Volatile Oils

ان شاء الله حنبتدي باول محاضرة في الفايتو، دخل لنا الدكتور الحسيني وبدأ في ال v.o. Introduction

حقول كام نقطه كده قبل ماندخل في محاضرتنا :-

الفايتو في الترم الاول 3 أفرع اساسية :

1. Volatile oils
2. Carbohydrates
3. Bitter principles and tannins.

في الترم التاني حناخد فرعين أساسيين ألا وهم :

1. Alkaloids.
2. Glycosides.

لازم تعرف ان الترم صغير جدا حناخد 6 أسابيع قبل الـmid term و 6 أسابيع بعده....الميدتيرم حتلاقيه في أول شهر 11 ....و الفاينال حتلاقيه في أول شهر 1

V.O.=Essential Oil=Ethereal oil

➡ This course consists of Introduction and examples

The introduction consists of 5 points :

- Definition
- Occurrence (animal & plant source)
- Importance
- Preparation
- Examination

حنعرف ال.v.oوكمان نعرف هو جاي من اي نبات وكمان لازم تعرف ان ال oil اللي طالع من النبات ده مش حاجه واحده ؛ممكن الoil يبقي ليه اكتر من constituents

وكمان حنعرف اهمية ال.v.o سواء كانت medicinal value or pharmaceutical value

وحنعرف ازاي نحضره اللي هي ال method of preparation

بالنسبه لل examinationيعني نتأكد ان ال .v.o ده مظبوط عشان اول ماتديه ل patientكدواء سواء كان externally or internally ممكن يعمله التهابات ويعمل irritation فلازم افحص واعمل examine لل.v.o واتطمن ان هو مش مغشوش

1-definitions

- **Volatile oil**: complex liquid mixture of odoriferous principles of varying chemical composition which **easily evaporate when exposed to air at room temperature**.

- **Spices التوابل** : dried fragrant aromatic or pungent plant organs, parts of their powders that contains odoriferous principles which are **used for seasoning food (to import aroma and flavor) rather than nutrition**.

- **Flavors**: products or substances designed to be added to food, beverages and medicines **to mask or improve the taste or odor**

Natural flavors	e.g. menthol isolated from peppermint oil
Semisynthetic flavors	Obtained from natural raw materials of plant origin e.g. vanillin synthetized from Eugenol or lignin.

Synthetic flavors	Usually obtained from cheap starting materials such as petroleum and coal.
Flavoring preparations	

Function of essential oils or V.O.:

1- Sedative: e.g. sandal wood, lavender and chamomile oils.
2- Stimulants as peppermint oils
3- Adaptogens (herbal remedy help the body to adapt to stress) as rose wood and geranium oils.

المهم في الكلام الكتير اللي فات ده هو الاتي:

V.O. is any substance obtained by the **steam distillation** of plants

يبقي لازم تبقي Capable to steam distillation .... والا ماتبقاش .v.o.

Distribution of V.oil :

a) Distribution in nature		
Animal source		Plant source
Attractants	protectants	هناخدها بالتفصيل

1) Animal source:

- ***Attractants:***

Ex.

Attractants	
1) Musk	Is derived from the **male musk deer** ذكر الغزال
2) Civet	Is derived from the both male and **female civet cat.**
3) Castoreum	Is derived from different types of Russian, Canadian beavers called **Castors**. N.B. Castors قارض يشبه الفار

- ***Protectants:***

  Ex.

Protectants
Example: **Amber** العنبر **oil from the sperm whale** حوت العنبر.
These are produced as a defensive mechanism to protect the animal against injury, as in the case of ambergris that is obtained from the sperm whale.

الحاجات المهمة من الجداول اللي فاتت دي هي الامثلة ....احفظ الامثلة كويس ☺

2-Plant source

There are famous families that are rich in V.O. such as:

1. Rutaceae.
2. Umbelliferae.
3. Compositae.
4. Labiateae.

V.O. may accumulate in (vvvvv.imp):

1- **Flowers:** e.g. Rose, bergamot, tuberose, jasmine.
2- **Leaves:** citronella, Eucalyptus and laurel.
3- **Barks:** cinnamon and cassia.
4- **Woods:** rose wood and sandal wood
5- **Roots:** vetiver النجيل الهندي
6- **Rhizomes:** turmeric الكركم and ginger.
7- **Fruits:** anise, star anise الينسون النجمي and all spices.
8- **Seeds:** nutmeg جوزة الطيب, Cardamom الحبهان.

All the organs of a given species may contain essential oil, but the composition of the oil usually varies with the site of its production in the plant e.g.:

يعني تواجد ال v.o. مثلا في ال bark نسبته بتختلف عن ال leaf لنفس النبات.

Example :

1. Cinnamon oil …..obtained from		
Bark: is rich in Cinnamaldehyde. وده هو اللي مسئول عن ريحة القرفة .	Leaf: is rich in mainly Eugenol.	
2. The bitter orange tree: produces three different types of oil:		
a) Bitter orange oil	b) Neroli oil	c) Petit grain oil
From the fresh pericarp of the fruits.	From the flower	From unripe fruits, leaves, twigs.

