERVATION OF RICE BRAN.
Philippine J. Sci. 52, 1-76 (1933).
A general resume with many references to the literature. The topics covered are: rice cultivation: rice straw: Philippine process of milling rice: rice starch: rice hulls: polished and unpolished rice: nutritious parts of the rice grain: rice bran; rice-bran oil (rice oil); vitamins in rice bran; proteins and mineral constituents; nutritive value of rice bran; deterioration of rice bran; preservation of rice bran. (C.A. 28, 1418).

Uchiyama, Y., Hori, H., and Nozawa, I.
EXTRACTING RICE BRAN OIL.
Japan 30, 903 (Mar. 22, 1917).
The app. comprizes the following elements, as illustrated: A, extraction vessel; B, filter; C, distg. pan; D, boiler; E, cooler; F, oil tank; G, pump; H, cooler; I, separator; K, benzine tank. (C.A. 12, 235).

Ueno, Seiichi, Yukimori, Takao, and Hayashi, Koki.
ALCOHOLIC EXTRACTION OF RICE-BRAN OIL. II.
J. Agr. Chem. Soc. Japan 20, 3-4 (1944).
EtOH after the 1st extn. can be reused in successive extns., although the acid no. is lowered less and less. Bran oil with acid no. 80 can be extd. into acid-free oil with acid no. 10 after 4 successive extns. with about 10% loss of neutral oil.
(C.A. 43, 881).

Utaka, Harukaze.
PREPARATION OF FURFURAL FROM JAPANESE RICE BRAN.
Rept. Osaka Ind. Research Lab. (Japan) 5, No. 16, 1-11 (1925).
The effect of HCl and H_2SO_4 as catalyzers in La Forge and Mains' method (C.A. 17, 3823), of prepg. furfural was investigated with Japanese rice bran. The sample used contained 11.99% H_2O. The % compn. of the solids was: pentosan 17.92% (10.53% as furfural), fat 0.44%, ash 14.09% (silica 6.31%), crude protein 3.69%, crude fiber 43.64% (ash in the fiber 2.75%), and other N substances 20.22%. The conclusions are: HCl is a better catalyst than H_2SO_4 with the rice bran, but H_2SO_4 may be better for industrial use; with the latter, 9-10% furfural can be obtained from the air-dried sample of bran. With 100 lbs. steam pressure, per sq. in., 1 hr. treatment is the best; the amt. of the acid should be about 0.4% of the total sample, in such a diln. as to make about 10 times the vol. of the bran. By this method, U. obtained besides furfural, 0.03% AcH, 0.07% volatile org. acids, 2% sugar and a trace of MeOH. (C.A. 19, 2336).

RICE BRAN

NUTRITION

Agnanta, I. M.
A COMPARATIVE STUDY OF RICE BRAN AND CORN BRAN AS FEEDS FOR GROWING AND FATTENING PIGS.
Philippine Agr. 25, 704-711 (1937).
The rice and corn brans used in the expts. contg: H_2O, 9.20, 11.67; fat 13.89; 4.95; ash 10.11, 3.25; protein 12.38, 9.69; fiber 9.72, 5.39; and carbohydrates 44.70; 66.05%, resp. The corn bran was only 61-88% as efficient as the rice bran in 3 tests using 6 pigs in each group in each test. (C.A. 31, 2308).

Allas, T. P.
RICE BRAN, CORN AND COPRA MEAL AS SUPPLEMENTS TO CAMOTE VINES FOR GROWING PIGS.
Philippine Agr. 13, 255-259 (1924).
A combination of copra meal and rice bran was the best supplement tried with camote (Ipomoea batatas). Rice bran alone was nearly as efficient. When corn alone was used as a supplement, more of the vines were consumed but with a much smaller gain in wt. (C.A. 19, 547).

Bickhoff, Emanuel, and Williams, K. T.
STABILITY OF CAROTENE ADDED TO SOLID CARRIERS.
Ind. Eng. Chem. 36, 320-323 (1944).
Pure carotene was added to prepns. of flours and rice bran. Pellets were made of the prepns. and stored at 37°, exposed to air. Carotene losses varied from 50 to 87% in 30 days. The addn. of vegetable and mineral oils provided varying degrees of protection. Prepns. of rice bran and mineral oil were very stable, up to certain oil contents. At low carotene levels diphenylamine was as effective as mineral oil. Mixts. of 1 part mineral oil and 4 parts bran plus 5 mg. diphenylamine retained 80% of the original carotene after storage for 4 months. (C.A. 38, 4043).

Bonadonna, Telesforo.
RICE BRAN IN THE FEEDING OF DAIRY COWS.
Lait 16, 811-832 (1936).
Rice bran was used in proportions of 25 to 40% in the ration of the dairy cows without affecting the palatibility of the ration or injuring the good health of the cows. The fat content of the milk was slightly reduced when the ratio contained 40% of rice bran. With 25% of rice bran in the ration, the fat content of the milk was higher than that of the control in one case and lower in the other case. The addn. of rice bran to the diet had the effect of reducing the "forage units" required to produce 1 l. of milk and also the quantity of protein required to produce a l. of milk. The volatile acidity of the butterfat from the cows fed the ration

contg. 40% of rice bran was slightly lower than that of milk from cows fed the ration contg. no rice bran. Difficulties of prepg. cheese from milk obtained from cows fed rice bran were discussed. (C.A. 31, 173).

Bray, C. I.

RICE AND RICE BY-PRODUCTS FOR FATTENING SWINE.
Louisiana Agr. Expt. Sta. Bull. 368, 50 pp. (1943).

Brewers' rice was equal to corn for fattening hogs. Ground dehydrated soybean hay added to the protein supplement was not beneficial. Oats and rape pasture did not show a high value, but they did reduce the amt. of protein supplement required per 100 lb. gains by about 35%. The crude protein, fat, N-free ext., crude fiber, water, and ash, resp., in Yellow Creole corn were 10.25, 5.20, 69.6, 1.95, 11.45, 1.56; in brewers' rice, 7.94, 0.55, 76.96, 0.65, 12.8, 1.1; in shrimp meal, 43.88, 2.00, 0.42, 10.0, 11.85, 31.85; in cottonseed meal, 41.25 and no data, in green rape, 2.89, 0.54, 2.90, 6.67, 89.47, 1.53; in green oats, 2.66, 0.54, 2.90, 2.84, 89.13, and 1.95; in soybean-hay meal, 12.94, 2.05, 32.56, 34.05, 9.15, and 9.25; in rice bran, 13.38, 10.25, 44.22, 11.75, 9.10, and 11.30; in wheat shorts, 17.31, 3.30, 58.69, 6.15, 10.30, and 4.25. The ns of the fat from animals fed corn-oat pasture, corn-dry lot, corn rice polish oat pasture, corn rice polish dry lot, corn rice polish rice bran oat pasture, corn rice polish clover pasture, and corn wheat short oat pasture were, resp. 1.45945, 1.45955, 1.4597, 1.45978, 1.45995, 1.4600, and 1.4593. The ns produced by other feeds are also listed. The crude protein, water, fiber, N-free ext., fat, and ash of rough rice were, resp., 6.25, 11.55, 7.35, 68.75, 1.45, and 4.65; of corn chop 9.38, 14.90, 2.05, 69.37, 3.25, and 1.05; and of rice screenings 6.56, 13.60, 0.55, 77.79, 0.55, and 0.95. Data are presented on the rates of growth, and gains per unit of feed for several combinations of the feeds listed above. (C.A. 40, 4819).

Browne, C. A., Jr.

THE CHEMICAL COMPOSITION AND FEEDING VALUE OF RICE PRODUCTS
Louisiana Agr. Expt. Sta. Bull. [2] 77, 430-458 (1904).

The rice is separated by various milling processes into different products, which are used as foodstuffs for animals. In the first place the hulls are removed by passing the grain through milling stones, screens and winnowing machines. The kernels are then decorticated, and the outer cuticle and much of the gluten layer of the grain, together with the germ, constituting the rice-bran or meal, are removed. The final process consists in polishing the grains. For this purpose, the latter are placed in rotating cylinders of wood and wire gauze, the surface of which is covered with soft, tanned hide. In the polishing process a film of gluten and starch cells is removed, and the fine flour thus obtained is called rice polish. The polished grains are then screened into various grades or sizes. In the following table are given the analyses of these products:

	Water	Fat	Ash	Pro-teids	Crude Fiber	Carbohy-drates	Starch	Pento-sans
Rice straw	10.84	0.59	14.04	3.31	32.91	33.31	-	15.84
Rice hulls	8.97	0.49	13.29	3.50	41.89	27.36	-	17.24
Rice meal(pure bran) I	8.57	14.30	3.79	13.41	9.51	46.48	18.80	-
Rice bran(16 percent. hulls, 28 percent. grits) II	9.84	9.01	11.55	9.33	14.76	44.26	25.42	8.05
Rice bran III	10.01	9.03	8.07	9.26	11.00	52.63	-	-
Rice polish(22 per cent. grits)	11.53	5.22	3.46	11.06	3.76	63.97	54.82	3.40
Rice polish	10.70	6.95	2.95	8.53	1.00	69.14	-	-
Raw rice	-	-	-	9.88	-	-	69.67	2.14
Polished rice	-	-	-	6.56	-	-	77.55	-

The rice hulls have absolutely no food-value, and are, in fact, injurious to cattle, as they are tough and fibrous and under the microscope are seen to consist on the outer surface of groups of parallel rows of jagged, comb-shaped spines. Judging from the results of analyses, rice meal (bran) should contain at least 12 per cent. of proteids and 12 per cent. of fat, but not more than 10 per cent. of crude fibre and 9 per cent. of ash. The presence of grits or broken grains of rice has been mentioned above. Although these have a high food-value, they are liable to pass through the animal undigested, and so be wasted. Rice meal, more properly called bran, is the most nutritious of the rice foods. The rice polish contains more starch than the bran, but less proteid and fat, and besides being used as a cattle food is sometimes employed as stuffing material for sausages.

Rice foods frequently become rancid and unpalatable owing to the decomposition of the rice oil by the enzyme, lipase. In some cases the oil was found to consist of nearly 90 per cent. of free fatty acids, amounting to 12 per cent. of free acid in the foods themselves. By subjecting the meals to a temperature of 200°F., the enzyme is destroyed, and subsequent production of rancidity takes place only very slowly, if at all. Another method of preventing rancidity consists in removing a portion of the oil. This also increases the food-value of the meal, and the extracted oil has, itself, a considerable commercial value. Rice foods containing the natural amount of oil have a laxative effect on animals, and this would be avoided by reducing the quantity of oil to 2 or 3 per cent. (J. Soc. Chem. Ind. 24, 631).

Browne, C. A., Jr.
MOLASSES CATTLE FOODS
Louisiana Planter 34, 236-237 (1905).

The commercial mixtures of food and molasses, many combinations of which are prepared in European countries, offer a supply of very digestible protein, but sometimes undergo rapid decomposition in warm

climates. Molasses has an antiseptic action when mixed with blood, and the activity of the bacteria which cause putrefaction is largely suspended, provided that the feed is properly dried, and that the amount of blood used is not excessive. One of the very best absorptive agents for molasses is bagasse; "molascuit" consists of about 20 per cent. of the pithy part of bagasse and 80 per cent. of molasses. Louisiana manufacturers could greatly improve upon molascuit, which is deficient in protein, by the addition of cottonseed meal.

The following table gives the composition of various molasses feeding-stuffs:

	Blood, Cereal, Molasses	Corn, Oats, Cottonseed Meal, Molasses	Corn, Oats, &c. Molasses	Extracted Rice Bran, Molasses	Molascuit: Bagasse, Molasses
Moisture	15.38	11.90	12.23	8.40	13.98
Fat	1.11	3.15	2.30	0.83	0.90
Ash	9.52	6.27	7.79	9.70	5.11
Fibre	12.98	14.30	12.78	13.00	5.64
Protein	16.13	12.75	6.41	14.00	1.94
Sugars	15.01	21.65	19.43	5.50	55.94
Other Carbohydrates, &c.	29.87	29.98	39.06	48.57	16.49

[J. Soc. Chem. Ind. (London) 24, 632].

Bréaudat, L.

STUDIES ON THE PROTECTIVE POWER OF BRAN IN A POLISHED RICE DIET
Bull. Soc. Path. Expt. 4, 498-502 (1911).

Rice bran, and a corresponding amt. of aq. ext. of rice bran were found to have a protective action in expts. with chickens on polyneuritis. This protection could not be ascribed to the additional N, nor to fat, cellulose, starch, etc. (C.A. 6, 769).

Bréaudat, L. and Denier

THE USE OF RICE BRAN IN THE PREVENTION AND CURE OF BERI-BERI
Ann. inst. Pasteur, 25, 167-189 (1911).

Statistical, experimental, and analytical data are presented. Prevention and cure resulted from the administration of 40 g. of rice bran per day. An extensive bibliography is given. (C.A. 6, 504).

Burk, L. B.

THE INFLUENCE OF PEANUTS AND RICE BRAN ON THE QUALITY OF PORK
Texas Agr. Expt. Sta. Bull. 224, 14 pp. (1918).

Peanuts fed to hogs for as long as 40 days produce an oily pork. When fattened on peanuts and finished for 30 days on milo chops and cottonseed meal a firm meat is produced. Rice bran 10 parts, and cottonseed meal 1 part produced an oily meat; feeding 50% of each produced a firm meat. (C.A. 12, 2211).

Carbery, M., and Chatterjee, Indubhusan
PRELIMINARY NOTE ON THE BEHAVIOR OF RICE KURA (BRAN) AS A CATTLE FEED
Agr. Live-stock India 8, 367-375 (1938).
Although the daily P_2O_5 requirement of Bengal cattle is about 10 g./500 lb. live wt., a pos. balance could not be attained in feeding expts. with rice bran until the ingestion was approx. 43 g. P_2O_5. The poor utilization of the P_2O_5 from rice bran appears to be assocd. with the fact that the P is chiefly in the form of phytin. Rice bran is very low in CaO (0.2%) and high in MgO (2.6%). (C.A. 33, 2563).

Carbery, M., Chatterjee, Indubhusan, and Talapatra, S. K.
THE MINERAL REQUIREMENTS OF CATTLE IN NORTHEAST INDIA, WITH SPECIAL REFERENCE TO RICE-STRAW FEEDING.
Indian J. Vet. Sci. 7, 155-211 (1937).
Digestibility expts. were carried out on rice straw, guinea grass, Napier grass, water hyacinth, linseed cake and rice bran. Despite the large ingestion of K_2O under rice-straw feeding, a pos. balance was not maintained until the daily ingestion was approx. 66-70 g./500 lb. live wt. Heavy K_2O ingestions seemed to induce heavier excretions of this substance, even greater than the intake. Where the ingestion of CaO was very high (55-60 g./day), as in the guinea grass rations, the amt. of K_2O ingested (72-74 g.) did not produce a pos. balance in K_2O. The high ingestion of K_2O from rice straw did not induce diuresis. A deficiency of MgO seemed to have an adverse effect on the Na_2O balance. Although a heavy ingestion of P_2O_5 (39-59 g./day) was obtained on the rice-bran ration, there was a neg. balance in this substance until the daily ingestion reached 43 g. The P in rice bran occurs mainly as phytin which is not readily assimilable. Neg CaO and Cl balances were obtained on the rice-bran ration. The aus or autumn variety of rice straw was considerably superior to the aman or winter variety in minerals and protein, but both straws were poor in P and slightly deficient in Ca. Sixty-one references. (C.A. 32, 2578).

Chen, Tsai-Chun
SUPPLEMENTARY VALUES OF BARLEY AND RICE-BRAN PROTEINS
Natl. Peiping Univ. Agr. Research Bull. No. 4, 23-34 (1931).
Barley supplemented with rice chaff shows a distinctly higher biol. value when fed to rats. (C.A. 26, 5610).

Coe, M. R.
LIGHT A FACTOR IN RANCIDITY
Science 75, 585 (1932).
Rice bran and rice polish when kept under color filters, such as blue, purple, blue-green, yellow and various shades of red, developed characteristics of rancidity. When kept under sextant green and sextant red filters, no evidence of such deterioration appeared, as shown by odor or tests with the fuchsine sulfurous acid reagent. The keeping quality of foods, such as salad oils, mayonnaise, butter, lard and potato chips, may be greatly enhanced by the use of properly colored wrappers, bottles, etc. capable of screening out active wave lengths. U. S. public service and foreign patents have been applied for. (C.A. 26, 4109).

Concha, Jesusa, and Valenzuela, Patrocinio.
PHARMACOPEIAL STUDIES ON TIKITIKI AND EXTRACT OF TIKITIKI
Univ. Philippines Nat. and Applied Sci. Bull. 6, 309-335 (1938).
(C.A. 33, 4742).

DuBois, J. T.
BERI-BERI
Weekly Cons. Trade Repts. (U. S. Dept. Com.) 1, (No. 18), 864 (1910).
Tests of the "bad rice" theory of the cause of beri-beri seem to show that the disease may be produced in fowls by feeding on milled rice, from which the outer cover of the grain has been removed. The removal of this cover takes out the P. It is believed that the disease can be prevented by using rice which has not had this P content removed. (C.A. 4, 2531).

