

PHARMACOGNOSY OF CYTISUS SCOPARIUS LINN.

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Abstract

Cytisus scoparius Linn. is a small deciduous shrub belonging to family Leguminosae. The green twigs are used as a heart tonic and diuretic in dropsy, besides in angina pectoris, hypertension and cardiac arrhythmias. It is also a substitute for digitalis.

The stem is dark green in colour with strong aromatic odour. A thick layer of cuticle covers the epidermis. Stomata occur in the furrows either flushed with epidermis or raised. Hypodermis is chlorenchymatous. Vascular tissue is in the form of a continuous ring enclosed by a sclerenchymatous pericycle.

Histochemistry, microscopical characters of powder, preliminary colour reactions and U.V. studies are presented in this paper.

Introduction

Biological activity : The plant is a bitter, nauseous and emits peculiar odour when bruised and not eaten by cattle (U.S.D. 1960; Anon. 1950). An antimicrobial substance and vit. B6 was isolated through plant tissue culture; seed agglutinin aggregated blood platelets (Anon. 1992), sparteine is less toxic (Wallis, 1960).

Therapeutic uses : It is a heart tonic and diuretic in dropsy (Wallis, 1960). In large doses emetic and purgative (Bentley and Trimen. 1880); hypotensive and spasmolytic (Bhakuni et al. 1969); sparteine and quinolizidine alkaloid is cardiac, respiratory stimulant and an oxytonic (Sim, 1965); substitute for Digitalis (U.S.D. 1960); sulphate of sparteine is used in tachycardia and functional palpitation (Anon. 1986).

In view of its potential therapeutic value and biological activity, the pharmacognosy of the young stems of *Cytisus scoparius* L. was taken up. Earlier studies were confined to histological features (Wallis, 1960; Youngken, 1950).

Material and Methods

The plant material was obtained from Survey of Medicinal Plants and Collection Unit of CCRH at Udhagamandalam (Tamilnadu). Young stems were boiled and fixed in F.A.A. (Johansen, 1940). Free hand sections were employed for the purpose of histochemical studies. Microtome sections cut at 12-15 μ m were made to study anatomical features following usual paraffin method (Johansen, 1940). Histochemical tests were done after Johansen (1940); Youngken, (1951) and Gibbs (1974).

Observations

Morphology

1-2m. high, lower part woody and upper part long with straight, green and angled branches. The lower leaves petioled and 3-foliate while upper unifoliate and sessile; flowers borne on solitary axillary pedicels, zygomorphic, yellow, papilionaceous. Stamens ten, monadelphous; calyx 2-lipped; style curved in a loop; pods laterally compressed, hairy at margins.

Synonym; Sarothamnus scoparius (L.) Wimmer ex Koch.

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- Common names** : Broom, Scotch broom, yellow broom.
Adulterant : Spartium junceum Linn. & Osyris alba Linn.)
Part used : Young stems.
Distribution : Native of Western part of Europe and Asia; naturalised in U.S., India (Nilgiris and Shimla).
Authority : Hinsdale in Boericke, 1984.
Young stem : 2-5 mm. Thick in T.S., 5-armed, stellate in outline, green, strongly aromatic slender and fibrous.

Anatomy

Epidermis : 1-layered, cells over the ridges narrow and those over furrows elongated; oval to spherical, barrel shaped, 12-31 μm tangentially long and 11-15 μm radially wide in the furrows, while 7.5-16 μm tangentially long and 12-20 μm radially wide in the ridges; isodiametric cells 9-14 μm in diameter; externally covered by a thick layer of cuticle which is thicker at the ridges. Contents slightly dense to dense; walls slightly thick. Stomata anomocytic, few tricytic, frequent in the furrowed region, flushed with epidermis or slightly raised over the surface; subsidiaries of free and abutting type with a sub-stomal chamber; guard cells ledged, ledges cuticular. Hypodermis in the arms parenchymatous, palisade-like, extending to the furrows, 2-4 layered, cells perpendicular to epidermis, 17-33 μm tangentially long and 16-27 μm radially wide, densely chlorenchymatous; in the median region parenchyma is 5-8 layered; cells large, polygonal to spherical, 31-73 μm in diameter, walls thin, intercellular spaces narrow; contents scanty; hypodermis at the ridges sclerenchymatous, 8-12 layered, cells polygonal to spherical, 6-12 μm in diameter, wall thick, lumen small, intercellular spaces absent, contents scanty; some sclerenchymatous cells in groups occur dispersed amongst parenchymatous cells in the arms.

