



MSA UNIVERSITY

جامعة أكتوبر للعلوم الحديثة والآداب

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Pharmacognosy

PHG112

3 GOOD HEALTH
AND WELL-BEING



4 QUALITY
EDUCATION



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References

Author	Date	Title	Publisher	ISBN
Michael Heinrich, Joanne Barnes, Simon Gibbons, Elizabeth M. Williamson.	2012	Fundamentals of Pharmacognosy and Phytotherapy	Elsevier Health Sciences	0702052310, 9780702052316
Biren Shah, Avinash Seth	2012	Textbook of Pharmacognosy and Phytochemistry	Elsevier Health Sciences	8131232603, 9788131232606
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Lecture 9

Introduction to Subterranean Organs (Underground Organs) and Some Examples

Interactive teaching methods and activities

QUIZIZZ



socrative

Learning Outcomes

By the end of this lecture, students should be able to:

1. Knowledge / Remembering

- **Define** subterranean (underground) organs and their importance in pharmacognosy.
- **List** different types of subterranean organs: roots, rhizomes, tubers, bulbs, and corms.
- **Identify** examples of medicinal subterranean drugs such as liquorice, ginger, turmeric, and rauwolfia.
- **Recall** the main active constituents of these drugs (e.g., glycyrrhizin, gingerol, curcumin, reserpine).

2. Comprehension / Understanding

- **Explain** the differences between root-origin and stem-origin underground organs.
- **Describe** the morphological differences between roots and rhizomes (presence of nodes, buds, root cap, etc.).
- **Discuss** the pharmacological uses of subterranean drugs such as liquorice (demulcent), ginger (antiemetic), turmeric (anti-inflammatory), and rauwolfia (antihypertensive).
- **Summarize** the nutraceutical and cosmeceutical applications of liquorice and other subterranean

Learning Outcomes

By the end of this lecture, students should be able to:

3. Application

- **Apply** morphological characteristics to distinguish between different underground organs.
- **Use** microscopic and powder characteristics (e.g., starch granules, vessels, fibers) to identify drugs like liquorice and ginger.
- **Perform** basic chemical tests (e.g., froth test for saponins) for identification of active constituents.

4. Analysis

- **Differentiate** between Spanish and Russian liquorice based on morphology and taste.
- **Analyze** the relationship between chemical constituents (e.g., saponins, volatile oils, alkaloids) and pharmacological effects.
- **Compare** rhizomes such as ginger and turmeric in terms of constituents, structure, and uses.

Learning Outcomes

By the end of this lecture, students should be able to:

5. Synthesis / Creating

- **Construct** a comparative table summarizing source, type of organ, active constituents, and uses of subterranean drugs.
- **Design** a simple identification scheme using morphological, microscopic, and chemical features.

6. Evaluation

- **Evaluate** the therapeutic importance of subterranean drugs in pharmacy practice.
- **Assess** the benefits and potential side effects of compounds such as glycyrrhizin (e.g., hypertension risk).
- **Judge** the importance of pharmacognostic identification in ensuring quality and preventing adulteration.



Subterranean Organs (Underground Organs)

