

Hydrocarbons and Derivatives

الهيدروكربونات ومشتقاتها

Hydrocarbons and Derivatives

- Hydrocarbons contain carbon and hydrogen only and, from these, by addition of functional groups and by interaction, all other natural compounds can theoretically be derived.
- تحتوي مركبات الهيدروكربون على كربون وهيدروجين فقط، وبواسطة اضافة مجموعات وظيفية ، يمكن ان تشتق كافة المركبات الطبيعية الاخرى نظريا
- In a particular class of compounds such as volatile oils, the components of any one member may be biosynthetically related (Peppermint: Menthol, Menthone) .

Hydrocarbons

- Hydrocarbons are important in nature as components of cuticular waxes.

- مركبات الهيدروكربون هامة في الطبيعة تشكل مكونات الشموع القشيرية.

- The majority of these are odd-numbered long-chain alkanes within the rang C25-35 formed by decarboxylation of the next higher free fatty acid.

- معظم هذه المركبات الكانات ذات سلسلة طويلة وتريية عدد ذرات الكربون، بين ٢٥-٣٥ ذرة كربون، لتشكل شفعية العدد بواسطة نزع الكربوكسيل من الحمض الدسم الحر ذو عدد ذرات الكربون الشفعي العدد.

Monobasic Acids

الاحماض احادية الأساس

- Organic acids possess one or more carboxyl groups.
- They participate in essential metabolism and in this capacity range from the simple acids of the respiratory sequence to the complex deoxyribonucleic acids.

C1-C6 Monocarboxylic acids

احادية الكربوكسيل

- A number of these acids together with hydroxy- and keto — derivatives are intermediates in the stages of biosynthesis of fats, isoprenoid compounds and various amino acids.

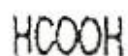
C1-C6 Monocarboxylic acids

In the free states are not found abundantly in nature but occur scattered throughout the plant kingdom in the esterified forms as a feature of some volatile oils, resins, fats, coumarins derivatives and alkaloids.

- لا توجد في الطبيعة بالحالة الحرة، ولكنها تكون مبعثرة في المملكة النباتية بشكل مؤسّتر كسمة لبعض الزيوت الطيارة، والراتينات، والمشتقات الكومارينية والقلوانيات. مثل حمض الفورميك والاسيتيك والبروبيونيك.

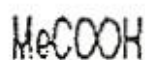
C1-C6 Monocarboxylic acids

Formic acid



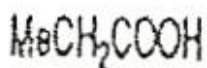
Name derives from its first isolation from the ant, *Formica rufa*. A decomposition product of many vegetable materials. Occurs free in the hairs of the stinging nettle; combined in the gitaloxigenin series of cardioactive glycosides. *N*-formyl-L-methionine is involved in the initiation of protein synthesis on ribosomes

Acetic acid



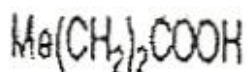
An essential primary metabolite, particularly as acetyl-CoA. Common in the esterified form.

Propionic acid



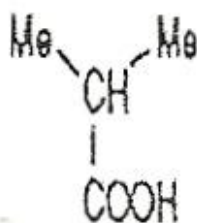
Produced in the fatty acid oxidative cycle when an acyl-CoA with an odd number of carbon atoms is involved. Esterified as a tropane alkaloid

n-Butyric acid



Occurs in traces in many fats

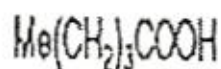
iso-Butyric acid



Occurs free in carob beans (*Ceratonia siliqua*) and as its ethyl ester in croton oil. Component of resins of the Convolvulaceae and minor tropane alkaloids. Intermediate in the metabolism of valine

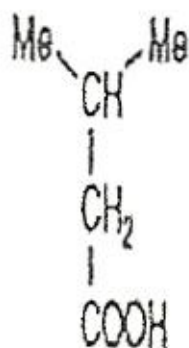
C1-C6 Monocarboxylic acids

n-Valeric acid



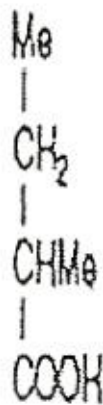
Not common; component of Convolvulaceous resins

iso-Valeric acid



Free and esterified in *Valeriana* spp. Combined in some tropane alkaloids (e.g. valeroidine) and in the pyranocoumarin, dihydrosamidin. Intermediate in the metabolism of leucine

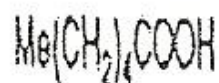
2-Methylbutyric acid



Component of some tropane and *Veratrum* alkaloids, Convolvulaceous glycosides and the pyranocoumarin visnadin

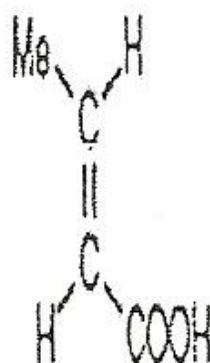
C1-C6 Monocarboxylic acids

Caproic acid



Occurs in traces in many fats

Crotonic acid (*trans*-
butenoic acid)



Constituent of croton oil

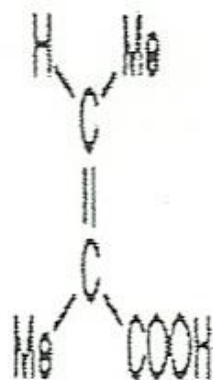
Tiglic acid



Occurs in croton oil (glycoside) from *Croton tiglium*. The acid of many minor tropane alkaloids, e.g. tigloidine. Component of Convolvulaceous resins. Biosynthetically derived from isoleucine

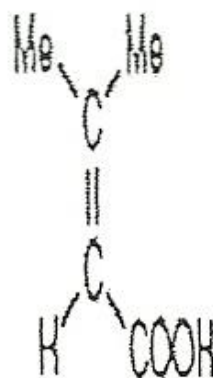
C1-C6 Monocarboxylic acids

Angelic acid



Occurs in the rhizome of *Angelica*. Esterifying acid of the *Schizanthus* alkaloid schizanthine X. Component of the *Cevadilla* seed alkaloid cevadine

Senecioic acid



First isolated from a species of *Senecio* (Compositae). Occurs as the esterifying acid of some alkaloids of *Dioscorea* and *Schizanthus*. Component of the pyranocoumarin samidin

Fatty acids

الحموض الدسمة

- These acids are important as components of plant oils (acyl lipids) in which they occur as esters with the trihydric alcohol glycerol.

• تعد هذه الحموض مكونات للزيوت النباتية، وتوجد بها على شكل استرات لكحول الغليسيرول ثلاثي الكربوكسيل

- They are also components of the resins of the Convolvulaceae and of waxes in which they are esterified with long chain alcohols.

• كما انها مكونات للراتينات الموجودة في نباتات الفصيلة الملتفة، وللشموع التي تكون فيها مؤسترة بكحولات طويلة السلسلة.

Fatty acids

They may be saturated (palmitic and stearic acids) or unsaturated (Oleic acid).

