

A Pharmacognostical Study of the Stem of *Cissus quadrangularis* Linn.

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The macroscopic and microscopic characters of the stem of *Cissus quadrangularis* Linn., which is used in the indigenous systems of medicine, are described.

CISSUS *quadrangularis* Linn. syn. *Vitis quadrangularis* Wall. (Hindi: *Hadjora*, *Harsankari*; Sanskrit: *Ashtisanhara*) belongs to the family Vitaceae. It is a common perennial climber conspicuous by its fleshy quadrangular stems found throughout the hotter parts of India and Ceylon. In South India the young shoots are frequently taken with curry¹.

The stem is used medicinally in the indigenous systems of medicine both in Ayurvedic and Unani systems¹⁻⁴. The stem is alterative, laxative and digestive. It is said to be very useful in piles, indigestion and anorexia; also useful in anaemia, asthma, epistaxis, disorders of menses and otorrhoea; given internally and applied topically for broken bones; used in complaints of the back and spine; beaten into a paste and administered in asthma.

Macroscopic characters (Plate I)

Fresh stem occurs in segments of variable length which are thick, fleshy or succulent, quadrangular, with acutely 4-angled or 4-winged internodes and much contracted at the nodes (Fig. 1); some of the nodes bearing the slender basal portion of the tendril; internodes 4-15 cm. long and 1-1.5 by 0.3-0.6 cm. thick. Outer surface smooth, glabrous, dark green in colour except along the angles or wings which usually show a streak dark reddish brown in colour. Fracture short-fibrous; transverse fracture greenish yellow in colour. Odour distinct, herb-like; taste acrid.

Microscopic characters (Plate I)

A transverse section through the internode exhibits a 4-angled outline (Fig. 2). On the outside is the epidermis (Figs. 3, 4 and 5, *epi*) which consists of a single row of epidermal cells and is covered with a fairly thick cuticle (Figs. 3, 4 and 5, *cut*). At places radial wall formation can be seen in the epidermal cells (Figs. 3 and 4, *r.w*). The epidermal cells are roughly tabular in form with outwardly convex walls in transverse section and appear polygonal with straight walls in surface view (Fig. 7). The epidermal cells measure $R = 12$ to 16 to 19μ , $T = 8$ to 15 to 24μ and $L = 12$ to 17 to 24μ . Numerous stomata occur in the epidermis; as seen in surface view each stoma is surrounded by four to five subsidiary cells (Fig. 7, *subs*) which are elongated and narrower than the adjoining epidermal cells; the stomata measure 30 to 35 to 40μ in length and 24 to 30 to 36μ in breadth. The epidermal cells at the angles of the stem (Fig. 5, *epi*) are devoid of stomata and contain some amorphous material which is dark brownish to dark brownish-red in colour.

Internal to the epidermis is found the cortex (Figs. 3, 4 and 5, *ct*), a region composed of several layers of thin-walled parenchyma cells which are at places separated from one another by small intercellular spaces and measure 16 to 36 to 60μ in diameter. At places the outer cortical cells show the formation of radial walls (Fig. 3, *r.w*₁). Some of the cortical cells contain chloroplasts or starch grains

