

## Sesame Oil and Its Mixtures Are Exceptions to AOCS Method Cd 7-58

Sir,

In AOCS Method Cd 7-58 for the determination of polyunsaturated fatty acids (as revised 1959 and reapproved 1989), the scope states that the method is not applicable to crude oils and to oils that contain pigments whose absorption may undergo considerable change during alkali isomerization. We wish to specify an additional restriction to the use of the Cd 7-58 method as well as IUPAC Method 2.505: "Evidence of purity and deterioration from ultraviolet spectrophotometry" (*IUPAC, Standard Methods for the Analysis of Oils, Fats and Derivatives*, 7th revised edition, 1987).

Indirectly, UV absorbances of unheated oils at maxima typical for conjugated fatty acids after alkaline treatment can be taken as measurements of polyunsaturated fatty acids. AOCS Method Cd 7-58 utilizes the following equations to calculate the percentages of the various conjugated polyenes:

$$\text{conjugated dienes (\%)} = 0.91 (a_{233} - a_0);$$

$$a_0 = 0.07 \text{ for esters.}$$

$$\text{conjugated trienes (\%)} = 0.47 \times 2.8 [a_{268} - 0.5 (a_{262} + a_{274})]$$

$$\text{conjugated tetraenes (\%)} = 0.45 \times 2.5 [a_{315} - 0.5 (a_{308} + a_{322})]$$

$$\text{conjugated pentaenes (\%)} = 0.39 a_{346}$$

where,  $a$  = absorptivity =  $A/b \times c$ ;  $A$  = observed absorbance,  $b$  = cell length in cm and  $c$  = conc. of oil or fat in g/L.

Sesame oil has a characteristic UV absorption with two maxima, at 287.5 and 235 nm, respectively. This absorption of sesame oil is, most likely primarily if not exclusively, due to its content of sesamin, sesamol and sesamolin (Budowski *et al.*, *JAOCS* 28(2):51-54, 1951) with absorption constants as shown in Table 1. The concentration ranges of these constituents in 14 Japanese strains were taken from Fukuda *et al.* (*Nippon Shokuhin Kogyo Gakkaish* 35 (7):483-86, 1988). When we used these figures to calculate the apparent conjugated dienes, we obtained

0.11-0.34%. We have also run a UV absorption curve (on a Perkin-Elmer Lambda 6/PECSS system) and obtained 0.17% apparent conjugated dienes. Similar calculations based on the above equations showed sesame oil, purchased in California, to contain 7.5% of conjugated dienes and 1% of conjugated trienes (Nawaz-Chaudhry, Sh., M.Sc. dissertation, Chapman College, Orange, California, 1988). However, the last figures are very high compared to the typical UV absorption of sesame oils.

Since there is a renewed interest in sesame oil in Japan, USA and other industrialized countries, it seems pertinent to bring forth this suggestion for improved accuracy of the aforementioned methods, *viz.*, that a notable exception to the applicability of the above method should be sesame oil and mixtures thereof. Such information should be added to AOCS Method Cd 7-58 and IUPAC Method 2.505 in forthcoming revisions.

TABLE 1

Concentrations of Sesamin, Sesamol and Sesamolin in Sesame Oils and Their Absorption Characteristics

| Constituent conc. (mg/100 g oil) | Sesamin (293-885) | Sesamolin (123-459) | Sesamol (trace-5.6) |
|----------------------------------|-------------------|---------------------|---------------------|
| $\lambda_{\text{max}}$           | 287               | 288.5               | 296                 |
| $\epsilon_{\text{max}}$          | 23.03             | 21.79               | 29.74               |
| $\lambda_{\text{max}}$           | 236               | 235                 | 233                 |
| $\epsilon_{\text{max}}$          | 26.01             | 24.85               | 21.18               |

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