- يمكن ان تكون مشبعة (حمض البالمتيك والسيتياريك)، او غير مشبعة (حمض الاوليك)

Monocarboxylic acids

<i>Comon name</i>	<i>Systematic name</i>	<i>Structural formula</i>
Caprylic	<i>n</i> -Octanoic	$\text{CH}_3(\text{CH}_2)_6\text{COOH}$
Capric	<i>n</i> -Decanoic	$\text{CH}_3(\text{CH}_2)_8\text{COOH}$
Lauric	<i>n</i> -Dodecanoic	$\text{CH}_3(\text{CH}_2)_{10}\text{COOH}$
Myristic	<i>n</i> -Tetradecanoic	$\text{CH}_3(\text{CH}_2)_{12}\text{COOH}$
<u>Palmitic</u>	<i>n</i> -Hexadecanoic	$\text{CH}_3(\text{CH}_2)_{14}\text{COOH}$
<u>Stearic</u>	<i>n</i> -Octadecanoic	$\text{CH}_3(\text{CH}_2)_{16}\text{COOH}$
Arachidic	<i>n</i> -Eicosanoic	$\text{CH}_3(\text{CH}_2)_{18}\text{COOH}$

Fatty acids

- Less commonly they are cyclic compound such as hydnocarpic acid and the prostaglandins.
- The latter are a group of physiologically active essential fatty acids found in most body tissues and are involved in the platelet-aggregation and inflammatory processes.
- They promote smooth muscle contraction making them of clinical use as effective abortifacients and for inducing labour.
- البروستاغلاندينات : مجموعة من الحموض الدسمة الفعالة فيزيولوجيا، تتواجد في معظم نسيج الجسم، وهي مكتنفة في تكدس الصفائح وفي العمليات الالتهابية، تحسن من تقلص العضلات الملساء في جعلها ذات اهمية في الاستعمال السريري ، مجهزة فعالة ومحرضة للمخاض.

Prostaglandins

البروستاغلاندينات

- All the active natural prostaglandins are derivatives of prostanoic acid.

• كل البروستاغلاندينات الطبيعية الفعالة تشتق من حمض البروستانويك

• A rich source of prostaglandin A₂ (PGA₂) is the soft coral *Plexaura homomalla*

• أما المصدر النباتي الغني بالبروستاغلاندين A₂ فهو نبات المرجانة الرخوي

Fatty acids

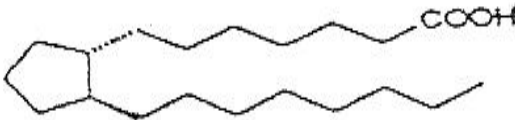
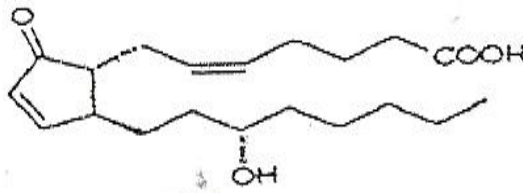
- The characteristic acid of castor oil, ricinoleic acid (hydroxyoleic acid) has both a hydroxyl group and an unsaturated double bond.
- A range of acetylenic fatty acids occurs throughout the plant kingdom and some of them possess antifungal and antibacterial properties.
- يوجد العديد من الحموض الدسمة الاستيلينية في المملكة النباتية، يملك بعضها خواص مضادة للفطريات، وخواص مضادة للجراثيم.

Fatty acids

Common name	Number of unsaturated bonds	Structural formula
Palmitoleic	1	$\text{CH}_3(\text{CH}_2)_5\text{CH}=\text{CH}(\text{CH}_2)_7\text{COOH}$
Oleic	1	$\text{CH}_3(\text{CH}_2)_7\text{CH}=\text{CH}(\text{CH}_2)_7\text{COOH}$
Petroselinic	1	$\text{CH}_3(\text{CH}_2)_{10}\text{CH}=\text{CH}(\text{CH}_2)_4\text{COOH}$
Ricinoleic	1	$\text{CH}_3(\text{CH}_2)_5\text{CH}(\text{OH})\text{CH}_2\text{CH}=\text{CH}(\text{CH}_2)_7\text{COOH}$
Erucic	1	$\text{CH}_3(\text{CH}_2)_7\text{CH}=\text{CH}(\text{CH}_2)_{11}\text{COOH}$
Linolenic	2	$\text{CH}_3(\text{CH}_2)_4\text{CH}=\text{CHCH}_2\text{CH}=\text{CH}(\text{CH}_2)_7\text{COOH}$
α -Linoicic	3	$\text{CH}_3\text{CH}_2\text{CH}=\text{CHCH}_2\text{CH}=\text{CHCH}_2\text{CH}=\text{CH}(\text{CH}_2)_7\text{COOH}$
γ -Linolenic	3	$\text{CH}_3(\text{CH}_2)_4\text{CH}=\text{CHCH}_2\text{CH}=\text{CHCH}_2\text{CH}=\text{CH}(\text{CH}_2)_4\text{COOH}$
Arachidonic	4	$\text{CH}_3(\text{CH}_2)_4\text{CH}=\text{CHCH}_2\text{CH}=\text{CHCH}_2\text{CH}=\text{CHCH}_2\text{CH}=\text{CH}(\text{CH}_2)_3\text{COOH}$

Fatty acids

Table 18.4. Cyclic unsaturated acids.

Common name	Structural formula
Hydnocarpic	$ \begin{array}{c} \text{CH}=\text{CH} \\ \quad \quad \\ \text{CH}_2-\text{CH}_2 \\ \quad \quad \\ \quad \quad \text{CH}(\text{CH}_2)_{10}\text{COOH} \end{array} $
Chaulmoogric	$ \begin{array}{c} \text{CH}=\text{CH} \\ \quad \quad \\ \text{CH}_2-\text{CH}_2 \\ \quad \quad \\ \quad \quad \text{CH}(\text{CH}_2)_{12}\text{COOH} \end{array} $
Gorlic	$ \begin{array}{c} \text{CH}=\text{CH} \\ \quad \quad \\ \text{CH}_2-\text{CH}_2 \\ \quad \quad \\ \quad \quad \text{CH}(\text{C}_{12}\text{H}_{23})\text{COOH} \end{array} $
Prostanoic	
PGA2	

Formation of olefinic fatty acids

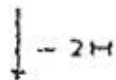
Acetate + malonate



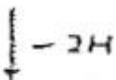
$\text{CH}_3(\text{CH}_2)_{14}\text{COOH}$ Palmitic



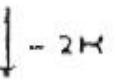
$\text{CH}_3(\text{CH}_2)_{16}\text{COOH}$ Stearic



$\text{CH}_3(\text{CH}_2)_7\text{CH}^{\text{cis}}=\text{CH}(\text{CH}_2)_7\text{COOH}$ Oleic



$\text{CH}_3(\text{CH}_2)_4\text{CH}^{\text{cis}}=\text{CH}-\text{CH}_2-\text{CH}^{\text{cis}}=\text{CH}(\text{CH}_2)_7\text{COOH}$ Linoleic



$\text{CH}_3-\text{CH}_2-\text{CH}^{\text{cis}}=\text{CH}-\text{CH}_2-\text{CH}^{\text{cis}}=\text{CH}-\text{CH}_2-\text{CH}^{\text{cis}}=\text{CH}(\text{CH}_2)_7\text{COOH}$ Linolenic