THE SUBTERRANEAN ORGANS

- 1- Stem origin**
- 2- Root origin**

1- Stem origin

Rhizome

Underground horizontal stem with stored foods



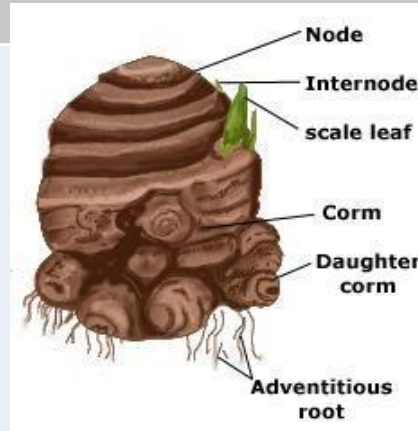
Bulb

Short stem with fleshy leaves



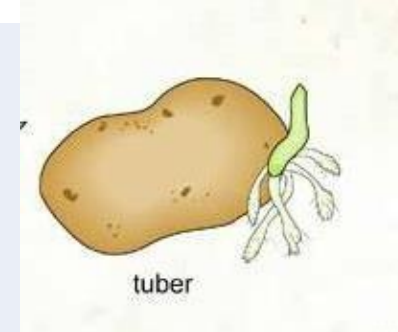
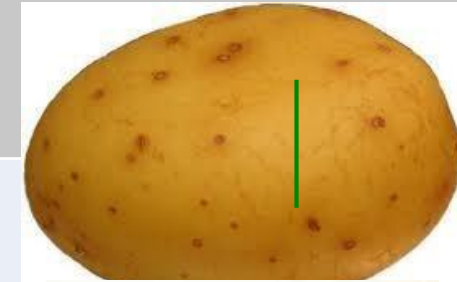
Corm

Short, vertical, swollen underground plant stem that serves as a storage organ

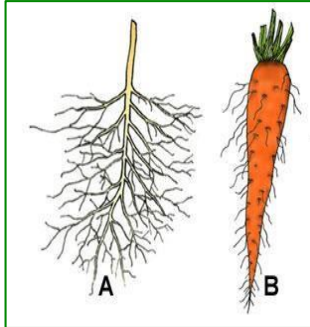


Tuber

Tubers are various types of modified plant structures that are enlarged to store nutrients

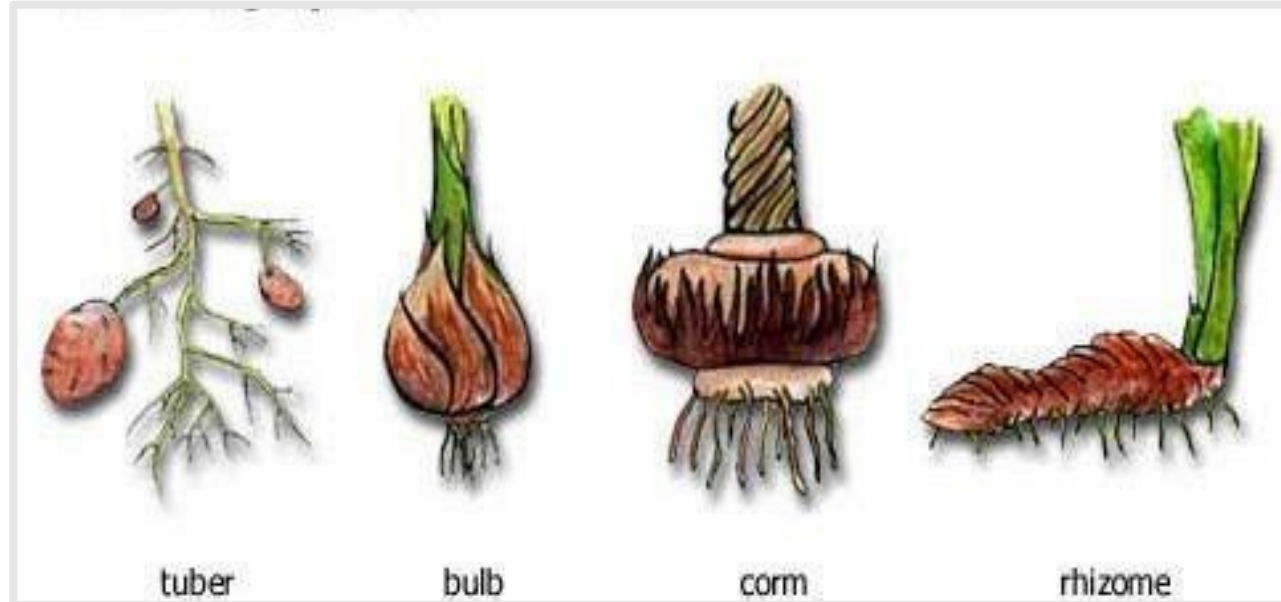


2- Root origin



Subterranean stem differs from the aerial stem in the following

- 1 It bears scale leaves (not foliage)**
- 2 Bears adventitious roots arise from the nodes.**



What is the difference between root and rhizome?

