emphasized that there was a relation between critical concentration of the detergent required and the amount of dirt to be removed. In a theoretical discussion on detergency Goette (*J. Colloid Sci. 4,* 459) reviewed the relations of the structure of various soaps, anion detergents, and pH to wetting and washing action. In a discussion on washing with soap Gardner & Smith (*J. Am. Oil Chemists' Soc. 26,* 194) suggested that an acid soap was adsorbed on the fabric which in hard water formed lime soap with strong adhering capacity. The lime soap was largely retained by the fiber and repeated washes accumulated substantial amounts.

Report of the Oil Color Committee April, 1950

SEVEN years ago with permission of the newly elected president, Lamar Kishlar, the Oil Color Committee of the Society was reorganized with the expressed objective of developing an instrumental method for measuring vegetable oil colors. The first step taken was the appointment of a small subcommittee consisting of Reid Milner, Procter Thomson, and R. C. Stillman, who undertook to study the best approach to the problem. The early work included studies of correlation between Lovibond colors and visual appearance or eye order of oils. Following this, the subcommittee investigated filter photometers as a possible type of instrument to be used.

Nearly three years ago the subcommittee began the investigation of a spectrophotometric method and at the annual meeting in May, 1949, reported a method which was adopted by the Society as a tentative one. It was recognized that this method was not entirely satisfactory, and so during the summer of 1949 thirteen men representing nine laboratories began an intensive study in which more than 30,000 individual spectrophotometric, Lovibond, and eye order measurements were made on 120 samples of vegetable oils. All of these voluminous data were tabulated and averaged, and statistical studies were made in four of the nine laboratories referred to.

Two meetings of the subcommittee, fully attended, were held in Chicago early in October, 1949, and late January, 1950. At this last meeting four different equations were presented as a result of these statistical studies and, after the fullest discussion, one of these was unanimously adopted for recommendation to the Oil Color Committee and to the Society.

The real purpose of this review is to pay tribute to the three men who inaugurated this work and to express my deep personal appreciation to them and to the members of the subcommittee for their splendid cooperation and their untiring efforts in carrying through the tremendous volume of work that they have done. It is my conviction that seldom, if ever before, has any committee of our Society completed such a large amount of work in so short a time and so successfully.

It is my pleasure and privilege to include in this expression of appreciation:

R. J. Buswell
F. R. Earle
M. W. Formo
S. Goldwasser
D. L. Henry
Duncan Macmillan
V. C. Mehlenbacher
Reid T. Milner
W. H. Schmidt
S. O. Sorensen
R. C. Stillman
Procter Thomson
L. K. Whyte

I also wish to thank for the subcommittee and for myself Geoffrey Beall of the statistical department of Swift and Company and Earl Follett of the statistical department of Archer-Daniels-Midland Company for their tabulation and studies of the data.

G. WORTHEN AGEE, chairman

Committee Report

AT THE 1949 Spring Meeting of the Society in New Orleans a *tentative* spectrophotometric method for the determination of color of vegetable oils was adopted. The tentative method of analysis contained a simple equation for converting spectrophotometric readings at 525 mμ to red color. The committee was not convinced that this simple equation was the best that could be derived for expressing the overall color of an oil in terms of its spectrophotometric readings. As a consequence a program involving the complete spectral analysis of 120 soybean, cottonseed, and peanut oils was undertaken. Nine different laboratories carried out the scheduled work.

It is impossible to include in this report a compilation of the data obtained. The committee plans to assemble all of the data, together with the statistical calculations later carried out on the data, in a separate report which will be made available to the members of the Society but which will not be published.

All of the data on the 120 oil samples were obtained prior to September 1, 1949. A number of the committee members then carried out statistical analyses of the data to determine what wavelengths best characterized the overall color of the oil. These statistical analyses were discussed at a meeting of the committee held in Chicago the week of October 2, 1949. At this meeting it was definitely decided that the primary wavelength for color measurement should be 550 mμ, that a green correction based on measurements at 620 and 670 mμ should be added, and that the possibility of a measurement at 460 mμ or nearby should be investigated. It was further decided that all correlations should be made using actual Lovibond colors as the primary correlating factor.

A second meeting was held in Chicago the week of January 30. At this meeting, which was attended by all of the collaborators, the results of the statistical treatment of the data were discussed. Of all of the equations derived for computing a red color correlating with Lovibond red, the best one involved transmittance readings at 460, 550, 620, and 670 mμ. The equation: photometric color $= 1.29 \times D_{460} + 69.70 \times D_{550} + 41.2 \times D_{620} - 56.4 \times D_{670}$ gave a correlation of 0.993 with Lovibond red. Calculated photometric colors based on this equation are plotted against actual Lovibond red in Figure 1.

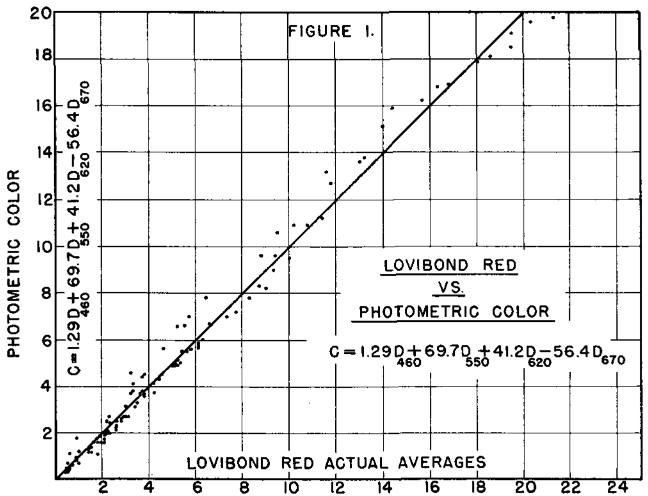
FIGURE 1.