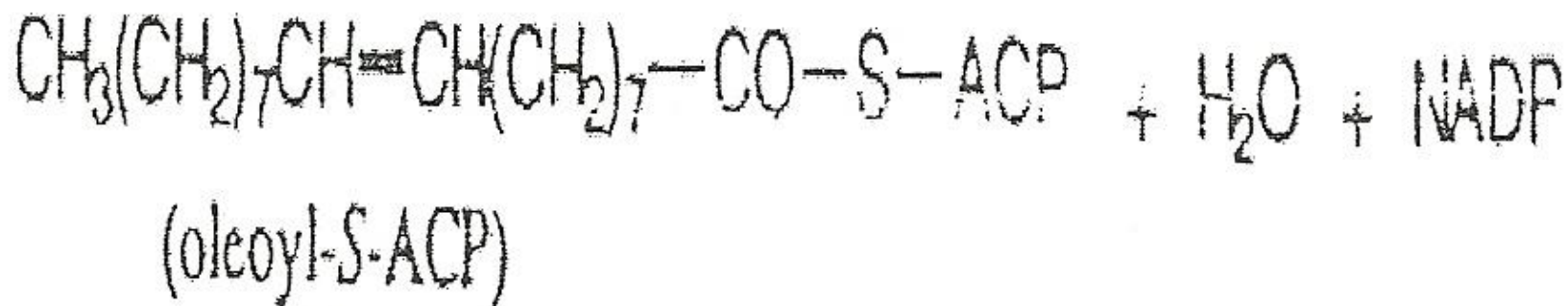
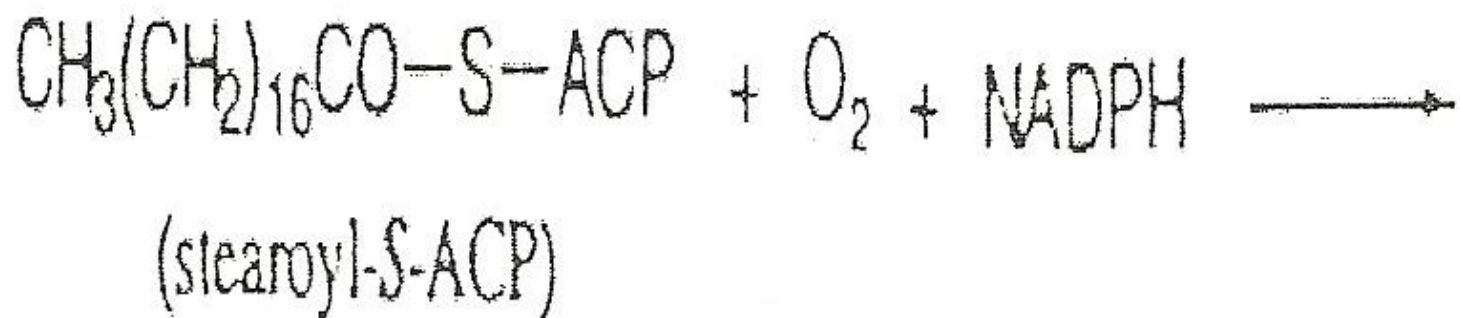
Fig. 18.1. Sequence of formation of olefinic fatty acids in plants.

Unsaturated fatty acids

Table 18.5. Comparison of symbols ascribed to unsaturated fatty acids.

<i>Common name of acid</i>	<i>Symbol employing biochemical equivalence of double bonds</i>	<i>Symbol based on chemical nomenclature</i>
Palmitoleic	16:1 (<i>n</i> -7)	16:1 (9 <i>c</i>)
Oleic	18:1 (<i>n</i> -9)	18:1 (9 <i>c</i>)
Petroselinic	18:1 (<i>n</i> -12)	18:1 (6 <i>c</i>)
Ricinoleic	18:1 (<i>n</i> -9) (hydroxy at <i>n</i> -7)	D(+)-12 <i>h</i> -18:1(9 <i>c</i>) (<i>h</i> = hydroxy)
Erucic	22:1 (<i>n</i> -9)	22:1 (13 <i>c</i>)
Linoleic	18:2 (<i>n</i> -6)	18:2 (9 <i>c</i> ,12 <i>c</i>)
Eicosadienoic	20:2 (<i>n</i> -6)	20:2 (11 <i>c</i> ,14 <i>c</i>)

Manufacturing of oleoys



PHARMACOPOEIAL AND RELATED DRUGS OF BIOLOGICAL ORIGIN

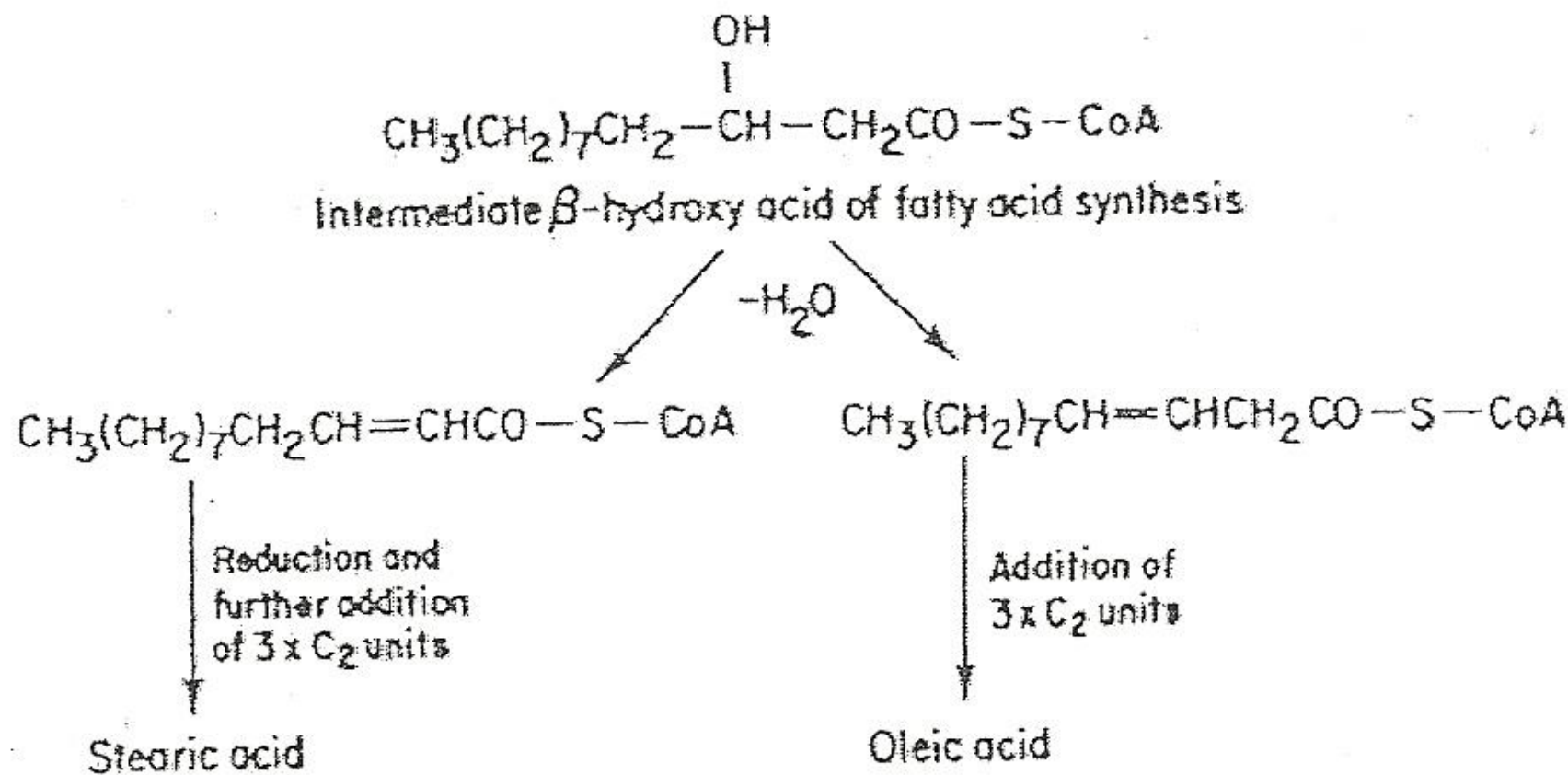
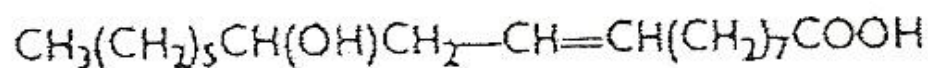
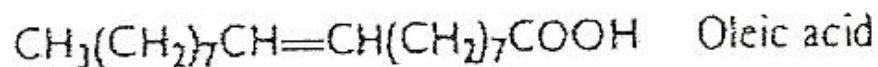
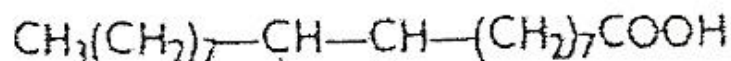
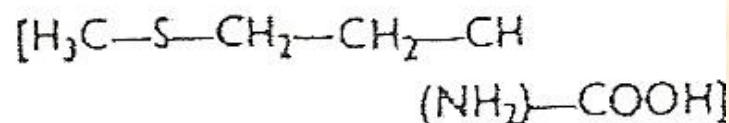


