
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
MSA
UNIVERSITY
IN EGYPT SINCE 1996
Established by Dr.Nawal El Degwi
MSA UNIVERSITY
جامعة أكتوبر للعلوم الحديثة والآداب
Pharmacognosy
PHG 112
Fall 2026

Lab 9

SUBTERRANEAN ORGANS



Intended Learning Outcomes (ILOs)

By the end of this laboratory session, students will be able to:

1. **Learn to differentiate between subterranean stem origin or root origin.**

2. **Differentiate the shape of different Subterranean.**

3. **Describe the macroscopic morphology of Liquorice, Ginger, and Rhubarb** entire and as powder (shape, color, odor, taste and surface characters).

4. **Identify the microscopic diagnostic features Liquorice, Ginger, and Rhubarb**

5. **Apply proper laboratory skills and safety rules**, including slide preparation, mount in KOH, accurate drawings, waste disposal, and lab conduct.

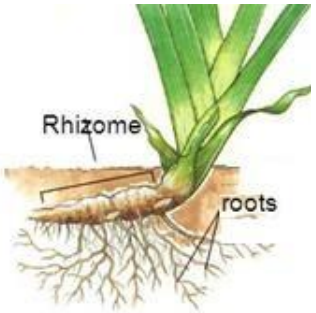


SUBTERRANEAN ORGANS

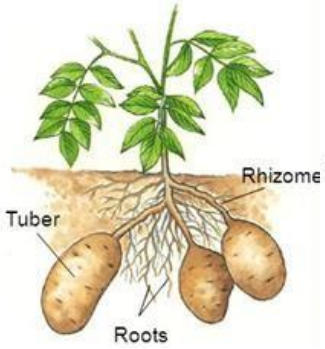
Subterranean organs

Subterranean stems

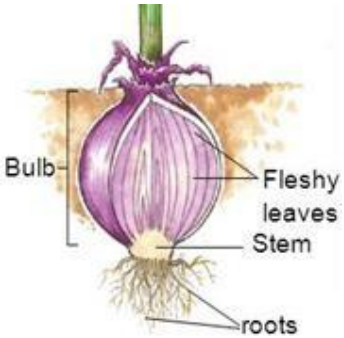
Rhizomes



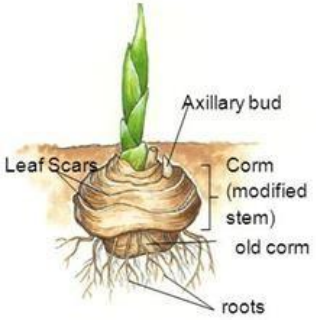
Stem tubers



Bulbs

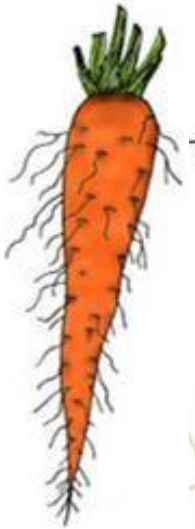


Corms

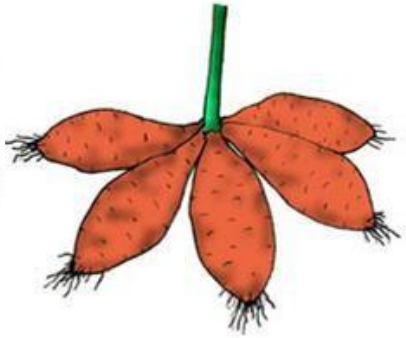


Subterranean roots

Roots



Root tubers



Subterranean Organs

All underground organs

Root origin

Characterized by

1. Never develop leaves
2. No nodes and internodes
3. No buds



Stem origin

Characterized by:

1. Bearing scaly leaves
2. Has nodes and internodes
3. Axillary buds with scaly leaves









LIQUORICE العرقسوس

Liquorice

Origin:

Dried **peeled** or **unpeeled** roots and rhizomes of ***Glycyrrhiza glabra var typica*** known as **Spanish liquorice**, or ***Glycyrrhiza glabra var glandulifera*** known as **Russian liquorice** Family Leguminosae.



Liquorice

Why peeled ?

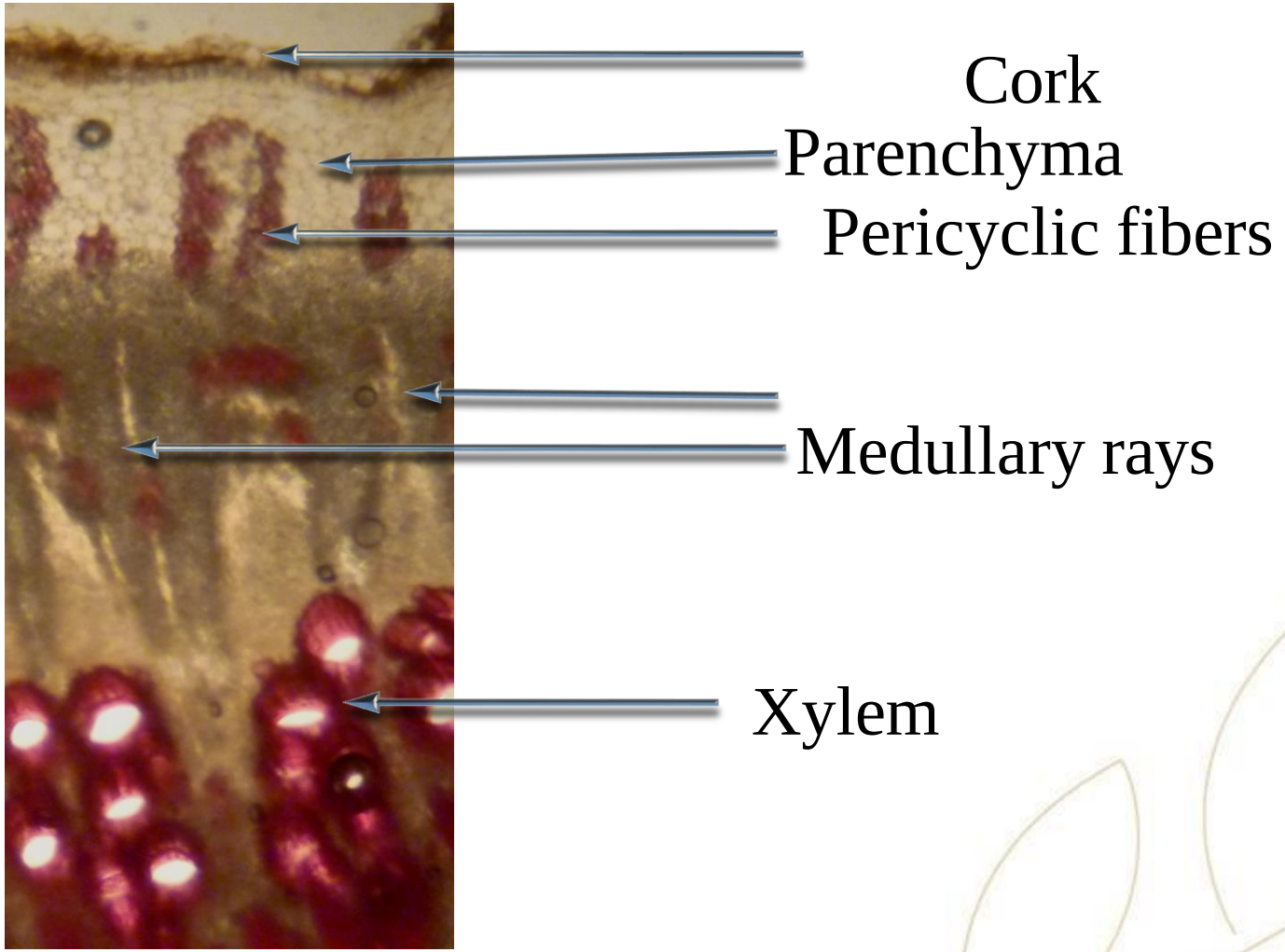


As the Cork contain:

