

● هاد الشابتير حكت الدكتوروة بتحبه كثير يعني ركزوا عليه بالدراسة

Note

Pharmacognosy

PREPARATION OF CRUDE DRUGS FROM MEDICINAL PLANTS

Cultivation, collection and processing of
herbal drug

References

Trease and Evans, Pharmacognosy

Dr. Jamila Dibas

Dr. Talal Abu rojai

إعداد الطالبة: آلاء العتوم

GRAPHICAL OUTLINE



collection



drying



Grinding



crude drug



By Erhirhie Earnest O.



Preparation of drugs for commercial market

- **Crude drugs:** undergo only drying and preparation by grinding.
- Preparation of drugs for commercial market includes:



1. Collection
2. Harvesting
3. Drying (By airflow or complete drying operation)
4. Garbling غرلة
5. Storage and preservation

Collection of medicinal plants

Time of collection affects both quality and quantity of active constituents.

It has been found that active constituents in plants vary in amount and nature throughout the year so **Seasonal Collection** is required.

For example: Rhubarb contains no anthraquinone in winter, instead it contains anthranols, In summer, anthranols are oxidized to anthraquinones (active constituent) so Rhubarb collection must be in summer.

use as laxative → anthraquinone.



بعض اوقات السنة
بنقطعها باليد
على شكل "anthraquinone"
بعضها مؤكسدة أما بالشار
بتختزل ويتحول الى
"anthranol"

Collection of medicinal plants

2. Time of the Day

- Flowers : Morning

لأنه نسبة الماء بالصبح تكون عالية

- Leaves (exceptions are available) : afternoon

mint , wild Thyme , sage
النعنع الزعتر المرصع البرصع

3. Stage of maturity and age:

- Clove: buds



لما collection (ال Clove) يسير لون البuds من green ل pink red

- leaves: at flowering stage.

يعني لما تكون البذور في بداية التوزيع يعني لسا ما نورت بشكل كامل

ميرمية
eg: sage



استخدم
as analgesic
مسكن

Collection of plant materials:

- Suitable time for collection the amount of a constituent is usually not constant throughout the life of a plant.
- [?] **Roots** and rhizomes should be collected in the **raining season**. In most cases they must be washed free of adhering soil and sand.
- [?] **Bark** should be collected in the dry season.
- [?] **Leaves** should be collected at the flowering stage.
- [?] **Flowers** should be collected when fully developed and also in the morning after the morning dew had evaporated. [?] **Fruits** and **seeds** should be collected **when fully ripe**.
- [?] Whole plant should be collected during flowering stage





إعادة للحي القلب

- Generally, when, plant part reaches it's optimal state of development, it is assumed that the targeted active constituent is in highest concentration:
- **1. Roots and rhizomes collected at the end of the ~~in autumn~~ **vegetation** period.**
- **2. Bark is collected in the spring.**
- **3. Leaves and herbs are collected when photosynthesis is most active and before fruit maturation.**
- **4. Flowers are usually gathered when fully developed.**
- **5. Fruits and seeds are collected when fully-grown and ripe.**
- **6. Seeds: fully matured and before the fruits have opened**

Preservation

سابقہ

- Preservation aims at limiting **decomposition** processes as much as possible.
- The plant material must first be preserved so that the active compounds will remain unchanged during transport and storage.
- Factors that might affect the quality of crude drugs:
 1. Light
 2. Oxygen
 3. Attacks by insects (this can be achieved by using methyl bromide or heating up to 65C
 4. Low Temperature

Preservation of plant materials

- After collection, the plant material must first be preserved **so that the active compounds** will remain **unchanged** during transport and storage.
- The most common method for preserving plant material is **drying**. Living plant materials have high water content:
 - [?] **Leaves** may contain 60-90% ما يطرأ على حرارة عالية عشوائياً ما يتغير لونها
 - [?] **Roots** and **rhizomes** 70-85%
 - [?] **Wood** 40-50%
 - [?] **Seed** contains 5-10%

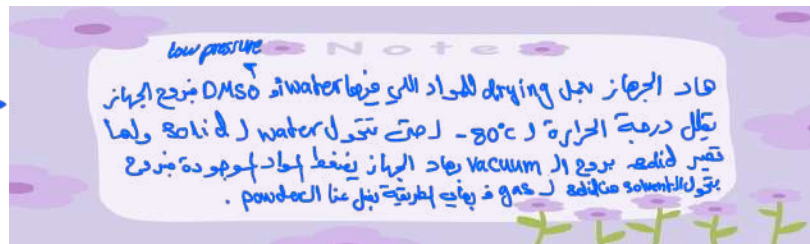
النظام مطلوب من هنا
مختص

Drying of crude drugs

- **Aim of drying:**
- 1. Remove moisture since it favors spoilage due to microbial growth
- 2. Prevents molding
- 3. Prevents enzymatic action
- 4. Prevents bacterial action.
- 5. Prevents chemical changes
- 6. Fixes cost.
- 7. To facilitate their grinding.
- 8. To reduce their size and weight.

Drying medicinal plants?

- 1. Drying in open air: in sun and under cover sheds at night or during wet weather, e.g. clove, cinnamon,...
- 2. Artificial oven drying (Oven-drying is more rapid than air-drying, controlled temp. In oven – drying , flowers and leaves are usually dried below 60° C to retain color , while roots and barks may be dried at slightly higher temperature.
- 3. Vacuum drying: in oven, rapid and at low temp.
- 4. **Lyophilization (Freeze Drying)** used for biological fluids, enzymes, proteins and royal jelly. No heat involved.



Chilis drying



- **In order to keep crude drugs for longer periods:**
- 1. It is essential to store them in a dry condition in carefully closed containers.
- 2. It is also advisable to exclude light, because - even if it does not affect the active constituents - it almost always causes changes in the appearance of the drug, especially loss of color.
- 3. It is also necessary to protect the drug against insect attack.

Grinding (size reduction of plant materials):

- the first operation that must be performed after drying is grinding of the plant material to a powder of suitable particle size.
- [?] Large particles take a longer time for complete extraction than small ones and large differences in particle size thus slow down the extraction process.
- [?] The purpose for powdering the plant material is to rupture its tissue and cell structures so that its medicinal ingredients are exposed to the extraction solvent.
- [?] Furthermore, size reduction maximizes the surface area, which in turn enhances the mass transfer of active principle from plant material to the solvent.