In the light of the tremendous amount of work accomplished and the volume of statistical data accumulated, it was the unanimous vote of the collaborators that the spectrophotometric method, using the above equation for a calculation of red color, be recommended to the Society for adoption.

Ten spectrophotometers were re-examined from the standpoint of standardization using nickel sulfate solution and carbon tetrachloride. Standardization points at 400, 460, 510, 550, 620, 670, and 700 mμ were agreed upon. Instrumental performance limits were set, based on these wavelengths. The Oil Color Committee has approved the method and recommends its adoption by the Society.

PHILIP W. BATEMAN
MORDEN G. BROWN
R. J. BUSWELL
F. R. EARLE
M. W. FORMO
E. B. FREYER
J. J. GANUCHEAU
K. S. GIBSON
S. GOLDWASSER
N. C. HAMNER
D. L. HENRY
J. P. HUGHES
W. A. JACOB
DUNCAN MACMILLAN
MAX C. MARKLEY
V. C. MEHLENBACHER
T. J. POTTS
B. N. ROCKWOOD
W. H. SCHMIDT
FRANCIS SCOFIELD
E. O. SEABOLD
S. O. SORENSEN
H. T. SPANNUTH
R. C. STILLMAN
PROCTER THOMSON
L. K. WHYTE
G. WORTHEN AGEE, chairman

Color

PHOTOMETRIC METHOD.

Definition: This method designates the color of fats and oils.

Scope: Applicable to cottonseed, soybean, and peanut oils.[1]

a) APPARATUS

1. Spectrophotometer. A spectrophotometer capable of adjustment to give the following readings on a standardizing nickel sulfate solution (3) at 25 to 30°C., after setting the zero point and after adjusting the 100% transmittance point (0 density) against CCl_4 in a cuvette having the specifications outlined in (2) below.

400 millimicrons	Less than 4.0% transmittance
460 millimicrons	26.2 ± 2.0%
510 millimicrons	73.9 ± 1.0%
550 millimicrons	54.8 ± 1.0%
620 millimicrons	5.2 ± 0.5%
670 millimicrons	1.1 ± 0.5%
700 millimicrons	Less than 2.0%

2. Matched glass cylindrical cuvettes, approximately 21.8 mm. inside diameter; outside diameter approximately 24.5 mm. All cuvettes to be used with a given instrument should be checked with CCl_4 and the nickel sulfate solution at 550 mμ within ±0.6% transmittance. The cuvettes should be kept clean and free from scratches.
3. Standardizing Nickel Sulfate Solution. Dissolve 200 grams $NiSO_4$ $6H_2O$, analytical reagent grade, in distilled water. Add 10 ml. of concentrated HCl. Dilute to exactly 1,000 ml. in a volumetric flask. The temperature of the solution should be between 25 and 30°C. The nickel content of the solution must fall between 4.40 and 4.46 grams of nickel per 100 ml. at 25 to 30°C.
4. Filter paper. Fine porosity such as E & D No. 192, Whatman No. 12, Reeve-Angel No. 871, or S & S No. 596.

b) REAGENTS

1. Carbon tetrachloride. Redistilled if the transmittance differs from distilled water by 0.5% at 400 mμ.
2. A.O.C.S. official diatomaceous earth.

c) CALIBRATION OF THE INSTRUMENT

1. Turn on the spectrophotometer and allow at least a 20 minute warm-up period before standardizing or making any measurement.
2. Set the wavelength scale to the desired wavelength.
3. Recheck the zero reading of the instrument and with a cuvette filled with CCl_4 in the instrument, set the 100% transmittance point exactly.
4. Fill a cuvette with the standardizing nickel sulfate solution and read the per cent transmittance at 400 mμ. Repeat 3 and 4 at 460, 510, 550, 620, 670, and 700 mμ. The readings must fall within the limits prescribed or the instrument must be adjusted to give the correct response.

d) PROCEDURE

1. The sample must be absolutely clear. If not, filter through a specified filter paper at a temperature of at least 10°C. above the melting point of the fat. If still not perfectly clear, add 0.5 gram of the A.O.C.S. official diatomaceous earth, agitate in the bleaching machine for 5 minutes at 250 r.p.m. at room temperature (or at 10° to 15° above melting point of the fat if necessary) and filter.

   In the case of fats that require melting, they should not be held at the higher temperature longer than necessary since darkening may occur.
2. Fill a cuvette with the sample, using a sufficient amount of oil to insure a full column in the light beam.
3. Place the filled tube in the instrument and read the optical density to the nearest 0.001 at 460, 550, 620, 670 mμ.
4. Photometric color $= 1.29D_{460} + 69.7D_{550} + 41.2D_{620} - 56.4D_{670}$. Special instrument scales for reading the four factors involved directly may be used.

---

[1] The color of other fats and oils which have not as yet been studied can probably be designated by this method.