

PHARMACOGNOSTIC STUDY OF *VALERIANA PYROLAEFOLIA* DECAISNE

BY C. K. ATAL AND K. L. KHANNA*

From the Department of Pharmacy, Panjab University, Chandigarh, India

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The macroscopical and microscopical characters of the roots, rhizomes and stolons of *Valeriana pyrolaeifolia* Decaisne have been described.

Valeriana officinalis has been used in medicine in Western countries as an antispasmodic in the treatment of hysteria¹. Wallis and Sanyal² described the macroscopical and histological characters of *V. wallichii*, an Indian substitute for valerian. In India a number of other species³ of valeriana grow. The pharmacognosy of *V. hardwickii* and *Nardostachys jatamansi* has been described by Mehra and Garg⁴. In the present investigation the pharmacognostic characters of *V. pyrolaeifolia* have been studied. This species is taxonomically closely related to *V. wallichii*. It differs^{3,4} (Fig. 1) from the latter in having smaller broadly ovate radical leaves with obtuse apex and sessile cauline leaves. Both the species occur interspersed in more or less the same areas and there is a chance of their being admixed by unskilled collectors. Preliminary chemical investigation of *V. pyrolaeifolia* also indicated that it may form a valuable substitute for the official valerian. An investigation of this drug was, therefore, undertaken.

MATERIAL AND METHODS

The material was collected from Kashmir, between Gulmarg and Khillanmarg. The authenticity was established by comparison with the description given in standard texts^{3,5}. Roots, rhizomes and stolons were fixed in 50 per cent ethanol. Both free hand sections and paraffin embedded sections were cut for histological studies. Usual methods⁶ of staining with safranin and fast green were followed.

Macroscopy

The dried drug (Fig. 2A) consists of vertical rhizomes, stolons and sub-horizontal rhizomes with numerous long wiry roots. The vertical rhizomes are knotty, undifferentiated into nodes and internodes and show roots and root scars. They are 0.4–0.8 cm. in diameter. The stolons vary in length from 5 to 8 cm. and in diameter from 0.25 to 0.5 cm., show distinct nodes and internodes and longitudinal wrinkles. The roots are seen arising from the undersurface of the nodes. The sub-horizontal rhizomes are more or less similar to the vertical rhizomes but can be differentiated by the presence of roots and root scars on the lower surface only. The roots are slender, 1–2 mm. in diameter and up to 10 cm. in length. The drug shows a short fracture, a distinct valerianaceous odour, a bitter camphoraceous taste and dark brown colour.

* Present address: School of Pharmacy, University of Connecticut, Storrs, Conn., U.S.A.

Microscopy

RHIZOME. The old thick rhizome in diagrammatic transverse section (Fig. 2B) is circular in outline and shows from without inward, cork, cortex, endodermis, pericycle, a ring of open collateral vascular bundles and a large central pith. The cork (Fig. 2D) consists of 3 to 6 layers of radially arranged suberised, lignified, tangentially elongated rectangular cells. They are brownish-black in colour and occasionally contain oil globules. They measure R, 12–24–52 μ ; T, 15–31–56 μ ; L, 14–33–59 μ . A single layer of thin walled tangentially elongated cells measuring R, 11–14–19 μ ; T, 35–49–57 μ , form the cork cambium. The cortex is



FIG. 1. The flowering plant of *Valeriana pyrolaefolia* $\times \frac{1}{4}$.

composed of 16 to 20 layers of cells. The outer 2 to 4 layers of cells are polygonal in outline and are collenchymatous. They measure R, 23–30–46 μ ; T, 28–41–59 μ ; L, 35–51–81 μ . The inner layers of the cortex are thin walled, parenchymatous and are rounded to polygonal in outline. They show well-marked intercellular air spaces and measure R, 38–48–58 μ ; T, 42–57–98 μ ; L, 21–40–63 μ . Almost all the cells contain oil globules. The endodermis consists of rectangular, suberised and lignified cells. They frequently show passage cells and measure R, 13–17–20 μ ; T, 31–46–70 μ ; L, 24–39–63 μ . The pericycle is composed of thin walled parenchyma cells which measure R, 9–15–23 μ ; T, 17–32–42 μ ; L, 33–45–56 μ . The vascular bundles (Fig. 2C) are open collateral and are from 13 to 16 in number. The phloem is collenchymatous and shows sieve tubes and companion cells. The xylem

STUDY OF *VALERIANA PYROLAEFOLIA*

consists of xylem vessels, fibres and xylem parenchyma. The fibres are few, thick walled, pitted and measure up to $180\ \mu$ in length. The pith is large, showing lacunae and consists of parenchymatous cells. These cells contain starch grains and oil globules and measure R, $49\text{--}51\text{--}81\ \mu$; T, $39\text{--}60\text{--}73\ \mu$; L, $37\text{--}53\text{--}59\ \mu$.