Dunn, R. W., and Salle, A. J.
RICE-BRAN EXTRACTS AND THE GROWTH OF MICROÖRGANISMS.
J. Bact. 31, 505-516 (1936).
Rice bran contains a stimulating substance or substances for carbohydrate-fermenting bacteria and for yeasts. The stimulating agent may be related to the carbohydrates but it is not glucose or any other hexose. Old exts. showed less stimulating ability both for bacteria and yeasts, while fresh exts. prepd. from fresh or from old bran were equally effective for bacteria, but only exts. from the former gave good yeast stimulation. Rice-bran exts. with 60% MeOH or 25% EtOH contain, with the possible exception of phosphate, all substances necessary for the growth of Es. coli and many other organisms. Better growth was obtained with such exts. if buffered, than in ordinary infusion media. The use of peptone 0.1% rice bran ext. medium is recommended for obtaining greater growth of carbohydrate-fermenting bacteria or for increasing the rate of growth of such types. (C.A. 30, 5254).

Dvorachek, H. E. and Sandhouse, H. A.
SOFT PORK FROM RICE BRAN
Arkansas Agr. Expt. Sta. Bull. 142, 8 pp. (1918).
Rice bran when fed to hogs produced a soft, oily fat, grayish in color. The use of cottonseed meal with bran for 8 weeks did not produce a harder fat. The feeding on corn and tankage for a period of 8 weeks to hogs fed previously on rice bran produce a fat equal in quality in every way to any corn-fed meat. The addition of tankage to rice bran in a fattening ration had a tendency to increase softness and oiliness of the fat produced. (C.A. 12, 1572).

Eijkman, C.
NATURE AND METHOD OF ACTION OF THE SUBSTANCE ACTIVE AGAINST EXPERIMENTAL POLYNEURITIS
Arch. Schiffs-u. Tropen-Hyg. 17, 328-335 (1913).
A white cryst. mass was isolated from an alc. ext. of rice bran, which reacted strongly alk. and which, neutd. with HCl, gave a product consisting of 84% KCl together with NaCl, P_2O_5, Ca and SO_3. In doses of 20-40 mg. the original substances or the neutralized product showed a curative action upon pigeons affected with beri-beri as did a mixture of 3 parts KCl and 1 part NaCl, but had no effect upon dogs. (C.A. 7, 2629).

Fairbanks, B. W., and Hamilton, T. S.
ANIMAL NUTRITION. RIBOFLAVIN IN RATIONS FOR POULTRY
North Am. Veterinarian 23, 575-578 (1942).
Riboflavin deficiencies are discussed and its importance in poultry feed is indicated. The following values for the content of riboflavin in feeds were obtained from a crit. survey of published detns.; liver meal (com.) 75, liver meal (fish) 52, dried yeast 50, dried buttermilk 35, meat and liver meal 32, salmon roe meal 29, young dried oat plant 26, dried whey 22, alfalfa meal 18, dried skim milk 17, dried young wheat 17, dried young timothy 17, fish meal (white) 12, yeast feeds (com.) 10, dried blue grass 10, meat scrap 8, corn-oil cake 6, soybean-oil meal 5, rice bran 4, wheat germ 4, corn germ 3.5, wheat bran 2.7, whole corn 1.6, wheat middlings 1.3; whole wheat 1.2 and rolled oats 1.1γ per g. 26 references. (C.A. 37, 1748).

Fraps, G. S.
FEEDING VALUES OF CERTAIN FEEDING STUFFS
Texas Agr. Expt. Sta. Bull. 245, 29 pp. (1919).
A discussion of the compn. and feeding value, based on digestibility, of acorns, alfalfa, bear grass, beet pulp, corn cobs, cotton burrs, cottonseed feed, peanut hulls, peanut hay, peanut meal, rice bran, rice hulls, Rhodes grass, soapweed stem and Spanish moss. Alfalfa hay as feed has about 70% of the value of wheat bran. Bear grass was not relished by stock to a great extent but it has a productive coefficient that compares favorably with other hays. It is tough when dry. Beet pulp has a productive value about 12% greater than wheat bran and about 75% of that of corn chops. Corn cobs fed with cottonseed meal were eaten well. They do not contain any digestible protein but the digestibility of the crude fiber compares favorably with that of hay. Peanut hay has a feeding value of about 28% more than alfalfa hay. Peanut meal containing only 5% crude fiber has a high digestibility. (C.A. 14, 435).

Fraps, G. S., and Carlyle, E. C.
ENERGY VALUE OF CORN BRAN, RICE POLISH, RICE BRAN AND RYE FLOUR AS MEASURED BY EXPERIMENTS ON BABY CHICKS.
Proc. Am. Soc. Animal Production 32, 396-399 (1939).
Compared with corn meal at 225 cal./100 g., the productive energy of rice polish was 216, rice bran 181, rye flour 133 and 3 lots of corn bran 103, 132, and 63 cal. The productive energy per unit of effective digestible nutrients and for metabolizable energy was reasonably close for all the feeds except rye flour, which had an appreciably lower value. (C.A. 34, 5892).

French, M. H.
THE VALUE OF RICE BY-PRODUCTS FOR FEEDING TO RUMINANTS
Ann. Rept. Dept. Vet. Sci. Animal Husbandry, Tanganyika Terr. 1937, 101-105 (Pub. 1938).
As detd. by expts. on sheep, the coeffs. of digestibility of the constituents of rice polishings were higher than those found for maize and millet in Tanganyika. Rice bran was somewhat less digestible and rice hulls gave extremely low values. (C.A. 33, 1829).

Gargaritano, M. L., Valenzuela, Patrocinio, and Hermano, Ariston
BIOLOGICAL ASSAY BY THE PIGEON METHOD OF DIFFERENT BRANDS OF TIKI-TIKI EXTRACT
Rev. filipina med. y farm. 28, 287-307 (1937).
The method is described. Four of the 7 brands made in Manila were of satisfactory potency. (C.A. 32, 5156).

Gervacio, E. T.
FURTHER STUDIES ON MOLASSES AS HOG FEED. MOLASSES VERSUS RICE BRAN IN RATIONS FOR GROWING AND FATTENING PIGS
Philippine Agr. 30, 492-498 (1941).
Rice bran and cane molasses contained, resp., 9.20 and 35.68% H_2O, 12.38 and 1.22% protein, 13.89 and 0.26% Et_2O ext., 44.20 and 54.01 N-free ext., 10.11 and 8.83% ash and had calorific values of 363.21 and 229.00 cal. per 100 g. The bran contained 9.72% crude fiber. (C.A. 36, 2037).

Giese, J. E., Clayton, C. C., Miller, E. C., and Baumann, C. A.
THE EFFECT OF CERTAIN DIETS ON HEPATIC TUMOR FORMATION DUE TO m'-METHYL-p-DIMETHYL AMINOAZOBENZENE AND o'-METHYL-p-DIMETHYLAMINO-AZOBENZENE
Cancer Research 6, 679-684 (1946).
Tumor production in rats by m'-methyl-p-dimethylaminoazobenzene was not consistently prevented by hydrogenated coconut oil, was slightly stimulated by rice bran ext., and was retarded by riboflavin (but to an extent less than that previously observed when p-dimethylaminoazobenzene was the carcinogen). Tumor production by o'-methyl-p-dimethylaminoazobenzene was stimulated by rice bran concentrate, retarded by hydrogenated coconut oil and riboflavin; the effects of diet against this carcinogen were intermediate between those observed against the parent compd. and the m'-methyl deriv. The action of riboflavin may be by interference with the essential carcinogenic reaction, while the effect of the other diets studied may be directly on the carcinogen. (C.A. 41, 7508).

Gutiérrez, M.
THE STABILITY OF THE VITAMIN B_1 CONTENT OF TIKITIKI EXTRACT AND A SIRUP PREPARATION OF VITAMIN B_1.
Acta Med. Philippina 2, 189-198 (1940).
When assayed by the rat-growth method (C.A. 34, 7021), samples of tikitiki ext., which had been prepd. by the College of Pharmacy of the Univ. of the Philippines, showed a deterioration of 50% of the original vitamin B_1 content after storage for 1 year, while a sirup prepn. of vitamin B_1, Benerva Sirup, showed a 60% deterioration after 1.5 years' storage (no protection from light or refrigeration in either case). Vitamin prepns. should be dated; the expiration date for tikitiki ext. should be 1 year from the date of manuf. Fermentation and changes in pH are not responsible for the destruction of vitamin B_1; the factor or factors which cause the deterioration are unknown. (C.A. 35, 2671).

Halliday, Nellie, and Evans, H. M.
THE FRACTIONATION OF THE VITAMIN B_2 COMPLEX FROM VARIOUS SOURCE MATERIALS
J. Biol. Chem. 118, 255-267 (1937).
Vitamin B_6 can be adsorbed on fullers' earth and eluted with 0.1 M. $Ba(OH)_2$ soln. with almost complete recovery from liver and whole wheat prepns. Complete removal is not accompanied by 4 adsorptions of a rice bran ext. Vitamin B_6 dialyzes through cellophane tubes and an eluate from dialyzed freshly prepd. liver filtrate or from whole wheat ext. would seem to be a promising source material to be used in concg. this vitamin. In liver filtrate vitamin B_6 is not appreciably destroyed by autoclaving at pH 9 for 1 hr. although the growth-promoting activity of the ext. is lowered. The activity is lost on storage in the cold even when liver filtrate is protected from light and bacterial decompn. No vitamin B_6 activity was found in wheat germ oil. None of the factors present in brewers' yeast ext. was destroyed by 10 hrs. of irradiation. Liver ext. prepd. according to the method of Lepkovsky, Jukes and Krause (C.A. 30, 8317) is a good source of the growth-stimulating filtrate factor but contains no vitamin B_6. A scoring system is described by which the relative vitamin B_6 potency of materials can be ascertained when account is taken of the degree of dermatitis developed in rats receiving only vitamin B_1 or vitamin B_1 and flavin. (C.A. 31, 4371).

Hanszen, A. H., and Selle, W. A.
INHIBITION OF EXPERIMENTAL LIVER CANCER IN RATS BY ADDITION OF AN ADSORBENT TO THE DIET
Proc. Soc. Exptl. Biol. Med. 54, 225-226 (1943).
The relatively indigestible fractions of yeast, liver, and rice bran adsorb butter yellow (p-dimethylaminoazobenzene) and thus remove this carcinogen from soln. in vitro. The addn. of the adsorbent clay, montmorillonite, to a diet contg. butter yellow fed young rats adsorbed much of the dye and protected most of the rats from its carcinogenic action. (C.A. 38, 1026).

Heller, V. G. and Penquite, Robert
FACTORS PRODUCING AND PREVENTING PEROSIS IN CHICKENS
Poultry Sci. 16, 243-246 (1937).
The factors responsible for the cause and cure of rickets do not affect perosis. Excessive minerals usually aggravate the condition. A ration was developed which was effective in producing perosis in 76-100% of the chicks. Drinking the aq. ext. of rice bran prevented the occurrence of defective legs. Aq. exts. of wheat bran, wheat gray shorts, wheat embryo and alfalfa were not very effective. Et_2O, alc. and water exts. of components of the basal ration, when added to the basal ration, did not aggravate the condition. The ash of 70 lb. rice bran added to 100 lb. of the basal ration prevented perosis. A correlation seemed to exist between the Mn content and the curative properties of the rations, but high percentages of Mn seemed to be detrimental to growth. Some of the best growth and protection came from rations having no Mn: hence other factors may be involved. (C.A. 31, 7487).

Hermano, A. J.
STANDARDIZATION OF EXTRACT OF TIKITIKI (RICE BRAN).
Rev. filipina med. y farm. 28, 343-346 (1937).
Biological assays for vitamin B_1 using rats and pigeons are described. A good ext. should contain at least 33 U.S.P. units of vitamin B_1 per g. (C.A. 32, 724).

Hermano, A. J., and Aguila, P. J.
STANDARDIZATION OF TIKITIKI EXTRACT.
Philippine J. Sci. 67, 335-349 (1938).
Chem. analyses were made of 9 brands of tikitiki ext. (I) manufd. locally. Biol. analyses by the rat-growth method were also made of crude rice bran and I manufd. by the Bur. of Sci., Manila. A discrepancy was noted in the weekly av. gain of wt. of the albino rats used, owing to breed or climatic conditions. Comparable results were noted with 40-50 mg. I (Bur. of Sci. brand) and 10 mg. of International standard vitamin B_1. This ext. contains the equiv. of 1 International unit of vitamin B_1 per 0.05 cc. Crude rice bran contains 1 International unit per g. (C.A. 33, 5592).

Ikeda, Tokichiro
THE ACTIVE SUBSTANCES OF RICE BRAN AGAINST THE DISEASE OF PIGEONS FED ON POLISHED RICE. II.
J. Orient. Med. 2, 90-101 (1924): Ber. ges. Physiol. u. exptl. Pharmakol. 29, 686 (1925).
Extn. purification and sepn. into protein fractions are described. The greatest part of the active substance (detd. by the yeast method) was in the choline fraction, but could not be isolated. 25% was in the purine, and a small part in the histidine-arginine fraction. (C.A. 20, 1653).

Iwata, Hisayoshi
COMPARISON OF NUTRITIVE VALUE OF FODDER PROTEIN. I. NUTRITIVE VALUE OF OIL CAKES, RICE BRAN AND WHEAT BRAN FOR THE ALBINO RATS.
J. Agr. Chem. Soc. Japan 12, 415-420 (1936).
The nutritive value and amino acid content of sardine cake, soybean cake, rape-seed cake, sesame cake, wheat bran, rice bran and their mixt. were compared. Wheat bran and rice bran were inferior to the others in nutritive value, though they were not inferior in amino acid content. It may be due to their lower digestibilities. (C.A. 30, 7153).

Kik, M. C.
THIAMINE IN PRODUCTS OF COMMERCIAL RICE MILLING.
Cereal Chem. 20, 103-109 (1943).
Rough rice or paddy and whole brown rice contained about 3γ of thiamine or approx. one I. U. per g. of dry material. Whole brown rice contained slightly more thiamine than rough rice. An av. of 80% of thiamine was lost during the milling process. From 50% to 90% of the thiamine was present in the free form: this range was from 76% to 90% for the products rice bran and rice polish. Of the finished, clean products, the end product head rice (sold for human

0.50 γ per g. of dry matter. Screenings and brewers rice consumption) contained an av. of 0.60γ, and 2nd head rice/contained 0.79γ and 1.40γ of thiamine, resp. Of the by-products, hulls contained 1.11γ thiamine per g. of dry matter, rice bran contained from 20.5 to 33γ and rice polish from 15 to 27.9γ. Three different samples of milled parboiled rice (prepd. in 3 different localities) contained 1.35, 1.61, and 1.74γ thiamine per g. of dry material. Two different samples of under-milled rice contained 1.22 and 0.92 compared with 0.57 and 0.65γ in milled rice. (C.A. 37, 1785).

Kinugasa, Y.

THE ANTINEURITIC VITAMIN AND OTHER SUBSTANCES HAVING A BIOS CHARACTER CONTAINED IN RICE BRAN.

J. Pharm. Soc. Japan 48, No. 6, 539-563 (1928).

Aq. or alc. ext. of rice polish was treated with neutral or basic Pb acetate in neutral or acidic soln. After filtering the ppt. an excess of $(AcO)_2Pb$ and $Ba(OH)_2$ was added to the filtrate to a slightly alk. reaction. The yellow ppt. (I) thus obtained was filtered. Contrary to expectation, the antineuritic factor of rice bran (II) was found almost completely in I and not in the filtrate. Also contrary to the findings of Funk, Voegtlin, Peters and others for the antineuritic substance of yeast (III), II was found to be precipitable with $HgSO_4$, the phosphotungstate of II was found sol. in dry Me_2CO, while F. found that that of III was insol. in it. From these facts K. concludes that II and III are not identical. By using the $(AcO)_2Pb$ and $Ba(OH)_2$ method of purification and the soly. of the phosphotungstate of II in dry Me_2Co, K. obtained an intensely active prepn. Daily doses of 5 mg. were effective in curing polyneuritic pigeons. A picrate of the active substance had the compn. $C_{19}H_{32}N_5O_7 \cdot C_6H_3N_3O_7$ and m. 198°. It also effected a rapid cure in neuritic pigeons with 5 mg. doses. A cryst. and an amorphous picrolonate were prepd. The former decompd. 320° and had the compn. $C_{14}H_{19}N_5O_{10} \cdot C_{10}H_8N_4O_5$, while the latter m. 204° and had the compn. $C_{19}H_{40}N_5O_7 \cdot C_{10}H_8N_4O_5$. Both picrolonates were also found to be effective in curing neuritic pigeons with 5 mg. doses. A cryst. substance with the compn. of $C_{10}H_8N_4$ and having a strong bios character was isolated. Since the substance active in curing polyneuritis was found to be ineffective in stimulating yeast fermentation and the substance effective in stimulating yeast fermentation was found to be inactive in curing polyneuritis, it is concluded that these substances are of different identity. More than 20 reactions were tested on 90 fractions of rice bran, but no specific reaction for II was found. (C.A. 22, 3915).

Kinugasa, Y., and Hattori, Y.

VITAMINS CONTAINED IN RICE BRAN AND CARROT.