Preparation: Grinding of crude drugs

First step in preparation is grinding of the plant material to a powder of suitable particle size.

Grinding **decreases the particle size** and **increase the surface area**.

1. Mortar and pestle.

بالعبارة الكثيرة

2. Hammer mill a common type for grinding crude drugs.

طاحونة

3. Knife mill is useful for production of **low-dust powders** of leaves, barks and roots for subsequent percolation or maceration.

تفتيت

نقع



➤ Machines are available for grinding crude drugs



Mortar and pestle



Hammer mill, Knife mill



Electrical blender

غربلة

Sieving and Garbling

- Simply it is removing of external matter
- In garbling the material is passed through a sieve of suitable mesh size giving two fractions. The remaining fraction consists of coarser particles which are returned to the mill for continued grinding.



Storage

- Well-dried and well-stored plant materials **can be used up to 6 months after the collection.**
- **Discard the plant materials** if there are molds or other signs of decay.
- Use glass, ceramic pot as cooking ^{آٹا کی} utensils, stainless steel pot can also be used.
- ^{leak ہوتا ہے} Plastic may be used but not for storing crude drugs with volatile oil. *e.g.: Sage.*
- **Do not use pots** made of aluminum, iron, tin ^{فوس} or other metals as these will leach into the tea.
- Use pure water (distilled water). ^{plant powder}

Extraction and Separation of natural drugs

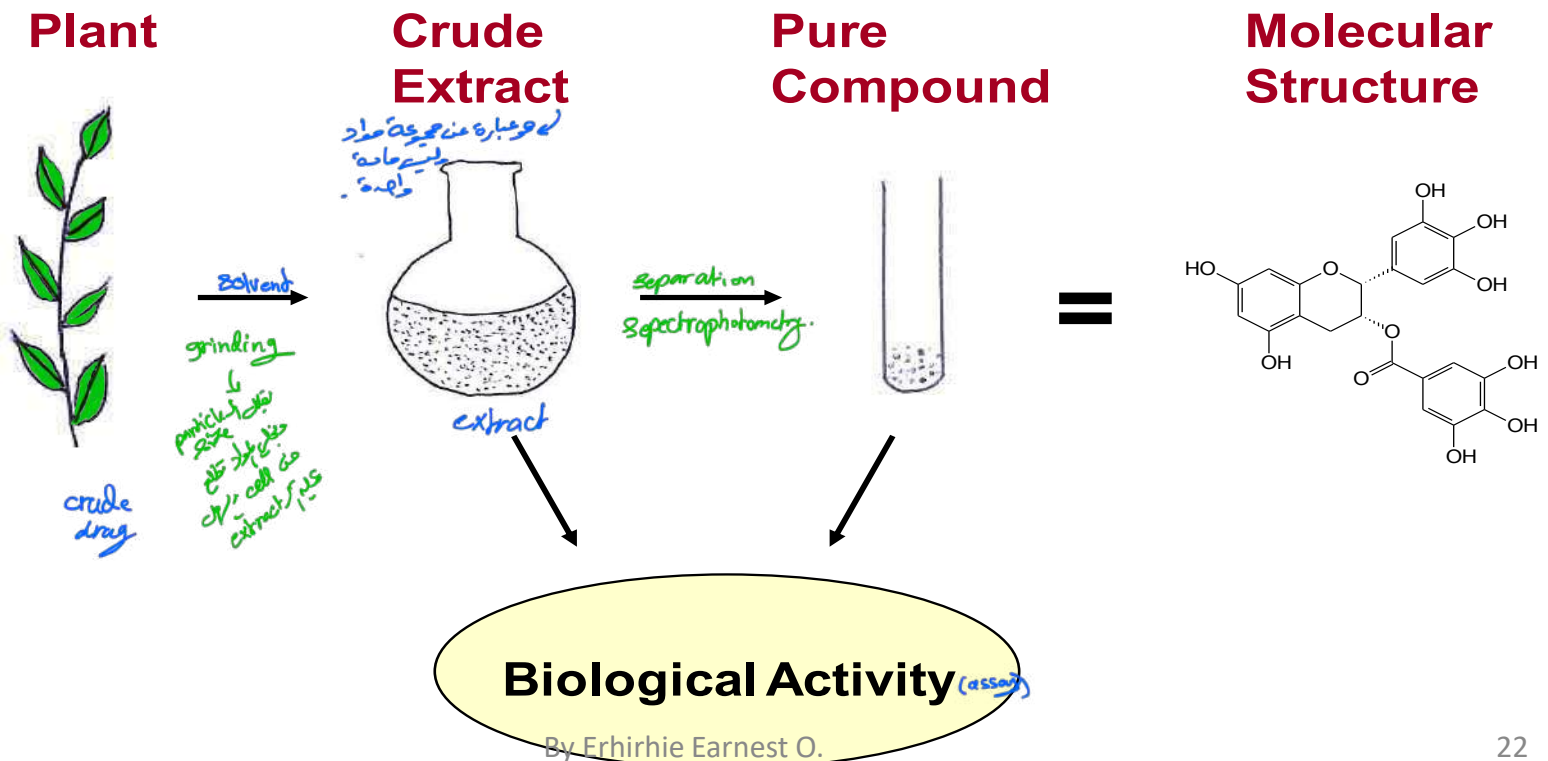
➤ INTRODUCTION

Extraction: This is the separation of medicinally active portions of plant from the inactive components by using selective solvents in standard extraction procedures.

استخراج
Extract: This is a preparation of crude drug which contains all the constituents which are soluble in the solvent used in making the extract.

→ separation active component from inactive component.

From Plant to Drug



➤ BASIC PRINCIPLE IN EXTRACTION

Plant constituents are usually contained inside the cells.

Therefore, The **solvent used** for extraction **must** ^{يتنشر} **diffuse** into the cell to dissolve the desired compounds.