1. Less Amount of active constituents.
2. Increasing the weight.
3. Having undesirable taste.

Liquorice

Transverse section:



Liquorice

Physical Characters:

- **Homogeneity:** Heterogeneous
- **Condition:** Ash like
- **Color:** Yellow
- **Odor:** Faint odor
- **Taste:** Very sweet free from bitterness



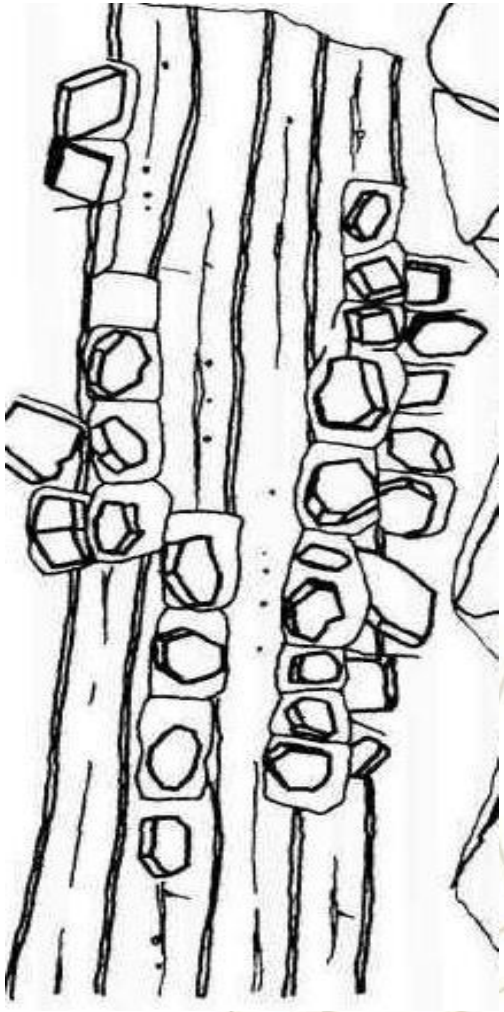
Liquorice

Key elements:

1. Crystal sheath

Parenchyma cells containing

prisms of CaOX arranged on fibers



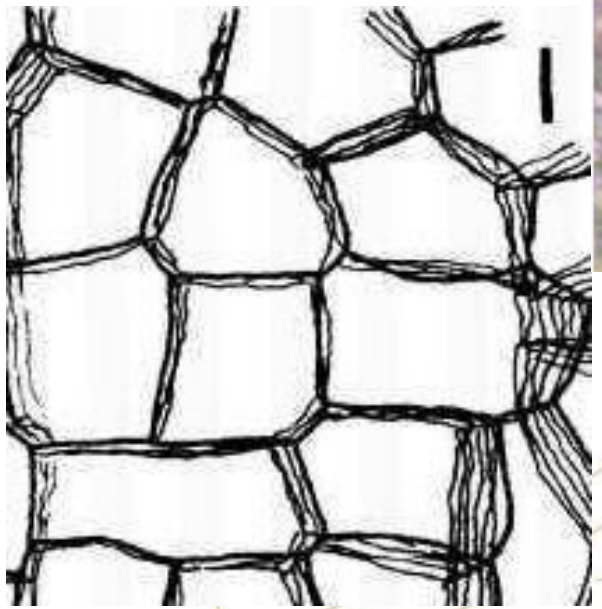


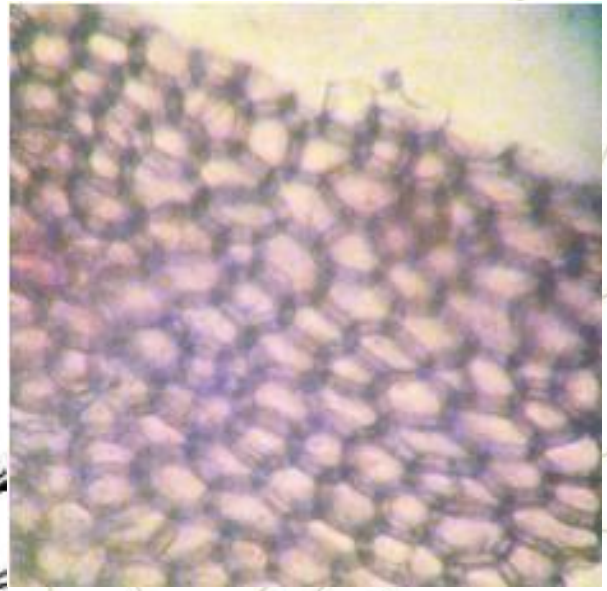
Liquorice

Key elements:

2. Cork cells

Thick, brown, formed of several layers of flattened polygonal cells.

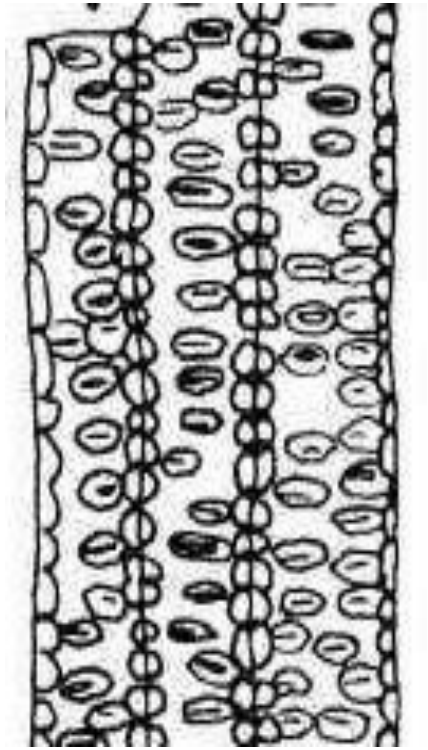




Liquorice

Key elements:

