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## Spectral techniques for identification of triglycerides

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### ABSTRACT:

Triglycerides are the esters of glycerol with fatty acids. They are present both in plants and animals. Triglycerides have immense economic and nutritional values. Therefore, it is very important to determine the structure of triglycerides carefully and correctly. By employing IR, Mass and NMR techniques, it is easy to establish correct structure of triglycerides. The present review therefore, shows the importance of spectral techniques in determining the structure of triglyceride.

**KEYWORDS:** Triglycerides, IR, NMR, Mass spectra.

### INTRODUCTION:

#### Glycerides:

Fatty acids often occur as esters of the trihydric alcohol, glycerol. The fully esterified triglycerides are typical of plant seed-oils, the properties of which depend on the fatty acids present, their relative amounts and their position in the molecule. If one of the acids is a hydroxy acid, further acylation of this hydroxy group can give rise to a tetra-acyl triglyceride, but this occurs only rarely. Triglycerides are used as a source of energy, they also provide flavour and palatability. Naturally occurring unsaturated fatty acids are predominantly in *cis* form and their double bonds are not conjugated [1]. Triglycerides rarely exist in glycerol ester of single fatty acid but contain mixed fatty acids. Food triglycerides have fatty acid carbon chain length ranging from (4 to 24) [2]. Spectroscopic methods are very important in determining the structure of triglycerides. This review helps in understanding how various spectroscopic methods help in establishing the structure of triglycerides.

Triglyceride

#### Spectral Techniques:

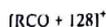
##### 1. IR Spectra:

Triglycerides are transparent to UV-visible region but possess many infrared absorption bands that are characteristic of their general structure. Most long chain triglycerides have very similar infrared spectra, although the presence of functional groups in the fatty acid chain will add additional bands. Infra red spectroscopy is a good method for quantitating total triglyceride. The strong band at  $1742\text{ cm}^{-1}$  due to carbonyl stretching can be used to measure total moles of triglyceride, provided no other ester molecule is present. Neither fatty acid chain length nor degree of unsaturation significantly affects absorptivity at  $1742\text{ cm}^{-1}$ . Acetotriglycerides have a prominent band at  $1235\text{ cm}^{-1}$  due to the acetate group [3]. Saturated triglycerides of different chain length can be distinguished by measuring the ratio of the C-H ( $2926\text{ cm}^{-1}$ ) and the ester carbonyl ( $1742\text{ cm}^{-1}$ ) absorption bands after suitable calibration. Band at  $967\text{ cm}^{-1}$  is characteristic of isolated *trans* double bond.

##### 2. Mass Spectra:

A mass spectrum is very important in the identification of triglycerides. Molecular weights up to  $C_{60}$  can be examined using mass spectra. Pure triglycerides can be identified from the degradation pattern. The presence of certain fragment ions is very helpful in identifying the triglyceride. Triglycerides are characterized by the presence of following type of fragment ions:

- i) Acyl ion  $[RCO]^+$ , Loss of acyloxy ion  $[RCOO]^+$ , Loss of acyloxymethyl ion  $[RCOOCH_2]^+$
- ii) Mass spectra of glycerides also shows characteristic peaks for  $[RCO + 74]^+$  and  $[RCO + 128]^+$  ions [4].
- iii)



In a glyceride molecule, the fatty acid composition can be easily deduced from the large  $(M-RCOO)^-$  and  $(RCO)^+$  peaks. In the mass spectrum of 2-stearo-1, 3-myristopalmitin ( $\beta$ -MSIP), there are three peaks at 523, 551 and 579 ( $m/z$ ) corresponding to the loss of three different acyloxy groups from the molecular ion (806). The three  $(RCO)^+$  peaks at 211, 239 and 267 confirm this.