Production of V.O

v.o. in the different plant tissue may be due to any of the following processes:

1. degradation
2. hydrolysis
3. direct biosynthesis in the cell protoplasm.

<u>خلي بالك من المعلومه دي :</u>

انا ممكن الاقي ال v.o. لوحده free وممكن الاقيه in combination مع حجات تانيه زي مثلا

1-Sugar part + v.o.(non sugar par) by acetal linkage =glycoside

2-Gum + v.o. = oleogum

3-Resin + v.o.= oleoresin

4-Gum + resin + v.o. = oleogum resin

V.O accumulate in specialized histological structures such as:

1. Oil cells	In lauraceae and zingiberaceae family.
2. Glandular hair	In labiateae family
3. Oil cavities (glands)	Rutaceae
4. Secretory canals (tubes)	Umbelliferae

Physiological significance of V.O

س)ايه هي فوائد ال.v.o للنبات؟

Benefits of v.o. to the plant

1- Attraction of insects
2- Defense mechanism
3- Solvents for wound healing resins
4- Elimination of certain abnormal metabolic pdts of the plant , and thus , may be detoxification pdts (i.e. Proton donors in certain metabolic reactions).
5- Energy producers.

الشرح:

بمعني ممكن ال .v.o تبقي رائحته حلوه فيقدر يجذب الحشرات الازمه لعمليه التلقيح مثلا وهكذا....

وممكن تبقي رائحته كريهه فيطرد الافات الضارة من النبات ك defense mechanism

ممكن ال .v.o يستخدم ك solvent ويقدر يعمل dissolve للresin عشان يعمل wound healingمثلا في حالات ال scratching فالنبات يقدر يعالج نفسه

ممكن ال.v.oبقدرته علي التطاير ان هو يطير ال toxic pdts ودي بنسميها عمليه detoxification

Benefits of v.o. to humans

1-Therapeutic value=medicinal value=aroma therapy

لها تأثير علاجي

2-Commercial value

اهميه تجاريه كالبرفانات والصناعات وكذلك التوابل مش بس نكهه دي كمان تستخدم كحافظه للاطعمه

3- pharmaceutical value

بتساعد في تصنيع الدواء وليس لها تأثير علاجي

Physical properties of V.O.:

1- Colorless (C.F. fixed oil)
2- Steam distilled (C.F. Fixed oil)
3- Have a high refractive index and most of them are optically active.
4- Immiscible with water
5- Soluble in common organic solvents and lipids (liposoluble).
6- They darken in color when exposed to light due to resinification).
7- 0n cooling, v.o. separate into: 1. Liquid fraction called oleoptene formed of hydrocarbons. 2. Solid fraction called stearoptene formed of oxygenated compounds.
Exceptions
1. Oil of lemon leaves on evaporation …a non-volatile gummy residue. 2. Oil of cinnamon , cloves, sassafras and winter green are heavier than water. N.B. Most V.O. are lighter than water except that example 3. Oil of anise and rose solidify just below room temperature (15, 18 ^{0}c). they may be solid in winter. 4. Oils containing azulenes are colored (e.g. oil of chamomile) …… لونهم اصفر

Chemical composition:

-All V.O. are complex and variable mixtures of constituents.

-Many types of hydrocarbons and oxygenated cpds such as alcohols, ketones, aldehydes, ethers, oxides, phenols, esters are found.

Factors affecting the chemical composition

1-The occurrence of chemotypes :

e.g.thyme is morphologically homogenous, it has different chemotypes:

- samples obtained from france contain Thymol, carvacol, geraniol as the major components.
- Samples obtained from spain contain Cineole.

الشرح:

يعني لو زرعنا النبات في مكان طبيعته تختلف عن مكان اخر اكيد محتويات النبات بتختلف برده ☺

2-Vegetative cycle:

e.g.The level of Linalol is 50% higher in the ripe coriander fruits than in the unripe fruits.

3-The environmental factors:

e.g.

*citrus زي الليمون والبرتقال>>> the higher the temperature, the higher the yield of the oil.

*peppermintالنعناع >>> temperate nights and long days leads to a higher yields of oil and an increase in the menthofuran level.

4-The cultivation practices التسميد

وجود سماد الازوت أو لا بيأثر في ال quality بتاعة ال oil ☺

5-The preparation method.

