



FUNDAMENTAL OF FOOD SCIENCE-II

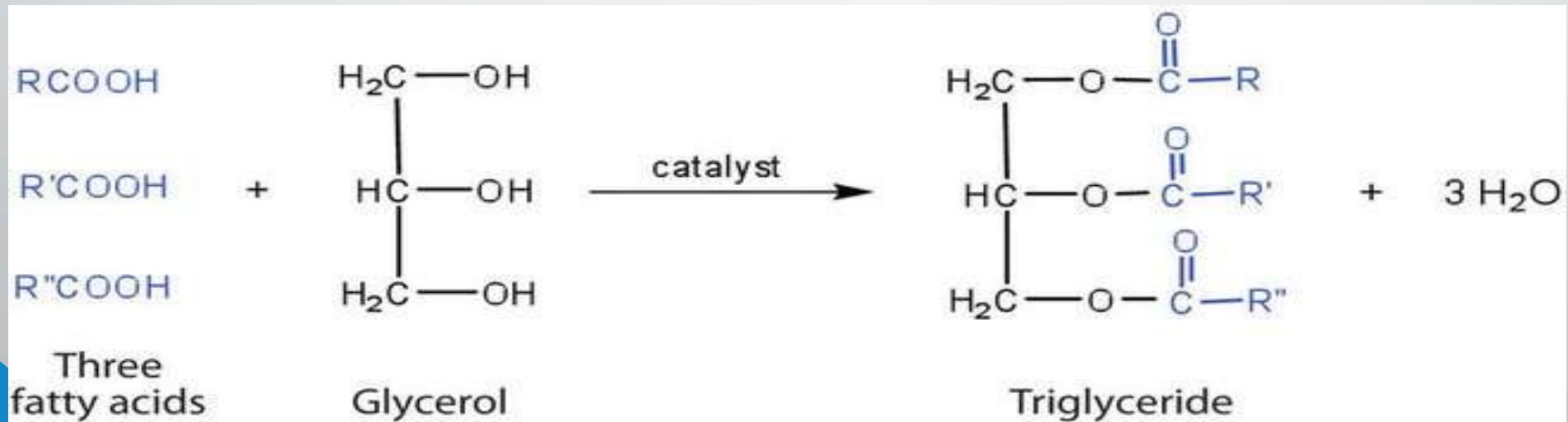
Topic-Fats and Oils

INTRODUCTION

- **Fats** are one of the three main [macronutrients](#), along with [carbohydrates](#) and [proteins](#).
- The terms *fat* and *oil* only indicate whether the material is liquid or solid:
- Fats that are liquid at room temperature are called oils.
- *Oil* normally refers to a lipid with short or [unsaturated](#) fatty acid chains that is liquid at [room temperature](#), while *fat* (in the strict sense) specifically refers to lipids that are solids at room temperature
- Fats and oils are essential nutrients which sustain life and belong to a naturally occurring substances called lipids.

STRUCTURE

- Fats and oils are called triglycerides (or *triacylglycerols*) because they are esters composed of three fatty acid units joined to *glycerol*, a trihydroxy alcohol.
- A triglyceride is called a fat if it is a solid at 25°C; it is called an oil if it is a liquid at that temperature.



COMPOSITION AND CLASSIFICATION

- They are composed of the elements carbon, hydrogen and oxygen. They are built up by number of individual fatty acids with glycerol.
- **Type of fats** according to saturation of the fatty acids they contain :-
 - + Solid Fats: solid at room temperature because they contain high proportion of saturated fatty acids. E.g. butter, Vanaspati and margarine.
 - + Liquid Fats or Oils: liquid at room temperature as they contain high proportion of unsaturated fatty acids. Oils such as corn, soyabean, cottonseed and sunflower contain a fairly large proportion of polyunsaturated fatty acids.
- **Types of fatty acids** and e.g.:-
 - + saturated: butyric, caproic, myristic, palmitic, stearic acids
 - + unsaturated: oleic, linoleic acids

ROLE IN COOKERY

- **Appearance:** Fats and oils can alter a food's appearance by creating a glossy or moist visual texture. The ability of fat to refract light is also responsible for the opaque appearance of milk. Fats also aid in the browning process of many foods, giving them an appealing golden brown color.
- **Emulsions:** Fats and oils are an important component in most emulsions. Emulsions are the dispersion of a fat or oil into water (or vice versa). There are many [emulsions in the culinary world](#) including salad dressings, mayonnaise, gravies, and [cheese sauces](#). Emulsifying fat into a liquid produces unique flavor and texture qualities.
- **Flavor:** Fat has the unique ability to absorb and preserve flavors. Oils are often infused with herbs and spices for preservation. Fats also contain compounds that lend specific flavors of their own. The way fat coats the tongue and allows flavors to linger can also alter a flavor experience.

- **Heat Transfer:** Fats provide one of the most efficient modes of heat transfer during cooking. From [deep fat frying](#) to [sautéing](#) in a skillet or wok, hot oil can transfer high levels of heat to the surface of food without overheating the interior portions. Using fats and oils to transfer heat also facilitates crust formation.
- **Nutrition:** Fats are the most calorie-dense compound in food, weighing in at over twice the calories per gram of proteins or carbohydrates. Fat is an effective method of delivering calories when needed. Fats are also important for delivering fat-soluble vitamins such as Vitamins A, E, D, and K.
- **Satiety:** Fats play an important role in making foods satisfying or making us feel full. Because fats take longer to digest than carbohydrates or proteins, high-fat foods stay in the stomach longer and delay the feeling of hunger.