Vascular tissue is in the form of a cylinder at the centre, pericyclic, endarch; tracheary elements consist of fibres, vessels, xylem parenchyma and rays arranged in radial rows, enclosed by a 4-6 layered sclerenchymatous pericycle. Secondary wall thickenings of tracheary elements made up of helices (both single and double), reticulate, annular and bordered pitted; pits alternate and opposite, polygonal to spherical; walls of the xylem parenchyma and ray cells possess simple pits.

Pith : is 8-10 celled in diameter, parenchymatous, cells large, circular or polygonal; walls thin; intercellular spaces few; contents scanty to slightly dense; pits simple.

Microscopic Characters of Powder

- Pieces of sclerenchymatous tissue with thick walled cells.
- Pieces of vessel elements either attached or isolated with bordered pits (opposite or alternate) and helical thickenings.
- Pieces of pericyclic fibers.
- Pieces of tracheary elements with single and double helices.
- Pieces of parenchymatous elements with simple pits.
- Pieces of arms of the stem with epidermis covered by thick cuticle and palisade.
- Pieces of epidermis with hypodermal palisade with stomata.
- Pieces of tracheary elements with phloem.

Histochemistry

- Lignins** : Present in secondary walls of vessels and tracheids.
Proteins : Present in palisade and xylem parenchyma.
Resins : Present in xylem and palisade tissue
Suberin : Absent.
Fixed oils and fats : Absent.
Alkaloids : Present in xylem, ray parenchyma and sclerenchyma.

- Tannins** : Present as traces in the epidermis and hypodermal palisade tissue.
- Starches** : Present in ground parenchyma and ray cells.

Organoleptic Characters

- Colour** : Olive green
- Odour** : Strongly pungent
- Touch** : Coarse
- Taste** : Slightly bitter.

Colour and U.V. Studies

	Visible light	U.V. Light
Powder (dry)	Olive green	Dark brown
Water extract of powder	Light green	Colourless.

Colour Reactions

- | | Reaction |
|--|------------------------|
| - Water extract treated with 10% FeCl ₃ | : Turned black. |
| - Water extract treated with 10% NaOH | : Turned deep yellow |
| - Water extract treated with 10% Iodine | : Turned reddish brown |

Discussion and Conclusion

Morphology

The drug consists of young branched pentangular twigs, 1-4 mm thick, with slightly winged angles. The internodes are 2-10 mm long. Externally the stems are dark green, smooth with brownish patches and internally yellow. The fracture is short and fibrous.

Anatomy

In transection the stem is stellate, 5-armed with well projected wings. The epidermis consists of cells which are oblong and squarish (Wallis, 1960), while circular and po-

lygonal ones also occur especially over the ridges. Stomata mostly anomocytic and few anisocytic occur frequently in the furrows either flushed with epidermis or raised over the surface. Further they are characterised with a sub-stomatal chamber.

Hypodermal cortex has been reported to be of several layered thick with parenchymatous cells extending to the wings (Wallis, 1960). Presently it is found to be palisade-like, 2-4 layered, densely chlorenchymatous and arranged perpendicularly to the epidermis in the arms, while 5-8 layered elsewhere containing polygonal cells with slightly dense contents.

Sclerenchymatous fibres are conspicuous, 8-12 layered at the proximal region and in a group of cells at the tip of the arms.

The vascular tissue is reported to be in a circle of compactly arranged open, collateral bundles separated by narrow medullary rays (Wallis 1960). But presently it is found as a continuous ring which is endarch, enclosed by a 4-6 layered pericycle. Further, the xylem is predominant with reduced phloem towards exterior. The xylem consists of fibres, vessels, xylem parenchyma and rays arranged in radial rows. The secondary walls of the tracheary elements was reported to be spiral (Wallis, 1960). But they are presently, reticulate, annular and bordered pitted also. However the phloem is scanty and made of phloem parenchyma, bast and sieve cells.

Histochemically lignin, proteins, resins, alkaloids, starches and tannins are detected while fixed oils and fats and suberin is absent.

Microscopic characters of powder has been reported (Wallis, 1960) and is presently confirmed except without non-glandular unicellular and papillate trichomes. Besides starch grains are rare.

The color of the powder (stem) as well as the extracts under visible and U.V. light is

also recorded (See observations). Further the colour reactions of the water extracts with 10% FeCl₃, 10% NaOH and 10% Iodine is also detailed.

The drug, *Cytisus scoparius* L. with its potential medicinal value and biological activity has tremendous scope for exploitation.

