made at single arbitrarily chosen concentrations and temperatures are not adequate for complete evaluation of a given detergent, and such investigation in the laboratory can be of great value in pointing the way to obtaining optimum results in actual use.

In our experience, for successful use in commercial laundries, a detergent must have soil removal and whiteness retention properties of the order of magnitude of built soap as first requirements. We have also found that the higher the values, the more satisfactory the product is likely to be in actual service.

In correlating laboratory tests with practice the practical aspects of laundering have not been neglected. Because of commercial relationships with thousands of laundries and because of the use of the test methods for production control of synthetic detergents, sodium carboxymethyl cellulose, laundry builders, and completely formulated built and promoted synthetic laundry detergents, as well as for experimental purposes, a considerable fund of correlated information has been collected. In many cases actual laundry performance has been determined by the use of test bundles carried through 20 or more washes in accordance with the generally accepted practices in the trade, in addition to direct observation. Within the limits of their applicability the laboratory tests have not once failed, in the past several years, accurately to reflect field performance.

The tests do not measure the tolerance of the detergent solution to soil loading especially for oil or greasy matter. This must be determined by other tests or by actual field trials.

Summary

Laboratory performance tests for laundry detergents can fill important needs in laboratory development programs and in control testing, in which cases full scale practical testing is inapplicable. It has been found to be unnecessary and undesirable to attempt close simulation of practice conditions. In order to be most useful to the experimental investigator or the manufacturer of detergents the soil removal and whiteness retention properties should be measured by separate tests.

A soil removal test has been devised in which the soil, which consists essentially of carbon black, is applied to the test fabric from aqueous medium. Soiling from aqueous medium has advantages with respect to reproducibility in tenacity and in variation and susceptibility to removal by detergents having different degrees of effectiveness. The quantity of soil removed is measured directly by means of light transmission measurements on the soiled detergent solution. This eliminates uncertainties and limitations inherent in the reflectance method and permits the use of high soil loads in the test cloth, which minimizes redeposition effects. Multiple wash tests are not required.

The whiteness retention property is determined by agitating unsoiled swatches in the detergent solution containing carbon black dispersion and measuring the reflectance change of the swatches.

The results of both tests are expressed in relative terms, reference detergents being used as controls.

The precision of the soil removal tests is approximately $\pm$ 3.4% in terms of mean deviation and that of the whiteness retention test approximately $\pm$ 5.1%. Both tests have been used over a period of several years for research and control purposes and have been successfully correlated with actual results in commercial laundries.

Acknowledgment

A large number of individuals in our laundry research organization have made substantial contributions to the development of the test procedures described in this paper and to the accumulation of the large mass of laboratory and field data which has made practical correlation possible. We are particularly indebted to Clifton E. Smith and Maurice G. Kramer for their contributions. The electron photomicrographs are the work of L. E. Kuentzel of our physics laboratories.

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[Received December 6, 1949]

Report of the Smalley Foundation Committee, 1949-50

FOLLOWING the custom initiated a year ago, the reports of the five subcommittees of the Smalley Foundation Committee are combined into one report. In doing this it appears desirable to discuss the activities of the various subcommittees individually and briefly. In most cases individual detailed reports covering grades, methods of grading, etc., have been mailed to the individual collaborators by the subcommittee chairmen. About 3,200 samples were distributed by this committee.

R. T. DOUGHTIE JR. — S. W. GLOYER
W. C. AULT — R. W. BATES, *chairman*
A. S. RICHARDSON

REPORT OF THE SUBCOMMITTEE ON OIL SEED MEAL

This year 15 samples were distributed instead of 30. It was believed that this number of samples distributed over the same period would be more desirable than 30 samples. At the end of the period we submitted a questionnaire to the collaborators asking their comment on the number of samples preferred. The results are listed:

Per cent returning the questionnaire	89
Per cent preferring 15 samples	91
Per cent preferring 30 samples	7

One collaborator indicated no preference, and one preferred 26.

On the basis of this tabulation we think the distribution of 15 samples should be continued although the subcommittee intends to give some consideration to increasing the number slightly, possibly distributing one monthly during the summer months.

Figure 1 shows the number of collaborators (based upon the percentage of the total who were within the recognized tolerance of the accepted average. The general average of all samples was also calculated. The values for the past three seasons are also listed:

	1947-48	1948-49	1949-50
Per cent of collaborators within tolerance (Moisture)	48.13	60.63	60.03
Per cent of collaborators within tolerance (Oil)	53.86	58.44	53.50
Per cent of collaborators within tolerance (Nitrogen)	52.76	51.12	50.98

The customary tolerance was used, viz.,

± 0.1 % on moisture
± 0.03% on oil
± 0.02% on nitrogen

It will be noted that the moisture results were again excellent. The average on the oil determination dropped to the 1947-48 level, and the nitrogen results remained relatively constant. The accuracy maintained on the determination of moisture has been remarkable. On one sample 75% of the collaborators were within 0.1% of the accepted average on moisture.

