Herbal Drug Technology

Practical No. 1

Aim: To perform preliminary phytochemical screening of crude drugs.

References

1. Harborne, J. B. (1998). *Phytochemical Methods: A Guide to Modern Techniques of Plant Analysis.* Springer.
2. Kokate, C. K., Purohit, A. P., & Gokhale, S. B. (2019). *Pharmacognosy.* Nirali Prakashan.

Objective

- To detect the presence of various secondary metabolites in the crude extract.
- To understand the correlation between phytochemical composition and pharmacological activity.
- To develop practical skills in performing qualitative phytochemical tests.

Principle

Crude plant materials contain diverse secondary metabolites such as alkaloids, glycosides, tannins, saponins, flavonoids, and terpenoids.

Each class of compound reacts with specific reagents to yield characteristic color changes or precipitates, allowing qualitative identification of these phytochemicals.

Materials Required

- Test tubes
- Test tube stand
- Pipettes and droppers
- Beakers
- Funnels and filter paper
- Measuring cylinders
- Water bath

- Bunsen burner

Chemicals and Reagents

Group of Phytoconstituents	Reagents Used
Alkaloids	Mayer's reagent, Dragendorff's reagent, Wagner's reagent
Flavonoids	Lead acetate, NaOH, Conc. H_2SO_4
Tannins	1% $FeCl_3$, Gelatin solution
Saponins	Distilled water
Glycosides	Fehling's A & B, Benedict's reagent, Keller–Killiani reagent
Steroids	Chloroform, Conc. H_2SO_4 (Salkowski's reagent)
Terpenoids	Chloroform, Acetic anhydride, Conc. H_2SO_4 (Liebermann–Burchard reagent)
Phenolic compounds	Ferric chloride solution

Preparation of Extract

1. Take 5 g of dried powdered leaves of *Azadirachta indica*.
2. Add 50 mL of ethanol (95%).
3. Heat on a water bath for 15–20 minutes, then filter.
4. Use the filtrate for phytochemical tests.

Procedure and Observation Table

S. No.	Constituent Tested	Test Performed	Observation	Inference
1	Alkaloids	(a) *Mayer's Test*: Add Mayer's reagent → Cream precipitate.	Cream/orange ppt	**Present (+)**

		(b) *Dragendorff's Test*: Orange precipitate forms.		
2	Flavonoids	(a) *Alkaline Reagent Test*: Yellow color turns colorless with acid. (b) *Lead Acetate Test*: Yellow precipitate.	Yellow color	**Present (+)**
3	Tannins	(a) *Ferric Chloride Test*: Blue-black color.	Blue-black color	**Present (+)**
4	Saponins	*Foam Test*: Persistent foam for 10 min.	Stable froth	**Present (+)**
5	Glycosides	(a) *Keller–Killiani Test*: Reddish-brown ring at junction. (b) *Fehling's Test*: Brick-red precipitate.	Reddish ring, red ppt	**Present (+)**
6	Steroids	*Salkowski Test*: Red color in lower layer.	Red layer	**Present (+)**
7	Terpenoids	*Liebermann–Burchard Test*: Green-blue color.	Greenish color	**Present (+)**
8	Phenolic Compounds	*Ferric Chloride Test*: Deep blue coloration.	Blue color	**Present (+)**

Results

Phytoconstituent	**Result**
Alkaloids	+
Flavonoids	+
Tannins	+

Saponins	+
Glycosides	+
Steroids	+
Terpenoids	+
Phenolic Compounds	+

Interpretation:

The ethanolic extract of *Azadirachta indica* leaves contains multiple classes of bioactive compounds, suggesting its wide range of pharmacological properties, including antimicrobial, anti-inflammatory, and antioxidant effects.

Discussion

- The presence of alkaloids and flavonoids suggests potential antimicrobial and antioxidant activities.
- Saponins and tannins contribute to anti-inflammatory and astringent effects.
- Steroids and terpenoids indicate anti-inflammatory and antipyretic potential.
- These qualitative findings can form the basis for further quantitative and chromatographic analysis (TLC, HPLC, etc.) to isolate and identify individual active compounds.

Precautions

- Use freshly prepared reagents.
- Avoid contamination between tests.
- Perform the tests at room temperature unless specified.
- Handle acids and organic solvents with care.
- Record color changes immediately.