Acknowledgement

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Figs. 1. 1-19. 1. T.S. of stem, 2. T.S. of arm (enlarged), 3. T.S. at the furrow (enlarged), 4-6. Digrammatic representation of helical, reticulate and pitted thickenings of tracheary elements. 7-19. Fragments of powder, 7. Chlorenchyma with adjoining parenchyma. 8. Sclerenchyma, 9. Pericyclic fibre with parenchyma, 10. Epidermis with underlying sclerenchyma, 11. Epidermis with underlying chlorenchyma and parenchyma, 12. A stomata with epidermis, 13. Epidermis, 14. Pith cell, 15. Phloem tissue. 16. Parenchyma cell, 17. A stoma. 18. Tracheary tissue. 19. Pericyclic fibres.

Chl	- Chlorenchyma,	Cu	- Cuticle,
ep	- Epidermis	P	- Parenchyma,
Pc	- Pericycle,	Pl	- Phloem
Pt	- Pith,	Sc	- Sclerenchyma,
St	- Stomata	X	- Xylem.

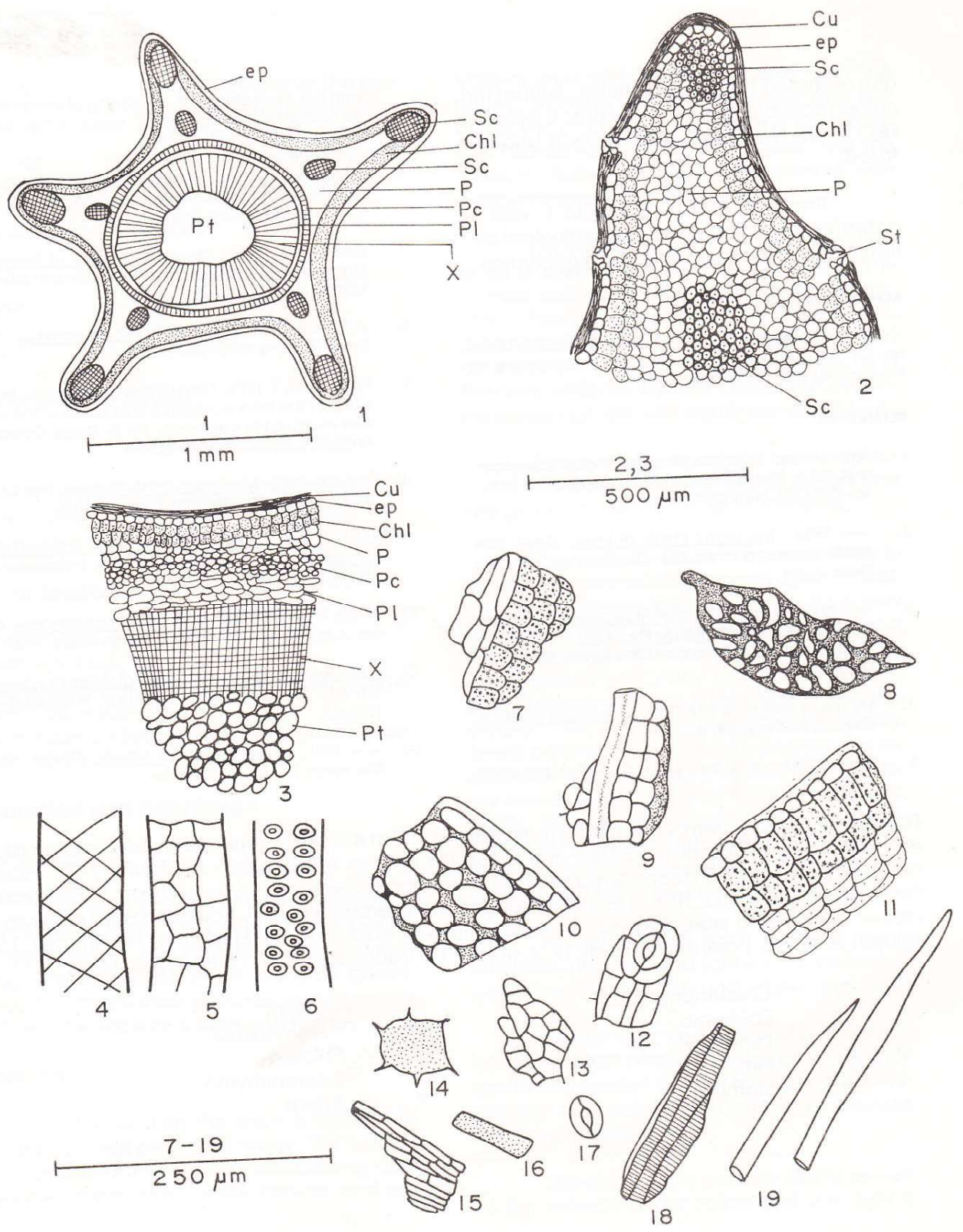


FIGURE-1