This season 98 laboratories participated, representing a 11% increase. The geographical distribution is shown in Figure 2. We believe it is in order to record the types of laboratories participating, which were as follows:

Commercial laboratories	40
Industrial laboratories	45
State or Federal organizations	13

The winning collaborators were:

1. The award of the American Oil Chemists' Society Cup for the highest proficiency in the determination of oil and nitrogen will be awarded to:

   D. B. McIsaac, Kershaw Oil Mill, Kershaw, S. C. His proficiency was 99.985%. Last year this value was 99.991%.

2. The certificate for second place will be awarded to:

   Edward R. Hahn, Hahn Laboratories, Columbia, S. C. His proficiency was 99.976%. Last year this value was 99.986%.

The other winners were:

	Per cent proficiency	Corresponding value last year
3. *Determination of Nitrogen:*		
1. P. D. Cretien, Texas Testing Laboratories, Dallas Tex.	100.000	99.986
2. D. B. McIsaac, Kershaw Oil Mill, Kershaw, S. C.	99.990	99.986
4. *Determination of Oil:*		
1. Edward R. Hahn, Hahn Laboratories, Columbia, S. C.	99.989	99.995
2. A. C. Summers, state chemist, Columbia, S. C.	99.989	99.995
5. *Determination of Moisture:*		
1. B. P. Harper, Southwestern Laboratories, Dallas, Tex.	100.000	100.000
1. E. C. Flack, Allied Mills, Peoria, Illinois	100.000	99.899

Due to the fact that only 15 samples were distributed this year, the proficiency values may have dropped slightly. For example, if a collaborator were 4 points off for the season, his proficiency would be less on the basis of 15 samples than on 30.

Certificates will be awarded to the winning collaborators.

We again call attention to the preparation and distribution of samples. On behalf of the American Oil Chemists' Society, we wish to express our appreciation to Law and Company for their careful handling of this phase.

R. W. BARTLETT — T. L. RETTGER
R. R. HAIRE — L. H. HODGES
R. T. DOUGHTIE — H. C. BLACK
T. C. LAW — R. W. BATES, *chairman*

REPORT OF THE SUBCOMMITTEE ON OIL SEEDS

During the season three series of check samples were distributed, viz., cottonseed, soybeans, and peanuts. The distribution was as follows:

Cottonseed	— 46 collaborators	10 samples
Soybeans	— 23 collaborators	10 samples
Peanuts	— 15 collaborators	7 samples

Generally the work of the collaborators in each series was very good and showed some improvement over the preceding year's work. This was particularly noticeable on the peanut series.

The highest results on the individual series were:

	Grade
Cottonseed	
1. No. 16. Edward R. Hahn,* The Hahn Laboratory, Columbia, C. C.	100.00%
2. No. 11. Edgar H. Tenent, Woodson-Tenent Laboratory, Memphis, Tenn.	99.52
Soybeans	
†1. No. 11. Edgar H. Tenent, Woodson-Tenent Laboratory, Memphis, Tenn.	100.00%
†1. No. 1. G. Connor Henry, Law & Co., Atlanta, Ga.	100.00
Peanuts	
1. No. 2. Thomas B. Caldwell, Law & Company, Wilmington, N. C.	99.92%
2. No. 23. M. L. Hartwig, Battle Laboratory, Montgomery, Ala.	99.60

Certificates will be given to the winning collaborators in all series.

G. CONNOR HENRY
EDW. R. HAHN
R. T. DOUGHTIE JR., *chairman*

REPORT OF THE SUBCOMMITTEE ON CRUDE VEGETABLE OILS

Seven samples of crude vegetable oil were distributed to 68 collaborators. Three were cottonseed oil, three soybean oil, and one peanut. The collaborators were not graded on the peanut oil. The grades on the cottonseed oil were based on refining loss, refined color, and free fatty acid while in the case of the soybean oil refining loss, bleached color and free fatty acid were used.

The results on the samples were in general good; however, many of the averages may have been pulled down a bit by the off cottonseed oil distributed as Sample No. 3. The settlement refining loss on this oil was 11.1%.

*This collaborator had a grade of 100% for the second consecutive year.

†It was originally intended to break the tie by re-calculating the results, using no tolerance, but inasmuch as only two tied and two certificates will be given, the breaking of the tie was deemed unnecessary.