Q)) Compare between fixed and volatile oil

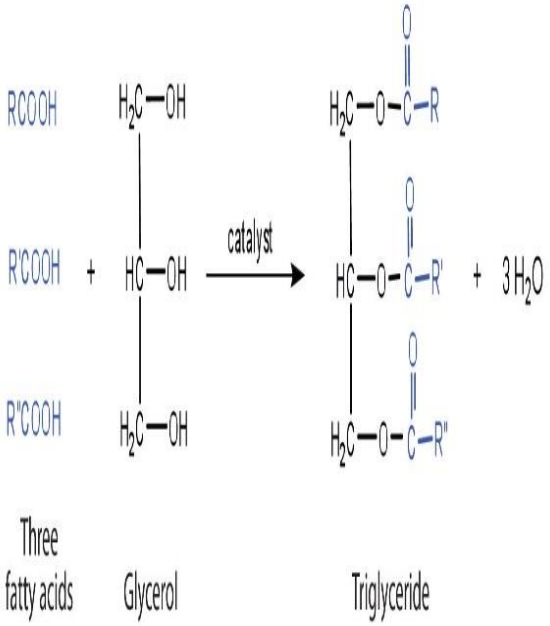
Fixed oil	Volatile oil
Cannot be steam distilled	Can be obtained by the steam distillation
Consists of glyceryl esters of fatty acids	They don't consist of glyceryl esters of fatty acids
Leave a permanent grease spot on filter paper	They don't leave a permanent grease spot on filter paper
Can be saponified with alkalies لان ال fixed oil عبارة عن ester	Can not be saponified with alkalies
On storage, they become rancid (rotten) N.B. Rancid تفسد/تتعفن	-On storage(on exposure to light and air),they oxidize and resinify=more viscous -they don't become rancid

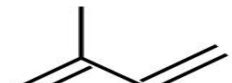
N.B.)

Chemotypes : have the same morphology but different chemical constituents

Example for chemotypes : fennel and bitter fennel

Chemical composition of V.O. and fixed oil:

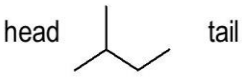
V.O.	Fixed oil
V.o. constituents are classified into: a) terpene hydrocarbons (aliphatic not aromatic): related to isoprene units or isopentene units (C5H8)	

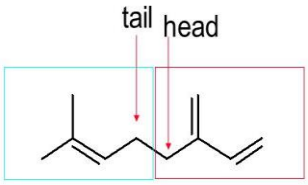


Isoprene (C_5H_8)

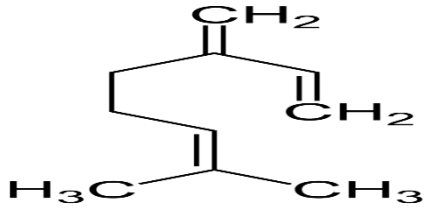
The Isoprene Unit

The isoprene units of myrcene are joined "head-to-tail".





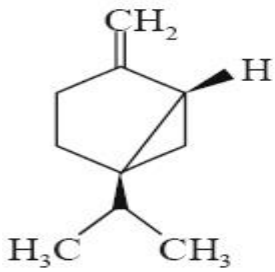
فلما.... 2 double bond فيهاisoprene unit ال يرتبط 2 units مع بعض بتتكسر one double bond وبالتالي ال monoterpene فيها 3 double bond وال sesquitepene فيها 4 double bond .... طب بالنسبة للacyclic monoterpene بيبقي شكله كده :



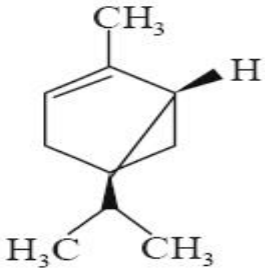
لاحظ وجود 3 double bond

طب بالنسبة لل monocyclic monoterpene حنضحي ب d.b. وتتكون cycle وبالتالي حيبقي موجود 2 d.b. ☺

طب بالنسبة لل bicyclic monoterpene حنضحي ب 2d.b. وتتكون 2 cycles وبالتالي حيبقي موجود 1 d.b.



Sabinene



α-Thujane

-which gives oxygenated derivatives of terpene HC (ex. Alcohols, aldehydes, ketones, ….) when oxygenation occurs.

b)Aromatic V.O.

- Phenyl propanoid (C6-C3)

ال c6 ثابته لانها phenyl اللي هي مصدر ال aromaticity بينما ال C3 ممكن تتغير ل c2 او c1

a) Nitrogen, sulfur or lactone containing cpds.

Classification of Terpenes

TYPE OF TERPENE	NUMBER OF CARBON ATOMS	ISOPRENE UNITS
Hemiterpene	C_5	one
Monoterpene	C_{10}	two
Sesquiterpene	C_{15}	three
Diterpene	C_{20}	four
Sesterterpene	C_{25}	five
Triterpene	C_{30}	six
Tetraterpene	C_{40}	eight
Rubber	> 500	> 100

NOTE: hemi = half
sesqui = one and a half
di = two
tri = three
tetra = four

N.B.

Hemiterpene (C5) , monoterpene (C10) and sesquiterpene (C15)are volatile (C10-C15).

Aromatherapy

Is a branch of complementary medicine which depends on the use of aromatic plants and their extracts mainly the essential oil to promote health, beauty and vitality الحيوية.

The end

By A.M.