J. Pharm. Soc. Japan No. 508, 469-489 (1924).

The adsorption of vitamins by Japanese acid clay, the best method of releasing them from the clay, and various chem. reactions with vitamins of different degrees of purity are studied and the results given. Conclusions: Japanese clay completely adsorbs from aq. exts. of rice bran and carrot both antipolyneuritic vitamin and vitamins which promote yeast growth. These vitamins can be completely freed from the clay, by treating the latter with $Ca(OH)_2$ or $Ba(OH)_2$. 0.1 g.

of this prepn. will cure polyneuritis of the pigeon. When purified as the picrate, 0.01 g. is sufficient. K. and H. maintain that not only anti-polyneuritic vitamins and vitamin which promote yeast growth are not the same, but that the former is different from that which promotes animal growth. (C.A. 19, 1589).

Kinugosa, Y., and Hattori, Y.
VITAMINS CONTAINED IN RICE BRAN AND SOME OTHER SUBSTANCES. I, II, AND III.
J. Pharm. Soc. Japan No. 485, 579-595: No. 486, 671-699: No. 487, 780-799 (1922).

The history of discovery of vitamin B (or oryzanin), various attempts to isolate the active principle, and a review of the chem. nature and reactions are given in detail with a complete review of Japanese investigations. In II, various methods of extn. and pptn. of vitamin B from rice bran were tried and the resulting products were tested quant. for their activity with anti-polyneuritis power with pigeons, and also with William's method of quant. detn. with yeast. In III, various other substances were extd. and their vitamin B contents were similarly detd. The results are given in 20 tables and 11 charts. The main conclusions are: A cold H_2O extn. gives a better result with rice bran than MeOH. In its prepn. from the bran, use of $Pb(AcO)_2$ as a pptg. agent gives least injurious effect on the vitamin. Pptn. with baryta from MeOH ext. gives the largest amt., but the H_2O-sol. fraction of this ppt. is slightly injurious to the appetite of pigeons and is an entirely different substance from the tannic acid ppt. An amorphous picrate of vitamin B, m.222°, is prepd. from the Et_2O ppt. from the aq. ext. of the bran, which is active in as small an amt. as 0.01 g. The anti-polyneuritis principle of the vitamin is precipitable with phosphotungstic acid (in acid medium) and gives a blue color with the uric acid and the PhOH reagent of Folin and Macallum. As the degree of purity increases, the intensity of the test with the uric acid reagent seems to decrease. A positive test with Folin reagents does not prove the presence of vitamin B, unless the presence of tyrosine is excluded. The diazo reaction is not sp. for this vitamin as the much purer product gives a more doubtful color test with this reagent. The result of comparison between anti-polyneuritis power (with pigeons) and Williams' yeast growth method, when applied to different prepns. from the rice bran, and the same prepns. for the different sources, show that although all samples of vitamin B promote growth of yeast, yet their anti-polyneuritis power does not always go in parallel with power to promote the growth of the yeast. Thus K. and H. support an idea that anti-polyneuritis power and H_2O-sol. growth-promoting principle in vitamin B are not the same substance. (C.A. 17, 2597).

Kondo, H., and Gomi, N.
EFFICACIOUS CONSTITUENTS OF RICE BRAN.
J. Pharm. Soc. Japan 1914, No. 391, 1-3.

No definite therapeutic chem. compd. was isolated. The relative value of exts. prepd. in different ways is discussed. (C.A. 9, 1072).

Lago, F. P.
HOG-FEEDING EXPERIMENTS INVOLVING THE USE OF SELF-FEEDERS.
Philippine Agr. 13, 29-44 (1924).
The compn. of dried shrimps and mungo pods fed was: protein 55.61 and 2.96, carbohydrates 3.26 and 9.14, fat 2.61 and 1.19, fiber 4.24 and 3.63, ash 19.73and 1.07, and H_2O 14.55 and 82.01%, resp. Analyses of corn, copra meal, rice bran, sweet potatoes and cowpea pods are also given. The best av. daily gain was 0.465 kg. per head with self-fed hogs, having free choice of corn, rice brans and copra meal. Hand-fed hogs receiving the same feed material gained 0.284 kg. per day. (C.A. 18, 2927).

Mackinney, G., and Sugihara, J. M.
RIBOFLAVIN ESTIMATION IN FRUITS AND VEGETABLES.
J. Am. Chem. Soc. 64, 1980-1981 (1942)
In general the Conner and Straub procedure (C. A. 35, 5193) was followed for the extn. and prepn. of the sample; because Supersorb was not available at first, 10-20 ml. of the sample was heated to boiling with 5 ml. 2% AcOH, made to volume (50 ml.) with buffer and a 15-ml. aliquot treated for at least 3 min. with 1 ml. of $KMnO_4$ and then decolorized with 3 ml. of 3% H_2O_2; the filtered solns. were compared with buffered standards at pH 6 in a Coleman fluorophotometer. These values are compared with those obtained after passage over Decalso and Supersorb. In some cases readings were made 20 hrs. later, which showed that the first ext. had a higher stability toward light. The following figures give the 2 values for riboflavin and that for thiamine (γ/g.): asparagus 1.15, 1.13, 2.19: brocoli - , 0.79, 0.77; dehydrated 6.3-13, 4.3, 13.4, 3.7-7.25: peas 0.83, 0.68, 1.03: cooked 0.82, 0.78, 1.00; dehydrated 3.36-4.01, 4.78-5.73, 4.16-4.38: spinach (dehydrated) 23.4, 18.6, 10.2: rice bran (concd.) 7.74, 5.44, 141: apricots (dried, sulfured) 1.94, 1.63, 0.21; prunes (dried) 1.59, 1.27, 1.24: dates (Deglet Noors) 0.73-1.14, 0.30-0.40, 0.53: grass (dehydrated) 8.23, 11.5, 5.28. Diffuse light causes a decrease in riboflavin content in C_5H_5N-AcOH standards from 100 to 32.4% in 24 hrs. and in buffer (pH 6) from 100 to 76.3%. (C.A. 36, 5575).

Maynard, L. A., Fronda, F. M., and Chen, T. C.
THE PROTEIN EFFICIENCY OF COMBINATIONS OF CORNMEAL AND CERTAIN OTHER FEEDINGS STUFFS, NOTABLY RICE BRAN,
J. Biol. Chem. 55, 145-155 (1923).
Rats weighing 60 g. were placed upon diets contg. 9% protein. The gain in weight per g. of protein eaten during the next 12 weeks was, if the protein was furnished by cornmeal, 1.18 ± 0.023 g.; of by corn meal and linseed oil meal, 1.21 ± 0.052 g.; if by corn meal and cotton-seed oil meal, 1.23 ± 0.046 g.; if by corn meal and peanut oil meal, 1.46 ± 0.052 g.; if by corn meal and soybean oil meal, 1.76 ± 0.046 g.; if by corn meal and rice bran 1.63 ± 0.036 g.; if by peanut oil meal alone, 1.45 ± 0.046 g.; if by rice bran alone 1.47 ± 0.055 g. Both peanut oil meal and rice bran were superior to corn meal but a mixt. of corn meal and rice bran was even better, indicating a mutually supplementing action that was not apparent in the case of peanut oil meal and corn meal. Data for soybean oil meal alone were not obtained, so no conclusion can be drawn regarding a possible supplementary action. (C.A. 17, 1658)

Miller, C. D.
VITAMIN B CONTENT OF RICE-BRAN BREAD.
Hawaii Agr. Expt. Sta., Ann. Rept. 1931, 30 (1932).
It is believed that the diet of many Hawaiians is deficient in vitamin B. Good bread was baked by incorporating 20% of rice bran in white flour. Approx. 30% of the antineuritic value of the rice bran was destroyed in the baking process. White bread proved no better than the vitamin B-free basal diet. (C.A. 26, 4360).

Mitchell, H. H., and Villegas, Valente
THE NUTRITIVE VALUE OF THE PROTEINS OF COCOANUT MEAL, SOY BEANS, RICE BRAN, AND CORN.
J. Dairy Sci. 6, 222-236 (1923).
An extension of the work of Mevens (C. A. 16, 1284). Data on the metabolism of rats on a N-free ration were obtained. These results were used in detg. the actual digestible N of the protein rations fed. Exptl. data are given for the utilization of coconut, corn and soy-bean meal and mixts., the rations contg. 5 and 10% protein. On a 5% protein ration the av. utilization of coconut meal protein was 77%, corn 72%, and soybean 78%. On a 10% protein ration the results seemed to show that the coconut-meal proteins are slightly less efficient than those of soy beans while between soy bean and rice bran there was no clear difference. Very little supplementary effect was noticed when mixts. of the proteins were fed. The net protein content of a number of feeds is computed. (C.A. 17, 2756)

Monti, Nestore
VOLATILE ACIDITY OF THE BUTTERFAT TAKEN FROM COWS RECEIVING RICE BRAN IN THEIR RATION.
Lait 15, 609-612 (1935).
The index of volatile acidity of the butterfat produced by cows receiving rice bran in the ration was about 20 compared with an index of about 29 for cows receiving the usual ration of grass, hay and wheat bran. The change in the index of volatile acidity was not due to the character of the fat in the rice bran, as an index of volatile acidity of about 20 was still obtained when the fat had been removed from the rice bran by extn. (C.A. 29, 5529)

Murai, T.
A NEW METHOD FOR THE EXTRACTION OF THE EFFICACEOUS CONSTITUENTS OF RICE BRAN.
J. Pharm. Soc. Japan No. 386, 1-4 (1914).
The active constituents of rice bran, which exert a protective influence against polyneuritis of birds, are extd. as follows: 100 g. of dried rice bran freed from fat by ether, are extd. with very dil. $Pb(OAc)_2$ soln. The ext. is neutralized with Na_2CO_3, filtered, and the filtrate conc. in vacuo, at 60°, to sirupy consistency. The active constituents are ppt'd. by addition of 7-10 vols. of abs. EtOH. They form a brownish yellow, hygroscopic, amorphous powder of disagreeable taste, which is very sensitive to heat. (C.A. 9, 469)

Nelson, M. M., and Evans, H. M.
LACTATION ON PURIFIED DIETS.
Arch. Biochem. 12. 229-239 (1947).

The loss in wt. of lactating rats placed on purified diets at parturition was comparable to the loss in wt. of lactating rats which had been maintained on the purified diets for a period of time preceding parturition. Lactating rats placed on purified diets at parturition but which were given lettuce ad libitum gained wt. A diet high in fat had a marked deleterious effect on lactation and the impairment of lactation was inversely related to the fat content of the diet. The strain of lactation was alone responsible for the loss in wt. Improvement in lactation with rats on the purified diets was made on the addn. of rice bran and liver exts. and yeast. (C.A. 41, 3843).

Okada, Deniti
INFLUENCE OF VARIOUS SUBSTANCES ON EXPERIMENTAL PRODUCTION OF CANCER OF THE LIVER BY DIMETHYLAMINOAZOBENZENE. I - VI.
Osaka Igakkai Zasshi (J. Osaka Med. Soc.) 39, 53-92, 221-241, 595-608 (1940); Japan. J. Med. Sci. IV. Pharmacol. 14, Abstracts, 31 (1941) (in German).

The concurrent administration of sufficient As compd. to produce some liver degeneration accelerated the cancer formation and increased the incidence. The accelerating influence of As disappeared in 4-12 weeks. After that period the cancer growth rate was the same with or without As. Administration of yellow P, by producing liver degeneration, accelerated cancer formation and increased the incidence. Cod-liver oil feeding seemed to retard the cancer formation. Rice-bran oil possibly had some retarding action. (C.A. 38, 6365).

Ohmori, Yoshihisa
PHOSPHOMONOESTERASE.
Enzymologia 4, 217-231 (1937).

The activity of phosphomonosterase has been studied with p-nitrophenol phosphate as a substrate and detn. of the p-nitrophenol formed colorimetrically or with hexylphosphate and detn. of the hexanol stalagnometrically. The 2nd method cannot be used for blood. By means of the colorimetric method the optimum pH values for 3 different types of phosphomonoesterase have been detd.: pig-kidney 8.2, yeast 5.6 and rice-bran 9. (C.A. 31, 8568).

Parthasarathy, D., and Mukherjee, R.
THE MANGANESE CONTENT OF SOME COMMON POULTRY FEEDS.
Indian J. Vet. Sci. 18, 47-49 (1948).

The Mn content of 35 substances used as common poultry feeds in India has been detd. by a colorimetric method. The sample was ashed at dull-red heat, the ash dissolved in a small quantity of concd. HNO_3, 5 cc of sirupy H_3PO_4, and sufficient distd. water were added to make the crucible 3/4 full. The soln. was heated for 30 min. on a water bath for complete extn. of the ash, then cooled, filtered,

and washed. K periodate (0.3 g.) was added to the filtrate, which was then heated on a water bath until the max. color developed. The cooled soln. was compared in a colorimeter with a standard soln. of $MnSO_4$ similarly treated. Rice bran and wheat bran have been found to be excellent sources of Mn, and ragi a good source of this element. Bajra, cheena, jowar, and mustard cakes are moderate sources of Mn. Limestone is a good source, but the Mn content varies. Among the green feeds studied cowpeas is a very good source. In general leaves are richer in Mn than the corresponding grains of jowar and cowpeas. (C.A. 43, 6331).

Pavlovskaya, T. E., and Slabodin, T. J.
EXTRACTION OF VITAMIN B_1 FROM RICE.
Doklady Akad. Nauk S.S.S.R. 41, 255-257 (1943).

Recovery of Vitamin B_1 (I) from rice by-products was studied. The exptl. extn. method consisted of treating 200 g. of sample with 300 cc. of solvent (either 8% or 70% alc.), filtering, washing the residue with solvent, evapg. off the alc. and applying a basic Pb acetate treatment to the aq. soln., which was finally evapd. to 50-100 cc. preparatory to detg. the amt. of I. The 8% alc. was much more effective than the 70% alc. in extg. I from rice germs (II). Grinding II favored extn. of I. Six successive extns. with 8% alc. were required completely to ext. I from II. The amts. of I, obtained from 1 kg. each of rice by-products by complete extn. with 8% alc., were: 70420 γ from II, 500 γ from rice husks, and 430 γ from rice bran. (C.A. 38, 3735).

Penquite, Robert, Heller, V. G., and Thompson, R. B.
CAUSE AND PREVENTION OF PEROSIS.
Okla. Agr. Expt. Sta. Bull. 243, 2-18 (1940).

Perosis was prevented by giving a drinking soln. consisting of a water ext. of rice bran. Exts. of Et_2O, EtOH and H_2O of the components of the basal ration did not prevent perosis, nor did exts. of wheat bran, wheat shorts, wheat embryo and alfalfa. The growth of the chicks consuming the water exts. of rice bran was increased, in disproof of the observation that the most rapidly growing chicks are normally more susceptible to perosis. The ash of 70 lb. of rice bran added to 100 lb. of the basic perosis-producing diet prevented the occurrence of perosis. There is a correlation between the Mn content of the rations and supplements used and their corrective properties. The exact quantity of Mn required varied considerably depending on the ration, the amt. of minerals present and other factors. The chickens used, as well as the quantity of Ca and P in the ration influenced the incidence of perosis. Mn was not the only preventive of perosis, since a ration contg. approx. the same quantity of Mn as the perosis-producing diet produced little perosis. The subcutaneous introduction of P was fully as productive of perosis as oral administration. Ca was assocd. with perosis to a much greater extent than was P. The birds receiving a Ca supplement had only 40% as much inorganic P in the plasma and cells as detd. by blood analysis. Mn fed at a level of 4800 p.p.m. decreased the viability and rate of growth of chicks. (C.A. 34, 7356).

Penuliar, S. P.
A COMPARATIVE STUDY OF CASSAVA-REFUSE MEAL AND RICE BRAN AS FEEDS FOR GROWING AND FATTENING PIGS.
Philippine Agr. 29, 611-615 (1940).
Cassava-refuse meal and rice bran contained H_2O 10.56, 10.65; fat 0.62, 5.82; ash 1.22, 14.17; protein 1.03, 10.35; crude fiber 4.66, 12.73; N-free ext. 81.91, 46.29%; and 346.00, 286.35 cal. per 100 g., resp. Cassava meal was 52% as efficient as rice bran during a 210-day feeding period. (C.A. 35, 2236).

Saito, Michio
DIGESTION EXPERIMENTS ON VARIOUS FEEDS.
Imp. Zootech. Expt. Sta. Bull. 26, 25 pp. (1931).
Digestibilities of fish meal, beet pulp, rice bran, wheat bran and alfalfa were detd. on wethers. (C.A. 35, 1323).

Salle, A. J., and Dunn, R. W.
EFFECT OF RICE-BRAN EXTRACT ON GROWTH OF ORGANISMS FROM SEVERAL GENERA.
Proc. Soc. Exptl. Biol. Med. 32, 939-942 (1935).
Out of 35 known carbohydrate-fermenting organisms 34 were stimulated by rice-bran ext., and none of 5 nonfermenting organisms was stimulated. (C.A. 29, 6254).

Schaumann, H.
THE PREPARATION AND EFFECT OF THE SUBSTANCES IN RICE BRAN ACTIVE IN POLYNEURITIS.
Arch. Schiffs-u. Tropen-Hyg. 14, 273-368 (1910); 15, 728-737 (1911); 16, 825-838 (1912); through Trans. Soc. Trop. Med. and Hgy., 5, 59-75.
Neuritis was prevented and cured by a substance isolated from rice bran. The bran also contains a poisonous substance, probably choline. The curative substance acts so as to build up P compounds and is almost entirely in the pericarp. (C.A. 7, 2778).

