ance in obtaining most of the compositional data reported here and to R. T. O'Connor and Miss Dorothy Heinzelman for the spectrophotometric analyses.

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Report of Seed and Meal Analysis Committee 1948-1949

THE Seed and Meal Analysis Committee has seven subcommittees engaged in the study of and/or collaborative testing of methods of analysis. Their activities and recommendations are given in this report.

Report of Subcommittee on Soya Flour Sampling

The committee is happy to report agreement on methods for sampling soya flour and the proposed methods are submitted herewith. No provision has been made for automatic sampling since investigation of current mechanical samplers has revealed operational incompatibilities of the devices with soya flour. Nevertheless, the work of the committee might well be extended towards a comprehensive examination of mechanical samplers vs. soya flour.

Soya Flour Sampling

Scope: Applicable to soya flour

I. PRODUCTION SAMPLING

A. *Apparatus:*

a. Small scoop (ca 1-2 oz.) of conventional design.

b. Closed container for retaining bag samples. It is suggested that the container have a diameter of ca 10", a height of ca 10" and be constructed from 26-28 gauge non-rusting sheet metal. The container should be equipped with a tight fitting lid which is replaced by a spouted cover during the actual sampling period. (See drawing.)

c. Sealable containers of ca 16 oz. capacity.

B. PROCEDURE:

1. Ca 1-2 oz. of flour is removed from bag by means of scoop at bagging point.
2. Sample is transferred to large, closed container through spout on cover of container.
3. Bags shall be sampled at regular intervals. Not less than 10% of bags in lot shall be sampled. If lot is composed of less than 100 bags, a minimum of 10 bags shall be sampled. Final composite sample shall not be less than five pounds.
4. Spouted cover on sample container is replaced by tight fitting cover on completion of the lot sampling.
5. The lot sample shall be mixed thoroughly by agitation and/or tumbling to give a homogeneous mass.
6. Portions of thoroughly mixed lot sample may be delivered to clean, airtight 16 oz. containers. The portions shall be scooped from various points around and in the lot sample.
7. Containers shall be filled to within 1/4" of top and be sealed immediately on completion of transfer.

II. SAMPLING AT LOADING, UNLOADING, STORAGE, OR TRANSIT POINTS

A. *Apparatus:*

a. Trier of stainless steel construction and equipped with a special cutting lip. The overall length of the trier is 31". The tube or body of the trier has an I.D. of 5/8" and a wall thickness of 1/32". Body of trier is slotted, the slot being 20" long and 1/4" wide. Right side of slot is slightly depressed while left side is somewhat raised, thus forming a cutting lip. A 2 1/2" tapered point is sealed off from the slot and body. A concentric, 5" wooden handle completes the trier, thus enabling the trier to be emptied by inversion.

b. Sealable container of ca 1/2 gallon capacity.

B. *Procedure:*

1. A number of bags equivalent to the square root of number of bags in lot, but not less than 10 bags must be sampled, i.e., 10 bags from 100 or less, 15 from 225, 20 from 400, etc.
2. Bags selected for sampling must be uniformly distributed throughout the whole lot.
3. From every bag selected for sampling, a core is drawn from a top corner of the bag

diagonally downward to center of bag by means of trier. Sample is drawn by inserting trier, slot down, to the proper point and rotating it clockwise for ca 1 turn, after which the trier and core can be withdrawn.

4. Core is immediately transferred to clean, sealed container.
5. On completion of sampling, composite sample of lot shall be mixed by agitation and/or tumbling to give a homogeneous mass.
6. Portions of thoroughly mixed sample may be transferred to clean, sealable laboratory containers of 16 oz. capacity.
7. Containers shall be filled to within ¼" of top and be sealed immediately on completion of transfer.

Recommendation: It is recommended that the above method be adopted as tentative for the sampling of soya flour.

Respectfully submitted,

L. R. BROWN
LEONARD GERHART
T. C. SMITH
M. W. DIPPOLD, chairman.

Report of the Subcommittee on Soya Flour Sieving Method

Our report for the year can be only a progress report as a thoroughly satisfactory sieving method for soya flour has not yet been developed. Due to the difficulties encountered with currently used methods, very little collaborative work has been attempted during the year, but a considerable amount of individual investigation has been carried on. This work concludes several types of air separation or classification procedures, and a number of proposed methods involving extraction of the fatty materials in soya flour prior to sieving.