Fig. 18.2. Alternative pathways for synthesis of unsaturated fatty acids.

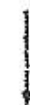


Ricinoleic acid

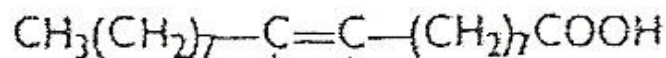
Methionine



Dihydrosterculic acid



2H

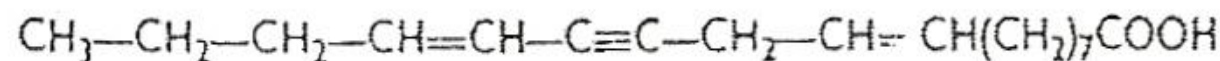
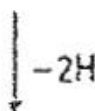
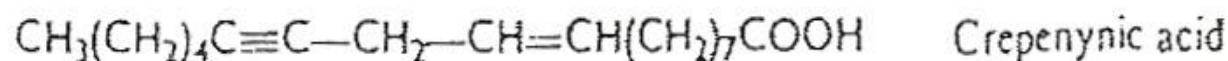
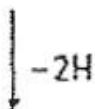
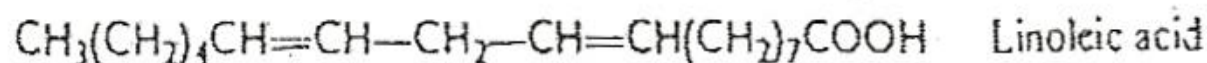


Sterculic acid



Fig. 18.3. Oleic acid as the precursor of ricinoleic and sterculic acids.

Formation of acetylenic fatty acids

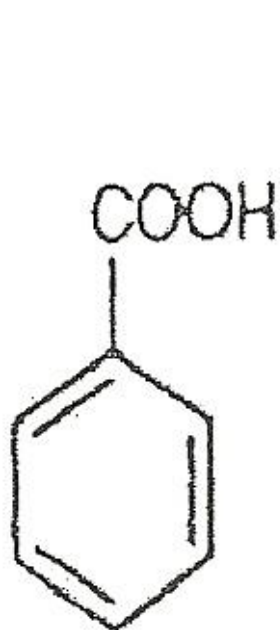


Dehydrocrepenynic acid

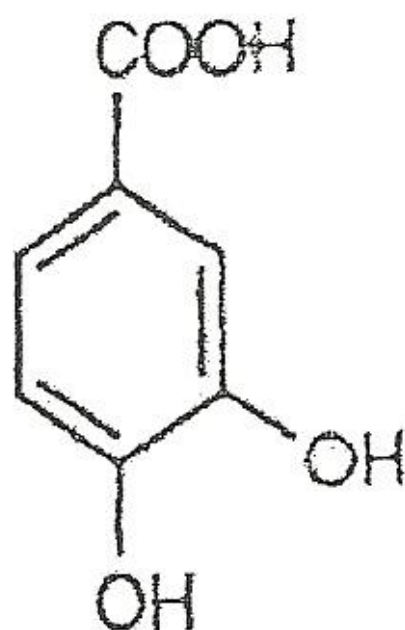
Range of acetylenes formed by further introduction of acetylenic bonds at the 'distal' part (furthest from carboxyl group) of molecules and by chain shortening in 'proximal' part of molecule.

Fig. 18.4. Formation of acetylenic fatty acids.