3. Bordered pitted lignified xylem vessels



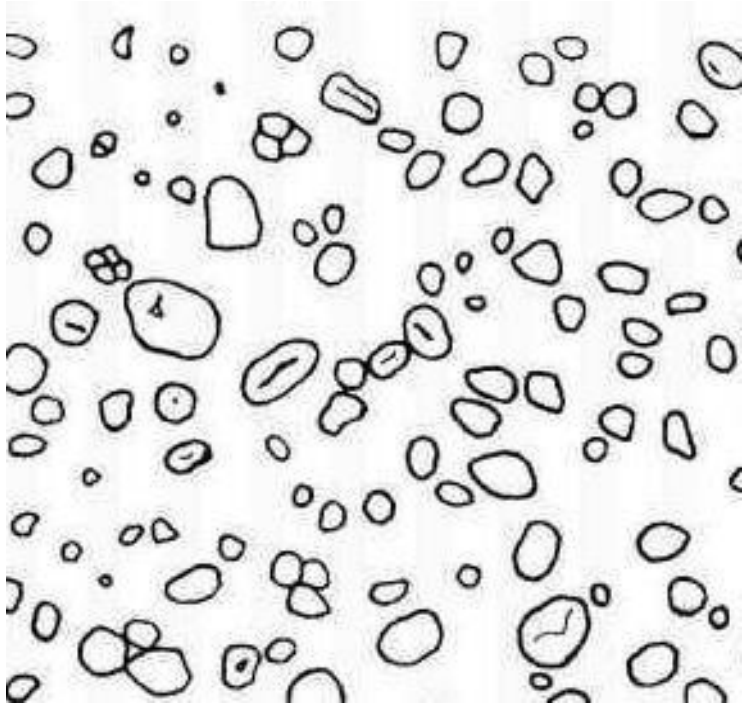


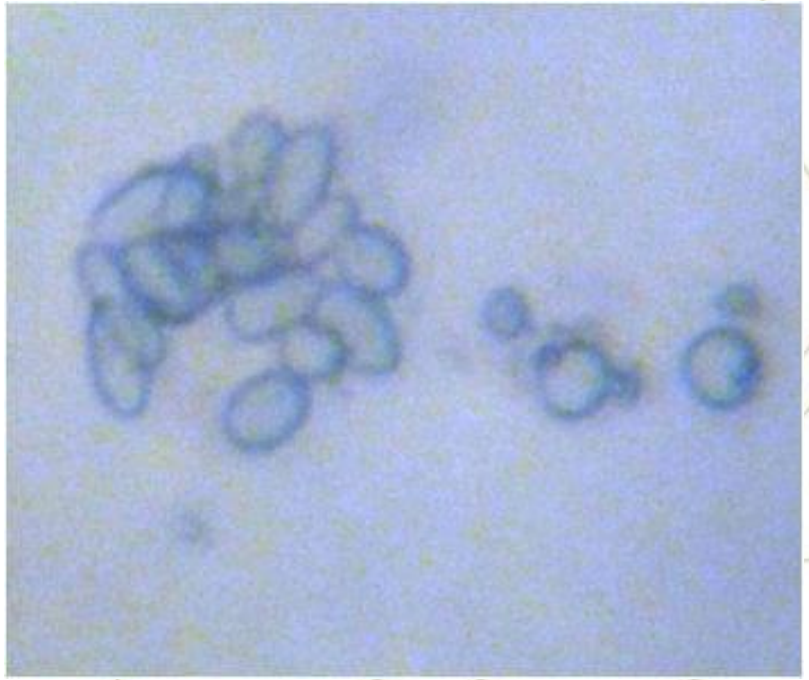


Liquorice

Key elements:

4. Starch granules





Liquorice

Chemical test:

Froth test:



Test Tube

5 mls Water

1 spatula of the Powder

Vigorous Shaking



Persistent froth stable for more than 1 min

Liquorice

Microscopically examination:

Test	Observation	Comment
Mount in KOH	**+ve**	**Crystal sheath**
Mount in Water	**+ve**	**Starch granules**
Mount in Phlouroglucinol	**+ve**	**Bordered pitted lignified xylem vessel**

Liquorice

Uses

1. Demulcent and mild expectorant.
2. Sweetening agent.
3. Anti-inflammatory for gastric and duodenal ulcer and rheumatoid arthritis (due to presence of cortisone like compounds).
4. Mild laxative.
5. Mouth wash for mouth ulcer.



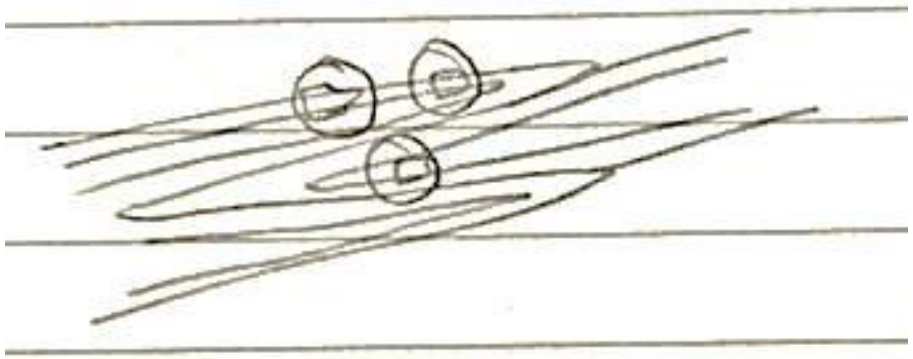




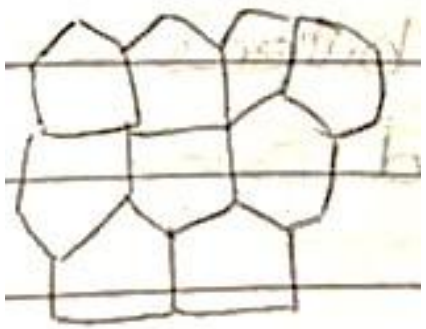


Main Key Eelements Drawings:

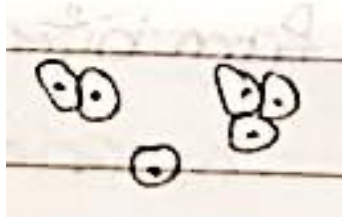
1 **Crystal sheath.**



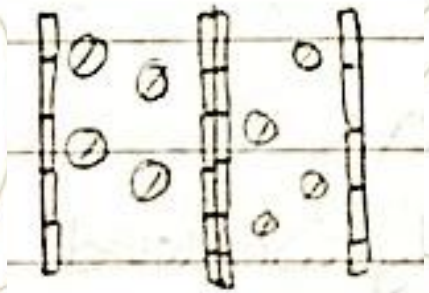
2 **Cork cells.**



3 **Starch granules.**



4 **Bordered pitted lignified xylem vessels.**




GINGER الزنجبيل

Ginger

Origin:

It is the fresh or dried rhizome of *Zingiber officinale*, family Zingiberaceae.



- It is deprived from the dark outer surface and collected as peeled ginger.

Ginger

What is Liming ?

It is coating with very thin protective layer of $CaCO_3$ to protect against insect attacks.