The root:

- *It is derived from the radical and grows towards the soil and water
- *It has no leaves
- *No nodes and internodes
- *No buds
- *No chlorophyll
- *Apical growing point called root-cap.

The rhizome:

- It has nodes and internodes
- The growing point covered with scaly leaves and not root cap.



*Subterraneans Having
Nutraceutical and Cosmeceutical
Applications*

Liquorice

Origin: Is the dried peeled or unpeeled root and rhizome (stolon) of *Glycyrrhiza glabra* var. *typica* (Spanish liquorice) or *Glycyrrhiza glabra* var. *glandulifera* (Russian liquorice) Family Leguminosae



Spanish liquorice

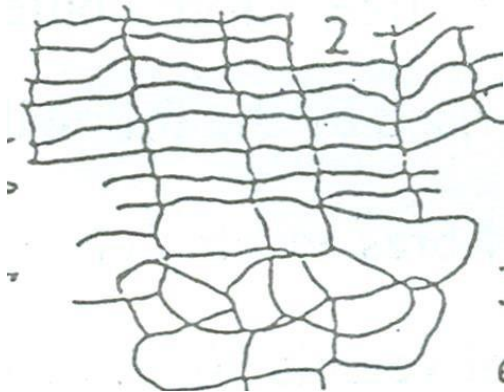
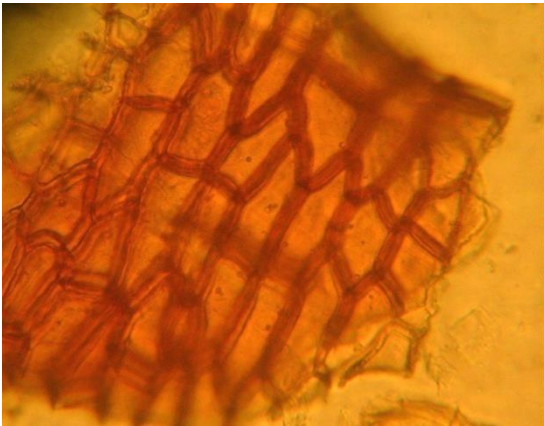
- It is mainly peeled stolon (rhizome) and few root.**
- The stolon bears scale leaves, buds and root scars and microscopically has central pith.**
- It has a sweet taste free from any bitterness.**

Russian liquorice

- Mainly unpeeled roots**
- It has sweet taste but with bitterness**

Powdered Liquorice

1- Cork cells



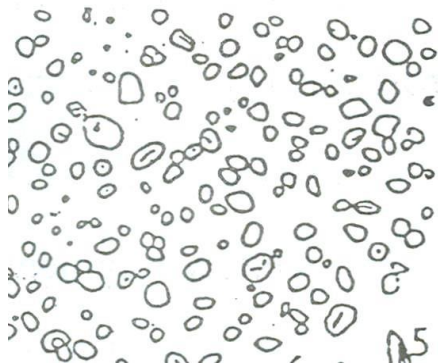
2- Crystal sheath



**3- Xylem vessels
lignified, showing
bordered pits**



4- Starch granules



5- Prisms of Ca oxalate



ACTIVE CONSTITUENTS

- 1- Sweet principle glycyrrhizin (triterpenoid saponin)**
- 2- Flavonoids, liquiritin, isoliquirtin**
- 3- Coumarins (liqcoumarin) & bitter principle (glycyramarin)**
- 4- Volatile oils**
- 5- Starch, sugar , β - sitosterol and protein**
- 6- Asparagine (amide of aspartic acid)**

USES AND ACTIONS:

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

Cosmeceutical applications

Skin whitening, brightening, clears hyperpigmentation, anti-aging, sun protection and acne management.



licorice irritation
root redness



hyperpigmentation



post acne marks



LICORICE ROOT



- OIL CONTROL
- CLEAR DARK SPOTS
- GLOW AND SHINE



It also promote hair growth but also leave your hair feeling soft and silky.

