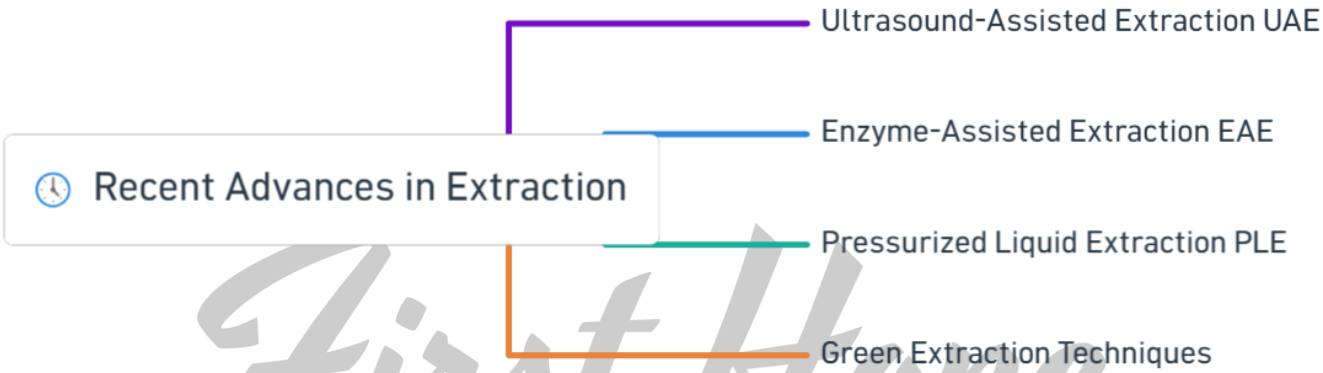
Extraction and Phytochemical studies

Recent advances in extractions with emphasis on selection of methods

Introduction

- Selection of extraction methods depends on the nature of plant material and phytoconstituents.
- A proper extraction method gives maximum yield with minimum degradation.
- Wrong selection of method may reduce the quality and activity of the extract.

Recent Advances in Extraction



First Hope

A. Ultrasound-Assisted Extraction (UAE)

- Uses ultrasonic waves to improve solvent penetration.
- Breaks plant cell walls.
- Reduces extraction time and solvent consumption.

B. Enzyme-Assisted Extraction (EAE)

- Enzymes break down plant cell walls.
- Improves release of intracellular compounds.
- Useful for polyphenols and flavonoids.

C. Pressurized Liquid Extraction (PLE)

- Uses high pressure and temperature.
- Increases solvent penetration and extraction efficiency.

D. Green Extraction Techniques

- Use eco-friendly solvents and technologies.
- Reduce environmental pollution and solvent waste.

Factors Affecting Selection of Extraction Method

Copyright by Engacy Learning Private Limited. All rights reserved. Reproduction or distribution without written consent is strictly prohibited.

1. Nature of Phytoconstituents

- Heat stable compounds can be extracted by Soxhlet extraction.
- Heat sensitive compounds should be extracted by cold maceration, ultrasound assisted extraction, or supercritical fluid extraction.
- Volatile compounds are extracted by steam distillation or supercritical fluid extraction.

2. Nature of Plant Material

- Soft plant parts are easier to extract than hard plant parts.
- Roots, bark, and seeds often need stronger extraction methods.
- Leaves and flowers may require mild extraction methods.

3. Particle Size

- Smaller particle size increases surface area.
- Increased surface area improves solvent penetration.
- Very fine powder may cause filtration problems.

4. Temperature

- Higher temperature increases solubility and extraction rate.
- Excessive heat may destroy thermolabile compounds.

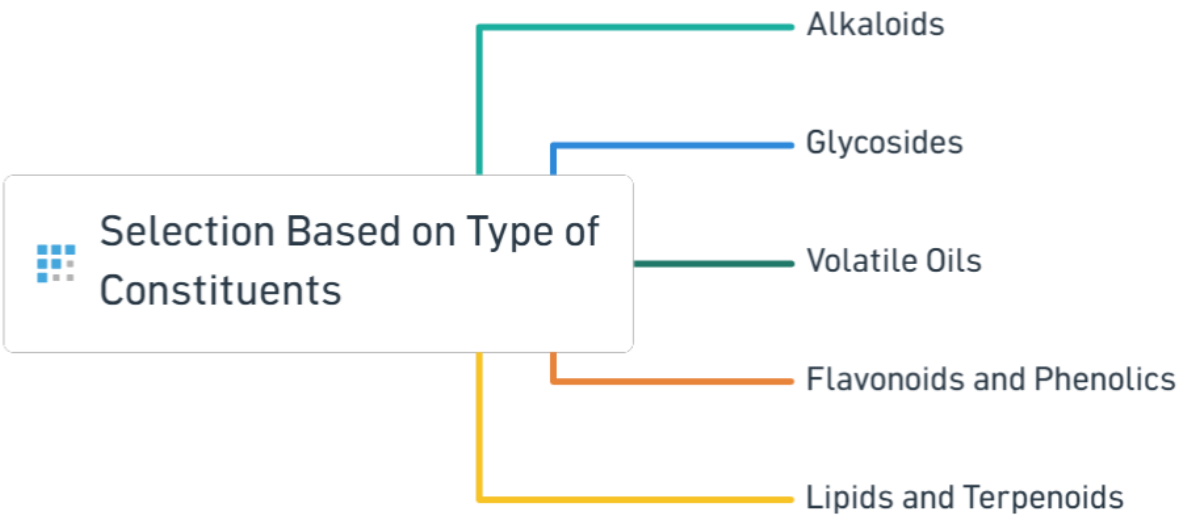
5. Time of Extraction

- Longer extraction time may increase yield.
- Very long extraction time may extract unwanted impurities.