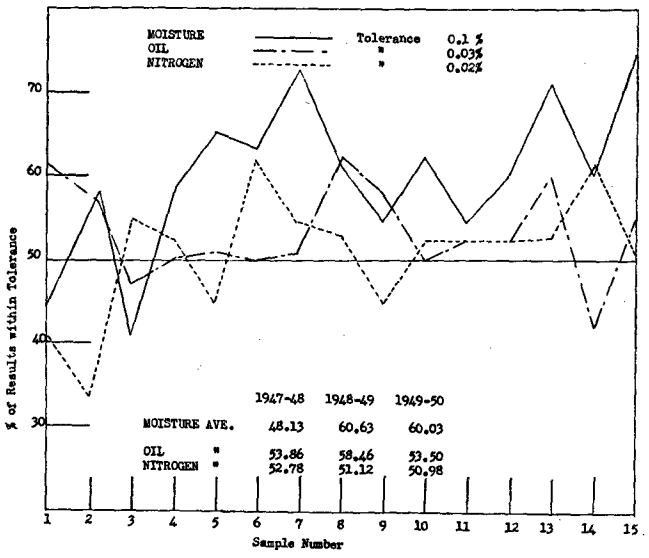


FIG. 1

Those receiving the highest grades for the 1949-50 season were:

1. No. 48. T. S. McDonald, The Procter and Gamble Company, Dallas, Texas..... 99.44
2. No. 45. R. W. Sutton, The Procter and Gamble Company, Longbeach, Calif..... 98.89

Certificates will be award to these collaborators.

A. A. KIESS F. R. EARLE
F. G. DOLLEAR A. S. RICHARDSON, *chairman*

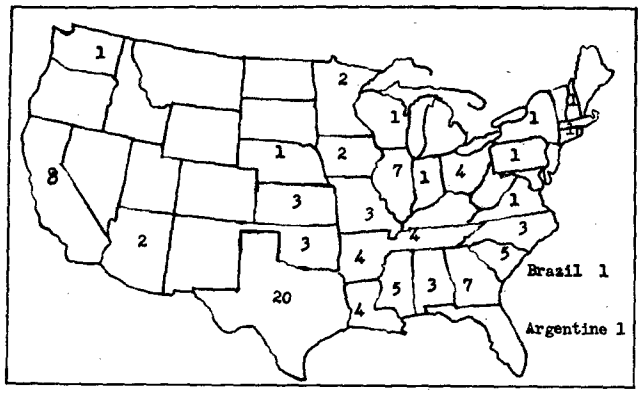
REPORT OF THE SUBCOMMITTEE ON TALLOW AND GREASE

During the past year the Subcommittee on Tallow and Grease of the Smalley Foundation Committee has continued its activity. Five check samples were submitted to a maximum of 43 collaborators while an average of 36 reports were received by the chairman in time to be included in the tabulated data submitted to each participant.

The properties reported in each case were Free Fatty Acids, Color, F.A.C., Titer °C., Moisture, Insoluble, and Unsaponifiable. Generally speaking, the results were very good and with isolated exceptions have fallen well within the range of duplication which might reasonably be expected. This has been particularly true of the values reported for free fatty acids and titer. On the whole, it may also be stated that the reported values for moisture, insoluble, and unsaponifiable have agreed very well indeed. This is particularly true if one considers the very great practical difficulties of sample preparation when heterogeneous and insoluble substances are involved. The wide range of color values reported indicate, however, that in many respects the method in present use leaves considerable to be desired in the way of reproducibility. This of course is not news to many workers, and a variety of potentially helpful suggestions have been received which are being carefully considered. We have noted some improvement in agreement on color. Some collaborators, we found, were not even aware of the proper method of reporting, and values such as 19+, 20, and 19GA were received. The best results were obtained on Sample No. 4 where 63% reported FAC 21.

An attempt has been made to grade the collaborators, but the grading system used is very tentative. We would welcome suggestions from the collaborators or members on this phase.

D. J. PETRAITIS S. A. SIEGEL (deceased)
J. L. TRAUTH W. C. AULT, *chairman*



98 Collaborators, 27 States, 2 Foreign

FIG. 2. Geographical distribution of samples

REPORT OF THE SUBCOMMITTEE ON DRYING OILS

Four sets of drying oils, each set consisting of two samples, were distributed during the season to 22 collaborators. Among the analytical tests recorded were color (Gardner), spectrophotometric color, refractive index, acid value, iodine value, break test, and viscosity. Soybean, linseed oil, and corresponding fatty acids were distributed. As a matter of information, the average standard deviation on iodine value was 2.29 (two samples ran high, viz., 4.11 and 6.05). On acid value, the value on oils was 0.467 and on the two samples of acids 2.98. The average standard deviation on refractive index was 0.00045. The tabulated results were mailed to the collaborators and it has been apparent that all participating have profited by the work.

No attempt has been made to grade the collaborators and the nature of the results are such that an equitable grading system would be very difficult. It is hoped that the interest shown this year may serve as a basis for continuing the work next season.

F. SCOFIELD D. S. BOLLEY
J. C. KONEN S. W. GLOYER, *chairman*
R. L. TERRILL