Extraction and Separation of natural drugs

- The commonly employed technique for removal of the active substance from the crude drug is called **extraction**
- **The forms in which plant drugs are used:** الأشكال التي تستخدم فيها الأدوية النباتية:
 1. Fresh plant material
 2. Dried plant material
 3. Acellular products like Volatile oil, Resins, and fixed oils
 (olive oil) ما ينتج من الزيوت الثابتة (olive oil)
 زيوت ثابتة
 زيوت ثابتة
 4. Galenical preparation and extracts
 5. Processed extracts



1. Fresh plant material

- Predominantly used in folk and herbal remedies.
- Fresh plant material is often required by the **flavor industry** and is also used by the **perfumery industry** where the volatile oils from fresh materials, such as flower petals, are ~~highly prized~~ and highly priced.

عطر
لبناني

2. Dried plant material

The method of drying depends on the nature of the plant material and the active constituents. **Plants containing** volatile oils lose much of their aroma if dried at elevated temperature and, if required for their volatile content, must be dried extremely carefully.

Plant material obtained in ^{المناطق الاستوائية} **the tropics** is normally sun-dried, often being **bleached** during the drying process.

← يتكون لونها رابع
يعني ما فيه لون

وقت معالجة

Processed extraction

- If the active constituents are not present in a free form but need liberating by enzymatic processes, care must be taken not to dry the plant too quickly. For example, **vanilla pod**, the source of natural vanillin, contain the phenolic glycosides glucovanillic alcohol. During the curing process, which involve **slow drying**, the **glycoside** is enzymatically **hydolysed**^① and **oxidized**^② to vanillin.

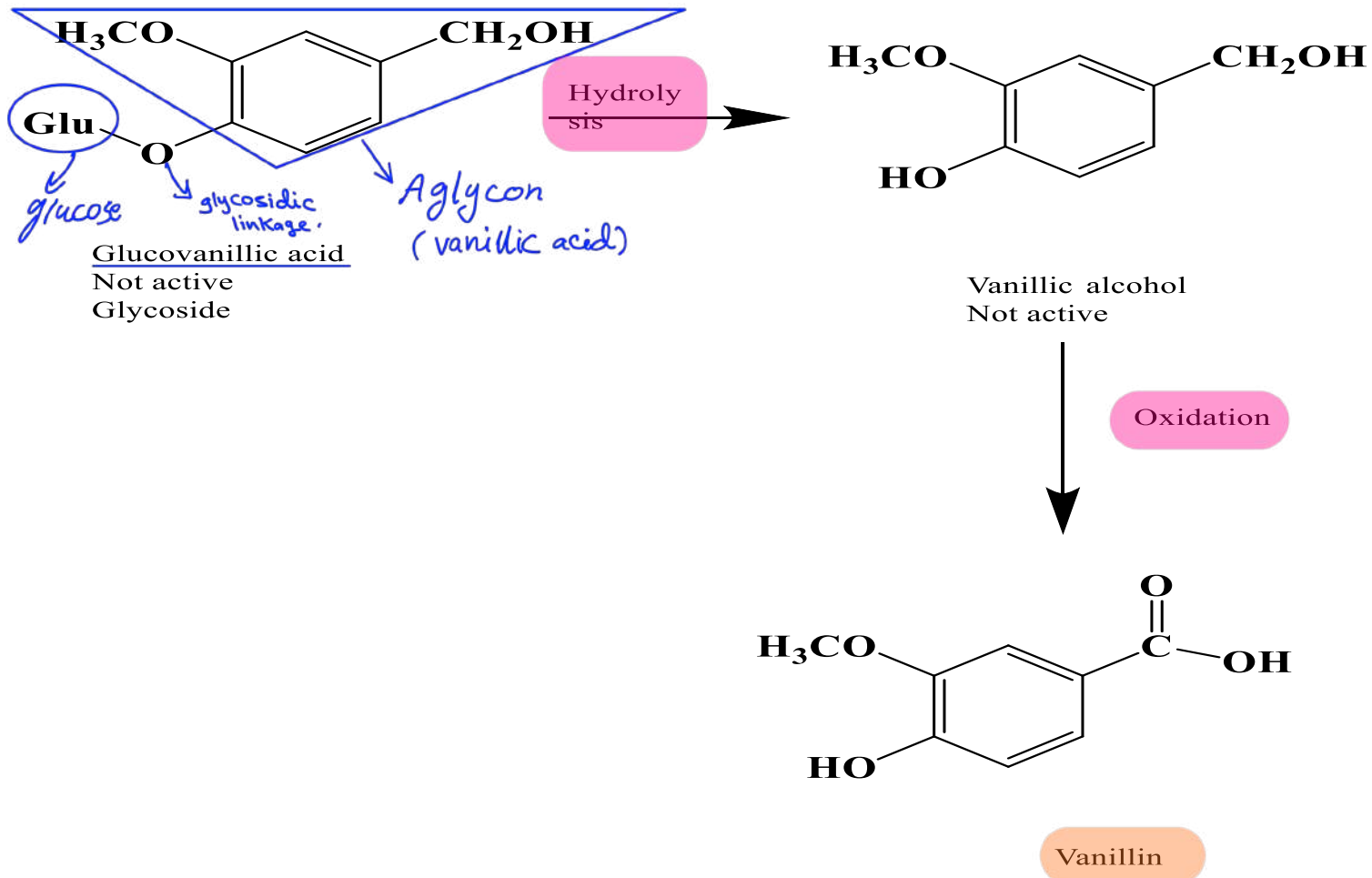
Vanilla *Vanilla planifolia*



Enzymatic hydrolysis.

Some active constituents need to be processed (slow drying is allowed)

Liberation of active vanillin by enzymatic process from *Gentiana Luten* and Vanilla pod



3. Acellular products

They are plant isolates like volatile oil, balsams, resins and fixed oils.