- **Strengthens hair roots preventing hair breakage and promoting overall hair health.**
- **Promotes hair growth, stimulates the scalp and encourages hair growth.**

The glycyrrhizic acid helps in the proliferation of hair follicles, leading to thicker and fuller hair over time.

- **Prevents Hair Loss**
- **Reduces Dandruff and Scalp Issues: has anti-inflammatory and anti-microbial properties, making it effective in reducing dandruff and soothing various scalp issues.**

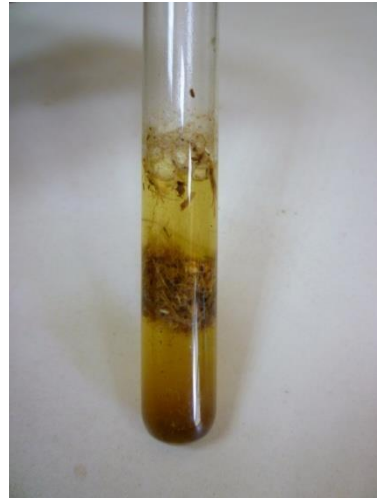
It helps maintain a healthy scalp environment for hair growth.



CHEMICAL TESTS:

1-Froth test:

Powder + Water in a test tube and shake well, Persistent froth stable for more than 1 min. (saponin)



2- Powder +66% H₂SO₄

orange red colour

Deglycyrrhizinated licorice

Deglycyrrhizinated licorice, or **DGL**, is an herbal supplement typically used in the treatment of gastric and duodenal ulcers.

It is made from licorice from which the glycyrrhizin has been removed.

Glycyrrhizin is known to cause negative side effects, such as hypertension and edema; removing the glycyrrhizin is meant to avoid these symptoms





Subterraneans Having Nutraceutical Applications

Ginger

Origin: Is the fresh or dried rhizomes of *Zingiber officinale* F. Zingiberaceae.

To avoid insect attack ginger undergoes:

Decorticated, peeled (unbleached)

Limed ginger (with calcium carbonate)



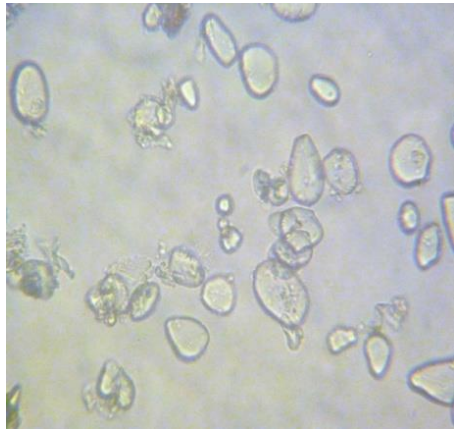
Ginger is an example for monocot rhizome

It has aromatic odour and pungent aromatic taste.

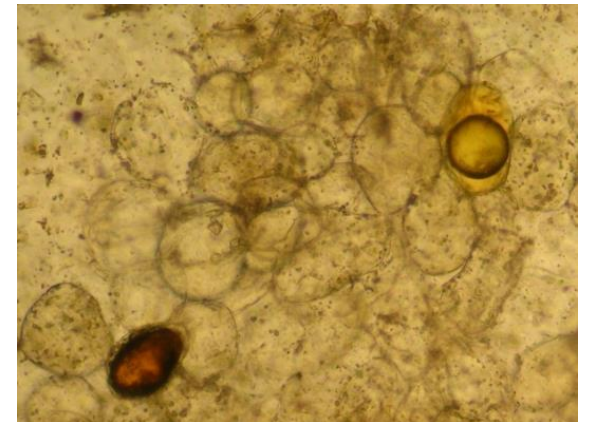
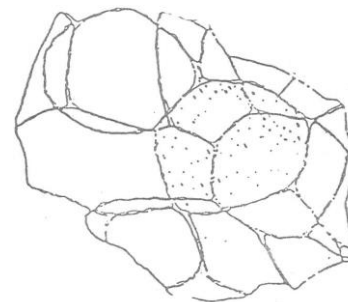
Its **pungency is destroyed** by boiling with KOH solution (c.f. capsicum).