Ginger

Physical characters:

- **Condition:** Powder
- **Color:** Yellowish brown
- **Taste:** Pungent taste
- **Odor:** Aromatic odor

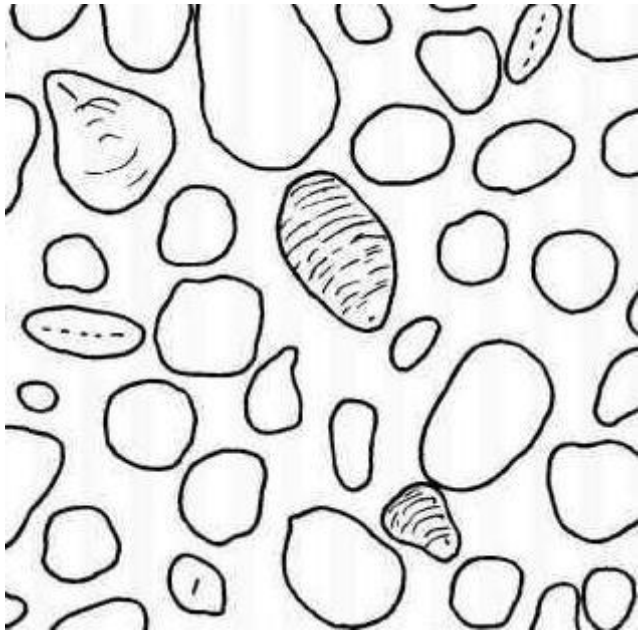


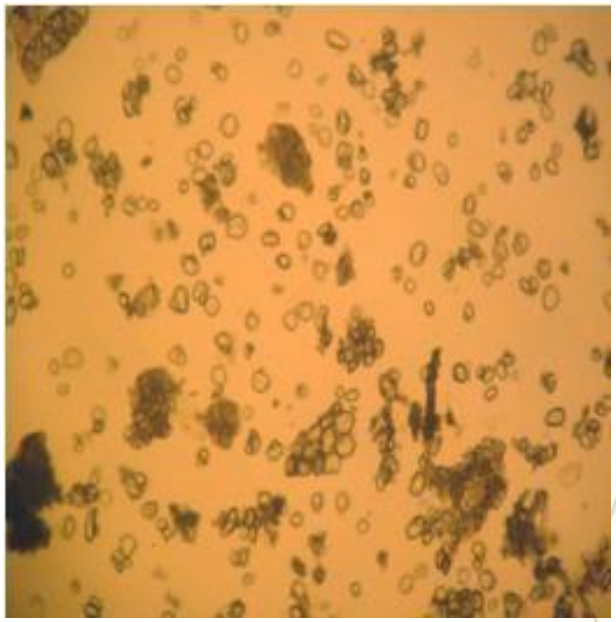
Ginger

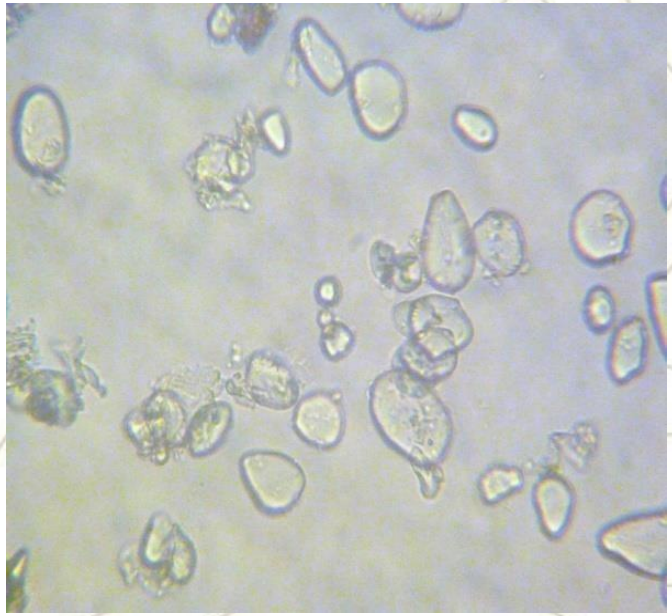
Key elements:

1) Scitaminaceous starch granules with transverse striation.

Mount in Water



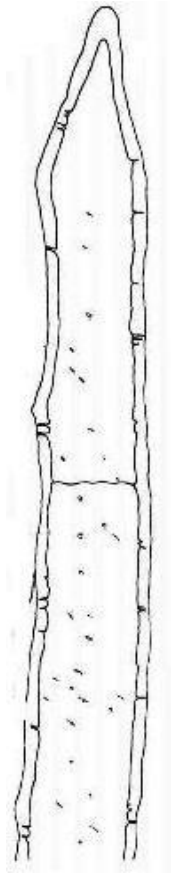


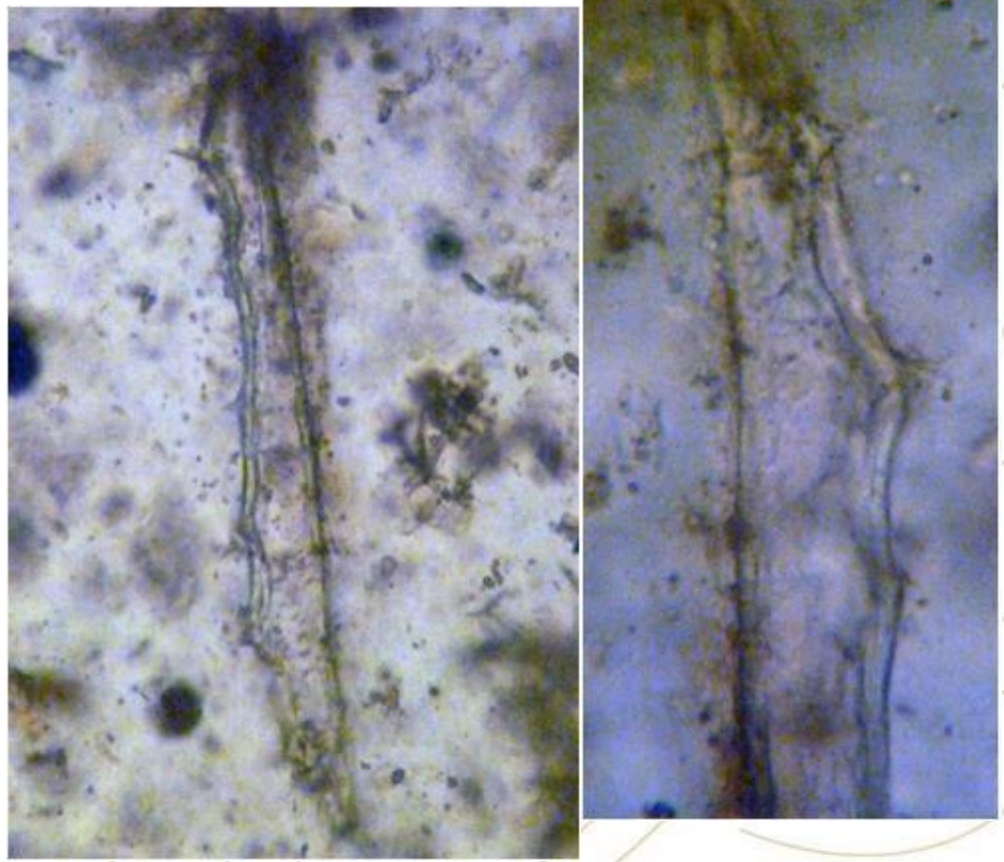


Ginger

Key elements:

2) Septate fibers with tortuous margin and transverse peptosic septa (pectin)(non lignified except middle lamella).