Methods to extract acellular products (Volatile oils):

- 1. **destructive distillation:** wood of **Scotch pine** (used for dermatitis)
من قشور الخشب الصنوبر "cool tar" العطران
- 2. **Steam distillation using Clavenger tube:** plant material is heated with water and steam is passed through the mixture and condensed. This needs a round-bottomed flask *قارورة* that contains water or alcohol (usually water), the plant is inserted inside it with the water, then it's attached into a condenser, also a collecting tube should be there to collect the extracted oil, distillation also requires a heat source, **if the treated material is very sensitive for heat (thermo labile) the steam distillation can't be used then, but other methods like:**
التي لا تتحمل الحرارة العالية
- ~ **Hydrosteam distillation:** here the plant is separated from the water by a membrane, the plant part is inserted to the membrane and by water heating, the vapor passes this membrane to the plant material, the v.o. is then extracted.
التي لا تتحمل الحرارة العالية

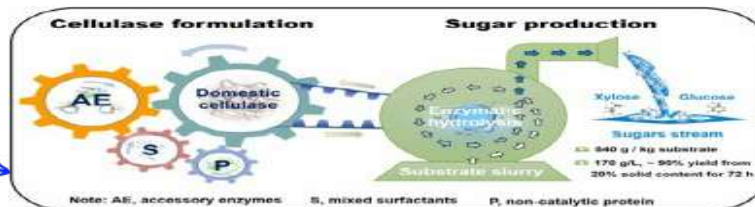
method of acellular depend on boiling point is (steam distillation)

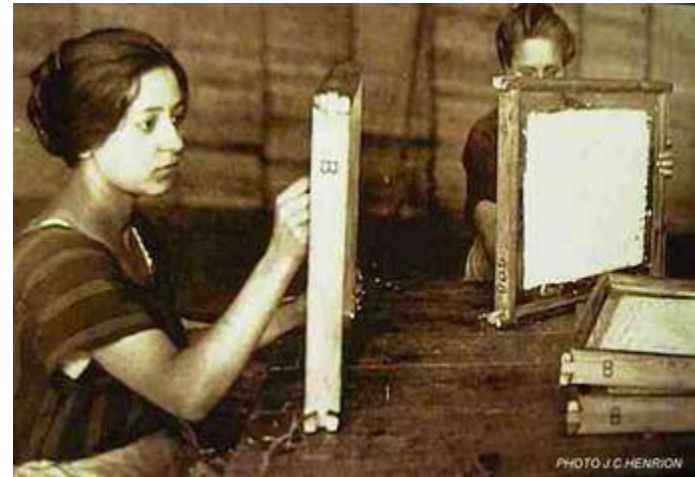
بواسطة الغشاء الذي يتأثر بالحرارة يستخدم فيه الطريقة

3. Acelleular products



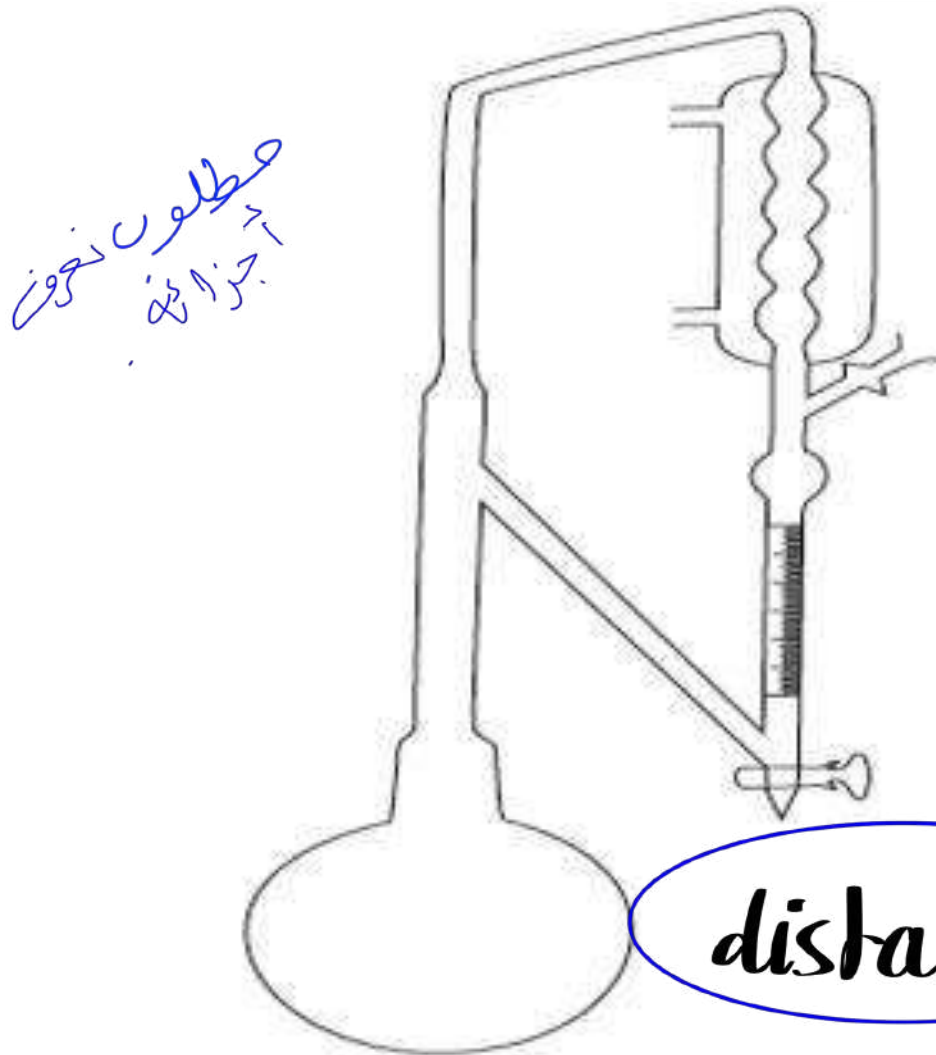
- **3. Expression** ^{العصر} used **pharmaceutically for citrus oils only**, fruits are turned by a stainless steel perforated roll, each pore is attached into an opening ending into a collector, upon turning these pores are induced.
- **4. Solvent extraction , using alcohol**, not used in pharmaceutical industry.
- **5. Enzymatic hydrolysis**: very uncommon , some **V.O. that has a sugar part** force to use this method to extract the non-sugar part (previously mentioned example: **Vanilla**).
- **6. Enfleurage**: in **expensive perfume industry**, an old method that uses sheets of waxes or fatty solid materials, the plant is inserted into these glassy sheets, then put in woody frames for a week or 2 weeks in a dark area, then the plant part used is removed and the sheets then are treated with alcohol to produce a concentrate of these v.o.