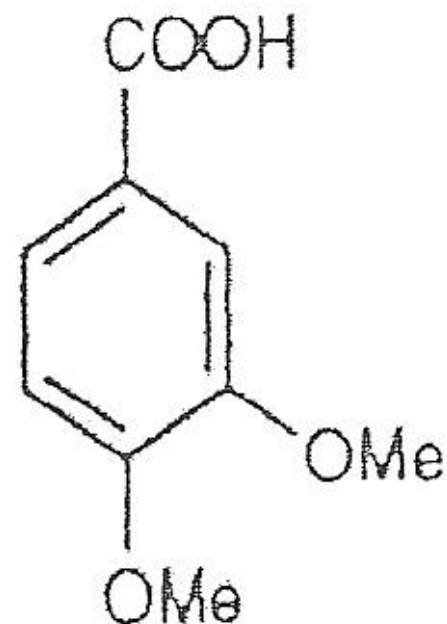
Aromatic cyclic acids



Benzoic
acid

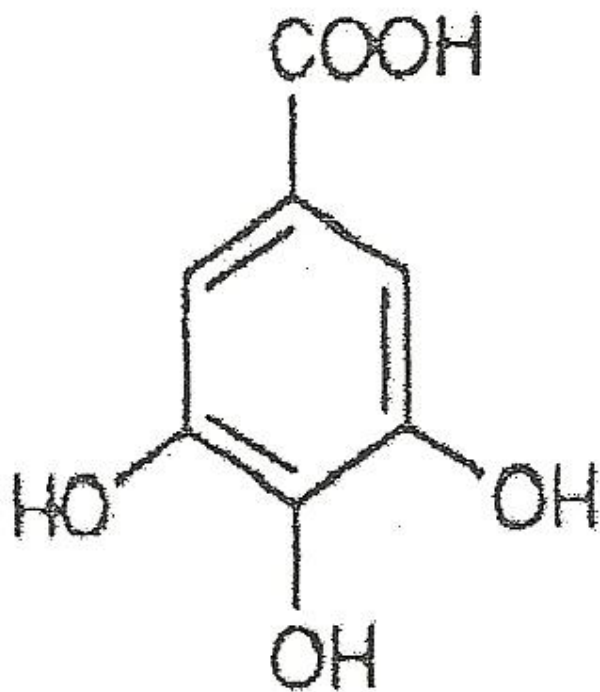


Protocatechuic
acid

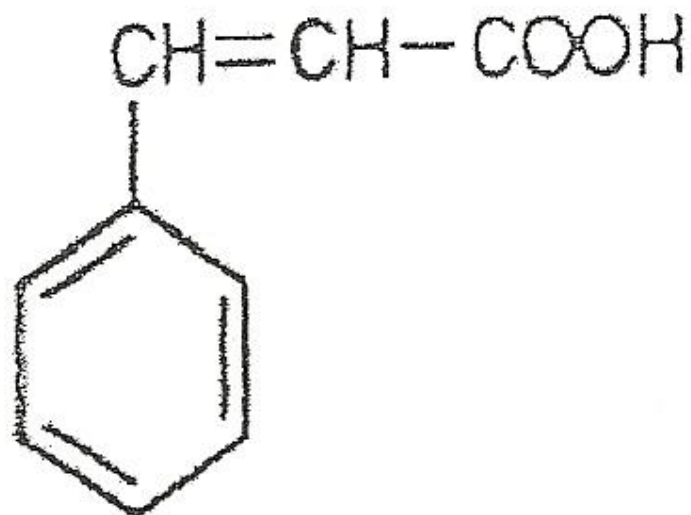


Veratric
acid

Aromatic cyclic acids

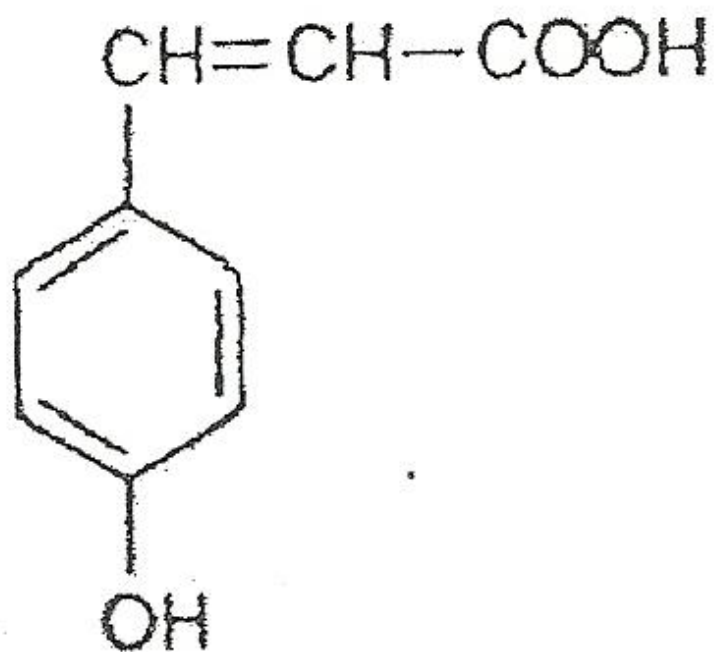


Gallic acid

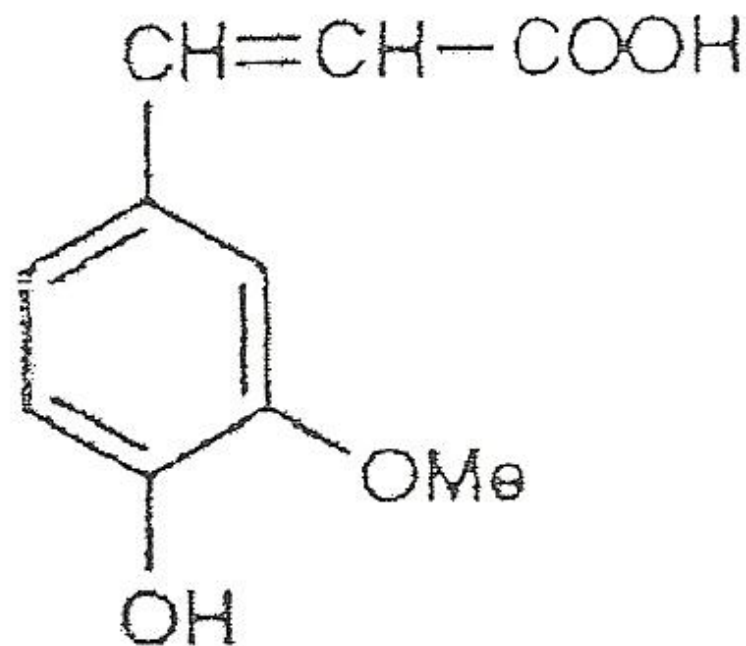


Cinnamic acid

Aromatic cyclic acids

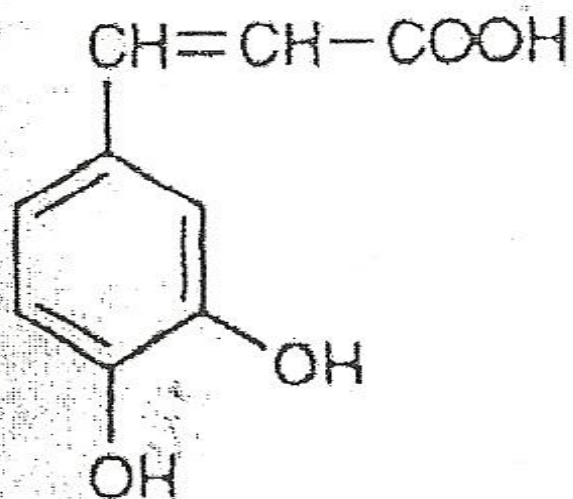


p-Coumaric acid

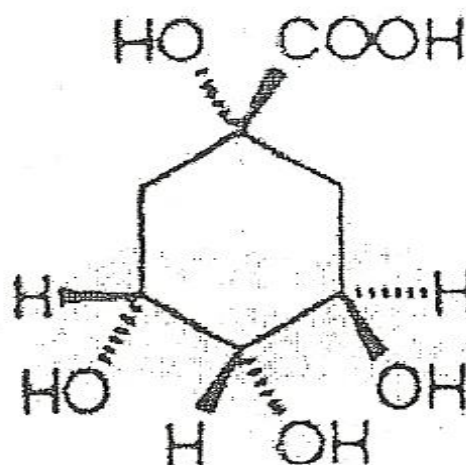


Ferulic acid

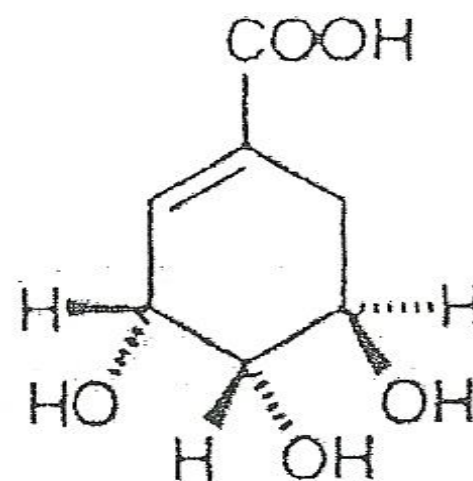
Aromatic cyclic acids



Caffeic acid



Quinic acid



Shikimic acid

Dibasic and Tri basic acids

الحموض ثنائية الأساس وثلاثية الأساس

- Oxalic acid, $(\text{COOH})_2$, forms the first of a series of dicarboxylic acids which includes malonic acid, $\text{CH}_2(\text{COOH})_2$, and succinic acid, $(\text{CH}_2)_2(\text{COOH})_2$.

