THE KEEPING QUALITY OF CRUDE COTTONSEED OIL

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The study here reported was conducted in connection with Investigation No. 2, "Isolation and Identification of the Constituents of Crude Cottonseed Oil with Special Reference to Effect on Refining Loss and Quality," which was submitted by the Basic Research Committee of the Interstate Cottonseed Crushers' Association and the American Oil Chemists' Society.

It is generally believed that the common practice of allowing crude oil to remain in contact with the foots (meal, etc.) at the crude oil mill while waiting for favorable market conditions often results in considerable loss, owing to the deterioration of the oil. Preliminary experiments to get some information about the changes which crude cottonseed oil undergoes during storage were undertaken in the Oil, Fat and Wax Laboratory of the Bureau of Chemistry. The oils used were expressed hot from decorticated seed at the laboratory, so that all changes taking place directly after expressing might be noted. It was the practice to filter a portion of the crude oil through paper as soon as it had been expressed. From 700 to 800 grams of each filtered oil was placed in amber-colored glass bottles of a size which left an air space of 150 to 250 c. c. above the oil at the beginning of the experiments. Another set of samples of the unfiltered crude oils, with some of heavier portions of the foots, was collected in similar bottles. Both sets of samples were placed in a dark locker to imitate, so far as possible under ordinary laboratory conditions, the storage of crude oil at the mill.

The characteristic of non-drying and semi-drying oils most influenced during aging is that of acidity; in most instances the iodine number, saponification value, etc., are not appreciably affected until after the oils have become rancid. Consequently, this study was confined to the determination of acidity. The acidity was determined as soon as possible after the expression of the oil and at definite periods thereafter by the following method:

Heat 10 grams of a sample of an oil with 20 c. c. of neutralized 95 per cent alcohol until the mixture is hot. Then titrate in the customary manner with tenth normal potassium hydroxide solution, using phenolphthalein as indicator.

The acidity is here reported as the "acid value," the number of milligrams of potassium hydroxide required to neutralize the free fatty acids in one gram of oil. The acid value multiplied by the factor 0.502 gives the percentage of free fatty acids in terms of oleic acid, which is still the customary manner of reporting the acidity of cottonseed and many other oils in the trade, although it has been shown that the free

fatty acids of an oil contain both saturated and unsaturated acids in about the same proportion as they occur in the neutral or glyceride portion of the oil.[1]

[1] Cotton Oil Press, 7 (No. 2), p. 35 (1923).

ACID VALUES

No. of oil	Sample	1925 May 8	May 9	May 12	June 16	Aug. 10	Oct. 10	Dec. 12	Feb. 1926	Acidity Increase
1	Filtered	2.06	—	2.06	2.06	—	2.08	2.08	2.28	0.22
1	+Foots	2.06	—	2.45	2.45	—	2.48	2.53	2.56	0.50
2	Filtered	—	4.24	4.24	—	—	4.24	4.43	4.43	0.19
2	+Foots	—	4.24	5.02	5.07	5.30	5.37	5.46	5.65	1.41
3	Filtered	—	3.36	3.36	—	—	3.42	3.45	3.45	0.09
3	+Foots	—	3.36	3.46	—	—	3.48	3.48	3.48	0.12

During the period of storage the temperature of the oils ranged from about 19° C. to 25° C., the most common temperature being 21° or 22° C. The variation in the temperature of these samples was subject to frequent change, as compared with that taking place in large quantities of oil held in storage. Without doubt, in the case of the small laboratory samples, this would cause a more rapid development of free fatty acids.

A 2.5 liter sample of filtered oil No. 1, examined in February 1926, gave an acid value of 2.28, which is identical with that given in the table. A similar quantity of No. 3 filtered oil tested the same day gave an acid value of 3.40. These samples were also stored in the dark.

Oil No. 1 and No. 3 were expressed from different lots of seed from Mississippi, and No. 2 was expressed from Tennessee seed. Each oil was examined for acidity after expression. At the end of the second week of storage the acidity was determined monthly. The table does not show all the data obtained. The figures given indicate when the changes in acidity were observed. From a practical standpoint the samples of oil in which the acidity increased no more than 0.5 may be considered as unchanged. So far as possible the treatment given each sample was identical, even the expression.

The results of the experiments here reported indicate that it is impossible to foretell how a given lot of crude cottonseed oil in contact with the foots will act when stored. The writers believe that the crude oil should be separated from the foots as soon as possible after they have settled from the oil.

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