STOLON. The stolon in diagrammatic transverse section (Fig. 3B) is similar to the rhizome. It differs from the rhizome in having 12 to 13 vascular bundles and by the absence of lacunae in the pith. The cork is

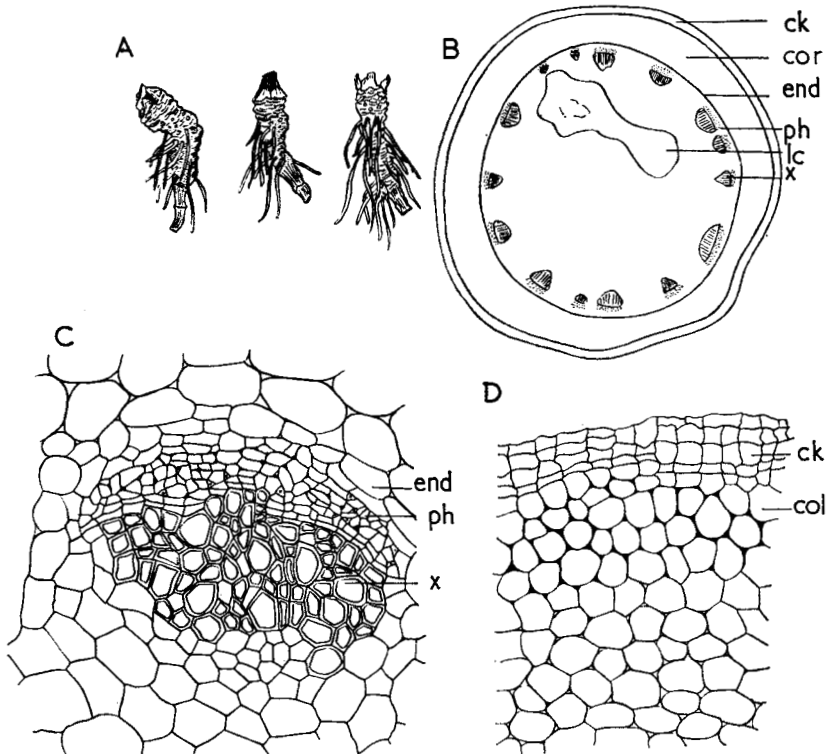


FIG. 2. A, the dried drug of *V. pyrolaeifolia* $\times 2/3$. B, T.S. rhizome of *V. pyrolaeifolia* (diagrammatic) $\times 6$; ck, cork; cor, cortex; end, endodermis; lc, lacunae; ph, phloem; x, xylem. C, T.S. rhizome of *V. pyrolaeifolia* showing vascular bundle $\times 175$; end, endodermis; ph, phloem; x, xylem. D, T.S. rhizome of *V. pyrolaeifolia*, showing cork and cortex $\times 125$; ck, cork; col, collenchyma.

1 to 2 layers thick and is brownish-black in colour. The cells measure R, $11\text{--}26\text{--}47\ \mu$; T, $8\text{--}21\text{--}36\ \mu$; L, $31\text{--}56\text{--}77\ \mu$. The cortex consists of about 13 layers of cells. The outer 3 to 4 layers are collenchymatous as in case of the rhizome. They measure R, $14\text{--}27\text{--}41\ \mu$; T, $21\text{--}31\text{--}49\ \mu$; L, $45\text{--}67\text{--}97\ \mu$. The next 9 to 10 layers of cells are parenchymatous, show intercellular air spaces and are filled with starch grains and oil globules. They measure R, $28\text{--}47\text{--}61\ \mu$; T, $27\text{--}51\text{--}73\ \mu$; L, $31\text{--}54\text{--}87\ \mu$. The endodermis is single layered and consists of broadly rectangular suberised and lignified cells. The passage cells are also

present. The endodermis cells measure R, 11–21–28 μ ; T, 17–32–45 μ ; L, 35–46–56 μ . The pericycle is formed of 1 to 3 layers of parenchyma cells measuring R, 7–12–18 μ ; T, 17–21–28 μ ; L, 49–59–89 μ . The vascular bundles have 4 or 5 layers of collenchyma associated with the phloem. The xylem consists of xylem vessels, tracheids and xylem parenchyma. The pith cells are also similar to those of rhizome and measure R, 24–39–52 μ ; T, 21–35–59 μ .