3. Acellular products

VOLATILE OIL STEAM DISTILLATION



هائي لعلية يستعمل فيها
ال "Volatil oil"

Clavenger tube

← مبادئ عمل حاد الجهاز :-

بنجيب النباتات التي تحتوي على "Volatil oil"
ويختار مع ماء أو كحول من الأحسن الماء ويضعها
بسخن في flask وال volatil oil مع تنفخ على درجات
حرارة قليلة ويستعمل بالcondenser الذي يعمل على
تبريد البخار ويحول إلى liquid ويخرج بنجوع ال "Volatil oil"

distillator

← disadvantage لحاد الجهاز :-

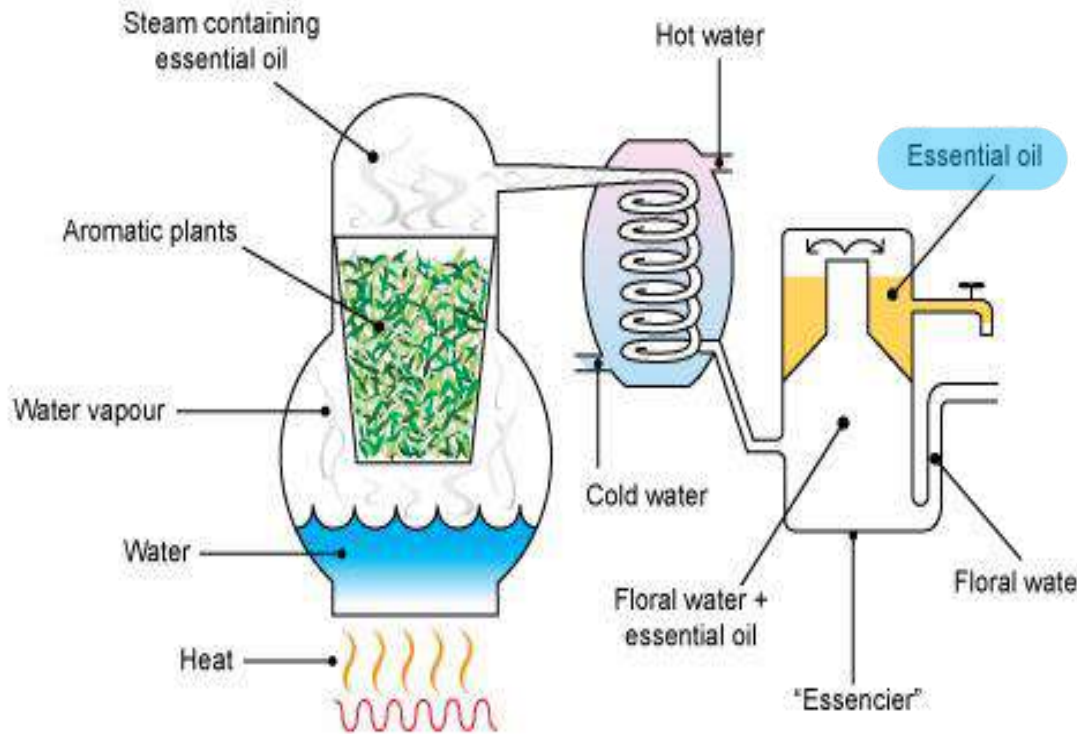
- ① إذا كانت النبتة تحتوي على material thermo labile
العالية مع تنفس .
② citrus oil بالعادة يتفخ .

Figure 1. Clevenger-type apparatus — Appareil de type Clevenger.

3. Acellular products

VOLATILE OIL STEAM DISTILLATION

Hydro-steam distillation



Clavenger tube

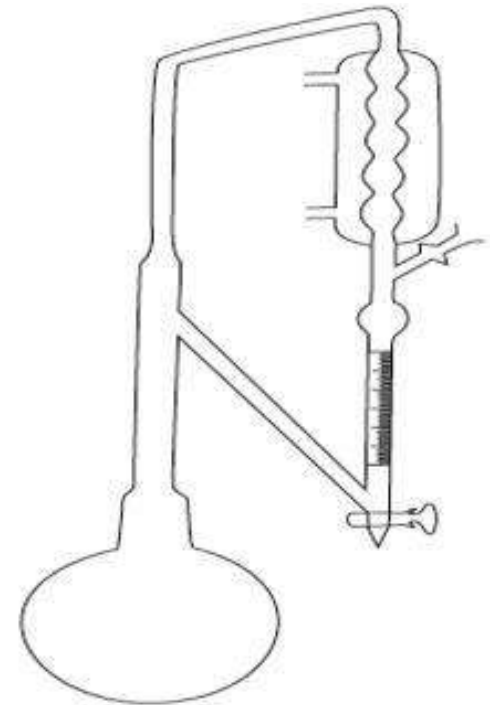


Figure 1. Clavenger-type apparatus — *Appareil de type Clavenger.*

عملية التقطير لتحضير الزيوت الطيارة

VOLATILE OIL STEAM DISTILLATION

- **Principle:** When water is mixed with another immiscible liquid and both are boiled together boiling will occur at lower temperature than the water's **boiling point** منخفضة أكثر من نقطة الغليان عملية التقطير التي تتم مع الماء Steam distillation
- Plant material is heated with water and steam is passed through the mixture and condensed
- **Disadvantage of steam distillation:**
- **1.** unstable material may be destroyed
- **2.** other substances in the plant may affect the composition of the oil e.g: citrus oil.
- **Ex.** In Citrus spp. The acidic nature cause a number of acid catalyzed rearrangements so another method should be used.