Powder

1- Large scitaminaceous starch granules



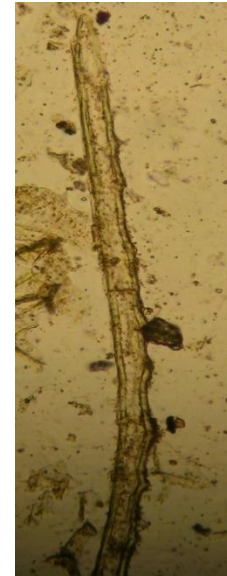
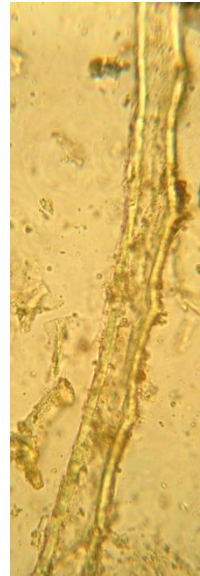
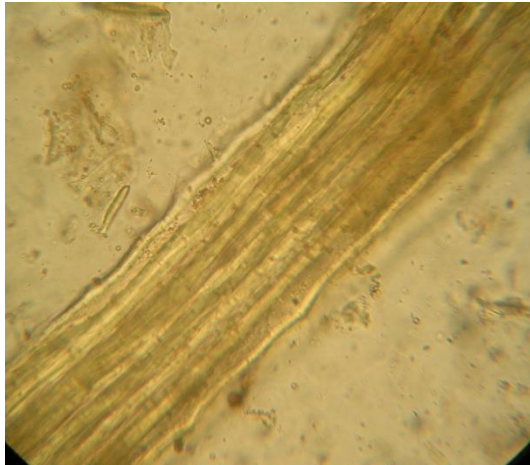
2- Parenchyma containing oleo-resin cells.



3- Non lignified xylem vessels.



4- Non lignified septate fibers with dentate margin and transverse pectosic septa



ACTIVE CONSTITUENTS


- 1- Volatile oil mainly Zingiberene, bisabolene and farnesene**
- 2- Gingerol and shogaols (responsible for pungent taste)**
- 3- Resin and starch**

ACTIONS AND USES

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




Turmeric

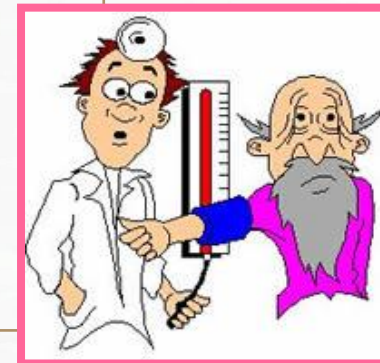
Name	Origin	Active constituents	Uses
Curcuma or Turmeric	Is the dried prepared rhizome of <i>Curcuma domestica</i> or <i>Curcuma longa</i> F. Zingiberaceae	<p>1- <u>Volatile oils; turmerone, zingiberene</u></p> <p>2- <u>Curcumin (a yellow polyphenol)</u></p> <p>3- Resin, starch (gelatinized) and sugar.</p> 	<p>1- <u>Antiinflammatory, antioxidant and antihepatotoxic</u></p> <p>2- <u>Colouring agent, and carminative</u></p>



Another Subterranean Example

Rauwolfia

Name	Origin	Active constituents	Uses
<p>Rauwolfia</p> 	<p>Is the dried root and rhizome of Rauwolfia serpentina</p> <p>F. Apocyanaceae.</p>	<p>Mainly <u>alkaloids</u></p> <p>(<u>Reserpine</u>, rescinnamine, ajmaline, ajmalinine and serpentine.)</p>	<p>1-Reserpine used as powerful <u>antihypertensive</u>.</p> <p>2-<u>In insomnia and psycatric disorders.</u></p>





Google notebook link:

<https://notebooklm.google.com/notebook/5b8c9885-3660-4f77-a955-b3a75113c313>



THANK
YOU!