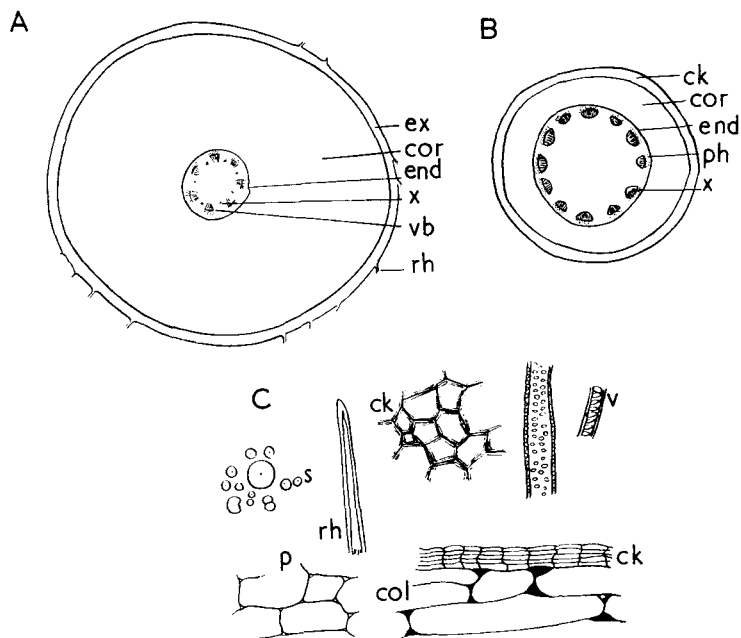


FIG. 3. A, T.S. root of *V. pyrolaefolia* (diagrammatic) $\times 30$; cor, cortex; end, endodermis; ex, exodermis and piliferous layer; rh, root hair; vb, vascular bundle; x, primary xylem. B, T.S. stolon of *V. pyrolaefolia* (diagrammatic) $\times 6$; ck, cork; cor, cortex; end, endodermis; ph, phloem; x, xylem. C, microscopic view of *V. pyrolaefolia* powder $\times 80$; ck, cork; col, collenchyma; rh, root hair; p, parenchyma; s, starch; v, vessels.

ROOT (Fig. 3A). The outermost layer of the root, the piliferous layer, consists of collapsed rectangular cells which are dark-brown in colour and measure R, 7–11–17 μ ; T, 14–22–27 μ ; L, 34–67–95 μ . It is suberised and lignified. Frequently these cells give rise to root hairs which are also suberised and lignified. The exodermis consists of rectangular cells, the anticlinal walls of which are wavy. These cells are also suberised and lignified and measure R, 12–26–35 μ ; T, 37–51–63 μ ; L, 37–47–70 μ . The cortex consists of about 21 layers of cells. The outermost 1 to 2 layers are collenchymatous and are polygonal to rectangular in outline. They measure R, 13–28–42 μ ; T, 21–27–49 μ ; L, 56–81–129 μ . The rest of the cells of the cortex are parenchymatous, circular to ovoid in outline and measure R, 18–37–56 μ ; T, 24–39–53 μ ; L, 77–106–167 μ . They contain starch grains and oil globules. The endodermis is formed of

STUDY OF *VALERIANA PYROLAEFOLIA*

suberised and slightly lignified rectangular cells. Passage cells are occasionally present. The cells of the endodermis measure R, 4–31–21 μ ; T, 14–23–35 μ ; L, 32–43–77 μ . The pericycle consists of 1 to 2 layers of collenchyma cells, polygonal in outline, measuring R, 9–15–21 μ ; T, 14–23–31 μ ; L, 28–47–81 μ . The xylem after secondary growth consists of xylem vessels and tracheids. The pith cells are polygonal, show slight thickening at the angles and measure R and T, 11–13–18 μ . The primary structure of the root (Fig. 3A) varies from tetrarch to heptarch.

POWDERED DRUG

Macroscopy

The powdered drug is dark yellowish-brown in colour. It gives a bluish-black colour with ferric chloride reagent and a yellowish-brown colour with 5 per cent potassium hydroxide solution. It has a strongly valerianaceous odour and a slightly bitter aromatic taste.

Microscopy

The powdered drug under the microscope (Fig. 3C) shows rounded to irregular starch grains with central dot-like hilum. The starch grains are usually simple but may be 2-compound and measure up to 24 μ in diameter, the average diameter being 7 μ . Fragments of pitted or spiral vessels are also discernible. The powder also shows fragments of collenchymatous tissue and cork cells as well as thin walled parenchyma cells. Occasionally thick walled root hairs may be seen. When the powder is mounted in chloral hydrate, no crystals appear as reported in the case of *V. wallichii*².

DISCUSSION

It will be clear from the foregoing description that the characters of *V. pyrolaeifolia* are quite distinct from the characters reported³ for *V. wallichii*. The former can be differentiated from the latter by the smaller size of the rhizome and stolon and by distinct differences in the cell dimensions of the various tissues. It can be further differentiated by the absence of secondary xylem in the interfascicular region and by the absence of lacunae in the pith of the stolon. In *V. pyrolaeifolia* the pericycle is collenchymatous in roots while in *V. wallichii* it is not so. The powder of *V. pyrolaeifolia* can also be differentiated from that of *V. wallichii*² by the shape and size of starch grains as well as by the fact that it does not give any crystals on treatment with chloral hydrate solution.

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