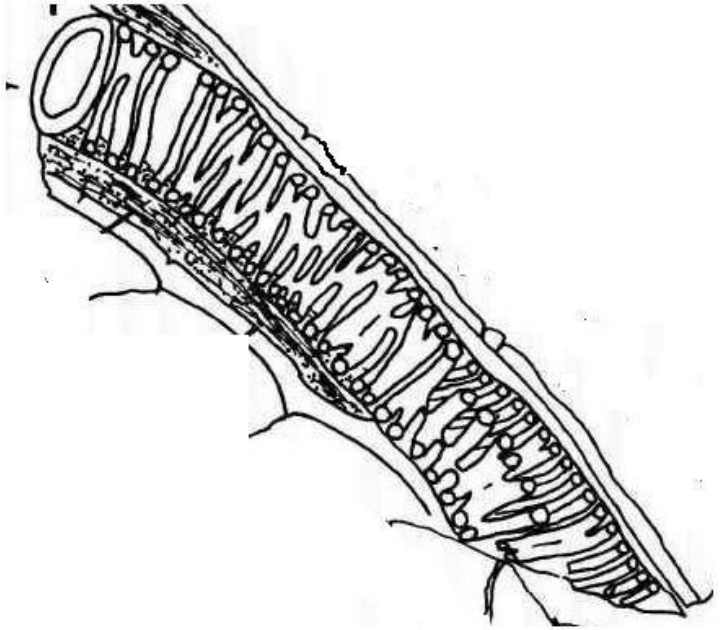




Ginger

Key elements:

3) Reticulate, non lignified xylem vessels.

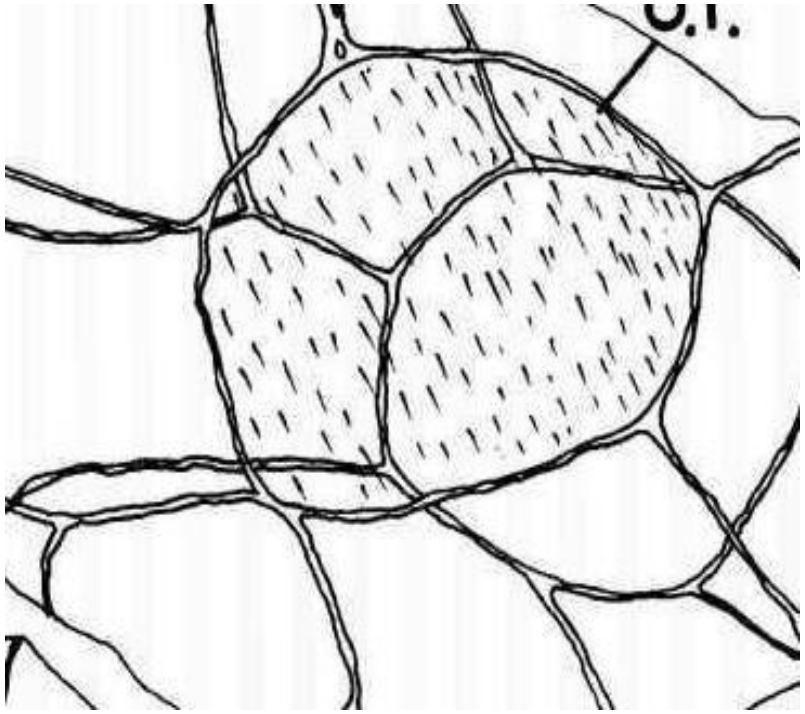


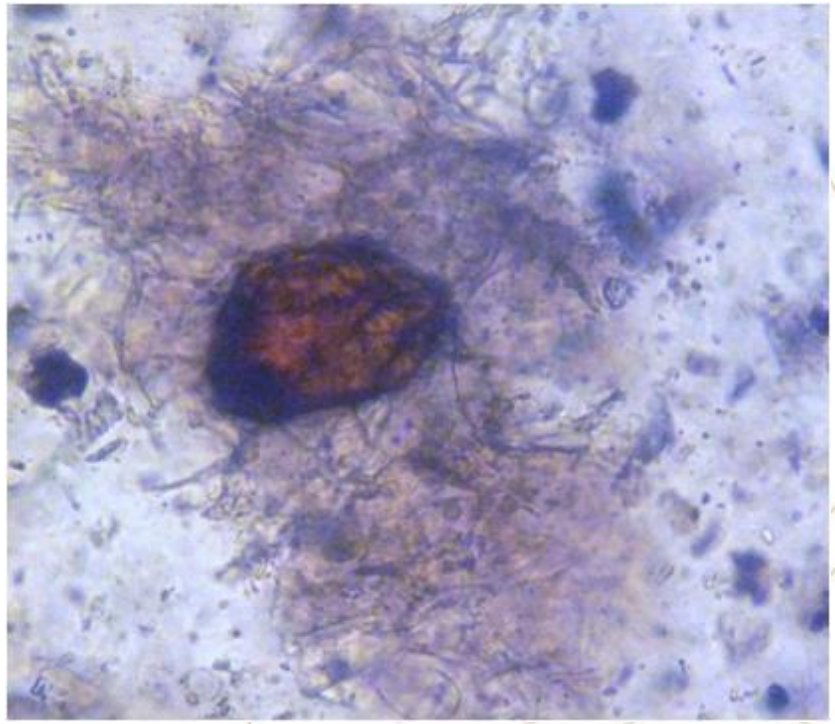


Ginger

Key elements:

4) Oleoresin cells with yellowish orange content





Ginger

Microscopically examination:

Test	Observation	Comment
Mount in KOH	**+ve**	**Septate fiber**
Mount in Water	**+ve**	**Scitaminaceous starch granules**
Mount in Phlouroglucinol	**+ve**	**Middle lamella of the septate fibers.**

Ginger

Uses

1. **Powerful anti-emetic in motion sickness.**
2. **Carminative & flavoring agent.**
3. **Reduce high cholesterol level in blood.**
4. **Antihypertensive (Improve blood circulation).**
5. **Anti-inflammatory in rheumatic pain.**
6. **Antioxidant.**
7. **Cough mixtures.**













Main Key Eelements Drawings:

1 **Scitaminaceous starch granules.**



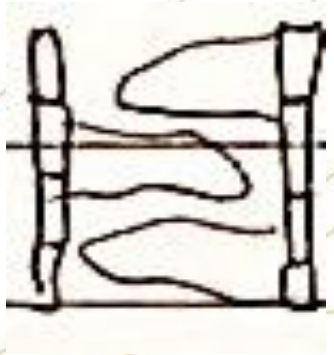
2 **Oleoresin cells**



3 **Septate fibers.**



4 **Reticulate, non lignified xylem vessels.**





RHUBARB الراوند

Rhubarb

Origin:

It is dried rhizome and big roots of *Rheum palamtum*, *Rheum officinale* and all *Rheum species* except *Rheum raponticum* Family, Polygonaceae deprived of cork and outer cortex



Rhubarb

Physical characters:

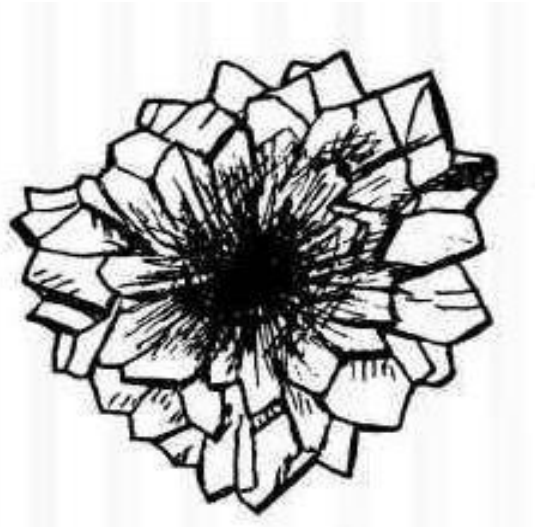


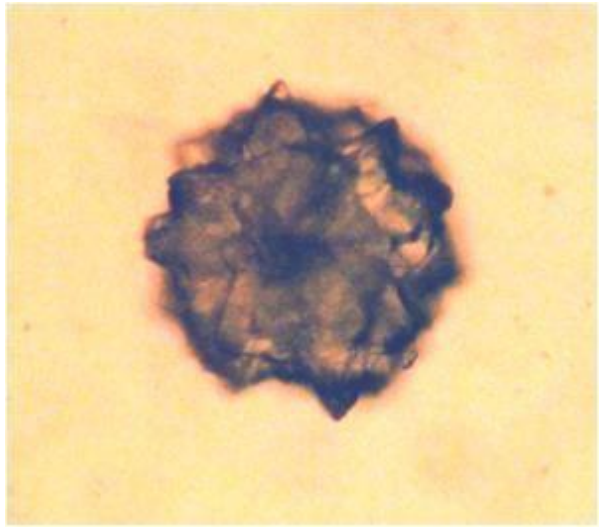
- **Condition:** Fine powder
- **Color :** Reddish brown
- **Odor:** Aromatic odor
- **Taste:** Bitter astringent with gritty taste

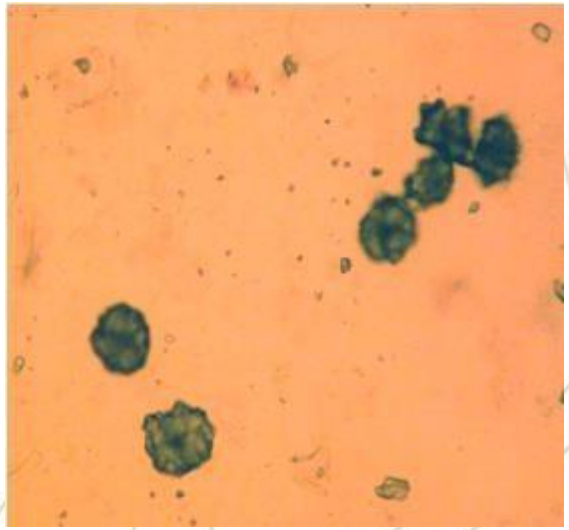
Rhubarb

Key elements:

1) Cluster crystals of CaOX coming from phelloderm



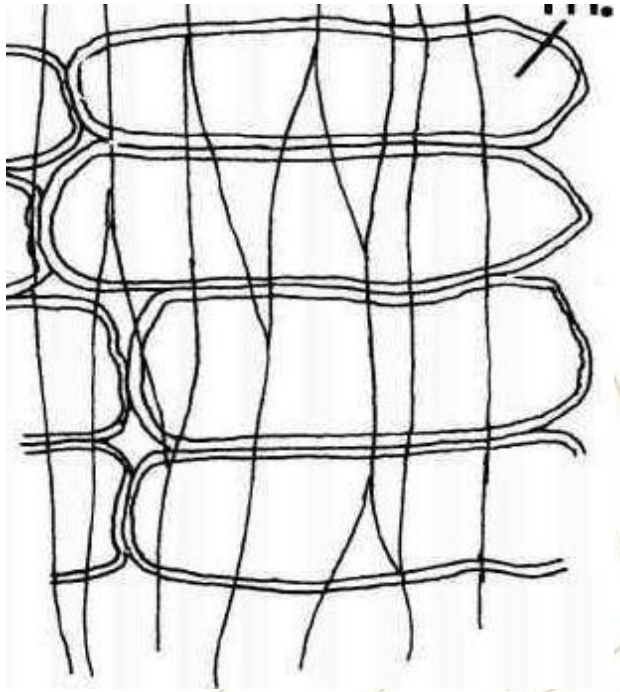




Rhubarb

Key elements:

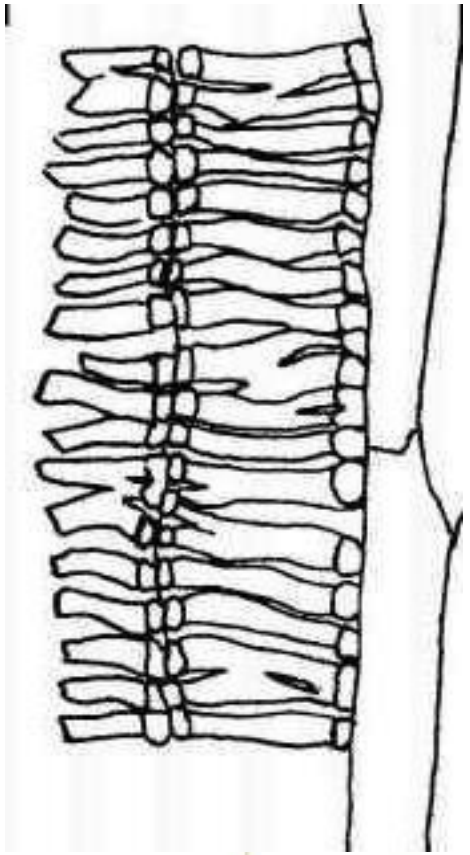
2) Medullary rays with reddish brown content



Rhubarb

Key elements:

3) Bordered non lignified reticulate xylem vessels

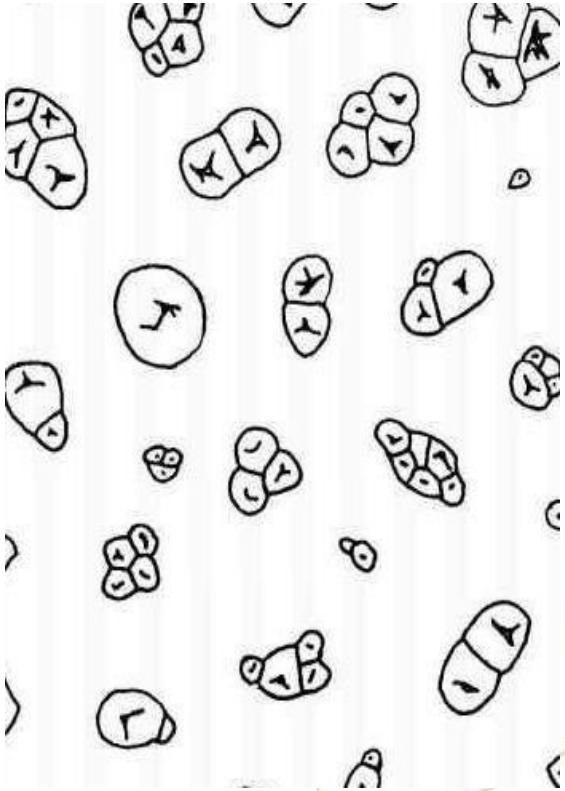




Rhubarb

Key elements:

4) Mullar shaped starch granules with fissured hilum.