Recommendation: It is recommended that the assignment of the subcommittee be extended for another year.

Respectfully submitted,

R. E. ANDERSON
M. W. DIPPOLD
F. R. EARLE
W. F. GEDDES
J. K. GUNTHER
L. R. BROWN, chairman.

Report of Subcommittee on the Determination of Water Absorption of Soya Flour

This subcommittee was asked to investigate the water absorption of soya flour with the idea of studying and adopting some method to measure this property. A limited survey was made by contacting major producers and users of soya flour to see if any need existed for such a method for use in commercial trading. From the results of this survey it appeared that no need existed, at least, not at the present time. A group of samples of varying fat content was sent to the members of the subcommittee with the request that the water absorption be measured by the following method:

Weigh 5 g. of sample into a 50-ml. centrifuge tube and add 40 ml. of distilled water from a burette.

Stir with a stirring rod until the mixture is homogeneous (usually ca 1 minute).

Centrifuge for 5 minutes at 2000 r.p.m.

Decant the clean liquor back into the burette which must contain distilled water to at least the lowest graduation point. Determine the volume of decanted liquor.

Ml. of water absorbed=40 ml. decanted liquor.

$$\% \text{ water absorption} = \frac{\text{Ml. water absorbed} \times 100}{\text{Weight of sample}}$$

The results obtained by the Committee appear below:

Laboratory	Low Fat			Medium Fat			High Fat		
	a	b	Ave.	a	b	Ave.	a	b	Ave.
1	.....	.....	284	.....	.....	232	.....	.....	230
2	252	276	264	222	224	223	220	222	221
3	290	303	298	252	257	255	217	227	222
4	250	270	260	244	260	252	216	234	225
Average			278			241			223
Range			38			32			9

From these results we concluded that:

1. The fat content might have some influence on the water absorption.
2. The agreement between laboratories was reasonably good on high fat samples, but poor on low fat flour.

Thereafter Mr. Brown conducted some tests designed to show further the influence of the fat content on the water absorption.

Moisture	Fat	Water Absorption
%	%	%
4.1	22.0	214
4.7	15.4	218
5.1	14.5	228
4.9	11.8	226
4.4	9.3	232
5.5	5.4	250
5.8	3.1	258
6.6	1.5	260

Additional tests carried out in Swift's Laboratories gave the following results:

Fat	Water Absorption
%	%
1.2	270
7.0	250
22.5	220
21.2	210
20.9	210

The foregoing data on the relation between the fat content and water absorption indicate that the amount of fat present definitely influences the amount of water that will be absorbed. However, the fat content is not the only factor.

The temperature of the added water was varied from 40°F. to 120°F. without affecting the results.

The time after centrifuging was varied from 1 to 10 minutes without changing the results.

Reduction in speed of centrifuge gave higher results, probably due to less packing of the particles with more spaces between them.

Two samples were tested and then separated into portions of different particle size and the water absorption determined on each.

	Water Absorption	
	Sample A	Sample B
	%	%
Original sample	281	238
Portion coarser than 200 mesh	296	.....
Finer than 200, but coarser than 325	299	330
Finer than 325	250	240

Dr. Gunther also tested the water absorption of samples of varying particle size and of different soluble protein content. However, the results did not indicate any definite trend or relationship.

Particle Size	Water Absorption		
	36% Soluble Protein	60% Soluble Protein	80% Soluble Protein
	%	%	%
20 to 40	303	351	314
40 to 60	303	317	295
60 to 80	308	292	290
80 to 100	306	315	287
100 to 200	298	278	265
200 to 300	280	284	266
Thru 300	250	249	245

In Swift's Laboratories a group of samples was separated into portions of varying particle size as follows:

Sample	Type of Flour	Over 100 Mesh	100-200 Mesh	200-325 Mesh	Over 325 Mesh
		%	%	%	%
1	Extracted	96	40		
2	Expeller	71.6	28.4		
3	Extracted	19.2	52.0	13.0	11.2
4	Expeller	0.4	61.6	22.0	16.0
5	Expeller	5.2	53.6	19.2	22.0
6	Expeller	0.4	52.0	36.4	11.2
7	Extracted	3.6	27.4	47.2	21.6
8	Extracted	2.8	22.0	34.8	40.4

The following tests were performed on each portion:
Water absorption by N.S.P.A. method.
Soluble protein as NH_3.
Water absorption—direct addition method.

