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CORRECTION

The words linoleic and linolenic were interchanged in the equations and sample calculations shown on page 142 of the May, 1946 issue of Oil & Soap in the article on "Applied Ultraviolet Spectrophotometry of Fats and Oils," according to the author, B. W. Beadle, American Meat Institute, Chicago.

Comparison of a Simplified, Quantitative Kreis Test With Peroxide Values of Oxidizing Fats*

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THE two chemical tests most widely employed in recent years to indicate rancidity in fats are (1) estimation of the peroxides by titration of the iodine liberated and (2) estimation of the color produced by reaction between oxidizing fats and phloroglucinol in acid solution (Kreis test).

Earlier work on the Kreis test has been well summarized by Lea (1). One of the chief objections to the test in its original form is the fact that the color development took place in a two-phase system and that the color was often distributed between the acid and the ether phases, in an irregular manner. Attempts to make the test quantitative in this form were not highly satisfactory (2). Walters, Muers, and Anderson (3) succeeded in developing the color in a single phase by dissolving the phloroglucinol in amyl acetate and substituting trichloracetic for hydrochloric acid. They found the test to be highly sensitive as compared to the older Kreis method and subject to quantitative measurement in a Zeiss-Pulfrich photometer.

White (4) compared the Walters, Muers, and Anderson method with peroxide oxygen values and with other methods of estimating rancidity on bacon fat. He found that the modified Kreis test was the most sensitive, gave excellent precision, and best correlation with the peroxide value. However, he concluded that the peroxide test was somewhat easier to apply.

Pool and Prater (5) developed a simplified modification of the Walters, Muers, and Anderson procedure, using glacial acetic acid in place of amyl acetate. The essential features of their method were obtained by private communication some months before its publication. In the present paper the simplified procedure has been applied to a number of oxidizing fats, and the results have been compared with peroxide values and iodine numbers on the same fats.

Analytical Methods

Peroxide Value. The Wheeler method (6) was used with minor modifications. The results were found to be more reproducible if the period of standing was increased to 10 minutes before titrating with thiosulfate. Stansby (7) has emphasized the importance of using the same weight of fat in this test; 0.5 gm. were used throughout. The peroxide numbers were expressed as millimols of peroxide per 1,000 gm. oil, i.e., peroxide number =

$$\frac{0.5\ (\text{ml. thio. used in titration})\ (\text{normality of thio.}) \times 1{,}000}{\text{wt. of fat}}$$

Iodine Numbers. The Hanus method as outlined by Woodman (8) was used.

Modified Kreis Test. Since this test as carried out differed in a number of minor details from that later published by Pool and Prater (5), the exact procedure used is described here.

Reagents. (A) Thirty gm. trichloracetic acid plus 100 ml. glacial acetic acid. (B) One gm. phloroglucinol plus 100 ml. glacial acetic acid (see note 6 on the method).

Procedure. Aliquots of chloroform solutions containing 0.2 gm. of fat (see Note 3) were transferred to colorimeter tubes and made up to 3 ml. with chloroform. Six ml. of reagent A and 1 ml. reagent B were added, the tube shaken (note 5), allowed to stand exactly 15 minutes at 37° C. (note 1), and cooled 3 minutes. A blank containing the fat but omitting the phloroglucinol and using 7 instead of 6 ml. of reagent A was prepared at the same time and treated in the same way (note 2).

The color was read in an Evelyn photoelectric colorimeter, using a 540 filter and setting the instrument at 100% transmission with the blank. The Kreis value was expressed as the optical density (i.e., 2-log galvanometer reading) divided by .02 (the concentration of fat in gm. per ml. of solution in the colorimeter tube).

NOTES ON THE KREIS METHOD

1. *Time and Temperature of Color Development.* The conditions for color development specified above were chosen arbitrarily. As pointed out by Walters, *et al.* (3) the red color does not reach a maximum at any time or temperature but changes gradually to a yellow color. Hence, the absolute values recorded for the Kreis test depend upon the time and temperature chosen for color development. The temperature effect

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