Rhubarb

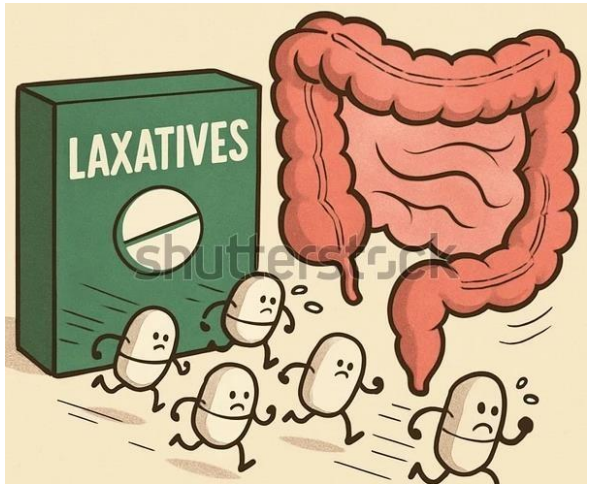
Microscopically examination:

Test	Observation	Comment
Mount in KOH	**+ve**	**Cluster crystal of Ca. Ox**
Mount in Water	**+ve**	**Mullar shaped starch granules**
Mount in Phlouroglucinol	**-ve**	**No lignified wall**

Rhubarb

Uses :

1. **Large doses:** Laxative or purgative.





2. **Small doses:** Astringent and anti-diarrheal

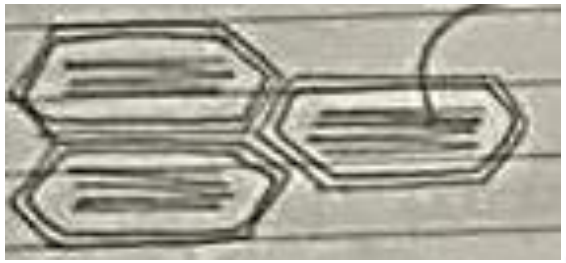


Main Key Eelements Drawings:

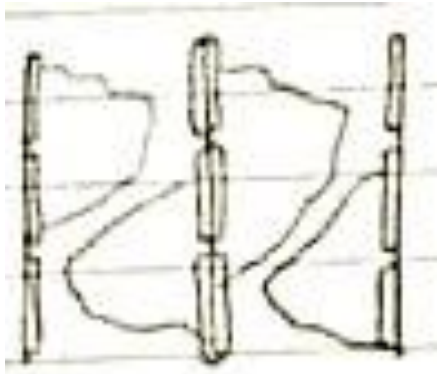
1 Cluster crystals of CaOX.



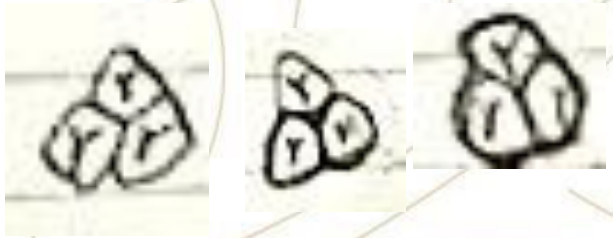
2 Medullary rays.

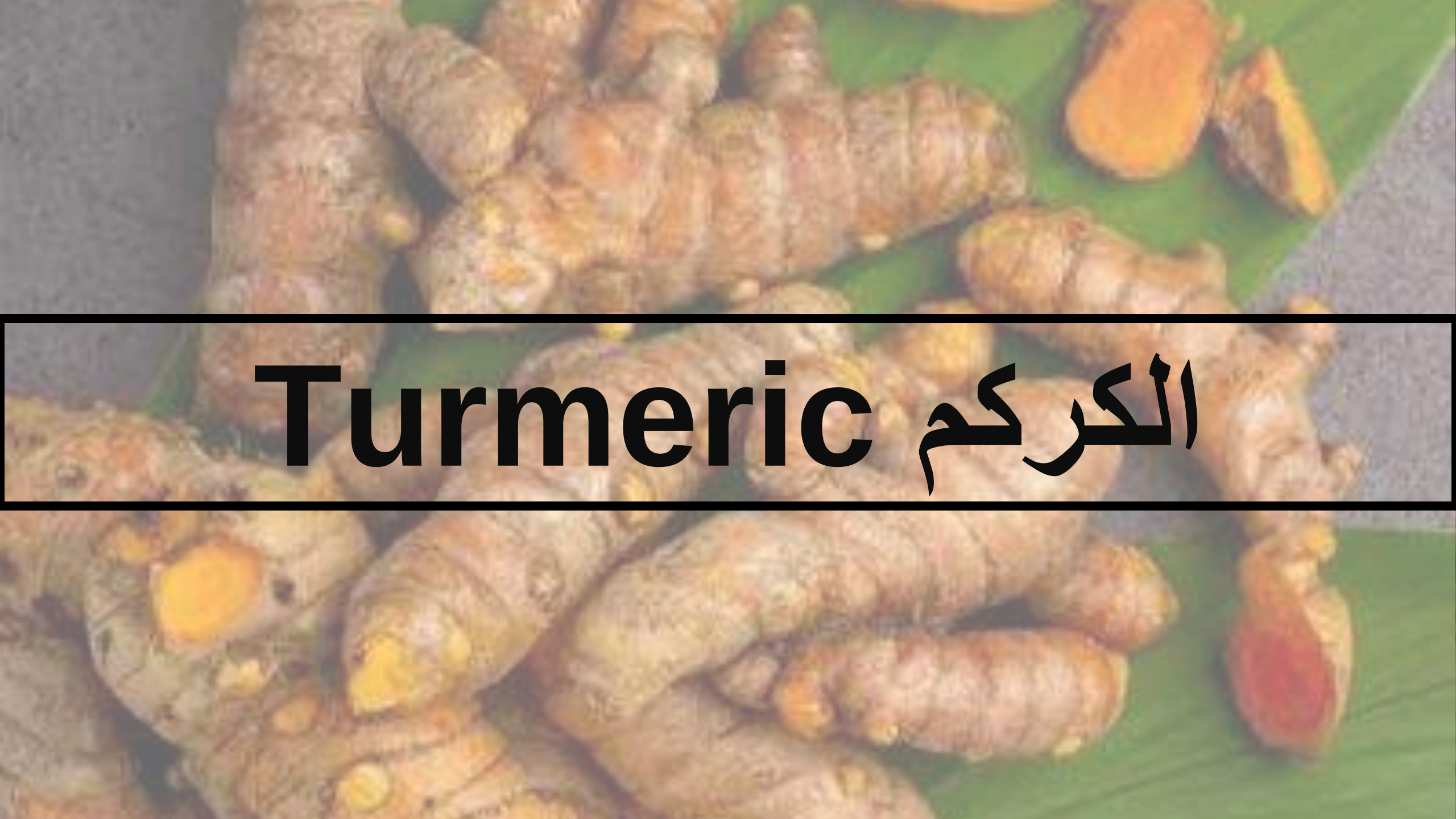


3 Xylem vessels



4 Starch granules




Turmeric الكركم

Turmeric (Curcuma)

Origin

It is the dried rhizome of *Curcuma domestica* or *Curcuma longa* F. Zingiberaceae.