Schrodt, M., du Roi and von Peter
FEEDING COWS WITH RICE MEAL
Biedermanns Zentr. 9, 734-737 (1880).
During the first period of the experiment, the cows were fed on 5 kilos hay, 2 of oat straw, 5 of turnips, 3 of rye and wheat bran, 1 of rape cake, and 20 grams salt per day; during the second period, half the bran was replaced by as much rice meal; in the third period, half the bran was replaced by 2.5 rice meal, and the rape cake was not given. The nutrient ratio of the above mixtures was as follows:- Periods 1 and 2, 1:1.5; period 3, 1:1.64. The cows to all appearance flourished and were healthy, but their liveweight decreased steadily. The effect of the rice on the yield of milk was, up to the end of period 2, good; but when the bran was no longer given (during a sub-period), the yield was still increased, but only to a small extent, and the butter was soft. During the succeeding periods the rice was found to be prejudicial to the yield of milk, therefore, although a small addition of rice meal is to be recommended, a large quantity is of no use. [J. Chem. Soc., 40, 297].

Schweigert, B. S.
THE VALUE OF VARIOUS FEEDS AS SOURCES OF ARGININE, HISTIDINE, LYSINE, AND THREONINE FOR POULTRY.
Poultry Sci. 27, 223-227 (1948).
Microbiologically detd. values of arginine, histidine, lysine, and threonine are given for corn, corn-gluten meal, milo, oats, wheat, wheat bran, rice bran, rice polish, alfalfa-leaf meal, soybean oil meal, cottonseed meal, linseed oil meal, peanut oil, cow peas, fish meal, meat and bone scraps, blood meal, sardine meal, bone meal, dried skim milk, casein, egg albumin, and gelatin. (C.A. 42, 7901).

Snell, E. E.
THE VITAMIN B_6 GROUP. IV. EVIDENCE FOR THE OCCURRENCE OF PYRIDOXAMINE AND PYRIDOXAL IN NATURAL PRODUCTS.
J. Biol. Chem. 157, 491-505 (1945).
A method for the estn. of pyridoxamine (I), pyridoxal (II), and pyridoxine (III) is elaborated, based on the following facts: (1) All 3 compds. are equally active in promoting growth of Saccharomyces carlsbergensis. (2) For Streptococcus faecalis R, I is highly active, II less active, and III almost inactive. (3) For Lactobacillus casei, II is highly active, I and III only slightly active. (4) I is destroyed by HNO_2, whereas II and III are stable in its presence. (5) II is inactivated by treatment with NaCN and NH_4Cl. (6) II is inactivated by standing with acetone in alk. soln. (7) II activity for L. casei is destroyed by heating with a casein hydrolyzate but is increased for S. faecalis and left unchanged for yeast. (8) I may possibly be converted to II in the presence of alpha-ketoglutaric acid. By means of this method it was found that I and II account for most of the vitamin B_6 activity of liver and yeast exts., whereas the same activity of rice-bran concentrate is due to III. The presence of I and II satisfactorily explains "pseudopyridoxine" activity.
(C.A. 39, 2106).

Sugiura, Kanematsu, and Rhoads, C. P.
EXPERIMENTAL LIVER CANCER IN RATS AND ITS INHIBITION BY RICE-BRAN EXTRACT, YEAST AND YEAST EXTRACT.
Cancer Research 1, 3-16 (1941).
Various factors which influence the production of liver cancer in rats by feeding p-dimethylaminoazobenzene (butter yellow) (I) were investigated. Under the conditions of the expt. only about 3% of the rats died during the first month as compared with 45% reported by Harada, Mizuta and Maruya (Osaka Igaku Zasshi 36, 1-7 (1937). Albino rats of the Sherman and Wistar strains are more susceptible to the carcinogenic action of I than those of the Evans strain. Daily ingestion of a small slice of fresh carrot has not noticeable effect on the production of liver cancer by I but it has an influence on the survival of the animal and consequently on the type of liver cancer. Rats fed I and rice-bran ext. (Et_2O-sol) did not develop liver cancer during a period of 150 days. The inhibiting effect of rice-bran ext. upon exptl. liver cancer appears to be transient because some of the rats finally developed the disease. The development of liver cancer in

rats fed I is inhibited by the daily ingestion of a small amt. of Et_2O ext. of yeast. The inhibition is less marked than that exerted by the rice bran ext. I does not produce liver cancer in rats fed a diet of unpolished rice contg. 15% brewers' yeast. All of the 34 rats examd. between 104 and 284 days after the beginning of the expt. showed smooth and practically normal livers. The inhibiting effect of yeast feeding upon the production of liver cancer was distinctly diminished when the basal diet of rice contg. I contained less than 15% yeast. With the addn. of 6% yeast to the diet, 40% of the animals had normal livers; 30% cirrhotic livers and 30% livers with a few tumor nodules when examd. on the 150th day. With the addn. of 3% yeast to the diet, 30% showed no malignant change in the liver and 70% had cancer nodules. All the rats which were not fed yeast showed typical liver cancer when examd. on the 150th day. The addn. of purified casein to the diet had no inhibiting effect on the production of cancer by I. Animals on the protein-sufficient diet lived much longer than those maintained on a similar diet without an extra supply of protein. The livers of these animals on the protein-sufficient diet grew larger and showed many large liver nodules. (C.A. 35, 2966).

Suzuki, Bunsuke, Matsusita, Kenji, and Aoki, Kunio
BIOS. VI-VII.
Proc. Imp. Acad. (Japan) 6, 334-336 (1930).

The effects of bios (1/5000) on 18 species of yeasts show that there are 3 classes of yeasts, those indifferent to bios, those that need bios for fermentation and an intermediate class which are capable of fermenting to the full extent if sufficient time is allowed but which act in a normal time with the addn. of bios. With Schizosacch. pombe the addn. of the bios did not cause the yeast to ferment normally, although this was brought about by the addn. of the oryzanin from rice bran. The bios or oryzanin had little or no favorable effect upon Sacch. exiguus, Sacch. marxianus and Zygosacch. major but the yeasts were capable of fermenting "Koji ext." normally. Aspergillus Oryzae is capable of synthesizing bios. (C.A. 25, 555).

Suzuki, U., Shimamura, T., and Odake, S.
ORYZANINE, A COMPONENT OF RICE BRAN, AND ITS PHYSIOLOGICAL SIGNIFICANCE.
Biochem. Z. 43, 89-153 (1912).

It is known that rice bran contains something capable of preventing beriberi in men, and the similar sickness in other animals, caused by living exclusively on polished rice. The authors have isolated the active substance from the bran. It is organic, sol. in alc., insol. in ether, is pptd. by phosphotungstic acid from solns. acidified with H_2SO_4, and from H_2O solns. by tannin. It was isolated in cryst. form as the picrate, but in amts. too small to permit detn. of its chem. constitution. Of the pure oryzanine, obtained from the picrate, 5-10 mg. given subcutaneously or per os suffice to cure a pigeon suffering from the polished rice sickness. Similar results were obtained with chickens, mice, and dogs. Oryzanine is absolutely required by the animal organism. Dogs fed on boiled meat and polished rice die in a few weeks with the symptoms of starvation. They remain in health if 0.3 g. of oryzanine is added to the daily diet. Judged from

their therapeutic action, grains and vegetables in general contain oryzanine. Milk, eggs, fish, and meat, and their alc. exts., were without effect on pigeons suffering from the polished rice diet. With dogs, however, the alc. ext. of meat is practically as efficient as oryzanine in preventing or curing the disease.

Oryzanine is readily decomp. by dil. mineral acids and alkalies, and is gradually split by emulsin. Crude oryzanine (obtained by alc. extn. of rice bran, pptn. of the ext. with phosphotungstic acid, and removal of the latter from the ppt. with $Ba(OH)_2$ is accompanied by nicotinic acid, which was isolated as the picrate. After b. 2 hrs. with 3% HCl, the crude oryzanine yielded choline, glucose, and 2 acids, $C_{10}H_8NO_4$ and $C_{18}H_{16}N_2O_9$. Both acids are difficulty sol. in cold H_2O, somewhat more sol. in hot, readily sol. in alk. and alc. Both give an intense diazo reaction with p-diazobenzolsulfonic acid, a deep indogo blue with phosphomolybdic acid and NH_3, a strong Millon reaction, and decolorize I-starch soln. These reactions are also given by crude oryzanine. The results of the authors constitute a confirmation and enlargement on the discovery of Casimir Funk (J. Physiol., 43, 395-400; C. A., 6, 1923) of which they were apparently unaware. (C.A. 6, 2774).

Takata, Ryohei, and Yokoyama, Kisaburo
UTILIZATION OF THE IRRADIATED MYCELIUM OF ASPERGILLUS ORYZAE FOR POULTRY FEEDING. IV. EFFECTS OF THE ADDITION OF RICE BRAN.
J. Agr. Chem. Soc. Japan 13, 673-676 (1937).

Addn. of irradiated mycelium of Asp. oryzae, rice bran and $CaCO_3$ to the standard ration for fowls produced a harmful effect. (C.A. 32, 1802).

Tirol, R. H.
COMPARATIVE FEEDING VALUE OF COARSE AND STANDARD RICE BRAN FOR GROWING PIGS.
Agr. J. (Fiji) 6, 41-48 (1933).

Samples of standard and coarse rice bran, the latter consisting of the hull, bran, polish and small particles of broken grains, contained H_2O 10.64, 10.48; either ext. 5.82, 1.11; ash 14.17, 15.03; protein 10.35, 4.25; crude fiber 12.73, 24.48; and carbohydrates 46.29, 44.65%, resp. When they were fed with a mineral mixt. (NaCl, charcoal and lime) to pigs, good growth was obtained with the standard bran and poor growth with the coarse bran. (C.A. 29, 1898).

Titus, H. W.
PEROSIS, OR DEFORMING LEG WEAKNESS, IN THE CHICKEN.
Poultry Sci. 11, 117-125 (1932).

Rice bran contains a factor which prevents or tends to prevent perosis in chickens. This factor is not extractable by ether and is not vitamin B, although it is possible that it belongs to the group loosely referred to as the vitamin B complex. In the absence of cod-liver oil, rice bran was quite effective in preventing perosis but not in preventing rickets. (C.A. 26, 3545).

Titus, H. W., and Ginn, W. M.
RICE BRAN, A PREVENTIVE OF PEROSIS (DEFORMING LEG WEAKNESS) IN CHICKENS.
Science 74, 249-250 (1931).
Expts. to be reported elsewhere indicate that in addn. to vitamin D, another accessory feed factor occurring in rice bran may be necessary for proper bone development in growing chicks. A description of perosis, held to be different from rickets, is given. (C.A. 26, 177).

Tomarelli, R. M., and Györgyi, Paul
ANTIOXYGENIC SYNERGISM OF TOCOPHEROL AND RICE-BRAN EXTRACT IN THE PRESERVATION OF CAROTENE.
J. Biol. Chem. 161, 367-379 (1945).
Rats 21 days old were placed on the following vitamin A-deficient diet: vitamin-free casein (Smaco) 18, Primex 5, glucose 73, salt mixt. 4 (U.S.P. XII). Removal of yeast from the diet was necessary since yeast as well as other sources of the vitamin B complex have been shown to contain factors that retard fat oxidation. The vitamin B requirement of the animals was supplied by daily administration of the cryst. vitamins, thiamine 20 α, riboflavin 25α, pyridoxine 20 α, calcium pantothenate 100 α, and choline chloride 20 mg. Once weekly they were given a few drops of viosterol. Depletion of vitamin A reserves resulted in cessation of growth and manifestation of ocular symptoms after 30-40 days. The rats were divided into several groups and finally a supplement of cryst. carotene with mixed tocopherols (dissolved in linoleic acid) and/or rice-bran ext. were added to the diet. The growth curves of these vitamin A-deficient rats showed that 5 α of carotene in 0.1 ml. of linoleic acid alone or with rice bran ext. would not alleviate the steady decrease in weight. The simultaneous administration of 0.2 mg. of mixed tocopherol with the carotene and linoleic acid resulted in a prompt growth response which was further enhanced by the addn. of rice-bran ext. These expts. have demonstrated that rice-bran ext. acts synergistically with mixed tocopherols in retarding oxidation of linoleic acid and therefore preserves carotene. Mixed tocopherol was selected as being typical of naturally occurring inhibitors and also because it has been used extensively in studies demonstrating its action in protecting carotene from destruction by oxidizing fat while in the intestine. (C.A. 40, 1210).

Tsukiye, S.
VITAMIN-B METHOD FOR SEPARATION.
Biochem. Z. 131, 124-139 (1922).
Rice-bran exts. contain before hydrolysis choline, glucose and levulose; the purine bases, adenine and hypoxanthine; the amino acids, arginine, lysine, etc.; but no histidine nor tryptophan. Vitamin B is not pptd. by Pb acetate from acid solns. It is completely pptd. by phosphotungstic acid from H_2SO_4 or HCl solns.;

by $AgNO_3$ in the presence of BaO in neutral or weakly alk. solns.; by ammoniacal $AgNO_3$ solns. but is sol. in excess NH_4OH: by picric and tannic acids, the former being sol. in alc. and hot H_2O. A part is pptd. by $HgCl_2$ but not by Au or Pt chlorides nor picrolonic acid. The biuret, Schmidt's, Millon's, Weidel's, xanthine, murexide, and diazo reactions are all negative. The Folin-McCollum-Denis uric acid test is weakly positive. This latter is apparently not due to Vitamin B itself. Vitamin B in neutral condition is not sol. in alc. more concd. than 80%, but is easily sol. in acid alc. and H_2O. It is both anti-neuritic and growth promoting. It is markedly absorbable by animal charcoal and metallic sulfides particularly. It is also dialyzable. T. prepd. it by extg. 1 kg. of rice-bran with 3 l. H_2O for 2 hrs. on the water-bath and filtering. The filtrate was evapd. on the water bath to a thick sirup, 75% alc. was added and the ppt. removed. The alc.-sol. fat and lipoids were removed with Et_2O. The residue was dissolved in H_2O and pptd. by Pb acetate with care not to use an excess. The ppt. was removed and the Pb removed as sulfate with dil. H_2SO_4. The filtrate was pptd. by concd. phosphotungstic acid in 5% H_2SO_4 and the ppt. washed with 5% H_2SO_4, decompd. with BaO, the BaO removed from the filtrate, which was acidified with HNO_3 and treated with $AgNO_3$. The ppt. was filtered off and the filtrate made weakly alk. with $Ba(OH)_2$ soln. The resultant ppt. was dissolved in dil. H_2SO_4 and freed from Ag with H_2S. The H_2SO_4 was removed, the neutral soln. acidified with HNO_3 and evapd. to dryness. The residue was extd. with 10% $AgNO_3$ soln. and ammoniacal $AgNO_3$ added to the filtrate. The ppt. was dissolved in dil. H_2SO_4 and the Ag pptd. out with H_2S. The filtrate was concd. and to it was added 10 times its vol. of abs. alc. The ppt. was sepd. by centrifugation, washed with abs. alc. then with Et_2O and dried in a desiccator. It is gray-white powder: it cures avian polyneuritis in doses of from 5 to 6 mg. From 4 kg. bran 0.3-0.5 kg. of product are obtained. (C.A. 17, 1494).

Tunoda, Eizi, and Morimoto, Hirosi
THE NUTRITIVE VALUE OF PROTEIN IN VARIOUS FEEDING STUFFS. I.
Imp. Zootech. Expt. Sta. (Chiba, Japan), Research Bull. No.41, 1-22, Appendix 1-33 (1939).

The value was compared by feeding expts. with albino rats during 100 days, the compn. of the diet being: crude protein of the sample(s) tested 10, butter 10, McCollum salts 5, cod-liver oil 3, oryzanin powder 3%, cornstarch the remaining part. Body wt. of the rats tested (34 days old) is 50 to 85 g. The results show that perilla cake (1), hempseed cake (2), soybean press cake (3), fish cake (4), benzine-extd. soybean meal (5), linseed cake (6) belong to the first class (gain in body wt. during 100 days more than 210 g.), that wheat bran (7), rice bran (8), cottonseed cake (9), peanut cake (10), sesame cake (11), belong to the second class (gain in body wt. 210-100 g.), and that rape cake (12) belongs to the third class (gain in body wt. less than 100 g.). The digestibility of proteins in these feeding stuffs is shown by expts. to be in the order: 1 (best), 9, 5, 4, 6, 2, 10, 11, 12, 8, 7 (worst). (C.A. 34, 7358).

Valdez, G. D.
A COMPARATIVE STUDY OF THE FEEDING VALUE OF "KISKIS" RICE BRAN AND "CONO" RICE BRAN FOR FATTENING SHOATS."
Philippine Agr. 27, 126-133 (1938).
The fine rice bran and coarse rice bran contain 9.20 and 10.27% moisture, 13.89 and 4.26% fats, 10.11 and 15.86% ash, 12.38 and 5.41% protein, 44.70 and 38.63% carbohydrates and 9.72 and 25.57% crude fiber, resp. (C.A. 33, 769).