● يشكل حمض الاوكساليك اول سلاسل حموض ثنائية الكربوكسيل التي تتضمن حمض المالونيك

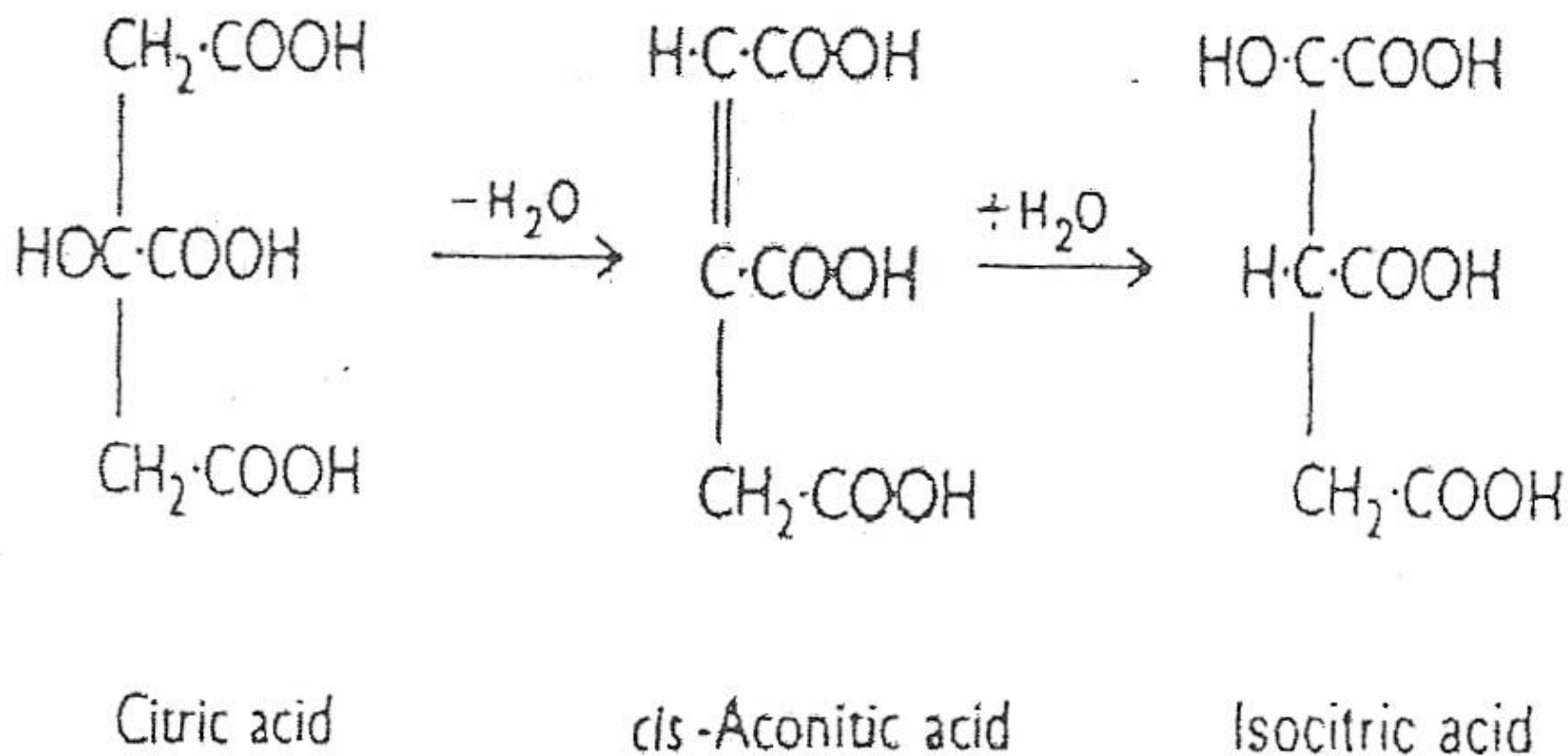
- Malic acid contains an alcohol group and has the formula $\text{COOH}-\text{CH}_2-\text{CHOH}-\text{COOH}$. It is found in fruits such as apples and tamarinds.

● يتواجد حمض الماليك في التفاح والتمر هندي

Dibasic and Tribasic acids

- A high percentage of tartaric acid, $\text{COOH}(\text{CHOH})_2\text{COOH}$, and its potassium salts occurs in tamarinds and other fruits.
- The tribasic acid is abundant in fruit juices, like Citric acid and aconitic acid, which occurs in *Aconitum* spp., is anhydrocitric acid.
- It forms part of the kreb's cycle and glyoxalate cycle in microorganisms.

Dibasic and Tri basic acids



Alcohols

- Possess one or more hydroxyl groups and exist naturally in either the free state or combined as esters.
- It can be classified in:
 1. Monohydric aliphatic alcohols
 2. Monohydric terpene alcohols
 3. Monohydric aromatic alcohols
 4. Dihydric alcohols
 5. Trihydric alcohols
 6. Polyhydric aliphatic alcohols

تصنيف الكحولات

- الكحولات الاليفاتية احادية الكربوكسيل
- الكحولات التربينية احادية الكربوكسيل
- الكحولات الاروماتية (العطرية) احادية الكربوكسيل
- الكحولات الثلاثية الكربوكسيل

Esters

الاسترات

- Many different types of esters are known, and those formed by acetylation of an alcoholic group are very common and are found in many biosynthetic groups of metabolites including volatile oils (linalyl acetate in lavender).

Esters

- Esters which involve aromatic acids such as benzoic and cinnamic acids with corresponding alcohols are sometimes found associated with free acids, other volatile metabolites and resins, in such products as balsams.
- A number of alkaloids (atropine and reserpine) are esters.

Esters

- A particularly important group of esters from the pharmaceutical viewpoint is that comprising the lipids or fatty esters. These involve a long-chain fatty acid and alcohols such as glycerol and the higher monohydric alcohols.

● المجموعة الهامة من الاسترات من وجهة النظر الصيدلانية هي التي تملك الشحوم او الاسترات الدسمة، انها تكتنف حمض دهني طويل السلسلة وكحولات مثل الغليسيرول

Lipids

الشحوم

- The term “lipid” includes not only fixed oils, fats and waxes (simple lipids), but also phosphatides and lecithins (complex lipids), which may contain phosphorus and nitrogen in addition to carbon, hydrogen and oxygen.
- يتضمن مصطلح lipid زيوتا ثابتة، ودهون وشموع وفوسفاتيدات وليستينات (معقد شحوم) التي تحتوي على فوسفور و نيتروجين بالاضافة للكربون والهيدروجين والاكسجين
- These substances are widely distributed in both the vegetable and animal kingdoms, and in plants they are particularly abundant in fruits and seeds.

Lecithins

- The lecithins are esters of glycerophosphoric acid in which the two free hydroxyls of the glycerol are esterified with fatty acids while one of the two remaining groups of the phosphoric acid is esterified to an alcohol(choline, ethanolamine, serine, glycerol or inositol).

• الليستينات هي استرات لحمض الغليسيرو فوسفوريك والتي تكون فيها مجموعتان من مجموعات الهيدروكسيل الحرة للغليسيرول مؤسترتين بحموض دسمة، بينما تكون واحدة من المجموعتين المتبقيتين لحمض الفوسفوريك مؤسفرة بأحد الكحولات (الكولين، الايتانول امين، السيرين، الغليسيرول او الاينوزيتول).

Lipids

Because plants have no mechanism for controlling their temperature, they must possess membrane lipids that remain mobile at relatively low temperatures. This property is conferred by the methylene-interrupted $C=C$ double bonds of the polyunsaturated acids bound as esters with the polar lipids.

Fats and fixed oils

- A naturally occurring mixture of lipids such as olive oil or oil of theobroma may be either liquid or solid and terms 'oil' and 'fat' have, therefore, no very precise significance. Coconut oil and chaulmoogra oil, for example, leave the tropics as an oil and arrive in Western Europe as a solid.
- In most medicinal cod-liver oils these solid materials are removed by freezing and filtration.