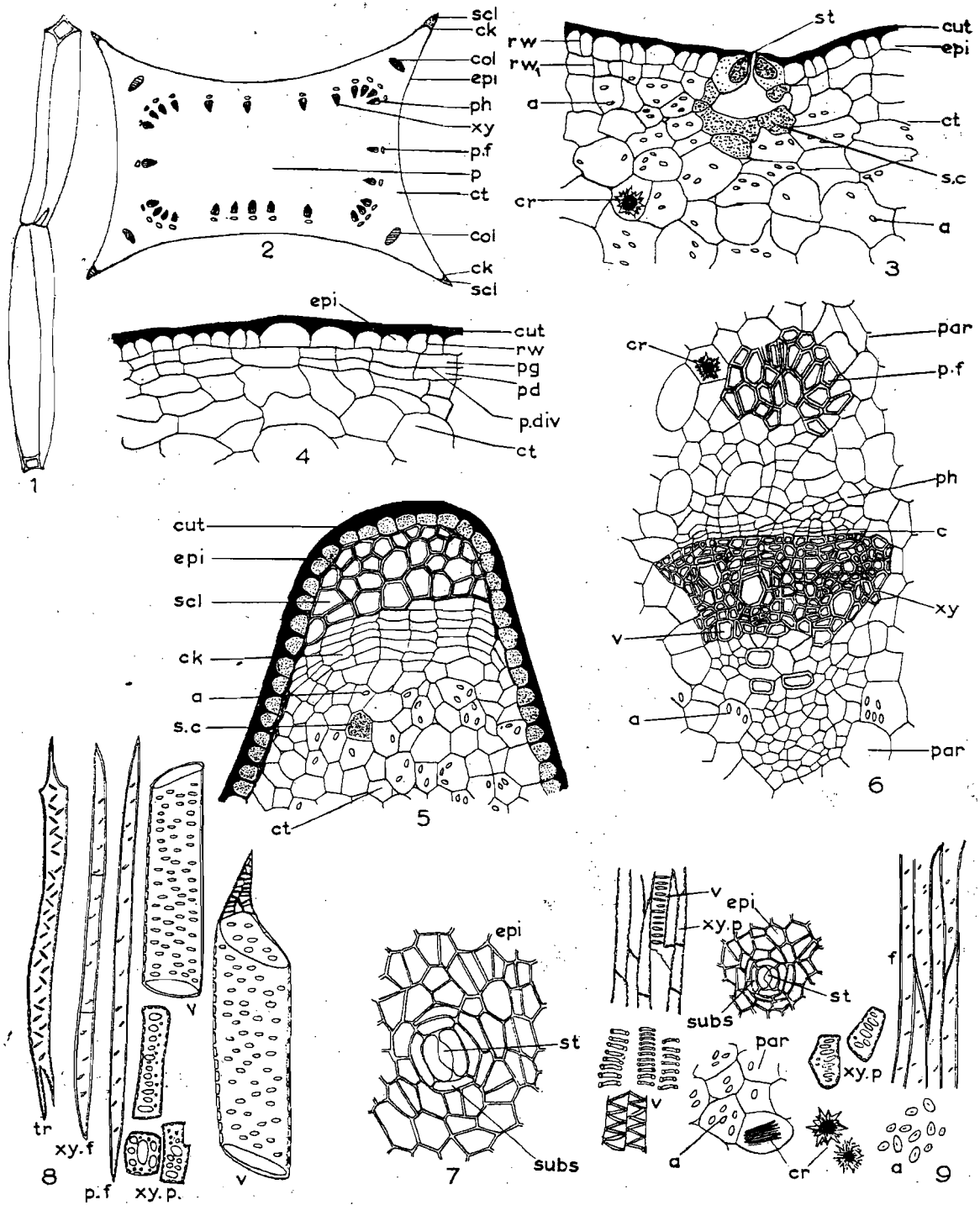


PLATE I—*Cissus quadrangularis* STEM [Fig. 1: Macroscopic appearance of a segment of stem showing internodes and node $\times 0.6$. Fig. 2: Diagrammatic t.s. of the stem $\times 13$. Fig. 3: Part of a t.s. through the cortical region of the stem $\times 210$. Fig. 4: Part of a t.s. of the stem where first divisions beneath epidermis have formed phellogen cells outward and phelloderm cells inward $\times 210$. Fig. 5: T.s. through the angular portion of the stem $\times 210$. Fig. 6: Vascular bundle as seen in t.s. $\times 210$. Fig. 7: Epidermis in surface view $\times 210$. Fig. 8: Elements from chromic-nitric acid maceration $\times 150$. Fig. 9: Powdered stem $\times 144$. *ck*, cork; *col*, collenchyma; *p.f*, pericyclic fibre; *ph*, phloem; *xy*, xylem; *p*, pith; *ct*, cortex; *epi*, epidermis; *cut*, cuticle; *s.c*, secretory cell; *cr*, druses or raphides of calcium oxalate; *a*, starch grain; *tr*, tracheid; *v*, vessel; *f*, fibré; *st*, stomata; *subs*, subsidiary cell; *scl*, sclerenchyma; *par*, parenchyma; *c*, cambium; *r.w*, radial wall in epidermal cell; *r.w*₁, radial wall in cortical cell; *p.div*, periclinal division; *pg*, phellogen cells; *pd*, phelloderm cells; *xy.f*, xylem fibre; *xy.p*, xylem parenchyma]