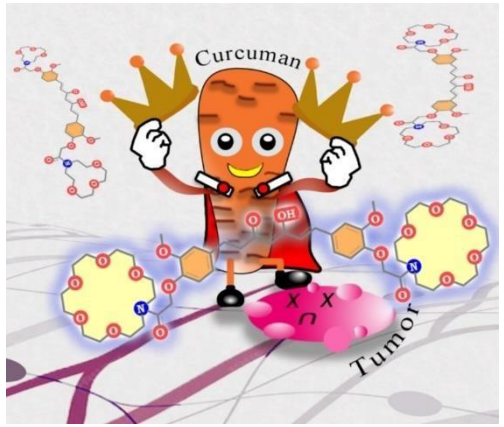




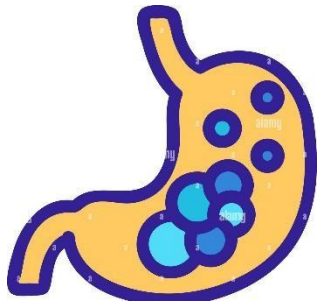
Turmeric (Curcuma)

Uses

1. Anti-inflammatory.
2. Anti hepatotoxic
3. Carminative
4. Antioxidant
5. Coloring agent









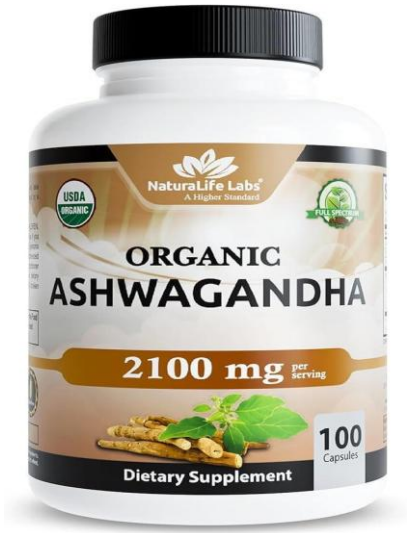



Ashawagandha
أشوغاندا

Ashawagandha

Origin

It is the dried roots of *Withania somnifera* F. Solanaceae









Ashawagandha

Uses

1. Sleep aid.
2. Memory enhancement.
3. An adaptogen to help increase energy and resistance to stress (e.g., in case of mental and physical fatigue related to stress).

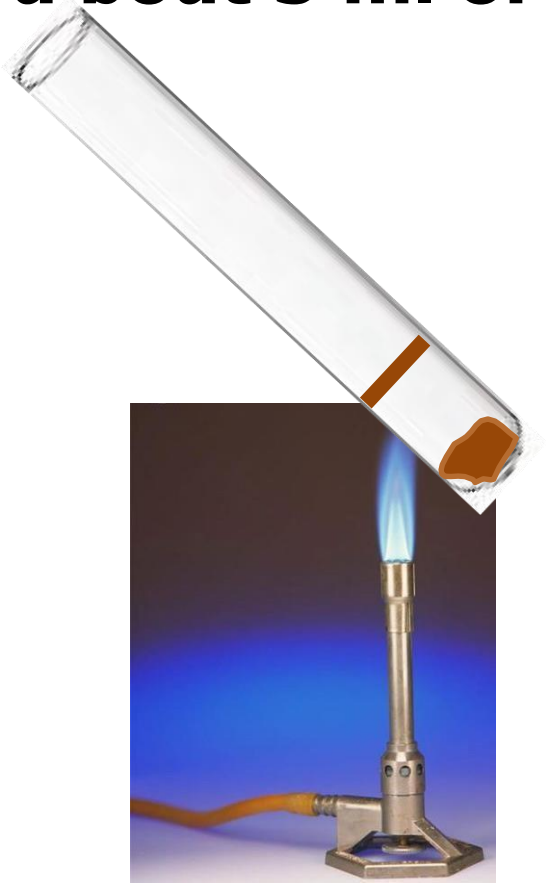






Practical work:

1- Boil a quarter spatula of the powdered seed in a bout 5 ml of KOH.





Boil

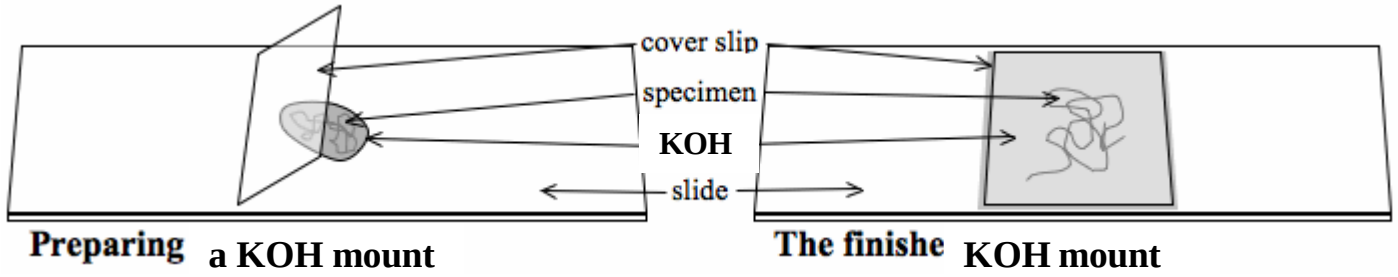


5 ml of KOH

¼ spatula of powder

Practical work:

2- Prepare your slide and check the key elements.



3- Complete your drawings.



P.S.

Keep your work place and tools clean.

Dispose the left KOH in the container not in the sink.

References:

1. Trease& Evans' Pharmacognosy by William Charles Evans, 2002.

2. Fundamentals of Pharmacognosy and Phytotherapy by Michael Heinrich, Joanne Barnes, SimonGibbons, and Elizabeth M. Williamson, 2004.

3. Botany :An introduction to Plant Biology, Third edditionby James D. Mauseth,2008.

Useful links:

https://www.youtube.com/watch?v=rbiyMxQ3ERs

https://www.youtube.com/watch?v=CuiiYTgakxY

https://www.youtube.com/watch?v=NMolSd_FVII


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