Drugs containing

Acids, Alcohols And Esters

العقاقير الحاوية على حموض وكحولات
واسترات

Tamarind pulp

التمر هندي

- Drug: the fruit (5-15 cm long, pulpy mesocarp, leathery endocarp with four to twelve chambers, in each of which is a single seed.) of the tree.
- Latin name: *Tamarindus indica*.
- Family: Leguminosae

Tamarind pulp

- Tamarind pulp occurs as a reddish —brown moist, sticky mass, in which the yellowish- brown fibers are readily seen.
- Odour, pleasant and fruity, sweet and acid.
- The pulp contains free organic acids, their salts.
- Nicotinic acid, invert sugar.
- يحتوي اللب على حموض عضوية (١٠ % طرطريك، السيتريك، الماليك)، واملحها والقليل من حمض النيكوتينيك.

Tamarind pulp

- Flavonoides (vitexin, isovitexin, orientin and iso orientin) occur in the leaves.
- Fixed oil in the seed contains a mixture of glycerides of saturated and unsaturated acids (oleic, linoleic).

Tamarind pulp

- Tamarind pulp is a mild laxative ملين خفيف and was formerly used in Confection of Senna; it has traditional medicinal uses. The leaves have been suggested as a commercial source of tartaric acid مصدر لحمض الطرطريك.

Manna

- The name 'manna' is applied to a number of different plant products.
- The biblical manna was probably the lichen *Lecanora esculenta*, which can be carried long distances by wind.

Manna

- The only manna of commercial importance is ash manna, derived from *Fraxinus ornus* from the family Oleaceae.
- The drug is collected in Sicily.
- When the trees are about 10 years old, transverse cuts are made in the trunk.
- A surgery exudation takes place and when sufficiently dried is picked off (flake manna) or is collected on leaves or tiles.

Benzoin

- Of the two commercial varieties of Benzoin-Siam and Sumatra Benzoin- only the latter is now included in the BP (1988).
- Sumatra Benzoin (Gum Benjamin) is a balsamic resin obtained from the incised stem of *Styrax benzoin* Dryand, and *Styraxparalleloneurus* Perkins from the family of Styracaceae.

Benzoin

- It is produced almost exclusively from cultivated trees grown in Sumatra.
- Siam benzoin derived from *Styrax tonkinensis*, is produced in a relatively small area in Siamese province and is mainly used in perfumery.

Constituents of Benzoin

1. Free balsamic acids (cinnamic and benzoic) and esters derived from them.
2. Triterpenoid acid (siaresinolic acid, sumaresinolic acid).
3. The total balsamic acids 20%.
4. The total tree acids 20%.

Uses of Benzoin

Benzoin, when taken internally, acts as an:

- Expectorant.
- Antiseptic.

It is mainly used as an ingredient of friar's balsam, or as a cosmetic lotion prepared from a simple tincture. It finds considerable use world-wide in the food, drinks, perfumery and toiletry industries; it is a component of incense.

Tolu balsam

بلسم الطولو

- Tolu balsam is obtained by incision from the trunk of *Myroxylon balsamum* from the family of Leguminosnae, a large tree which differs but little from that yielding balsam of Peru.
- Wild trees are abundant in Colombia and Venezuela.
- The trees are cultivated in the West Indies.

Constituents of Tolu balsam

1. About 80% resin derived from resin alcohols.
2. Free aromatic acids (15% free cinnamic acid, 8% free benzoic acid).
3. Numerous triterpenoids.
4. Tolu contains about 50% of total balsamic acids.

Uses of Tolu balsam

- Tolu balsam has antiseptic properties
خواص مطهرة.
- It was a common ingredient of cough mixtures, to which it was added in the form of syrup or tincture.
- يستخدم على شكل أمزجة مضادة للسعال على شكل شراب او صبغة

Peru Balsam

بلسم البيرو

- Balsam of Peru is obtained from the trunk of *Myroxylon balsamum var.pereirae* from the family of Leguminosae.
- The drug is produced in Central America and is now included in the EP and in the BP.

Constituents of Peru Balsam

- The official drug is required to contain not less than 45% and not more than 70% of esters.
- The chief balsamic esters present are benzyl cinnamate.
- The drug also contains about 28% of resin.
- Small quantities of vanillin and free cinnamic acid.

Uses of Peru Balsam

- Balsam of Peru is used as an:
 1. Antiseptic dressing for wounds. يدخل في تركيب الضمادات المطهرة للجروح
 2. Parasiticide. خارجيا يستخدم مضاد للطفيليات

Peru Balsam is used internally to treat catarrh and diarrhoea. Peru Balsam can produce allergic response.

له خواص مضادة للاسهال، ويمكن ان يتسبب استخدامه الموضعي بتفاعلات تحسسية

Prepared Storax

- Prepared Storax BP is a balsam obtained from wounded trunk of Liquidambar orientalis from the family of Hamamelidaceae and subsequently purified. This is known as Levant storax and is obtained from a small tree found in the south —west of Turkey.

Constituents of Storax

- Free and combined cinnamic acid.
- 30-47% balsamic acids.
- Resin

Uses of Storax

- Storax is chiefly used in the preparation of friars balsam benzoin inhalation.

Almond Oil

زيت اللوز

- Almond Oil is a fixed oil obtained by expression from the seeds of *Prunus amygdalus var.dulcis* (sweet almonds), *Prunus amygdalus var. amara* (bitter almonds) from the family of Rosaceae.
- The oil is mainly produced from almond grown in the countries bordering the Mediterranean.

Constituents of Almond Oil

- Both varieties of almond contain 40-55% of fixed oil. 20% proteins, mucilage, emulsin.

The bitter almonds contain in addition 2.5- 4% of the colourless, crystalline, cyanogenetic glycoside amygdalin.

Uses of Almond Oil

- Almond Oil is used in the preparation of many toilet articles and as a vehicle for oily injections.
- When taken internally, it has a mild, laxative action.
- The volatile almond oils are used as flavouring agents.

Arachis Oil

- Arachis oil is obtained by expression from the seeds of Arachis hypogaea from the family of Leguminosae, (earth-nut, ground nut, peanut) a small annual plant cultivated throughout tropical Africa and in India..

Constituents of Arachis Oil

- Arachis Oil consist of the glycerides of oleic, linoleic, palmitic, arachidic, stearic, lignoceric and other acids.

Uses of Arachis Oil

- Arachis Oil has similar properties to olive oil.

It is an ingredient of camphorated oil but is used mainly in the production of margarine, cooking fats and others.

Soya oil

- Soya oil is derived from the seeds of Glycine max from the family of Leguminosae.
- The principal esterifying fatty acids are linoleic (44-62%), oleic (19-30%), palmitic (7-14%), linolenic (4-11%) and stearic (1.4-55%).
- The BP oil may contain a suitable antioxidant.

Sesame Oil

- Sesame oil (Gingelly oil, Teel oil) is obtained by refining the expressed or extracted oil from the seeds of Sesamum indicum from the family of Pedaliaceae, a herb which is widely cultivated in India, China and many tropical countries.
- The oil is official in the EP and BP.

Sesame Oil

- The seeds contain about 50% of fixed oil which closely resembles olive oil in its properties and which it has, in some measure, replaced. It is pale yellow, bland oil which on cooling to about -40 solidifies to a buttery mass, it has a saponification value the same as that for olive and a somewhat higher iodine value (104-120).

Sesame Oil

- Principal components of the oil are the glycerides of oleic and linoleic acids with small proportions of palmitic, stearic and arachidic acids.
- It also contains about 1 % of the lignan sesamin and the related sesamolin.
- The characteristic phenolic component is the basis of the BP test for identity and also the test for the detection of sesame oil in other oils.