Van Veen, A. G.
THE ANTINEURITIC VITAMIN FROM RICE BRAN AND POLYNEURITIS IN EXPERIMENTAL ANIMALS. VIII. REPORTS ON THE ANTINEURITIC VITAMIN FROM RICE BRAN.
Mededeel. Dienst Volksgezondheid Nederland.-Indie 21, 184-195 (1932). (C.A. 27, 2983).

Van Veen, A. G.
THE CONSTITUENT PARTS OF RICE BRAN IN REFERENCE TO THE ISOLATION OF THE ANTINEURITIC VITAMIN.
Mededeel. Dienst Volkagezondheid Nederland Indie 20, Pt. 2, 80-96 (1931).
A review and discussion of expt. work (published elsewhere) on the isolation of the antineuritic vitamin and on the nature of the accompanying substances. A bibliography is appended.
(C.A. 26, 3544).

Van Veen, A. G.
THE CRYSTALLINE VITAMIN B_1 PREPARATIONS OBTAINED FROM YEAST AND RICE BRAN.
Z. physiol. Chem. 208, 125-128 (1932).
A comparison was made of V's (C. A. 25, 3379) cryst. B_1 prepn. from rice bran with Windaus's (C. A. 26, 3006) cryst. prepn. from yeast. Both showed the same antineuritic potency of 0.4 mg. Both formed HCl salts, chloroaurates and picrolonates with the same m.ps; and the mixed m. ps. showed no depression. Slight discrepancies, however, were observed in the analysis. The formula for the rice prepn., calcd. from analysis of the picrolonate, was $C_{12}H_{20}O_2N_4S$ whereas W. reported $C_{12}H_{17}ON_3S$ for the yeast prepn. It is probable that both are identical with the original prepn. of Jansen and Donath (C. A. 20, 2005). The S is evidently linked otherwise than in cystine or cysteine. (C.A. 26, 4360).

Van Veen, A. G.
RICE BRAN AS A SUPPLEMENTAL FOOD.
Geneesk Tijdschr. Nederland.-Indie 81, 1182-1193 (1941).
The diet of the East Indians lacks protein. Large quantities of rice bran are normally shipped from the Dutch East Indies to be used elsewhere in cattle feeds. The rice bran is rich in protein and fat, and also in Ca, Mg and P. It is proposed that the rice bran be used locally as a supplemental human food. It will keep well if dried when first prepd. The whole bran has a bitter taste, but this can be overcome by first removing the husk from the grains

before polishing the rice. The product so obtained is rich in protein, fat, thiamine, and nicotinic acid, and is available at a very low price. Several recipes for utilizing rice bran are submitted. (C.A. 37, 1785-1786).

Williams, R. R.
NOTE ON THE EFFECTS ON PIGEONS OF AN EXCLUSIVE DIET OF RICE MEAL, BRAN, AND POLISH.
Biochem. J. 21, 1349-1351 (1927).
Rice mill by-products are distinctly harmful to pigeons when fed as the exclusive diet. W. is of the opinion that in the "deficiency diseases" there exist toxemias consequent or incident to dietary disturbances. (C.A. 22, 1179).

Windaus, A., Tschesche, R., and Ruhkopf, H.
THE ANTINEURITIC VITAMIN. II.
Nachr. Ges. Wiss. Göttingen Math.-physik. Klasse 1932, 342-346.
There seems to be but one antineuritic vitamin. The prepns. from yeast and rice bran are identical. Analyses made of vitamin B_1-picrolonate, hydrochloride, chloraurate and rufianate lead to $C_{12}H_{16}N_4OS$ as the most likely formula for vitamin B_1.
(C.A. 27, 2983).

Wong, S. C.
NUTRITIVE VALUE OF RICE BRAN EXTRACT FOR CULTIVATING MICROÖRGANISMS.
Proc. Soc. Exptl. Biol. Med. 37, 13-16 (1937).
Directions are given for the extn. of nutritive substances from rice bran; the ext. is equal to or better than meat infusion broth for growing many microörganisms. (C.A. 32, 5427).

RICE BRAN OIL

COMPOSITION AND ANALYSIS

Anonymous

OIL OF RICE.
Schweiz. Wochschr. 42, 66 (1904).
Pharm. J. 72, 216 (1904).

The high percentage (from 31.6 to 77.2) of free fatty acids in the oil from Rangoon rice is due to the presence in the bran of a lipase which effects the decomposition of the glycerides, with the formation of free fatty acids. [J. Soc. Chem. Ind. (London) 23, 259].

Anonymous

RICE OIL.
Seifensieder-Ztg. 40, 1318 (1913).

Two American samples contained 44 and 47% resp. free fatty acids while 4 Eng. samples averaged 13% with sapon. no. 194. By cooling from 50 to 18° about 50% of solid fat sepd. This had a titer of 36.8°. The oil is used in soap manuf. and when sapon. has an odor like Carnauba wax. (C.A. 8, 588).

Anderson, R. J., Nabenhauer, F. P., and Shriner, R. L.

THE DISTRIBUTION OF DIHYDROSITOSTEROL IN PLANT FATS.
J. Biol. Chem. 71, 389-399 (1927).

Appreciable amts. of the satd. sterol, dihydrositosterol, $C_{27}H_{47}OH$, have been isolated from corn gluten, corn, wheat and rice bran and corn and wheat germ oil. The prepns. obtained from different sources and their acetyl derivs. show slight variations in m.p. and [a] but it is impossible to det. from the present data whether these variations depend upon the degree of purity or are due to the presence of isomeric satd. sterols. (C.A. 21, 758).

Antoniani, C.

PHYTOSTEROLS. II. THE STEROLS IN RICE OIL.
Atti. accad. Lincei 16, 510-514 (1932).

Recently, Anderson and Nabenbauer (C. A. 21, 100) indicated the presence of dihydrosterol, stigmasterol and phytosterol A, B, C, and D, in rice oil. A. shows, however, that the tetra-Br deriv. on fractionation gives 3 di-Br derivs. These only contain 1/4 the expected amt. of Br. This and a consideration of the indices of rotation indicate that they are only derivs. of phytosterol and dehydrosterol. Thus, phytosterol B, C, D, are only mixts. contg. varying amts. of phytosterol and dehydrosterol. (C.A. 27, 2960).

Balce, Sofronio and Balagot-Meneses, Aurelia

CERTAIN CHARACTERISTICS OF PINIPIG FROM "GLUTINOUS" RICE.
Univ. Philippines Nat. and Applied Sci. Bull. 5, 173-175 (1936).

Pinipig oil prepd. from CCl_4 extn. of the glutinous rices, malagkit sungsong, macan I and inadhica, was red and possessed the following properties: sp. gr. 0.9238, n = 1.4693, I no. 100.5 sapon. no. 186.85: unsaponifiable 2.85% unsatd. acids 65.9%

(crude), satd. acids 19.7% (crude) and acid value 4.78, I no. of unsatd. acids 126.78 and I no. of the crude satd. acids 10.4. Bran from the hambas variety of rice contained the glycerides of the following acids: oleic 45.6, linolic 27.7, palmitic 17.3, stearic 1.8, lignoceric 0.7, arachidic 0.7 and myristic 0.2, together with unsaponifiable matter 4%. Pinipig freed from its oil showed no signs of rancidity after storage for 10 months. (C.A. 31, 7275).

Cruz, A. O., West, A. P., and Aragon, V. B.
COMPOSITION OF PHILIPPINE RICE OIL (RAMAI VARIETY).
Philippine J. Sci. 48, 5-12 (1932).
The oil contained in the bran of Philippine rice (ramai variety) has the following compn.; glycerides (1) of unsatd. acids, oleic 45.3, linoleic 27.6; (2) of satd. acids myristic 0.10, palmitic 16.9, stearic 2.6, arachidic 0.5, lignoceric 0.90; unsaponifiable matter 4.0%. Rice bran oil is therefore similar in compn. to cottonseed or peanut oils. Because it cannot be expressed from the rice bran but must be extd. with solvents, rice oil does not seem commercially promising at present. (C.A. 26, 3688).

Cruz, A. O., West, A. P., and Mendiola, N. B.
COMPOSITION OF PHILIPPINE RICE OIL (HAMBAS VARIETY).
Philippine J. Sci. 47, 487-494 (1932).
Rice oil obtained from hambas rice bran consists principally of glycerides of oleic, linolic and palmitic acids and is very similar to kapok, cottonseed and peanut oils. It is a possible addnl. source of income for the rice industry. (C.A. 26, 3128).

Davidsohn, J.
RICE OIL AND FAT.
Seifenfabr. 34, 178-179 (1914).
Upon standing a solid fat seps. from the oil. The consts. of the liquid portion are d_{15} 0.918, acid no. 98.5, butyro-refractometer reading at 25° 67.8, sapon. no. 198, I no. 108, unsapon. 0.21%. It is suitable for soft soaps. The solid portion has d_{15} 0.924, acid no. 124, butyro-refractometer reading at 50° 44.7, m. p. 46°, titer 39.6°, sapon. no. 197, I no. 74.0, unsapon. 0.14%. (C.A. 8, 1519).

Dean, H. K.
INVENTORY OF OILS AND FATS.
Soap, Perfumery & Cosmetics 20, 865-867; 1213-1216 (1947).
The phys. and chem. properties of the fats and oils, nutmeg butter, olive, olive kernel, palm, palm kernel, peach kernel, pilchard, raisin seed, rape, ravision (from seeds of a wild variety of Brassica campestris), and rice oil are reviewed. Safflower, sardine, seal, sesame, soybean, sunflower, tall, tallow (beef and mutton), teaseed, turtle, walnut, whale, and wheat germ. (C.A. 42, 2117).

De'Conno, E., and Finelli, L.
THE CONSTITUTION OF RICE BRAN FAT.
Ann. chim. applicata 20, 26-29(1930).
The fat of rice bran extd. with petroleum ether m. 24-5°, has an acid no. 101.25, a sapon. no. 189.13, an I no. 100.77, unsaponifiable matter 1.415%. The EtOH soln. was fractionally pptd. with $(AcO)_2Mg$ into 3 fractions: these were sapond., converted to NH_4 salts, then to Ba salts and the % Ba was detd. Results indicate that the original fat consisted of glycerides of oleic, linoleic, arachidic, stearic, and palmitic acids. (C.A. 24, 2510).

Fisher, G. S.
DETERMINATION OF ν-TOCOPHEROL IN VEGETABLE OILS.
Ind. Eng. Chem., Anal. Ed. 17, 224-227 (1945).
In vegetable oils which do not contain beta-tocopherol, ν-tocopherol can be detd. colorimetrically in the presence of α-tocopherol after oxidation with HNO_3 in the presence of AcOH. (Interfering substances can be removed by sapon.) The developing red color shows an absorption max. at 475 mμ which indicates its identity with chroman-5,6-quinone (tocopherol red). About 96% of the α-tocopherol is converted to tocopherol red in 30 sec. Under the same conditions α-tocopherol yields a yellow and β-tocopherol a reddish purple color, which fades rapidly. Concns. of ν- and α-tocopherol (by difference from total tocopherol) are listed for crude and refined cottonseed, peanut and rice bran oil, for refined soybean and pecan oil, and for crude okra-seed oil. (C.A. 39, 2418).

Fitelson, J.
THE OCCURRENCE OF SQUALENE IN NATURAL FATS.
J. Assoc. Offic. Agr. Chemists 26, 506-511 (1943).
The literature references on the occurrence of squalene in fats are summarized. A method is given (technique described in detail) for the detection of squalene in fats. The hydrocarbons, together with part of the other unsaponifiable constituents, are extd. from 100 g. of sapond. oil with petr. benzine by the Grossfeld method (C.A. 31, 4840) and then washed through a 25 x 0.8-cm column of adsorbent Al_2O_3, which concentrates the squalene in the unabsorbed residue. Squalene-6HCl is formed by passing anhyd. HCl through an ether soln. of this residue, and it can occasionally be identified microscopically after direct recrystn. from Me_2CO. Interfering material (probably hydrocarbons) which is frequently present at this stage and prevents satisfactory recrystn. can be removed with petr. benzine (b. 60-70°) in which squalene-6HCl is only slightly sol. Subsequent recrystn. from Me_2CO usually produces the typical diamond or hexagonal shaped plates of the hexahydrochloride. The vols. of solvent used in the recrystn. are governed by the yield of crystals, which can be anticipated by detg. the "squalene" content (C. A. 38, 801) and which is directly proportional to the "squalene" content. By this method, as little as 2 mg. of squalene per 100 g. of fat has been detected. The m. ps. of crystals obtained from

various fats varied from 110 to 35°. Squalene is known to exist in several isomeric forms, for which m.ps. of 100-50° have been reported. The following "squalene" contents were found in various fats (no. of samples exam'd. given in parentheses): olive (44) 136-708, cottonseed (12) 4-12, corn (9) 19-36, peanut (11) 13-49, sunflower (3) 8-19, soybean (9) 7-17, teaseed (3) 8-16, sesame (1) 3, rape (1) 28, mustard (1) 7, patua (2) 2-5, rice bran (1) 332, grapeseed (1) 7, almond (1) 21, cocoa (1) none, coconut (1) 2, linseed (1) 4, butter (1) 7, cod liver (1) 31, seal (1) 35, chicken (1) 4, lard (1) 3, beef (1) 10. Squalene-6HCl crystals were obtained from all the above fats with the exception of cacao butter, which was not exam'd. microscopically. (C.A. 38, 883).

Goss, W. H.

OIL FROM GRAIN.

Trans. Am. Assoc. Cereal Chemists 2, No. 2, 5-19 (1944).

The important grain oils are corn, soybean and linseed with only small quantities of rice bran and wheat-germ oils. All these oils are characterized by their relative contents of 5 important fat acids; palmitic, stearic, oleic, linoleic and linolenic, which permit their use for specific purposes. Illustrations and descriptions are given of the hydraulic presser, continuous expeller and screw presses and solvent extractor used in production of these oils. In the past these oils have been used mainly in the food and paint industry. Recent development tends toward various fractionation processes for sepn. of the desired components. New synthetic products are derived from fat acids, such as a new rubber substitute, Norepol, which is made from linoleic acid. (C.A. 38, 3151).

Iwai, Masayoshi

INCREASE OF ACID VALUE OF CRUDE RICE OIL ON STORAGE.

J. Soc. Chem. Ind. Japan 46, 491-493 (1943).

The acid value of the upper oil layer of crude rice oil stored in open bottles increased much more rapidly in summer than in winter. The acid values of thoroughly mixed samples of crude oil after several months' storage are much greater than those of the upper clear oil portions of the same samples. The oily wax layer is a chief source of the rancidity of crude rice oil. (C.A. 42, 6141).

Jamieson, G. S.

CHEMICAL COMPOSITION OF RICE OIL

J. Oil & Fat Ind. 3, 256-261 (1926).

A sample of extd. rice oil with an acid value of 73.7 contained 14.7% of satd. and 74.3% unsatd. acids. The oil had an I no. of 99.9 and sapon. no. of 185.3. The compn. of the oil was olein 41, linolin 36.7, myristin 0.3, palmitin 12.3, stearin 1.8, arachidin 0.5, lignocerin 0.4, unsapon 4.6. (C.A. 21, 1195).

Jumelle, Henri

RICE OIL.

Mat. grasses 12, 5312-5313 (1920).

The amt. of oil in the rice kernel is rarely more than 3%. Rice bran contains about 9.5%. In Italian rices the oil content varies

from 10 to 15%. Oil obtained by pressure showed: sapon. no. 179, glycerol 9.0%, and unsaponifiable matter 0.7%, while extd. oil gave a sapon. no. of 186, glycerol 4.85% and unsaponifiable matter 3.2%. The I no. of this oil is 107. According to Tsujimoto the solid fatty acids which represent 20% are composed of palmitic acid and the liquid acids consist of 45% oleic and 35% isolinolic acid. (C.A. 14, 1615).

Kato, Akio

SQUALENE IN RICE OIL.

J. Nippon Oil Technol. Soc. 2, No. 4, 34-39 (1949).

From 1.4 kg. crude rice oil was obtained 31 g. unsaponifiable oil (I), clear, red, viscous, n_D^{15} 1.5200, Ac no. 139, iodine no. 225.9. Thirty g. I in 5 vols. ether treated with dry HCl under cooling gave 2.5 g. white crystals (II), m. 123-125.2°; this agrees in m.p. with hexahydrochlorosqualene obtained from shark-liver oil by Tsujimoto (C.A. 12, 1004). Recrystn. of II from acetone gives a product (III), m. 143-5°, which corresponds in m.p. to the hexahydrochloride of the squalene isomer from teaseed oil (Hadorn and Jungkunz, C. A. 43, 1582e), although III showed a contamination of sterol. Recrystn. of III from petr. ether gives insol. crystals, m. 144-9° and contg. 32.13% Cl. (C.A. 44, 1269).

Kimura, Wasaburo

THE THIOCYANATE NUMBER AND ITS APPLICATION. III. A new method in oil analysis.

J. Soc. Chem. Ind. (Japan) 32, suppl. binding 187B (1929).

The fatty acids of a number of oils, free from unsaponifiable matter, were analyzed by the thiocyanate method for detg. linolic acid. The following amts. in % were found for linoleic, oleic and satd. acids, resp.: camellia oil, 2.63, 85.86, 11.51; palm oil (1) 9.87, 43.12, 47.01; rice oil, 36.97, 45.63, 17.40; olive oil, 11.04, 79.56, 9.40; palm oil (2), 10.91, 42.61, 46.48; sesame oil, 44.38, 43.17, 12.45. With mixts. of known amts. of linolic, elaidinic and palmitic acids, the thiocyanate method is sufficiently accurate. (C.A. 24, 2000).