The specifications of the water soluble protein procedure used for soya flour are:

Weigh 10.00 g. of sample into an Erlenmeyer flask.

Pipet 100 ml. of water at 75°F. into the flask, stopper and shake vigorously for 30 seconds.

Allow to stand 4 hours at room temperature. Shake vigorously for 30 seconds, once during each hour sample stands at room temperature.

Transfer ca 50 ml. to a centrifuge tube and centrifuge 5 min. at 1,500 to 1,800 r.p.m.

Pipet 10 ml. of supernatant liquid into a Kjeldahl flask and determine nitrogen by A.O.C.S. Method Aa 5-38 or any approved official method.

Report nitrogen as percent NH_3.

Direct addition procedure for water absorption of soya flour is: Ten grams of sample are weighed into a beaker of convenient size. Water is added from a burette with continuous stirring until the sample becomes fluid or free water appears.

The samples are defatted with petroleum and the water absorption again determined by the N.S.P.A. Method. The results appear below:

Sample	Fat	Soluble Protein as NH_3	Water Absorption Direct Method	Water Absorption	
				Orig. Sample	Defatted Sample
	%	%	%	%	%
7 Ext.	0.8	6.90	37	242	256
8 Ext.	0.4	5.15	35	273	284
1 Ext.	0.5	4.36	32	322	360
3 Ext.	21.5	3.78	30	219	380
6 Exp.	5.3	3.26	30	251	280
4 Exp.	20.3	3.09	22	218	370
5 Exp.	5.4	2.81	30	355	350
2 Exp.	5.6	1.62	20	282	340

From these data the following conclusions can be drawn:

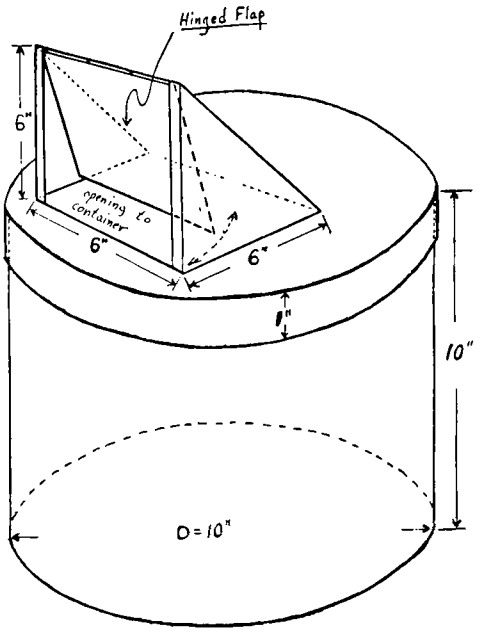
1. The influence of fat on water absorption is confirmed by the fact that as the fat is removed, the water absorption increases. Generally, then samples containing larger amounts of fat showed proportionately greater increases in water absorption after the fat was removed.

2. There is a fair correlation between the soluble protein content and the water absorption as measured by the direct addition method.

Conclusions: Some information about the water absorption of soya flour has been developed, but no satisfactory method has been evolved. In view of the fact that there is no apparent need for such a method, there seems to be no justification for any further work at this time.

Respectfully submitted,

L. R. BROWN M. L. LAING
J. K. GUNTHER V. C. MEHLENBACHER, chairman



Sample container for soya flour (with spouted cover in place).

Report of Subcommittee on Copra Meal

A considerable amount of work has been done investigating procedures that would be applicable to copra meal analysis concerning moisture, protein, fat, crude fiber and ash. The results of this investigation indicate that further study is necessary, and it is recommended that the present committee be carried over for another year for continued investigation of this problem.

Respectfully submitted,

C. A. LATHROP D. F. MASKEY
W. J. GOODRUM R. E. ANDERSON, chairman

Other Subcommittees

As crude fiber is defined as the fraction isolated and weighed by following the present method, collaborative work on the determination of fiber in soya flour will depend on research developments that may justify such work. Until some encouraging techniques are developed there seems no justification for continuing the present subcommittee.

It appears that a method for the determination of lecithin in soya flour is of academic interest only, as there seems to be little or no interest in it in relation to trading. Until a trading interest is indicated there

seems to be little justification in continuing the present work on the development of a method.

