

Dry Refining of Sesame Oil with Alkali-Enriched Sodium Metasilicate

S.B. Mukhopadhyay, P.K. Gupta and A.K. Basu*

Department of Chemical Technology, University Colleges of Science & Technology, Oil Technology Section, Calcutta-700009, India

The paper describes an easy method of refining sesame oil with alkali-enriched dry sodium metasilicate (SMS). This method offered significant reduction in free fatty acids (FFA) of the oil. Extent of FFA reduction depended on the degree of the alkalinity of SMS-NaOH mixture. Color of the oil was not markedly improved by the process.

KEY WORDS: Alkali-enriched, dry-refining, sesame oil, sodium metasilicate.

Refining losses of oils are generally lower when sodium carbonate is used as the neutralizing agent, because it does not attack the neutral glycerides. The free fatty acids (FFA) are first neutralized by sodium carbonate, and then a weak sodium hydroxide wash is given to improve color. Several variations have evolved to overcome the difficulties of frothing due to liberation of CO₂, which makes the separation of soapstock difficult, but the method is not usually practiced commercially because of additional difficulties (1-5). Jennings (6) reported refining of animal fats, which showed improved storage stability, by treating the fat with aqueous solutions of sodium silicate and small amounts of tannic acid, Na₃PO₄ or NaH₂PO₄, and a wetting agent at 66-88°C. In the present work, sodium metasilicate (SMS) alone and in admixture with NaOH were used as neutralizing agents.

MATERIALS AND METHODS

The neutralizing agents used were as follows: Sodium metasilicate·5H₂O (Loba-Chemie Indo Australanal Co., Bombay, India) was dried under vacuum at 105°C, and had an alkalinity of 0.88% as Na₂O. Sodium metasilicate·5H₂O (alkalinity 0.88% as Na₂O) was treated separately with strong sodium hydroxide solutions [BDH, Glaxo Laboratories (India) Ltd., Bombay, India] to

enhance its alkalinity to 9.43% and 19.7% as Na₂O, and the mixtures were dried under vacuum and ground. Technical grade sesame oil was obtained from Hindustan Lever Ltd. (Calcutta, India).

The oil was heated to 80-90°C, dry SMS (alkalinity 0.88% as Na₂O) was added, and the mixture was stirred for 30 min. The mixture was then centrifuged and washed with hot (95-100°C) distilled water (10% based on oil). The oil was then dried under vacuum over a water bath. Similar experiments were conducted with NaOH-treated SMS samples.

RESULTS AND DISCUSSION

Results are shown in Table 1. Refining with solid alkaline silicate was found to be convenient, as it precludes emulsion formation and, therefore, separation of soapstock could be easily effected. The method is superior to the sodium carbonate process where the liberated CO₂ creates problems in the operations. It has been observed that the higher the alkalinity of sodium metasilicate mixture, the greater was the reduction in FFA.

The dry-refining process with dry alkaline silicate has limitations in the respect of the removal of the color bodies. The process appears to be useful for readily preparing low-FFA, medium-color triglyceride oils that may find applications where the color of final products does not pose a problem.

REFERENCES

1. Mattikow, M., *Oil Soap* 19:83 (1942).
2. Mattikow, M., *J. Am. Oil Chem. Soc.* 25:200 (1948).
3. Sullivan, F.E., *Ibid.* 32:121 (1955).
4. Smith, F.H., and A.V. Ayres, *Ibid.* 33:93 (1956).
5. Clayton, B., U.S. Patent no. 2,641,603 (1953).
6. Jennings, W.H., Fr. Patent no. 1,565,188 (Cl. C. 116) (1969).

[Received August 8, 1991; accepted November 24, 1991]

TABLE 1

Refining of Sesame Oil with Dry Mixture of Sodium Metasilicate and Caustic Soda^a

Quantity of oil (g)	Alkalinity of Na-metasilicate (as Na ₂ O) (%)	Amount of Na-metasilicate used	FFA (%)	Color (1/4" cell)		Reduction in FFA (%)	Reduction in color (%)	
				Y	R		Y	R
Before treatment	—	—	2.76	12	2.6	—	—	—
25	0.88	20% excess	0.94	11	1.5	65.9	8.3	6.3
15	9.43	20% excess	0.63	10	1.4	77.2	16.6	12.5
15	19.78	20% excess	0.27	9	1.4	90.2	25.0	12.5

^aFixed conditions: Temperature of oil, 80-90°C; reaction time, 30 min; temperature of wash water, 95-100°C.

*To whom correspondences to be addressed at: Dept. of Chemical Technology, University Colleges of Science and Technology, Oil

Technology Section, 92, Acharyya P.C. Ray Rd., Calcutta-700009, INDIA.