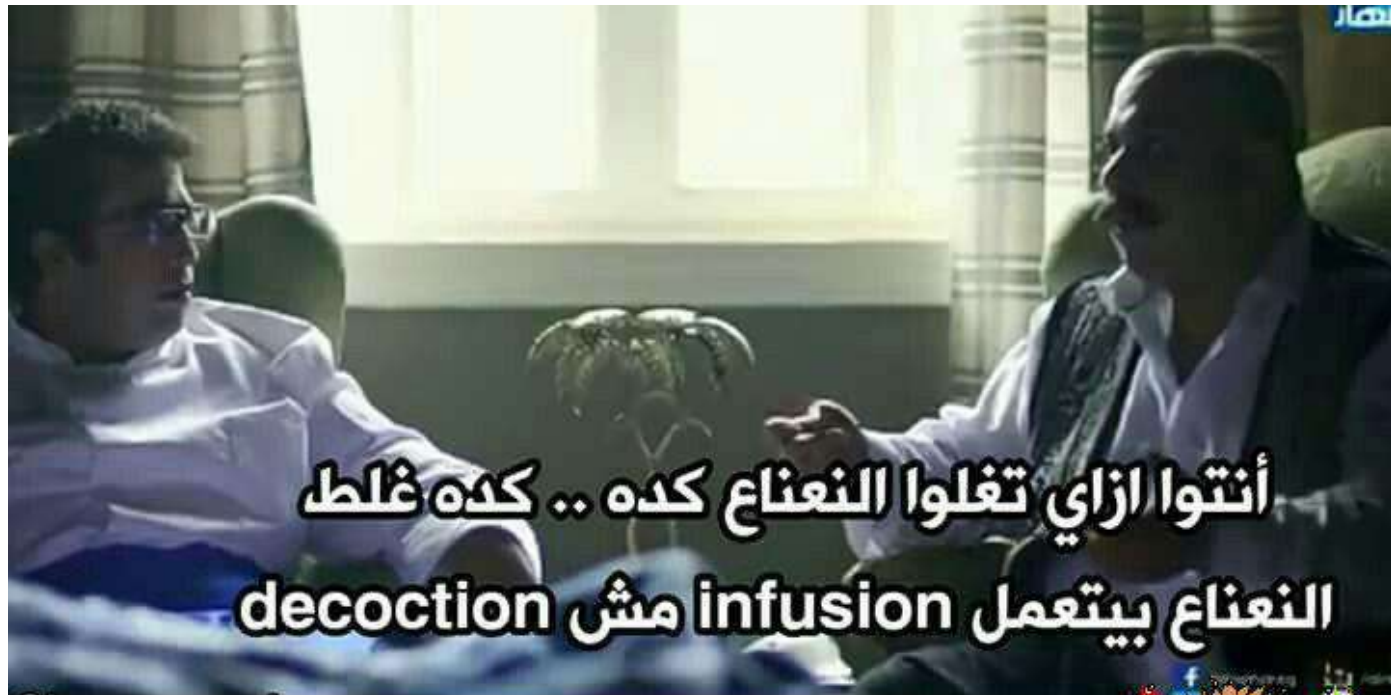
4. Galenical preparations and extracts

- Galenical: مستحضر طبي من اصل نباتي
- Galenical preparations: Are extracts of plant materials used in therapy.
- **Methods of extraction to any plant:**
- **A. Infusion** : ^{النقع} drug stood in hot or cold water or other solvent for a short period of time.
- Ex. Preparation of plants containing volatile oil.

Methods of extraction to any plant:

- **B. Decoction:** ^{الغلي} drug boiled with water or solvent.
- **Ex.:** roots, rhizomes and barks
- **C. Maceration:** ^{تقعير لترات طويلة} prolonged infusion (2-3 weeks), often in **aqueous alcohol**
- **D. Percolation:** ^{تكرهيج} Maceration followed by a slow flow of fresh solvent through the ground material.
e.g.:- coffee machine.
- **E. Hot extraction:** repeated infusion with hot solvent example : **Soxhlet extraction** * *consequent limited solubility and impurities insoluble -*





أنتوا ازاي تغلوا النعناع كده .. كده غلط
النعناع بيتعمل infusion مش decoction

@kareem ayyad



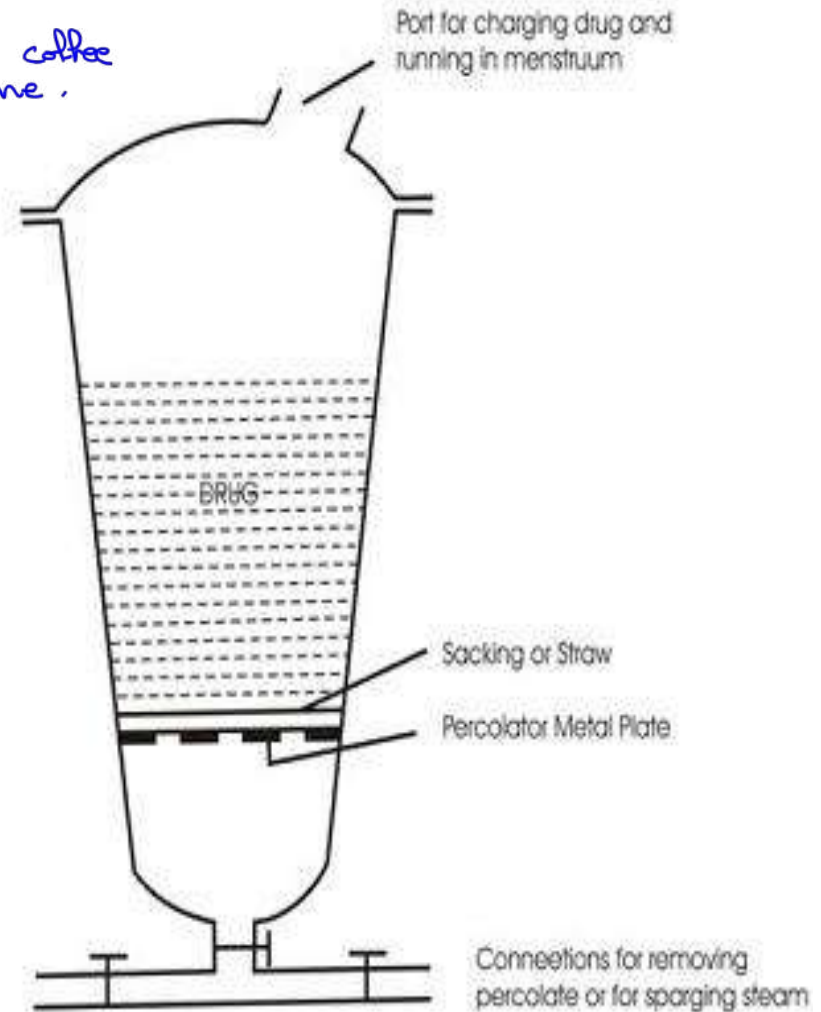
يا بني بطل بقي الهبل اللي بتقوله دا
انت صدقت إنك دكتور بجد ولا إيه



➤ COMMON METHODS OF PLANT EXTRACTION

- **Percolation:** *التسريع*
e.g. - american coffee machine.

