The question of the stability of a standard (official) bleaching clay is examined, and it is shown that activated clay and the more active natural clays are stable in activity over a period of at least a year. What had been thought at one stage of the investigation to be a loss of activity in the active clays was shown to be really a deterioration of *bleaching response* of the small lots of refined oils used in the aging studies. However, this deterioration was largely absent in the case of A. O. C. S. official earth (making it therefore the preferred earth where the grading of refined oil is concerned). Also, it is shown that soybean oil when held in the crude state does not exhibit the same degree of deterioration of the refined bleach color. There is no data available to show whether refined soybean oil held in bulk storage also exhibits a deterioration of bleaching response against highly active clays—largely because soybean oil is generally stored in the crude state.

There are presented the results of a collaborative check color reading study which show that interlaboratory checking on Lovibond colors in the case of refined bleached soybean oils is unsatisfactory in general, and this lack of good agreement in reading colors might be the cause of much annoyance in the operation of a trading rule under which refined bleach color is a factor in determining its grade.

Abstract of the Report of the Bleach Test Committee for 1943-44

THIS committee assumed a new and enhanced importance last year with the emergence of a trading rule [1] involving the refined bleached color of crude soybean oil and the designation of a standard bleach test employing activated clay. This test was devised by the Technical Committee of the National Soybean Processors' Association after some actual commercial experience had shown the inadequacy of the tentative A. O. C. S. bleach test, when the latter was used as a basis of grading crude soy oils—specifically a particular class of badly off-color oils. In the case of these oils the test indication failed to constitute a fair index to the bleaching quality. Considerable work had been done in developing the activated clay bleach test, as well as in deriving a general correlation of its indications with those of the tentative A. O. C. S. test.

Some question of the stability of the activated clay arose, and this was thoroughly discussed at a meeting of the committee in Chicago on October 6, 1943, at which a subcommittee was appointed to establish the facts concerning this question. The text of this subcommittee's report follows:

> Periodic bleach tests made in several laboratories on a more than a dozen small lots of refined soy oil comparing their responses against N. S. P. A. official clay and A. O. C. S. official earth show rather marked changes in the case of the more active clay but no significant change apparent in the case of the official A. O. C. S. earth. This indicates either that the very active clay is losing activity on aging or that changes are occurring in the oils to which the A. O. C. S. official earth is unresponsive but which inactivates the more susceptible active clay. Further work is in progress designed to show conclusively which one of these possible explanations correctly accounts for the test data given in the accompanying tables.
>
> Comparative tests also showed that no significant change occurs in the activated clay as a result of the exposure due to repeated opening of the laboratory clay container incident to normal use.
>
> The data supporting these conclusions are given in accompanying Tables Nos. 1 to 7.

A graph embodying the data from one of these tables is shown as Figure 4 in a paper by the chairman in this issue, as well as additional bleach response-time data on other bleaching clays. The change shown may be considered to be typical of that indicated by most of the data comprising the subcommittee report.

[1] This rule was subsequently suspended by order of the Office of Price Administration.

This deterioration of bleaching response between the test refined oils and the active clays (compared to the absence of such change, on most oils, in the case of A. O. C. S. official earth), which was first thought to indicate a deterioration of activity of the clay, became so pronounced and so persistent (the curves showing little tendency to level off even after many months had passed), that attention was then concentrated on attempting to establish conclusive experimental evidence that the clay was really stable in activity, rather than planning the tests to show that it may not be stable.

Thus by the time of the Society's Spring meeting in New Orleans in May, 1944, a fairly impressive amount of evidence of diverse sorts had been assembled which seemed to establish beyond doubt that the activated clay, and certain active natural clays which had been introduced into the aging studies, were indeed substantially stable in their bleaching activity, and that hence the changes indicated by the subcommittee's data were the result of changes occurring in the oils.

A meeting of the committee was held on May 11, 1944, at the New Orleans convention and so important was the material presented at that meeting in determining the interpretation of the preceding months' work that it was considered appropriate to incorporate it into a supplement report to be considered in connection with the report submitted to the Society at the New Orleans meeting.