Mehlenbacher, V. C.

FAT AND OIL MICROSCOPY.

Inst. Spokesman (Natl. Lubricating Grease Inst.) 5, No. 1, 1-4, 6-7 (1941).

Fats and fatty oils can be identified under the microscope by the examn. of the crystal habit of the resp. fat acid mixts. derived therefrom. Photomicrographs are given for the fat acids from lard, beef tallow, cottonseed oil, kapok oil, rice bran oil, palm oil, babassu oil, olive oil, sardine oil, whale oil and coconut oil. Teaseed oil can be identified by the crystals formed on a slide from the fat acids and KOH in BuOH; corn oil and perilla oil can be identified in a similar fashion. In some cases the microscopic technique can be applied to mixts. of fatty oils while in other cases the oils lose their identity when mixed. (C.A. 37, 4587).

Mehlenbacher, V. C.

FAT AND OIL MICROSCOPY.

Oil & Soap 13, 277-282 (1936).

Crystals of the following oils were studied microscopically with aq. KOH, aq. NaOH, KOH and NaOH in alc. and Bu alc., mixts. of KOH

and NaOH in alc., and Bu alc., Br, I and phenylhydrazine; olive, kapok, soybean, rice, bran, perilla, corn, palm, peanut, walnut, hempseed, mustard, sesame, cottonseed, teaseed, babassu, coconut, linseed, rapeseed, lard, beef fat, sardine, whale and several hydrogenated fats. Regarding the applicability of these methods to the analysis of mixts. it was concluded from examns. of known mixts. that the possibility to differentiate various fatty substances in mixts. depends upon the compn. and concn. of the same. Some are easily identified while others lose all known characteristics when mixed. Twenty photographs of crystals are show. C.A., 31, 281).

Murti, K. S., and Dollear, F. G.
RICE BRAN OIL. II. COMPOSITION OF OIL OBTAINED BY SOLVENT EXTRACTION.
J. Am. Oil Chemists' Soc. 25, 211-213 (1948).
The characteristics and compn. of 2 crude and one refined rice-bran oil were detd. The oils were obtained by solvent extn. of com. rice brans from Texas-grown Blue Bonnet and Arkansas-grown Zenith varieties of rice. The glyceridic compn. of the 2 crude oils and 1 refined oil was found to be: 0.80, 1.06, and 0.84% linolenic acid: 33.2, 30.6, and 33.1% linoleic acid: 45.0, 46.0, and 46.3% oleic acid; 17.1, 17.3, and 17.1% satd. acids; and 3.9, 5.0, and 2.7% unsaponifiable matter, resp. (C.A. 42, 5692).

Nabenhauer, F. P. and Anderson, R. J.
PHYTOSTEROLS OF RICE-BRAN FAT.
J. Am. Chem. Soc. 48, 2972-2976 (1926).
Extn. of rice bran with petroleum ether yields about 10% of an oil consisting largely of free fatty acids but contg. about 5% unsaponifiable matter (chiefly a viscous oil). The cryst. portion of the unsaponifiable matter contains myricyl alc., m. 85°; dihydrositosterol, m. 144-5°, α_D^{24} 24°; stigmasterol, m. 169-70°, α_D -50° and a phytosterol, which is probably not homogeneous sitosterol. The oily part of the unsaponifiable matter yields on distn. yellowish to light brown oils, boiling between 110° and 260°. The higher fractions gave sterol color reactions which are partly due to the presence of phytosterol. (C.A. 21, 100).

Nobori, Hiroso
ANTIOXIDIZING PROPERTY OF RICE OIL.
J. Soc. Chem. Ind. Japan 46, 646-648 (1943).
A strong antioxidant was detected in rice oil by the Mackey test. The substance is easily destroyed by alkali, but is resistant to heat. Exts. of rice-oil cake obtained by MeOH-Me_2CO, MeOH-Me_2CO-HCO_2H (or AcOH), petr. ether, and ether had an antioxidizing action similar to that of rice oil. (C.A. 42, 6141).

Nobori, Hiroso
RICE OIL PRODUCED IN FRENCH INDO-CHINA.
J. Soc. Chem. Ind. Japan 46, 15-17 (1943).
Rice bran from French Indo-China contained 20.78% of oil, which was composed of 23.33% satd. acid, 45.57% oleic and 31.10% linolic acid; the unsaponifiable matter amounted to 4.98% in which the presence of melissyl alc. and sitosterol was confirmed. On the whole the oil did not differ very much from Japanese rice oil." (C.A. 42, 6141).

Smetham, A.

NOTES ON RICE-OIL AND MAIZE-OIL.

Analyst, 18, 191-193 (1893).

Rice-Oil. The author has examined a sample of rice-oil obtained from Rangoon rice meal by hydraulic pressure. The oil was dirty-greenish in colour, semi-solid at ordinary temperatures, and contained crystals giving it the appearance of the "figging" of soft-soap. The following results were obtained:-

Iodine absorption	96.4 percent
KHO required for saponification	19.32 "
Saponification equivalent	290
Free fatty acids (KHO x 5)	64.0 percent

Another specimen obtained by ethereal extraction from a mixture of various rice meals yielded almost identical results, with the exception of the free fatty acids which were higher (77.20 percent). The melting point of this sample was 29° C. The oil similarly obtained from (a) the husk, (b) the cleaned rice, separated from a sample of recently imported Rangoon rice, contained a smaller amount of free acids, namely (a) 34.0 percent; (b) 31.6 percent. The meal supposed to have been derived from the same rice, yielded an oil containing 43.4 percent of free fatty acids.

English rice meal as a rule contains 8-9 percent of oil, whilst Rangoon meal averages 15 percent (rice meal is the by-product obtained when rice is dressed between emery rollers, and does not therefore include the interior portion of the grain).

Maize-Oil. This is a clear yellowish oil, sweet to the taste and smell, and sufficiently cheap to render it available as an adulterant of the dearer oils. Its iodine absorption and saponification equivalent are 116.3 percent and 282 respectively. [J. Soc. Chem. Ind. (London), 12, 848].

Sumi, Mizuho

THE STEROLS ISOLATED FROM SEVERAL VEGETABLES.

Bull. Inst. Phys. Chem. Research (Tokyo) 8, 228-33 (1929). Abstracts sect. 2, 30.

S. investigated the sterols isolated from (1) Enteromorpha compressa, (2) Cytophyllus fusiforme Harv, (3) Digenea simplex C, (4) Osmunda regalis L., (5) spore of Lycopodium clavatum, (6) pollen of Typha japonica Miq, (7) seed of Gingko biloba L. and(8) oil of rice bran. The sterols were all sitosterol. The ergosterol content mixed in these sterols was detd. by the ultra-spectroscopic method. The non-crystd. portions of the unsaponifiable parts of (1), (2), and (3), which were purified by cooling with liquid air, and with digitonin, were tested for the antirachitic property. 0.1 mg. per day of these fractions had the power to prevent rickets in young white rats. (C.A. 23, 3730).

Todd, A. R., Bergel, Franz, Waldmann, Hans, and Work, T. S.

distn. under low pressure and finally esterification with p-nitrobenzoyl or beta-napthoyl chloride. Distn. of the esters and hydrolysis of the products gave 3 alcs., alpha-orysterol m. 121-2°, $[\alpha]_D$ 49° (p-nitrobenzoate m. 187-9°, beta-naphthoate m. 187-9°), beta-orysterol m. 113-14°, $[\alpha]_D$ 51.3° (p-nitrobenzoate m. 227-8°, beta-naphthoate m. 166°), and β-orysterol m. 119-20°, $[\alpha]_D$ 51.9° (p-nitrobenzoate m. 233-4°, beta-naphthoate m. 157°). All these alcs. were biologically inactive, similar in properties to the tritisterols of Karrer and Salomon (C. A. 31, 6250) and appeared to be isomeric alcs. of the formula $C_{30}H_{50}O$. By similar methods, beta-amyrin, alpha-tritisterol m. 113-14° and a 3rd alc. m. 174-5° were obtained from wheat germ oil. The supposed "vitamin E" of Kimm (C. A. 30, 8141) corresponded to ν-orysterol in properties and was quite inactive. (C. A. 32, 2992).

Trevithick, H. P. and Lewis, R. R.
RICE OIL.
Oil & Soap 13, 232-233 (1936).
Rice oil in com. quantities is now available. Its consts. are: d_{15-50} 0.9192, I no. 103-5, thiocyanogen no. 68.8, sapon. no. 188.8, unsaponifiable 4.89%, acid no. 101.5, free fat acids as oleic 51.05%, titer 23.9°. If the absence of linolenic acid is assumed in the above sample, the following fat acid compn. is indicated: oleic 39.56, linoleic 39.91, satd. acids 15.64 and unsaponifiable 4.89%. (C. A. 30, 7370).

Tsuchiya, Tomotaro, and Kinomura, Shigeru
CHANGE OF OIL DURING STORAGE OF RICE POLISHINGS. II.
J. Nippon Oil Technol. Soc. 2, No. 4, 30-33 (1949).
During the storage of rice polishing for 17 months, the content of oil decreased to 3-5% and the acid no. increased to a max. then showed a gradual decrease till the end; sapon. no. decreased to 93. The oil (3.69%) extd. from the polishing showed acid no. 88.14, I no. 117.8, and sapond. no. 110.6; it is dissolved in ether, sapond. with alkali and removal of soap gives a neutral oil which showed unsaponifiable substance 50.01% and I no. 109.8. Fat acid obtained from the neutral oil showed I no. 115.2 and neutralization no. 163.7. (C. A. 44, 1269).

Tsuchiya, Tomotaro
ASH IN RICE OIL.
J. Nippon Oil Technol. Soc. 1, No. 2, 10-18 (1948).
Crude rice oils (23 samples) showed d_4^{30} 0.912-0.918, n_d^{30} 1.4664-1.4708, sapon. no. 179-187, unsaponifiable substance 3.6-5.0%. The ash content was 0.13-0.72 which decreased to below 0.01% by refining. Dewaxed rice oil still contained a considerable amt. of unsaponifiable substance. (C. A. 43, 5611).

Tsuchiya, Tomotaro, and Ohkubo, Osamu
ASH CONTENT OF RICE OIL
J. Nippon Oil Technol. Soc. 2, No. 5, 40-45 (1949).
Analyses of ash (%) in dewaxed rice oil and crude rice wax are, resp.: ash 0.14, 1.10; SiO_2 0.01, 0.11; Fe_2O_3 0.04, 0.36; CaO 0.02, 0.12; MgO 0.03, 0.30; P_2O_5 0.01, 0.17. (C. A. 44, 5618).

Tsujimoto, M.

THE COMPOSITION OF RICE OIL.

Chem. Rev. Fett. u. Harz. Ind. 18, 111-112 (1911).

A com. rice oil, prepared by T. Katayama in Okayama, from rice bran by benzine extraction, served as a basis for the following investigations. Its constants were: d_{15} 0.9273, acid no. 34.75, sapon. no. 184.87, I no. (Wijs) 107.60, n^{20} 1.4742, unsapon. 4.78%. The total fatty acids showed a d_{100} 0.8528, m.p. 30.5, sapon. no. 182.73, I no. (Wijs) 109.47. The unsapon. recryst. several times from alc. m. at 136-137° and indicates phytosterol. The satd. fatty acids, sepd. from their Pb salts and purified by re-cryst. showed a m.p. of 58.5° for the solid acids; their sapon. no. was 216.28, the mean mol. wt. 259.38, showing them to be crude palmitic acid. The unsatd. fatty acids gave no Br addition products insol. in ether, showing absence of linoleic acid and higher unsatd. acids, but bromination of the total fatty acids by Farnsteiner's method gave after 1 week a cryst. mass of radiating crystals of m.p. 114°, thus showing a tetrabromide. Oxidation of the unsatd. acids by Hazura's method gave a ppt. whose benzine-insol. portion was dissolved in ether and recryst. from alc., yielding rhombic plates of m.p. 131° and s.p. 118.9°, with a sapon. no. of 176.89, and a mean mol. wt. of 317.14. An ultimate analysis of same gave C 68.10% and H 11.71%, showing dihydroxystearic acid which indicates the presence of oleic acid in the original fatty acids. The ether-insol. portion was boiled 5 times with 1 l. H_2O each time; the products which sepd. on cooling were united and again boiled 2 times with 1 l. H_2O each time; white crystals of silky luster sepd. on cooling with the following characteristics for (1) and (2) resp.: m.p. 158.5°, 159.0°; sapon. no. 163.61, 164.68; mean mol. wt. 342.90, 340.66, C 62.68%, 62.83%, H, 10.84%, 10.91%. These data agree fairly well with sativinic acid except the m.p. (pure acid m. at 173-174°); the author believes that besides elamargarinic acid there exist some isomers of linoleic acid and that these isolinoleic acids occur oftener in oils and fats than suspected. The insol. portion of the tetrahydroxy acid extraction was disolved in alc. and filtered; the residue after evapn. of the alc. showed a m.p. of 142° (partly liquid at 129°) and a sapon. no. of 170.88; this indicates a mixt. of dihydroxystearic and tetrahydroxystearic acids. The filtrate from the oxidation of the unsatd. acids showed no constituents of any importance. If the amt. of solid acids is taken as 20% and the I no. of the liquid acids at 130 (figure accepted by T. Hoshi in Kogyo Kwagaku Zasshi, 1908, 223) the following comp. is calc. for the rice oil: palmitic acid 20%, oleic acid 45%, and isolinoleic acid 35%. (C. A. 5, 2440).

Tutiya, Tomotaro

RICE OIL. II. GENERAL PROPERTIES.

Kwagaku Kogyo Siryo [Materials for Chem. Ind. (Tokyo)] 14, 98-102 (1941).

Twelve samples of com. crude rice oil had d_{30} 0.9121-0.9177, n_D^{30} 1.4670-1.4708, acid value 16.25-67.61, sapon. value 180.7-185.6, I value 99.1-107.2, unsaponifiable substances 4.32-5.21%. Three samples of purified rice oil, which form no ppt. in the winter, had d_{30} 0.9131-0.9153, n_D^{30} 1.4700-1.4708, acid value 1.14-6.30, sapon. value 187.1-187.9, I value 106.8-107.9. The purified rice oil has a little higher n, d., I value, and a little lower solidifying point

and sapon. value, than olive oil (rice oil is recently used as a substitute for olive oil). Rice oil is classed as a semidrying oil, from its I value, but can be used as a nondrying oil, since it is very stable to oxidation. The viscosity index was for rice oil and olive oil, resp., 152 and 149. (C.A. 35, 7745).

Ueno, Seiichi and Ueda, Takedo

RICE OIL AND ITS UTILIZATION. IV. CONSTITUENTS OF LIQUID ACIDS IN RICE OIL.

J. Soc. Chem. Ind. Japan 41, Suppl. binding 325-326 (1938).

The C_{18} acids contained in the liquid acids of clear rice oil were investigated. Sepn. by the Pb salt-alc. method gave liquid acids of neutralization value 198.7 and I no. 127.2. Oxidation by $KMnO_4$ yielded dihydroxystearic acid. Linolenic acid was absent. Bromination gave alpha-linolic acid bromide. U concludes that the liquid acids of clear rice oil are composed of about equal parts of oleic and linolic acids. (C.A. 33, 1529).

Weinhagen, A. B.

VEGETABLE AND ANIMAL FATS AND WAXES. II.

Z. physiol. Chem. 103, 84-86 (1918).

This article confirms the earlier statement that there is no glycerol present in the solid fat from rice bran, while the oil contains only 1.7%. (C.A. 13, 2141).

RICE BRAN OIL

PROCESSING AND UTILIZATION

Ban, Hiroshi
HIGH VACUUM DISTILLATION.
J. Nippon Oil Technol. Soc. 2, Nos. 2/3, 48-65 (1949).

With a glass app. and a 10-l. still at a vacuum of 0.02-0.03 mm. Hg a distn. was made on the following: high-acid rice oil for acid removal, hydrogenated seal oil for palmitic acid, and hydrogenated whale oil for stearic acid. In addn. higher alcs. are distd., wax is sepd. from crude rice wax, hard wax from hydrogenated rice wax, squalene from shark-liver oil, and cold-resistant lubricating oil from hydrogenated squalene. (C.A. 43, 8709).

Dressler, R. G.
SPECIAL METHODS FOR REFINING OILS.
Oil & Soap 17, 124 (1940).

Rice-bran oil of 5.2% free fat acid which gave 40% loss by oridnary refining methods, showed a loss of 16% when refined with 7% of 20° Be. lye, 1% Na silicate, 1% water, agitated rapidly for 30 min., heated to 60° with slow agitation for 10 min., and treated with 4% water with agitation. After agitation was stopped 2% of cold water was sprayed over the surface of the oil. Another method, useful for refining inedible tallow oil with low loss specifies 3% of 25° Be. Na_2CO_3 and 4% Na silicate. The solns. are mixed and added to the cold oil while agitating for 15 min. and then heating to 60° and agitating for 10 min. more. From 5 to 7% of cold water is then added with slow agitation after which the mixt. is allowed to settle. The loss for an oil contg. 5.2% free fat acid was 9%. (C.A. 34 5303).