- **Shortening:** [Shortening](#) is not just the name of a solid, shelf-stable fat but it is also the term used to describe fat's ability to make baked goods tender by impeding the formation of [gluten](#) strands.
- **Solubility:** While fats and oils are not soluble in water, other chemical compounds are only soluble in fats. Many of these fat-soluble compounds are responsible for foods' flavor and even vitamin content. Including fat in food allows for maximum flavor and a wider range of nutritional content.
- **Texture:** Fats and oils have a texture all their own but are also responsible for tenderizing baked goods via the shortening process (see above). Fat provides a very specific, lubricating [mouthfeel](#), which is why most dry crackers or chips are served with high-fat content dips or spreads. Emulsions made with fat are responsible for the creamy texture of many items like ice cream, mayonnaise, and other sauces.

CHANGES IN FATS DURING STORAGE

- Fats and oils undergo undesirable changes during storage, which results in spoilage. The major kind of spoilage is **rancidity** which implies development of undesirable odor and flavor in oils and fats caused by the action of air, water and enzymes. **Flavor inversion** precedes rancidity changes and implies the loss of characteristic flavor of fats and leave a flat and greasy aftertaste instead.
- To prevent the fat spoilage, store fats and oils in dry, tightly covered and sealed with narrow openings containers to ensure exclusion of air and moisture until needed. Store in cool, dry place away from cooking area, where the temperature and humidity fluctuations are not great.

STORAGE

- Storage conditions that affect the deterioration of fats, oils, and food in general are summarized in the acronym **HALT**: Humidity, Air, Light, and Temperature.
- Reducing exposure to humidity, air, light, and warm temperatures will prolong storage life.
- Proper food packaging can reduce or eliminate moisture, air, and light. Newly opened oil should be left in its original container or be placed in a clean container, since even a small amount of old oil mixed with fresh oil will hasten rancidity.
- Temperature dramatically affects the storage life and quality of fats and oils. Some fats, such as butter or margarine, can be frozen to prolong storage time. All fats, oils, and foods containing fat keep better in a cool area of a house, such as a basement.

- Fats and oils vary in their ability to store for prolonged periods. Generally, shortening can be stored for several years, whereas cooking oil must be rotated more frequently.
- The storage life of fats and oils and foods containing them varies widely for several reasons:
 - (1) storage conditions differ,
 - (2) expiration dates differ,
 - (3) most food products contain a mixture of different kinds of fats that vary in stability,
 - (4) individual consumers differ in their ability to tolerate rancidity.
- Addition of antioxidants such as tocopherols, and other phenolic compounds such as BHA, BHT or propyl gallate are used to retard rancidity in commercial fatty products

SELECTION

- A no. of household fats and oils are available in India. The choice depends on the food preparation in which the fat is to be used, the family needs, the food budget and regional preference.
- Ghee is preferred for its delicate flavour, in preparation of sweets and to serve with rice or snacks. Butter is used as a spread and in some baked products for the same reason.
- Oil is normally used for seasoning vegetables, dals and as frying medium. The choice of oil varies from one region to another eg., mustard oil is used in Bengal, coconut oil is used in Kerala, groundnut oil is used in Gujarat and gingelly (til) oil in Tamil Nadu.
- A large amount of oil is marketed as unrefined or crude oil. Criteria for selection of oil are presence of the natural characteristics aroma, natural colour, clarity, freedom from admixture with other kinds of oils, freedom from solid particles and flat or rancid odour.

- All the oils and fats supply energy irrespective of their source. Most of the vegetable oils supply unsaturated fatty acids.
- The animal fats, ghee and butter, supply some vitamin A also.
- Refined oils have a longer shelf life than refined oils of the same kind. As impurities are removed in refining, the smoke point of refined oils during frying is higher than that of unrefined oils. Refined oils are used in bakery products (bread, biscuits etc) by large bakeries.
- Hydrogenated fats (vanaspati) are also available for use in food preparation. Hydrogenated fats is more stable than the vegetable oil from which it is made. The hydrogenation process is designed to produce characteristics most desired in terms of use and consumer acceptance.

In India, it is made as a substitute for ghee, and therefore its physical appearance and texture resembles ghee. It is also fortified with Vitamin A to the same level as ghee (or 2500 I.U. per 100g) to protect the consumer. Hydrogenated fats have a higher smoke point than refined oils, and are used for frying bland foods. These are also used in pastries as a shortening agents.

SOURCES OF FATS AND OILS

- They may be of vegetable/plant, animal and marine origin.
- Examples of vegetable fats include the solid fat cocoa butter, and the liquid oils include corn oil, sunflower oil, soyabean oil, cottonseed oil, peanut oil, olive oil, canola oil, etc.
- Animal fats include lards from hogs, tallow from beef, and butterfat from milk.
- Fish oils include cod liver oil, oil from menhaden, and whale oil, etc.

PRODUCTS MADE FROM FATS AND OILS

- Butter
- Margarine
- Shortenings and frying oils
- Mayonnaise and salad dressings



THANK YOU