6. Cost and Industrial Suitability

- Industrial methods should be economical, safe, and scalable.
- The method should produce consistent quality extract.

Selection Based on Type of Constituents



Copyright by Engacy Learning Private Limited. All rights reserved. Reproduction or distribution without written consent is strictly prohibited.

A. Alkaloids

- Alkaloids are commonly extracted by acid-base extraction.
- Dilute acid converts alkaloids into soluble salts.

B. Glycosides

- Glycosides are extracted using water or alcohol.
- Excessive acid or heat should be avoided because glycosides may hydrolyze.

C. Volatile Oils

- Volatile oils are extracted by steam distillation.
- Supercritical fluid extraction is also useful.

D. Flavonoids and Phenolics

- Flavonoids and phenolics are extracted using alcohol, hydroalcoholic solvents, or ultrasound assisted extraction.

E. Lipids and Terpenoids

- Non-polar solvents and supercritical carbon dioxide are useful for lipids and terpenoids.

Choice Of Solvent for Extraction with Emphasis On Selection Of Method

Introduction

- Solvent selection is a crucial step in phytochemical extraction.
- The solvent should efficiently dissolve the desired phytoconstituents.
- The choice of solvent depends on polarity, safety, cost, and the purpose of extraction.

Important Properties of an Ideal Solvent

1. Should dissolve the required phytoconstituents effectively.
2. Should not react with plant constituents.
3. Should be easy to remove after extraction.
4. Should be safe and economical.
5. Should not leave harmful residues.
6. Should be suitable for herbal industry applications.

Common Solvents Used in Herbal Extraction

1. Water

- Safe, inexpensive, and widely used.

Copyright by Engacy Learning Private Limited. All rights reserved. Reproduction or distribution without written consent is strictly prohibited.

- Extracts sugars, gums, tannins, glycosides, and proteins.
- May support microbial growth if extracts are not preserved properly.

2. Ethanol

- Widely used in herbal industries.
- Extracts many polar and moderately polar compounds.
- Safer than methanol for medicinal preparations.

3. Methanol

- Common laboratory solvent.
- Extracts phenolics, flavonoids, and glycosides.
- Toxic and therefore not preferred for final herbal products.

4. Chloroform

- Extracts alkaloids, steroids, and terpenoids.
- Mainly used in laboratory extraction and fractionation.

5. Petroleum Ether

- Extracts fats, waxes, oils, and other non-polar compounds.
- Commonly used for defatting plant material before extraction.

First Hope

Solvent Selection Based on Polarity

A. Non-Polar Solvents

- Used for non-polar constituents.
- Extract fats, waxes, fixed oils, chlorophyll, and some terpenoids.
- **Examples:**
  - Petroleum Ether
  - Hexane
  - Benzene

B. Medium Polar Solvents

- Used for moderately polar constituents.
- Extract alkaloids, flavonoids, coumarins, and some glycosides.
- **Examples:**
  - Chloroform
  - Ethyl acetate
  - Acetone

Copyright by Engacy Learning Private Limited. All rights reserved. Reproduction or distribution without written consent is strictly prohibited.

C. Polar Solvents

- Used for polar constituents.
- Extract tannins, glycosides, phenolics, sugars, and saponins.
- **Examples:**
  - Water
  - Ethanol
  - Methanol

Selection of Solvent Based on Extraction Method

1. Maceration and Infusion

- Usually use water, ethanol, or hydroalcoholic mixtures.
- Suitable for heat-sensitive compounds.

2. Soxhlet Extraction

- Uses solvents such as ethanol, methanol, chloroform, or petroleum ether.
- Suitable for heat-stable constituents.

3. Steam Distillation

- Used for volatile oils and aromatic compounds.
- Water and steam act as extraction media.

4. Ultrasound-Assisted Extraction (UAE)

- Commonly uses ethanol, methanol, acetone, or hydroalcoholic solvents.
- Provides faster extraction with less solvent consumption.

5. Supercritical Fluid Extraction (SFE)

- Uses supercritical carbon dioxide (CO_2).
- Suitable for non-polar compounds, terpenoids, and essential oils.

Importance of Solvent Choice in Herbal Industries

1. Improves extract quality.
2. Increase yield of active constituents.
3. Reduces extraction of unwanted impurities.
4. Enhances safety of herbal products.
5. Helps in standardization and quality control of herbal formulations.

First Hope

Copyright by Engacy Learning Private Limited. All rights reserved. Reproduction or distribution without written consent is strictly prohibited.

First Hope

FREE PREVIEW

Click here to visit our website

PHARMACY PREMIUM NOTES

Complete subject and semesters are available on FirstHope app only.

Scan or click here

Click here to get the app >

Available on Google Play

JOIN THE FIRSTHOPE COMMUNITY

Join our Telegram channel

Click here to join Telegram >

Scan or click here

@FirstHopeNotes

Instagram

@firsthope.official

Click here to follow >

YouTube channel

FirstHope-Pharmacy / Live streams

Click here to watch >

WhatsApp channel

Follow FirstHope on WhatsApp

Click here to join >

FirstHope website

firsthope.co.in

Click here to visit >

B.Pharm / D.Pharm / M.Pharm / Pharm.D

Preview notes. Complete subjects and semesters in the FirstHope app.