Feuge, R. O., and Reddi, P. B. V.
RICE BRAN OIL. III. UTILIZATION AS AN EDIBLE OIL.
J. Am. Oil Chemists' Soc. 26, 349-353 (1949).

An odorless, tasteless, and neutral product can be obtained by conventional refining, bleaching, and deodorization of rice bran oil. The smoke, flash, and fire points are comparable to those of other high-quality edible oils; and the oil solidifies less easily than cottonseed or peanut oil and is also more resistant to oxidation. It can be winterized easily and the yield is over 90% compared to 65-75% for winterized cottonseed oil. During hydrogenation rice bran oil behaves like a typical vegetable oil. The plasticity of the hydrogenated oil is almost identical with that of cottonseed oil having a similar I no. and the keeping quality is superior to that of cottonseed and peanut oils of similar fatty acid compn. (C.A. 43, 6842).

Hata, Koro

ESTERIFICATION OF FAT ACID AND OIL HAVING HIGH ACID NUMBERS.
J. Nippon Oil Technol. Soc. 1, No. 3, 46-52 (1948).
Esterification of an equimol. mixt. of fat acid and higher alcs. from sperm oil, heated at 150° for 10 hrs., gives a product having an acid no. 24.7, while heating at 243° for 5 hrs. gives a product having an acid no. 2.96. Oleic acid and oleyl alc. (30:31 g.) at 243° for 5 hrs. gives a product having an acid no. 6.26. Barley-germ oil and rice oil of high acid no. can be esterified with glycerol at 260°; addn. of decolorizing carbon is helpful. (C.A. 43, 5609).

Iwai, Masayoshi

UNSATURATED HIGHER ALCOHOLS FROM RICE OIL.
J. Nippon Oil Technol. Soc. 2, No. 6, 19-33 (1949).
Fe Zn oxide catalyst having Fe_2O_3:ZnO 1:2 gave the best result. With 20% of this catalyst on methyl ester of rice oil fat acid and by heating at 330° for 70 min. with H initial pressure at 100 atm. gave 90.5% unsatd. higher alc.; the same treatment of rice gave 72.8%. The rate of alc. formation was Me ester > Et ester > rice oil. (C.A. 44, 5618).

Kawai, Junichi

DECOLORIZATION OF RICE OIL BY HYDROGEN PEROXIDE.
J. Nippon Oil Technol. Soc. 2, No. 1, 30-32 (1949).
Treatment of rice oil with 2% of 35% H_2O_2 removed 69% of color; this is a much better performance than that of activated C or acid clay. (C.A. 43, 5611).

Kawai, Junichi

DECOLORIZATION OF RICE OIL BY HYDROGEN PEROXIDE. II.
J. Nippon Oil Technol. Soc. 2, No. 5, 16-19 (1949).
Use of 2% H_2O_2 (29.5%) on oils having high acid no. and subsequent treatment with 4% acid clay or acid clay-activated C gave good results. (C.A. 44, 5618).

Kawai, Junichi, and Kinoshita, Shosaku

UTILIZATION OF RICE OIL.
J. Nippon Oil Technol. Soc. 2, No. 6, 33-37 (1949).
Rice oil having an acid no. 120 is esterified with EtOH and hydrogenation of the product contg. 80% ester gave a product m. 33.2-3.6° with acid no. 2.7 and I no. 6.1. It is suitable as a substitute for cacao fat. (C.A. 44, 5617).

Kawakami, Yasota, and Kinoshita, Shosaku

TREATMENT OF RICE OIL "FOOT."
J. Nippon Oil Technol. Soc. 1, No. 2, 24-26 (1948).
Attempt was made to obtain hydrogenated fat acid and soap by use of 200 g. "foot," 6 g. NiO-kieselguhr, 6 g. MgO, 100 g. water, with the initial H pressure at 42 kg. per sq. cm. at 180° for 3 hrs. This expt. was not successful. (C.A. 43, 5611).

Komori, Saburo
ORES FOR THE CHIEF OR ACCESSORY CATALYST IN THE PREPARATION OF HIGHER ALCOHOLS BY CONTACT REDUCTION.
Japan 154,110 (Dec. 9, 1942).
Powd. limonite or bauxite was added to water and, after removal of heavy particles at the bottom, boiled for 1 hr. with concd. HNO_3, washed thoroughly with hot water 5 times, stirred with HNO_3 contg. metallic Fe, then mixed with NH_4OH, and the crude $Fe(OH)_3$ filtered, dried, and heated 1 hr. at 400°. Rice-bran oil Et ester 150 g. heated 30 min. at 330° with 20 g. of this catalyst while H was passed in under 200 atm. was reduced to a high-mol. alc. with iodine no. 78.3, sapon. no. 23.1, and Ac no. 148.1 (yield 82%). (C.A. 43, 3835).

Komoro, Saburo
PREPARATION OF UNSATURATED HIGHER ALCOHOLS BY CATALYTIC REDUCTION. VIII. PROMOTERS FOR IRON OXIDE CATALYST.
J. Soc. Chem. Ind. Japan 44, 740-741 (1941).
The hydrogenation of the Et ester of rice-bran oil to form alcs. in the presence of an Fe oxide catalyst contg. various amts. of Cr_2O_3, Al_2O_3, ZnO, or CdO as promoter was studied. The ester mixed with 20% catalyst was caused to react with H at 330-35° under 195-215 atm. for 30 min. Catalysts contg. 5-6 mol.-% Cr_2O_3 or Al_2O_3 raised the yield of alcs. to 70% from that of 50% when the catalyst of pure Fe oxide was used. Addn. of promoters in excess was undesirable as it caused the catalyst to form fine particles, difficult to sep. after the reaction. ZnO and CdO were also good promoters, though less effective than Cr and Al oxides. (C.A. 42, 2228).

Kuwayama, Sadao
A CASTOR- OIL SUBSTITUTE FROM RICE OIL.
J. Nippon Oil Technol. Soc. 1, No. 4, 27-34 (1948).
To 100 g. dewaxed rice oil, 80 g. glacial AcOH (I), 28 g. 30% H_2O_2 is added and agitated for 3 hrs. The oil, after removal of AcOH and H_2O, showed acetyl no. 107.6. The amt. of I can be reduced to 8 g. when 3-4 g. 90% H_3PO_4 is added to obtain the same result. (C.A. 43, 5611).

Nakajima, Satoshi, and Kosuge, Kiichi
DEODORIZATION AND ACID REMOVAL FROM FAT AND OIL IN HIGHLY EVACUATED STATE. II.
J. Nippon Oil Technol. Soc. 2, Nos. 2/3 (1949).
Crude rice oil (acid no. 99) on distn. under 0.06-0.08 mm. pressure at 160° for 4 hrs. gave a residue (68.4%) with acid no. 5.4 and a distillate (31.4%) with acid no. 191.6. (C.A. 43, 8705).

Nakajima, Satoshi, Kosuge, Kiichi, and Kanzaki, Shuichi.
DEODORIZATION OF FATS AND OILS IN HIGHLY EVACUATED STATE. I. DECREASE OF ACID CONTENT.
J. Nippon Oil Technol. Soc. 1, No. 3, 30-38 (1948).
By heating to 180-90° under 0.07 mm. pressure, in a tower somewhat similar to a pipe still, sardine oil was well deodorized, and its acid no. and I no. were decreased. Similar treatment gave (for raw material, residue, and distillate, resp.): whale oil: acid no. 26.6, 1.2, 167; sapon. no. 189.6, 184.8, 203.0; yield 100, 88.11. Rice oil:

acid no. 41, 0.2, 1.42. sapon. no. 181.2, 188.4, 180.6; unsaponifiable substance 4.8%, 1.17%, —; yield: 100, 73.5, 26.5. (C... 43, 5609).

Nishimura, Minoru
DEWAXING OF RICE OIL. I.
J. Nippon Oil Technol. Soc. 1, No. 1, 7-9 (1948).
Use of evacuated, unglazed porcelain cylinders is described as the dewaxing agent. (C... 43, 5611).

Nishimura, Minoru
DEWAXING OF RICE OIL. II.
J. Nippon Oil Technol. Soc. 1, No. 1, 18-23 (1948).
Dewaxing of rice oil by use of evacuated, unglazed porcelain cylinders covered with filter cloth is tried. The best yield is obtained at 20-5° with suction of 50 mm. of Hg. (C... 43, 5611).

Nishiyama, Haruto shi
STUDIES ON RICE CLEANING. II. THE CHANGES OF PHYSICAL AND CHEMICAL PROPERTIES OF RICE BRAN OIL WITH REPEATING THE RICE CLEANING.
Bul. Sci. Fakult. Terkult, Kyushu Imp. Univ. Fukuoka, Japan 10, 171-182 (1942).
The color of all bran oils changed from dark green to orange with repeated washing. The viscosity and acid no. decreased. Sapon. no. and ester value of 1 and 2 showed a gradual rise, while 3 remained unchanged. The iodine no. of 1 increased steadily while 2 and 3 at first increased and then remained stable. The unsapond. matter of all samples decreased. (C... 43, 5126).

Nobori, Hiroso, and Nakajima, Kyuji
POLYMERIZATION OF SOME JAPANESE VEGETABLE OILS.
J. Soc. Chem. Ind. Japan 49, 13-14 (1946).
When vegetable oils were polymerized by heating to 300° and agitating in a current of CO_2, in general the acid value increased and the sapon. value decreased gradually with time, the I value decreased rapidly in the 1st stage and then linearly with time for soybean oil, cottonseed oil, and rice oil, but decreased linearly with time from the beginning for peanut oil and rapeseed oil. Sp. gr. and n increased more rapidly in the easily polymerized oils. The mol. wt. was more than 2000 after heating for 20 hrs. Linseed oil showed a mol. wt. of 2381 in 10 hrs. and completely gelatinized in 13 hrs. Soybean oil was liquid after heating 15 hrs., but became gelatinized suddenly when heated for 17 hrs. This phenomenon was not observed with cottonseed oil and rice oil which produced polymerized oils of high n next to soybean oil. Rapeseed oil and peanut oil were comparatively difficult to polymerize. (C... 42, 6139).

Reddi, P. B. V., Murti, K. S., and Feuge, R. O.
RICE-BRAN OIL. I. OIL OBTAINED BY SOLVENT EXTRACTION.
J. Am. Oil Chemists' Soc. 25, 206-211 (1948).
Freshly milled rice bran has been extd. with com. hexane and the recovered oil and extd. meal have been examd. for their wax content. The oils were refined and bleached by standard and special methods. The crude and refined oils were examd. spectrophotometrically. Extn. of good-quality rice bran with com. hexane results in oil of good color, stability and low free fatty acid content. When the oil is extd. at a temp. below 10° and the extn. discontinued at the right time, the extd. oil represents 90-95% of the total lipids in the bran and contains but little wax. This wax amounts to about 3-9% of the total extractable lipides. When subjected to NaOH refining methods, rice-bran oils behave like cottonseed oils of comparable free fatty acid content. Both NaOH refining in a hydrocarbon solvent and with Na_2CO_3 result in losses approximating the Wesson loss. Some of the refined oils when bleached produce products acceptable for edible purposes. The refined rice-bran oil has a greenish cast which can be removed by bleaching with an activated acidic clay. (C.A. 42, 5691).

Sakurai, Ko.
ALKALI REFINING OF RICE OIL.
J. Nippon Oil Technol. Soc. 2, No. 1, 47-50 (1949).
Preliminary treatment of the crude oil with 0.5% H_2SO_4, HCl, or oxalic acid before alkali refining gave better yields of neutral oil. (C.A. 43, 5610).

Sakurai, Ko.
DECOLORIZATION OF RICE OIL BY ACID.
J. Nippon Oil Technol. Soc. 2, Nos. 2/3, 25-30 (1949).
Ten % aq. soln. of oxalic acid or 0.5% aq. H_2SO_4, or HCl is added to the oil and air is blown in while heating at 90° in the former case and 70° in the latter case. (C.A. 43, 8709).

Sato, Kazuo.
DEWAXING OF RICE OIL.
J. Nippon Oil Technol. Soc. 1, No. 2, 2-10 (1948).
An estn. of the rate of pptn. of wax in oil is shown to be 0.016 mm. per hr. and a graphical representation of size, rate of rotation per min., and the amt. to be dewaxed per hr. by use of the centrifuge is made. (C.A. 43, 5611).

Swift, C. E., Fore, S. P., and Dollear, F. G.
RICE-BRAN OIL. V. THE STABILITY AND PROCESSING CHARACTERISTICS OF SOME RICE BRAN OILS.
J. Am. Oil Chemists' Soc. 27, 14-16 (1950).
The extn. processing, characteristics, and stability of 9 batches of hexane-extd. rice-bran oil were investigated. Pilot-plant extns. of 5 batches of rice bran yielded crude oils equiv. to 91% of the hexane-sol. portions of the bran. The 9 crude oils whose free fatty acids range from 2.0 to 6.3% were refined with losses from 12 to

23.5%, although the neutral oil of 6 crude rice bran oils ranged from 89.9 to 92.6%. The Lovibond color of the 9 oils ranged from 35 yellow and 4.5 red to 70 yellow and 9.5 red, and the bleached oils from 15 yellow and 1.5 red to 35 yellow and 3.2 red. Steam refining plus alkali refining was effective in reducing losses. I nos. ranged from 101.3 to 105.7 for the refined, bleached, and deodorized oils. Stabilities averaged 24 hrs. The 9 oils hydrogenated to shortening consistency had I nos. averaging 66 and stabilities averaging 370 hrs. (C.A. 44, 2261).

Takahashi, Kazuhiko

UNSATURATED HIGHER ALCOHOL FROM RICE OIL FATTY ACIDS. II.

J. Nippon Oil Technol. Soc. 2, No. 5, 19-23 (1949).

Reduction of methyl ester of rice oil fat acid in vacuo while passing through H at 330° for 70-90 min. with 12% Zn Cr oxide as catalyst gives 38-68% unsatd. higher alc. when the rate of hydrogenation of unsatd. double bonds was 10-21% and remaining esters 31-62%. (C.A. 44, 5618).

Tsuchiya, Tomataro

DECOLORIZATION OF RICE OIL.

J. Nippon Oil Technol. Soc. 1, No. 3, 24-29 (1948).

Addn. of AcOH (0.1-1.0%) to acid clay decreases yellow and green colors but the red is increased; addn. of H_2SO_4 is effective only when the amt. is not more than 0.1% at 50-80°; addn. of H_3PO_4 (0.1-0.5%) gives the product of best color. Treatment with activated Fe powder gives good results, although a large amt. was necessary to decolorize to the extent of refined soybean oil. (C.A. 43, 5611).

Tsutsumi, Shigeru.

HYDROGENATION OF UNSATURATED OIL AND THAT OF RICE OIL OF HIGH ACID NUMBER WITH NICKEL OXIDE AS CATALYST. I. HYDROGENATION OF CHRYSALIS OIL.

J. Nippon Oil Technol. Soc. 1, No. 3, 12-15 (1948).

With 2% Ni oxide, 3% acid clay, 1.5-2.5% H_2O, the oil (I no. 124, acid no. 1.6) hydrogenated with an initial H pressure of 15 atm. and at 180° for 3 hrs. gave a product having I no. 1.8-7.1, m.p. 56-62°, and acid no. 6.3-10.9. (C. A. 43, 5610).

Tsutsumi, Shigeru

HYDROGENATION OF UNSATURATED OIL AND THAT OF RICE OIL OF HIGH ACID NUMBER WITH NICKEL OXIDE AS CATALYST. II. HYDROGENATION OF RICE OIL HAVING HIGH ACID NUMBER.

J. Nippon Oil Technol. Soc. 1, No. 3, 16-17 (1948).

Rice oil having acid no. 158 and I no. 113.1 was hydrogenated at 180° with an initial H pressure of 15 atm. for 3 hrs., with 2% Ni oxide, 3% acid clay, 0-10% H_2O. The presence of H_2O was harmful in this case, and the lot without H_2O gave a product having I no. 2.0, acid no. 157.3 in 1.5 hrs. (C.A. 43, 5610).

Tsutsumi, Shigeru.
HYDROGENATION OF UNSATURATED OIL AND THAT OF RICE OIL OF HIGH ACID NUMBER WITH NICKEL OXIDE AS A CATALYST. III. THE MECHANISM OF ACTION OF WATER AND ACID CLAY ON NICKEL OXIDE.
J. Nippon Oil Technol. Soc. 1, No. 3, 17-18 (1948).
Action of water and acid clay on the acceleration of Ni oxide for hydrogenation is explained as follows: A mol. of H_2O is adsorbed by the double bond of the C:O group to cause polarization. When acid clay and H_2O are used, the clay is electrically neg. and the polarization is still stronger. The presnece of H_2O is unnecessary in an oil having a high acid no. The supply and demand of electrons between the C:O group and H_2O-acid clay cancel each other, and the effect at the double bond becomes less, while the use of acid clay alone gives polarization at the double bond. (C.A. 43, 5610).