Olive Oil

- Olive oil (salad oil, sweet oil) is a fixed oil which is expressed from the ripe fruits of *Olea europea* from the family of Oleaceae. The olive is an evergreen tree, which lives to a great age but seldom exceeds 12 m in height.
- The oil is expressed in all the Mediterranean countries and in California.

Constituents of Olive Oil

Olive oils from different sources differ somewhat in composition. This may be due either to the use of the different varieties of olive or to climatic differences.

All Types contain Oleic acid (56-86%), linoleic acid (0-20%), Palmitic acid (7.5-20%) and stearic acid (0.5-15%).

Uses of Olive Oil

- Olive oil is used in the preparation of soaps, plasters, etc., and is widely employed as salad oil.
- Oil for use in the manufacture of parenteral preparations is required to have a lower acid value and peroxide value than the normally required, and to be almost free of water as determined by Karl fisher.

Castor Oil

- Castor oil (cold-drawn castor oil) is a **fixed oil** obtained from the **seeds** of ***Ricinus communis*** from the family of **Euphorbiaceae**.
- The fruit is a three - celled thorny capsule.
- The castor is a native of India; the principal producing countries are Brazil, India.

Constituents of Castor Oil

- Castor seeds contain 46-53% of fixed oil, which consist of the **glycosides of ricinoleic, isoricinoleic, stearic and dihydroxystearic acids.**
- **The purgative action of the oil** is said to be due to free ricinoleic acid and its stereoisomer, which are produced by hydrolysis in the duodenum.
- $\text{CH}_3(\text{CH}_2)_5\text{CH}(\text{OH})\text{CH}_2\text{CH}=\text{CH}(\text{CH}_2)_7\text{COOH}$

Uses of Castor Oil

- Castor oil is used as:
 - 1- a domestic purgative.
 - 2- Now is used after food poisoning
 - 3- and as a preliminary to intestinal examination.
- Owing(due) to the presence of resin, the seeds have a much more violent action than the oil and are not used as a purgative in this country.

Hydnocarpus Oil

- Hydnocarpus oil is the fixed oil obtained by cold expression from the fresh ripe seeds of
 - *Hydnocarpus* *weighting*,
 - *H. anthelmintica*,
 - *H. heterophylla* and other species of Hydnocarpus,
 - and also of *Taracogenos kurzii*
- These plants are found in India, Burma, Siam and Indo-China and belong to the Flacourtiaceae.

Constituents of Hydnocarpus Oil

- Hydnocarpus oil contains hydnocarpic acid, chaulmoogric acid, gorlic and other acids.
- They are strongly **bactericidal** towards the **leprosy micrococcus**, but the oil has now replaced by the ethyl esters and salts of hydnocarpic and chaulmoogric acid.

Coconut Oil

- Coconut oil is the expressed oil of the dried solid part of the endosperm of the coconut, ***Cocos nucifera* L.** from the family of **Palmae**, which is official in the BP.
- The plant is widely distributed throughout the tropics.
- Coconut oil is a semisolid, melting at about 24 C and consisting of the triglycerides of mainly lauric and myristic acids.

Uses of Coconut

- Coconut is used in the nutrition.

Palm Oil

- Palm oil is obtained by steaming and expression of the mesocarp of the fruits of *Elaeis guinensis* from the family of Palmae.
- Palm oil is yellowish- brown in colour, of a buttery consistency and of agreeable odour. Palmitic and oleic acids are the principal esterifying acids.

CottonSeed Oil

- Cottonseed oil is expressed from the seeds of various **species of *Gossypium*** from the family of **Malvaceae**.
- Cottonseed oil is used in the nutrition but only after refining (deleting of Gossypol) or only by cooking (heating to more than 60 C).
- Cottonseed is also used in the isolation of Gossypol.

Linseed and Linseed Oil

- Linseed (flaxseed) is the dried ripe seed of *Linum usitatissimum* from the family of Linaceae, an annual herb about 0.7 m high with blue flowers and a globular capsule. The flax has long been cultivated for its pericyclic fibres and seed.

Constituents of Linseed

- Linseed contains about 30-40% of fixed oil,
- 6% of mucilage.
- 25% of protein.
- Cyanogenetic glucosides linamarin and lotaustralin.

Linseed Oil

- Linseed oil is the extraction of linseed.
- The process is one of hot expression of a linseed meal.
- Linseed oil of BP quality is a yellowish - brown drying oil with a characteristic odour and bland taste.
- On exposure to air it gradually thickens and forms a hard varnish.

Uses of Linseed Oil

- Crushed linseed is used in the form of a poultice and whole seeds are employed to make demulcent preparations.
- The oil is used in liniments, and hydrolyzed linseed oil has potentially useful **antibacterial** properties as a topical preparation in that it is effective against *Staphylococcus aureus* strains resistant to antibiotics.

Evening primrose Oil

زيت زهرة الربيع المسائية

- Evening primrose oil is the fixed oil from the seeds of *Oenothera spp.* from the family of **Onagraceae**. It contains esterified γ -linoleic acid (GLA).
- يحضر من بذور انواع الاونوثيرا من الفصيلة الاوناغرية
- The beneficial effects of evening primrose oil may well be related to **affording a precursor of the prostaglandins** for those individuals whose enzymic conversion of linoleic acid to GLA is deficient.

Theobroma Oil

- Theobroma oil or cocoa butter may be obtained from the ground kernels of ***Theobroma cacao*** from the family of **Sterculiaceae**, by hot expression.
- Cocoa butter consist of the glycerides of stearic, palmitic, arachidic, oleic and other acids.
- It is the most expensive of the commercial fixed oils.
- Its principal pharmaceutical use is for the preparation of suppositories.

Lard

- Lard (prepared lard) is the purified internal fat of the hog, *Sus scrofa* (order *Ungulata*, *Suidae*).
- For medicinal purposes lard is prepared from the abdominal fat known as 'flare', from which it is obtained by treatment with hot water at a temperature not exceeding 57°C.

Lard

- Lard is a soft, white fat with a non rancid odour.
- Lard has a lower melting point (34-41 C).
- Lard contains 40% of solid glycerides such as myristin, stearin and palmitin and 60% of mixed glycerides such as olein.
- Lard is used as an ointment base but is no longer official in UK.

Wool Fat

- Wool fat (anhydrous lanolin) is a purified fat-like substance prepared from the Wool of the sheep, *Ovis aries* (Bovidae).
- Wool fat is a pale yellow, tenacious substance with a faint but characteristic odour.
- It is insoluble in water. Soluble in ether and chloroform.

Wool Fat

- The chief constituents of wool fat are cholesterol and ischolesterol, unsaturated monohydric alcohols.
- It is also contains aliphatic alcohols such as cetyl, ceryl and carnaubyl alcohols.
- Wool fat is used as an emollient base for creams and ointments.

Yellow Beeswax, White Beeswax

- Beeswax is obtained by melting and purifying the honeycomb of *Apis mellifica* and other bees.
- Beeswax is a true wax, consisting of about 80% of myricyl palmitate (myricin), it also contains about 15% of free cerotic acid, an aromatic substance cerolein, hydrocarbons, lactones, cholesteryl esters and pollen pigments.

Uses of Beeswax

- Beeswax is used in the preparation of plasters, ointments and polishes.

Carnauba Wax

- Carnauba wax derived from the leaves of *Copernicia cerifera* from the family of Palmae.
- The wax is hard, light brown to pale yellow in colour. Esters, chiefly myricyl cerotate are the principal components, with some free alcohols.
- Carnauba wax is used in pharmacy as a tablet coating agent and in the manufacturing of candles and leather polish and in phytocosmetics.