Abstract of Interim Supplement to Bleach Test Committee Report 1943-44

THIS covers a presentation of the experimental evidence establishing the stability of the bleaching clays being studied and the significance of the subcommittee's data in light of this newer information, particularly with respect to the choice of a clay for use in a standard bleach test. The report can perhaps best be summed up by quoting its closing paragraphs:

> "In view of the findings at hand the Committee is led to the following conclusions:
>
> 1. That off-quality refined soybean oil undergoes some change on aging in containers up to one drum size,

despite being moderately refrigerated, which is manifest by a deterioration of response against bleaching clays. This occurs to some extent also in the case of prime oils. It is more pronounced in the case of the more active clays and is generally (but not always) absent in the case of A. O. C. S. Official earth. When it does occur in the case of A. O. C. S. earth the change of response is generally of smaller magnitude and often within the uncertainty of making Lovibond readings on the types of oils studied. (In a few isolated instances there appeared to be an improvement in bleaching response.) This behavior would mitigate against the use, in a standard bleach test, of any clay against which oils showed a marked deterioration of bleaching response, where the grading and evaluation of *refined* soybean oil is the primary concern, especially if the change referred to can be shown not to occur appreciably in the case of refined oil in bulk storage.

2. In the case of aging samples of crude soybean oil the change in bleaching response (R.B. color) is so slight as to be negligible in the strong dosage required, and hence the Committee believes that an activated or other active clay would be acceptable as the standard test bleach clay for the grading of crude oil.

3. Considering the extreme range of qualities which must be covered by a standard bleach test for grading crude soy oils, especially during seasons when crop damage is prevalent, we do not think that any test which properly grades the off-qualities of soybean oil can be considered an entirely satisfactory test for routine use by the industry in control and other than official grading work, especially during the majority of seasons when the crop is normal and prime oils predominate.

4. The present Official A. O. C. S. bleach test for soybean oil has been found by experience to be generally satisfactory in the routine testing and evaluation of soybean oils, and it would serve for the basis of grading crude soy oils in trading during all normal crop years. Moreover, it would serve also to a considerable extent as the basis for commercial grading even in years of crop damage, but might fail in the latter instance on an estimated 20 to 40% of the oil sold during a season of very heavy crop damage such as 1942-43. That, however, as last year's experience showed, is sufficient to rule it out for widespread use as the basis of trading.

5. Therefore, we believe that this committee should be continued and that further consideration be given to the question of a more powerful bleach test designed to grade all types of crude soy oil, specifically (1) to weigh the 4% activated clay test against an equivalent test using a much higher percentage of Official A. O. C. S. earth; (2) to check further on the magnitude of the change in bleaching response (R. B. Color) of soy oils stored as crude samples, and (3) to determine if possible whether refined soy oils in bulk storage undergo the same change in bleaching response shown in aging less than drum quantities.

Respectfully submitted,

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Stability Values of Fats by the Active Oxygen Method and by Storage in Glass Vials

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IT IS not unusual for large quantities of lard to be held in storage for periods in excess of six months. Whether or not a given lot of lard will be edible at the end of such storage periods depends upon its initial stability and the conditions of storage. Since it is generally thought that the natural stability or instability of fats and oils of equal degree of unsaturation is due chiefly to the presence or absence of inherent antioxidants, considerable interest has been stimulated in finding satisfactory antioxidants to add to edible fats. As an indication that some progress already has been made along this line, permission has been granted (1) to add small amounts of a number of antioxidants to lard.

Published work on the evaluation of antioxidants, however, has been limited almost entirely to rapid stability tests, with the result that little is known concerning the significance of results by these tests in terms of storage stability. Extensive work (2) has been reported on the storage stability of butter in relation to its rate of oxygen absorption at 105-107° C. The conclusions were that "the induction periods and the rates of oxidation vary so irregularly that there is no evidence of any relation of these to keeping quality." It has also been reported (3) that for lard containing added d-isoascorbyl palmitate and lecithin, the stability values determined by oxygen-absorption measurements in the Barcroft Warburg apparatus are more closely related to storage keeping quality than are stability values determined by the active oxygen method. In experiments on the evaluation of antioxidants in butterfat, a general relationship has been shown (4) between the protection factors determined by oxygen-absorption measurements at 100° and peroxide values in storage tests.

In an investigation on the improvement of lard, particularly by increasing its stability or resistance to rancidity through the addition of antioxidants, attempts are being made to compare stability values obtained by the more commonly used rapid methods with those determined by storage tests. The first storage experiments have been under way for 20 months; not all the test samples are rancid but the storage period has been long enough for practical requirements. In these experiments, stability values determined by storage in glass vials at 21° C. were compared with those determined by the active oxygen method.

General agreement was found in most instances but not a constant relationship between storage stability under these experimental conditions and stability determined by the active oxygen method, particularly

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