In this method, the plant material is subjected to a slow flow of fresh solvent at intervals until sufficient active ingredient is extracted.



Commercial scale (about 1 ton capacity) percolator

ع.و



E. Soxhlet extraction: Hot extract .

↳ limited impurities .

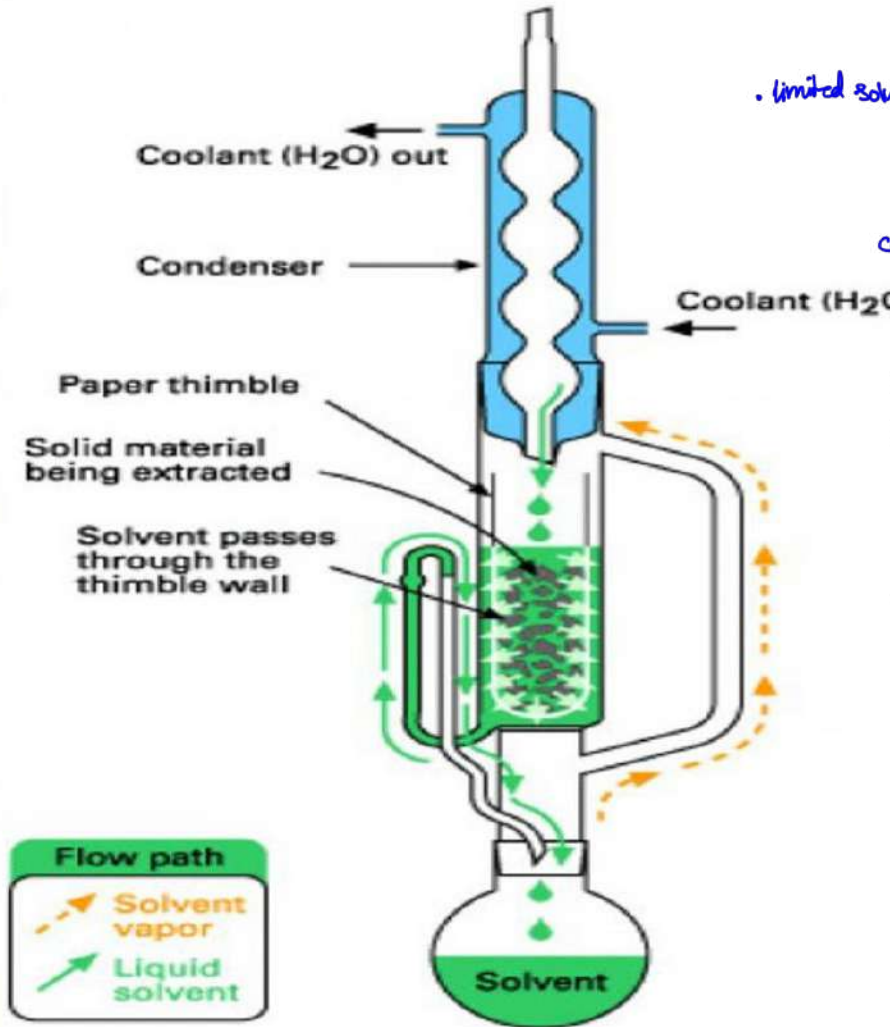
هات الفكرة
مهمة

- Soxhlet extraction is only required where the desired compound has a limited solubility in a solvent, and the impurity is insoluble in that solvent.
- If the desired compound has a high solubility in a solvent then a simple filtration can be used to separate the compound from the insoluble substance.
- The advantage of this system is that instead of many portions of warm solvent being passed through the sample, just one batch of solvent is recycled.
- This method cannot be used for thermolabile compounds as prolonged heating may lead to degradation of compounds

بستقيم المادة مرة واحدة .

Soxhlet extraction

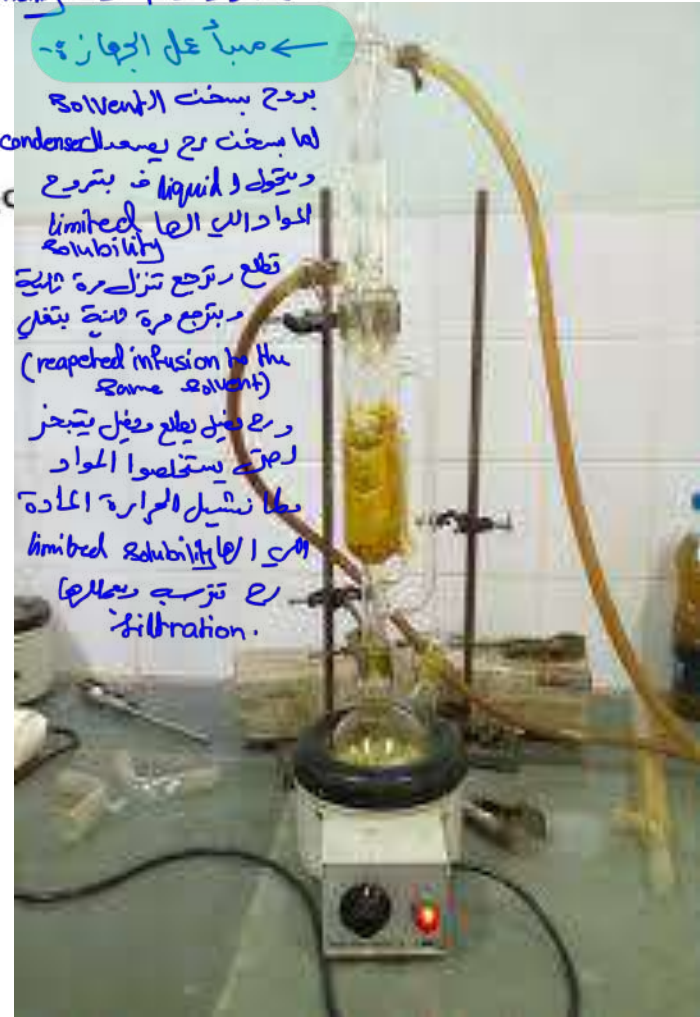
Extraction: Withdrawal of soluble constituents from crude drug by treatment with solvent



المواد المراد تكون limited solubility.