The Subcommittee on the Analysis of Tung Fruit and Meal has conducted collaborative work on the tentative methods and on methods of analysis of tung meal. The harvesting and processing season is such that an approved report is difficult at this time. A report may be expected at the time of the Fall Meeting.

Soya Flour

The methods for the determination of moisture and volatile matter (Bc 2-47), oil (Bc 3-47), nitrogen and protein (Bc 4-47), ash (Bc 5-47), and crude fiber (Bc 6-47) in soya flour have been tentative for two years. In the meantime they have been adopted as official by the Association of Official Agricultural Chemists. A survey of laboratories using them shows them to be satisfactory.

Recommendation: It is recommended that the methods specified for the analysis of soya flour be made official.

Oilseed Meals

The methods for the determination of ash (Ba 5-47) and crude fiber (Ba 6-47) have been tentative for two years and have been found satisfactory. They are in agreement with the official methods of the Association of Official Agricultural Chemists.

Recommendation: It is recommended that the methods specified for the determination of ash and crude fiber in oilseed meals be made official.

This report and the recommendations have been given unanimous approval by the Seed and Meal Analysis Committee.

Respectfully submitted,

E. C. AINSLIE	T. C. LAW
R. E. ANDERSON	R. S. MCKINNEY
L. R. BROWN	V. C. MEHLENBACHER
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C. H. COX	T. L. RETTGER
E. B. FREYER	T. C. SMITH
	T. H. HOPPER, chairman

Glyceridic Oils in Our National Economy[1]

P. H. GROGGINS[2]

FLYING north from New York City for about 12 hours will put you in Eskimo country. Up there, where life is still extremely primitive, animal glyceridic oils provide three elemental necessities of existence: food, light, and heat. Without animal fats and oils the Eskimo would long since have disappeared from the Arctic. I want to emphasize the fact that our own civilization—although much more advanced, or at least more complicated, than the Eskimo's — is nevertheless also dependent in many ways upon glyceridic oils.

I hope that my discussion of glyceridic oils in our national economy will provide some worthwhile food thought and that it may shed a little light on needed research in this field; and with respect to some of the statements I shall make regarding economic problems, I hope that it will not generate too much heat.

Many people may not appreciate the real importance of glyceridic oils until they find out what it means to be without them. The nation's wealth and welfare depend a great deal on them. They are, in fact, an elemental necessity of modern life. This was no secret to the Germans during the recent war and is no secret now to the undernourished people of Europe. They have learned the hard way how important glycerides are. Here in America we have been more fortunate. Our shortages of fats and oils have not been serious enough to change appreciably the living habits of individual consumers.

Members of the American Oil Chemists' Society realize fully that the physical well-being of each one of us, the successful operation of many manufacturing plants, and the strength of our national defense all require adequate supplies of both edible and industrial glycerides. The nation's consumption of these products is a reliable yardstick for measuring the general health and cleanliness of the people, the maintenance of our homes and factories, and the productiveness of industry.

As the United States has built its way to the top position among the world's industrial nations, it has used more and more fats and oils. Consumption has almost doubled in the last quarter of a century. Back in 1920 the total disappearance of glycerides in this country was about 6 billion pounds. In 1947 it was more than 10 billion pounds. World conditions in recent years have encouraged us to produce more fats and oils, particularly the edible varieties, but our output of industrial glycerides has not kept pace with increased consumption.

The fats and oils used mainly in food products, including lard, butter, cottonseed oil, and soybean oil, account for 70 to 75% of our total domestic glyceride production. Except in the drought years from 1935 to 1937 we have had exportable surpluses of food fats, particularly lard, soybean oil, and margarine. The various overseas relief programs—from wartime Lend-Lease to E.C.A. — have required substantial quantities of food fats. Without the synthetic foreign markets represented by these programs, producers of edible fats and oils would probably be confronted today by price-depressing surpluses.

In the case of industrial glycerides the picture is different. The United States has always imported coconut and palm oil, castor oil, linseed, tung, oiticica, and other oils to meet our industrial requirements. These imports go into a wide variety of products—into soap and other detergents, protective coatings, textiles, artificial leather, lubricants and tin and terne plate, to name a few.

As these uses indicate, a large segment of American industry needs glyceridic oils and their primary constituents, fatty acids and glycerol. In times of

[1] Address before American Oil Chemists' Society, November 15, 1948, New York City.

[2] Chemical Engineer, Bureau of Agricultural and Industrial Chemistry, United States Department of Agriculture.