(Figs. 3 and 5, *a*) or druses or raphides of calcium oxalate (Figs. 3 and 9, *cr*). The starch grains are simple and oval, elliptical or round in shape and measure 4 to 16 to 22 μ in length or diameter. The druses occupying the major part of the cavity of the cell measure 12 to 22 to 36 μ in diameter and the raphides measure 60 to 90 to 110 μ in length and 16 to 25 to 45 μ in breadth. The raphides often occur in remarkably large cells filled with mucilage and there are cells with mucilage from which raphides are absent. Embedded in the cortex are some secretory cells (Figs. 3 and 5, *s.c*) with dark brown amorphous contents which are particularly noticeable within the angular region and also close to the stomatal cavities. At the corners internal to the uniseriate epidermis there are 3 to 4 layers of compactly arranged sclerenchymatous cells with lignified walls which appear to be more or less angular in outline in transverse section (Figs. 2 and 5, *scl*). Next to the sclerenchymatous zone there are 3 to 4 layers of rectangular cork cells (Fig. 5, *ck*) which are arranged compactly without any intercellular spaces and are compressed radially. The phellogen arises in the subepidermal layer (Fig. 4, *pg*) in localized areas but is formed somewhat deeper beneath the angles or ridges.

In the cortical region within the angles collenchyma occurs in the form of discrete strands (Fig. 2, *col*) all round surrounded by the cortical parenchyma cells; the individual collenchyma cells are almost isodiametric with cellulosic thickenings at their angles and measure 20 to 27 to 35 μ in diameter.

The endodermis is not distinguishable from the other layers of the cortex. The vascular bundles are of the collateral, open type and are arranged in a ring around the large central pith (Fig. 2). The bundles are separated from one another by strips of parenchymatous tissue. Externally each vascular bundle is delimited by a group of closely joined pericyclic fibres (Figs. 2 and 6, *p.f*); individual fibres have lignified walls with narrow thickening and small oblique pits, acuminate ends and a fairly broad lumen (Fig. 8, *p.f*) and measure 540 to 1000 to 1500 μ in length and 7 to 13 to 15 μ in breadth. Within the vascular bundles the cambium zone separates the external region of the phloem tissue from the internal region of the xylem tissue (Fig. 6, *c*). A few crushed and obliterated cells of the primary phloem are found at the outer edge of the secondary phloem; the latter consists of sieve tubes, companion cells and phloem parenchyma. The xylem is composed of vessels, tracheids, fibres and xylem parenchyma. The vessels (Figs. 8 and 9, *v*) show annular, spiral, reticulate or pitted type of thickening and have end walls that are either transverse or have tail-like tips and measure

174 to 295 to 550 μ in length and 20 to 70 to 110 μ in breadth. The tracheids (Fig. 8, *tr*) are less broad than the vessels but wider than the fibres and have oblique pits arranged in a spiral form and their one end may be lobed or forked. The tracheids measure 186 to 280 to 430 μ in length and 10 to 15 to 25 μ in breadth. The xylem fibres (Fig. 8, *xy.f*) are septate, have lignified walls with narrow thickening and slit-like pits, acuminate ends, a fairly broad lumen and are shorter in length than the pericyclic fibres and measure 260 to 420 to 740 μ in length, and 10 to 12 to 14 μ in breadth. Xylem parenchyma cells (Fig. 8, *xy.p*) have mostly lignified walls and show simple round or oblong pits and measure 36 to 90 to 155 μ in length and 15 to 25 to 45 μ in breadth.

The large central pith constitutes more than half of the thickness of the stem and is composed of thin-walled parenchyma cells which are comparatively bigger in size than the cortical parenchyma cells and measure 30 to 60 to 115 μ in diameter. The pith shows small intercellular spaces and some of the pith cells contain numerous starch grains or druses or raphides of calcium oxalate.

Powder — Pale yellowish to pale yellowish brown in colour. Under the microscope it is characterized by the presence of numerous starch grains (Fig. 9, *a*) which are of the simple type and elliptical, oval or round in shape with a distinct hilum and measure up to 22 μ in length or diameter; fragments of parenchyma cells (Fig. 9, *par*) containing starch grains; druses or raphides of calcium oxalate (Fig. 9, *cr*) either in the parenchyma cells or free in the powder; fragments of lignified fibres (Fig. 9, *f*) which may be septate or non-septate having simple oblique pits; polygonal straight-walled epidermal cells (Fig. 9, *epi*), some with dark brownish amorphous contents; stomata (Fig. 9, *st*) surrounded by their subsidiary cells and the adjoining epidermal cells; fragments of lignified vessel elements (Fig. 9, *v*) with annular, spiral, reticulate or pitted thickenings; few lignified xylem parenchyma cells (Fig. 9, *xy.p*) with simple, round or oblong pits.

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