← مبدأ عمل الجهاز :-

يوضع بسخت solvent
لما بسخت مع يصب solvent
ويستقر liquid في يتروح
المواد التي لها limited
solubility
تقطع وترجع تنزل مرة ثانية
وترجع مرة ثانية بتقطع
(repeated infusion by the
same solvent)
ويعمل يقطع ويغلي يتبخر
لصوت يستخلصوا المواد
بطا نشيل الحرارة المادة
limited solubility
في تنزله وتطالها
filtration.



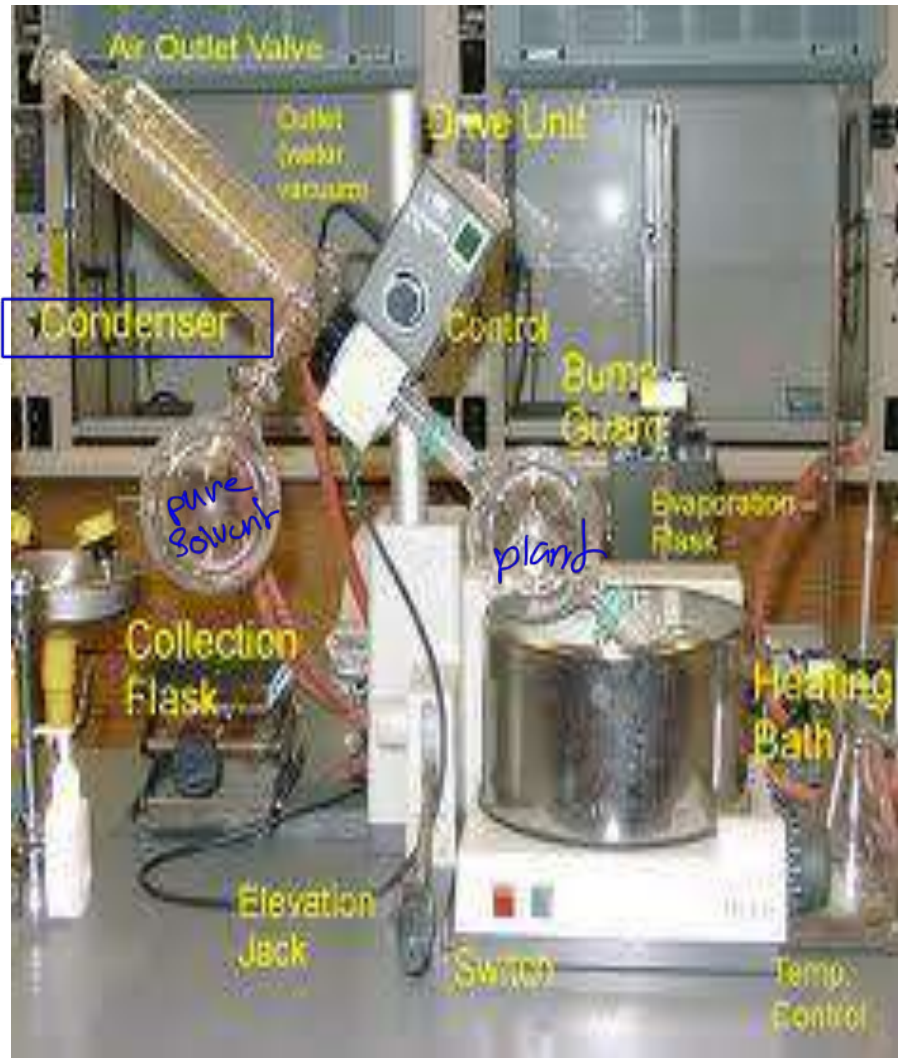
Concentration of filtrate to dryness

- The filtered plant part (liquid portion) must be reduced to paste-like, cakey, and finally powdered form through standard techniques.
- The essence of concentrating filtrate to dryness is to:
- [?] Calculate the active ingredient present after the extraction by calculation of **percentage yield**.
- [?] To **obtain dose** of plant extract in milligram or gram that can be further constituted in a known volume of vehicle for experimental animals dosing.

The enriched extract from **maceration** or extractors, concentrated by;

- [?] Feding into a **water bath, oven, hot plate, heating mantle**, ...etc to produce a thick concentrated extract free from solvent.
- [?] Or the concentration could be done using **rotary evaporator** in order to remove excess solvents from samples by applying heat to a rotating vessel at a reduced pressure. 
- [?] A **freeze dryer** or **lyophilizer** can also be used to concentrate and dry the filtrate extract (**only aqueous**) at reduced temperature 

➤ COMMON METHODS OF CONCENTRATING FILTRATE TO DRYNESS



Rotatory evaporator

40 °C



Heating mantle

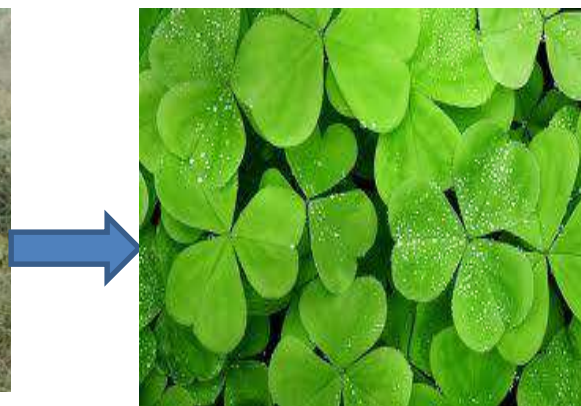


Freeze dryer (Lyophilizer)

= - 80 °C

By Erhirhie Earnest O.

GRAPHICAL OUTLINE



By Erhirne Earnest O.