Tutiya, Tomotaro
RICE OIL. I.
KWAGAKU KŌGYŌ SIRYŌ [Materials for Chem. Ind. (Tokyo)] 13, 91-95 (1940).
Tje dark-green color (chlorophyll and the like) of rice oil cannot be easily adsorbed by acid clay. It is decolorized, nowever, by acid clay mixed with some acids, especially oxalic acid (cf. Japan, pat. 129,313). 5-10% acid clay alone can decolorize yellow and blue colors, but the red color is increased. When oxilic acid is used in 0.1-1.0% together with 5-10% acid clay all three colors are decolorized. Colors were measured by the Lovibond tintometer. (C. A. 35, 4234).

Ueno, Seiichi
INVESTIGATION OF RICE OIL AND ITS UTILIZATION. IX. REFINING OF RICE OIL OF EXTRAORDINARILY HIGH ACID VALUE.
J. Soc. Chem. Ind. Japan 44, Suppl. binding 291 (1941).
Rice bran oil of very high acid nc. is refined by washing with dil. alkali soln. (0.5-3%) or Na_2CO_3 and $NaHCO_3$ soln. (1%). (C. A. 44, 7569).

Ueno, Seiichi
INVESTIGATION OF RICE OIL AND ITS UTILIZATION VIII. REFINING OF RICE OIL BY VACUUM DISTILLATION.
J. Soc, Chem. Ind. Japan 43, Suppl. binding 75-76 (1940).
The distn. of rice oil was carried out with superheated steam at 300 to 350° under a pressure of 80-100 mm. Hg. Yields were 16%, residue 10%, and loss 3% for acid value of original oil distillate 39.0 and 30, 4.4 and 4.5%, resp., for a distillate of acid value 63.7. (C.A. 34, 4932).

Ueno, Seiichi
RICE OIL AND ITS UTILIZATIONS. I. PREPARATION, PROPERTIES AND CONSTITUENTS OF RICE OIL. II. PREPARATION OF STEARIN, OLEIN AND HAIR-DRESSING OIL FROM RICE OIL.
J. Soc. Chem. Ind. Japan 40, Suppl. binding 200-202 (1937).
The fat acids from the crude rice oil were esterified and then fractionally distd. The lowest fat acid found was palmitic acid and the highest stearic acid. The existence of a fat acid of more C atoms than C_{18} was indicated. Stearins were prepd. from the crude oil by refining and hydrogenating and then distg. under vacuum. They were white and odorless. Com. oleins were prepd. from refined raw oils by partial hydrogenation. They were suitable for tech. purposes. An Et ester was prepd. from crude rice oil by heating it for hrs. with twice its wt. of abs. alc. in 1% H_2SO_4 and then distg. under vacuum. (C.A. 31, 6911).

Ueno, Seiichi and Aso, Michio
RICE OIL AND ITS UTILIZATIONS. III.
J. Soc. Chem. Ind. Japan 40, Suppl. binding 289-291 (1937).
Crude rice oil did not polymerize when heated to 270-5°. Clarified rice oil (d_{15} 0.9230, n_D^{40} 1.4652, viscosity at 70°, 12.45 (units not given), acid no. 40.7, sapon. no. 188.5, I no. 107.9, Lovibond color units (1/4 in.) red 2.40, yellow 22.00, blue 0.02) was found to yield the best polymerized oil when heated 20 min. at 280-5°. The product had the following properties; n_D^{40} 1.4664, viscosity at 70° 14.00, Lovibond color units (1/4 in.) red 6.80, yellow 39.50, acid no. 46.3, sapon no. 189.0, I no. 99.2. Crude olein obtained from the polymerized oil was pale, contained linolic acid but no linolenic, and was inferior to com. oleins in the Macky test. Of 20 rubber and other antioxidants tried, the following had marked antioxidant power when incorporated in polymerized clear rice oil: Bayal MB, Antigen A, Antigen C, Antigen D, pyrogallol, pyrocatechol and hydroquinone. (C.A. 31, 8969).

Ueno, Seiichi and Komori, Saburo
PRODUCTION OFA HIGHER UNSATURATED ALCOHOL BY LOW-TEMPERATURE REDUCTION.
J. Soc. Chem. Ind. Japan 49, 74-75 (1946).
An unsaturated higher alc. was prepd. from rice-bran oil in the presence of Zn-Cr-O catalyst. The results are tabulated. The best conditions were 325-35° for 1-2 hrs. with an initial pressure of 40 atm. (C.A. 42, 6311).

Ueno, Seiichi, and Ota, Yasuo
INVESTIGATION OF RICE OIL AND ITS UTILIZATIONS. VI. ALKALI REFINING OF RICE OIL.
J. Soc. Chem. Ind. Japan 43, Suppl. binding 74 (1940).
A mixt. of soybean and rice oil was refined with a concd. soln. of NaOH (74 g. NaOH made up to 100 cc. with H_2O). Three samples of 25.5, 36.0 and 31.3 acid value, resp., after refining had, resp., 0.8, 0.5, and 1.0 acid value. (C.A. 34, 4932).

Ueno, Seiichi, and Ota, Yasuo
INVESTIGATION OF RICE OIL AND ITS UTILIZATIONS. VII. REFINING OF RICE OIL BY ESTERIFICATION WITH GLYCEROL.
J. Soc. Chem. Ind. Japan 43, Suppl. binding 74–75 (1940).
After 3 to 4 hrs. esterification of rice oil with dynamite glycerol under reduced pressure the acid value was decreased below 5.0 and nearly proportional to that of the I no. Under ordinary pressure, after 6 hrs. esterification with glycerol reduced the acid value in one sample from 30.0 to 5.9 (C.A. 34, 4932).

Ueno, Seiichi and Takeuti, Ryonosuke
INVESTIGATION OF RICE OIL AND ITS UTILIZATIONS. V. REFINING OF RICE OIL BY ALCOHOL EXTRACTION.
J. Soc. Chem. Ind. Japan 42, Suppl. binding 46 (1939).
Repeated extn. with MeOH or ETOH removes most of the free fatty acids and coloring matter from the neutral insol. oil.. However, an amt. of neutral fats almost equal to the free fatty acid is dissolved at the same time. (C. A. 33, 6076).

Ueno, Seiichi, Yukimori, Takao, and Hayashi, Koki.
ALCOHOLIC EXTRACTION OF RICE-BRAN OIL. I.
J. Agr. Chem. Soc. Japan 19, 940-944 (1943).
For industrially feasible extn. of acid-free oil from rice-bran oil (yield above 90, loss of neutral oil below 5, and lowering of acid no. above 40%) 75-80% ETOH about 4 times the vol. of the oil is recommended. This method does not apply to bran oil with acid no. less than 10. (C.A. 43, 881).

RICE BRAN OIL

MISCELLANEOUS

Auriol, R. F.
BY-PRODUCTS OF STEAMED RICE: OIL, SOAP, PRESS-CAKE.
Bull. mat. grasses inst. colonial Marseille 21, 112-116 (1937).
The oil content of rice in various stages of com. prepn. is examd. Pressure and solvent (light petroleum, 70-90°) methods of extn. are compared. Rice oil is not suitable for edible purposes when used alone, but is serviceable for soap manuf., especially if mixed with other oils, e.g., coconut oil. Solid fats deposited from mixts. of rice, cottonseed and coconut oils can be utilized for margarine manuf. Press-cakes from rice-oil extn. form valuable feeding stuffs for cattle and sheep. (C.A. 32, 3994).

Endo, Hidemaro.
STUDIES OF RECLAIMED RUBBER. XIV. THE EFFECT OF COMPOUNDING INGREDIENTS ON RECLAIMED RUBBER. 3. EFFECTS OF VEGETABLE OIL AND FISH OIL ON RECLAIMED VULCANIZATES.
J. Soc. Rubber Ind. Japan 15 100-117 (1942).
The author studied the effect on the phys. and aging properties of reclaimed vulcanizates (C.A. 42, 6152c) of vegetable and animal oils, such as soybean oil, rapeseed oil, cottonseed oil, rice bran oil, castor oil, vegetable wax, sardine oil, herring oil, shark oil, peanut oil, and whale oil. (C. A. 43, 2021).

Ganchev, N.
THE OIL FROM (BULGARIAN) RICE REFUSE MEAL.
Annuaire univ. Sofia. V. Faculté agron. sylvicult. 16, 430-442 (1938).
An av. oil content of 17% was found. The compn. and characteristics of the oils were detd. by the usual methods. The rice oil must be mixed with other oils rich in satd. acids in order to make it useful for the manuf. of hard soaps. (C. A. 33, 9694).

Gyorgy, Paul (to Wyeth, Inc.).
STABILIZED FAT COMPOSITIONS.
U. S. 2,526,865 (Oct. 24, 1950).
Fat-type compns., such as unsatd. glycerides, are stabilized against oxidative changes by the addn. of α-tocopherol and a crude source of vitamin B complex. For example, the addn. of rice bran concentrate and α-tocopherol in concns. of 2.5 and 0.03%, resp., to a modified dried system composed of 18 g. corn starch and 3.5 g. redistd. linoleic acid at 30° decreases oxidative changes; the I no. of the system is 126.8 after 7 days and of the control is 50.4 after 7 days. (C. A. 45, 1362).

Kawakami, Yasota.
WAX FROM CRUDE RICE OIL.
J. Nippon Oil Technol. Soc. 2, No. 1, 33-41 (1949).
Dewaxing by use of the De Laval and a basket-type centrifuge is described. Rice wax commercially prepd. by hydrogenation at high pressure and temp. showed sapon. no. 142-4, m.p. 67-9°, while that prepd. by hydrogenation of pure rice wax gave sapon. no. 73 and m.p. 76°. (C.A. 43, 5611).

Komatsu, Shinichiro.
IMPROVEMENT OF HYDROGENATED RICE WAX.
J. Nippon Oil Technol. Soc. 3, No. 1/2, 141-145 (1950).
Refining of hydrogenated rice wax by use of a solvent is described. The color in the wax could not be removed by a solvent. (C.A. 44, 7570).

Morigami, Syuzo.
THE INFLUENCE OF RICE-BRAN OIL ON THE GROWTH AND HISTOLOGY OF NORMAL AND TUMOROUS TISSUES IN TISSUE CULTURE.
Gann 33, 384-389 (1939); Osaka Igaku Zasshi 37, 827 (1938).
C. A. 34, 180 reported that daily ingestion of a small amt. of rice-bran oil prevented the production of cancer in livers of dimethylaminoazobenzene-fed rats. In the present study the action of various fractions of rice-bran oil was tested upon the outgrowth of normal and tumorous tissues in vitro. Rice-bran oil (R) was sapond. with alc. KOH and the unsaponifiable material was extd. with ether. The ether-sol. material was divided into acetone-sol. fraction (L) and acetone-insol. fraction (U). The fraction U was treated with CH_3-OH and 3 different cryst. substances, U_1 and U_2 and U_3, have been isolated. All the fractions were tested in concn. of 0.05% in the culture medium of normal chicken embryo fibroblasts and tissue of rat sarcoma due to benzopyrene. The results showed that fraction R stimulated the growth of normal fibroblasts. Fraction L significantly stimulated the growth of both normal and sarcomatous tissues. Fraction U had definite inhibitory action upon both normal and sarcomatous tissues. Fraction U_1 and U_2 more or less stimulated the growth of fibroblasts, but U_3 inhibited the growth markedly. (C.A. 34, 1386).

Naito, Shoichiro, and Tsuchiya, Tomotaro.
OLEIC ACID FROM RICE OIL FOR TEXTILES.
J. Nippon Oil Technol. Soc. 2, No. 6, 13-19 (1949).
Oleic acid prepd. from rice oil had I no. 117.3; it cannot be used for textiles without antioxidants. Addn. of 0.5% alpha-naphthol showed in the MacKey test, the rise in temp. to 96° after 173 min. (C.A. 44, 5618).

Nishimura, Minoru, and Murakoshi, Yasu.
HIGHER ALCOHOLS AND HIGH-MELTING PRODUCTS FROM REDUCTION OF CRUDE RICE WAX AT HIGH PRESSURE.
J. Nippon Oil Technol. Soc. 2, Nos. 2/3, 66-69 (1949).
Reduction of rice wax with CrO_3-Cu-Ba catalyst at initial H pressure of 130 kg./sq. cm. and temp. at 300° gave the best product of distn. and residue. (C.A. 43, 8709).

Printon, T. A. (to National Oil Products Co.)
TEXTILE AND LEATHER TREATMENTS SUCH AS FINISHING AND FAT LIQUORING.
U. S. 2,180,256 (Nov. 14, 1939).
Rice oil is used (suitably after being sulfonated and in various mixts.). (C.A. 34, 1864).

Sakurai, Ko.
VITAMIN E PREPARATION FROM RICE OIL.
J. Nippon Oil Technol. Soc. 2, No. 1, 42-46 (1949).
Sapon., ether extn., soln. in MeOH, and cooling give about 0.3% Vitamin E. (C.A. 43, 5907).

Schioppa, Luigi.
VITAMIN E. II. THE EUTROPHIC ACTION OF VITAMIN E, AND THE VITAMIN E ACTIVITY OF RICE-GERM OIL.
Z. Vitaminforsch. 4, 162-167 (1935).
Wheat-germ oil has a marked eutrophic action on animals fed a ration deficient in vitamin E. Rice-germ oil has a similar action. (C.A. 29, 7403).

Shimazono, J.
THE HEMOLYTIC ACTION OF RICE FAT (FROM ORYZA SATIVA L.). STUDY OF HEMOLYSIS BY FATTY ACIDS.
Arch. expt. Path. Pharmakol. 65, 361-366 (1911).
The alc. and ethereal extracts of rice act. hemolytically. The active substance was isolated and identified as palmitic acid. The lower members of the fatty acid series up to caproic acid, when tested as Na salts, were inactive. Nonylic acid forms a transition member being weakly hemolytic. The acids higher than capric showed an activity not less than oleic. With the very high acids the insolubility of the Na soaps was a disturbing feature. (C.A. 5, 3834).

Tsuchiya, Tomotaro.
WAX FROM RICE OIL.
N. Nippon Oil Technol. Soc. 1, No. 1, 1-6 (1948).
One kg. of crude oil gives 180 g. crude wax (I), acid no. 34.1, sapon no. 174.8, and I no. 51.6. I is washed with 300 ml. MeOH 4 times, then with 30 ml. Me_2CO 3 times. Acetone-insol. substance (II) showed m. 74-5°, acid no. 14.8, sapon no. 79.5, I no. 59.7, unsaponifiable matter 31.27%, yield 10 g. II is washed with 400 ml. ether and with a large amt. of $CHCl_3$ and the wax (III) thus purified showed m. 75-6°, sapon. no. 72.8, I no. 12.6, unsaponifiable substance 48.71%. III is an ester mainly composed of tetracosanoic acid and myricyl alc. with small amt. of acids contg. above or below 24 C and some unsatd. acids and alcs. contg. above or below 26 C. (C.A. 43, 5611).

Ueno, Seiichi, Matsuda, Sumio, and Kimura, Taka.
RICE OIL AND ITS UTILIZATION. XII. UNSAPONIFIABLE CONSTITUENTS OF RICE-OIL WAX.
J. Soc. Chem. Ind. Japan 47, 604-607 (1944).
Rice-oil wax was treated with 90% alc. and the unsaponifiable matter in the difficultly sol. portion was examd. The phytosterol portion constituted about 20% of the unsaponifiable matter; stigmasterol and sitosterol were detected in it. Higher alcs., which constituted the greater part of the unsaponifiable portion, consisted mainly of myricyl alc. and a smaller amt. of ceryl alc.; small quantities of other alcs. seemed also to be present. (C.A. 42, 6555).

Ueno, Seiichi, Matsuda, Sumio, and Okada, Yoshio.
RICE-BRAN OIL AND ITS UTILIZATION. X, XI.
J. Soc. Chem. Ind. Japan 44, 687-689 (1941).
The acid constituents of the wax of the rice-bran oil consist mainly of palmitic, oleic, and linoleic, and a small amt. of stearic acid. An unsatd. acid $C_{24}H_{48}O_2$ or $C_{26}H_{52}O_2$ and a satd. acid $C_{31}H_{62}O_2$ also are present. The oleic and linoleic acids are assumed to exist as esters with alcs. of high mol. wts. or as mixed glycerides with acids of higher mol. wts. A hard wax, m. 67-70, was prepd. by hydrogenating the wax, and when 30 parts of pure stearyl alpha- or beta-naphthylamide was added to 100 parts of the product, a hard wax, m. 72-81°, was obtained, which could be used as a substitute for carnauba wax. (C.A. 42, 2119).

Ueno, Seiichi, Ota, Yasuo, and Ueda, Zenichi.
VITAMIN E. III.
J. Soc. Chem. Ind., Japan 39, Suppl. binding 110-112 (1936).
The activity of the vitamin E fraction obtained from rice oil was tested by animal-feeding expts. Growth curves for albino rats on various diets are presented. The antisterility effect of the fraction was confirmed. (C.A. 30, 5626).

Yamazaki, Riichiro, and Ogawa, Goro.
RICE WAX. I.
J. Soc. Chem. Ind. Japan 44, Suppl. binding 241 (1941).
The muddy deposit from crude rice-bran oil was found to be wax. The unsapond. matter was melissyl alc. 45, ibotaceryl alc. 10, ceryl alc. 22, sitosterol 3, and unidentified 20%. (C.A. 44, 8139).

AUTHOR INDEX

SUBJECT INDEX