

Full Length Research Paper

Setting pharmacognostic standards for *Convolvulus arvensis* Linn.

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***Convolvulus arvensis* Linn. (Convolvulaceae) was studied to determine the various parameters for pharmacognostical standards. The present investigation deals with the report on macro and microscopical, vein islet and vein termination numbers, palisade ratio, stomatal index (upper and lower surfaces of the leaf) and different chemical parameters. The present study reports some quantitative parameters needed for pharmacognostical quality, which might be helpful for future workers, pharmacologists and herbal practitioners involved in herbal medicines.**

Key words: *Convolvulus arvensis*, pharmacognostic standards, palisade ratio, stomatal index.

INTRODUCTION

The plant is herbaceous, annual or perennial, with ± woody rhizomes. Its stems prostrate and twine, up to 1 m tall; is glabrous or sparsely pubescent. Petiole is 0.3 to 2 cm; leaf blade is ovate-oblong to ovate; 1.5 to 5 × 1 to 4 cm; is glabrous or pubescent; base is hastate, sagittate, or cordate; apex, obtuse, mucronulate; prominently 3-veined basally; upper parts, pinnately veined. Inflorescence is axillary, cymose; 1 to 3-flowered; peduncle, 3 to 8 cm; bracts, 2; linear, ca. 3 mm. Pedicel ca. 4 is as long as calyx. Sepals are unequal, 3.5 to 5 mm; the outer 2 are broadly oblong to obovate, shorter, abaxially sparsely pubescent or glabrous; margin, ± ciliate; apex, retuse; inner ones, ovate-circular; margin, membranous; apex, obtuse or retuse. Its corolla is white or pink, with broadly funnel form, 1.5 to 2.6 cm; midpetaline bands are pubescent outside distally; limb, shallowly 5-lobed. Stamens are unequal; filaments, minutely scaly basally; disc, copular; ovary, ovoid, glabrous or sparsely pubescent. Stigmas are cylindrical. Capsules are ovoid to subglobose, 5 to 8 mm, and glabrous. Seeds are 4 or fewer; colour, dark brown or black; are ovoid, 3 to 4 mm, and are tuberculate. It flowers from June to August, and from June to September: 2n = 24, 48, 50 (Ali and Qaiser, 2007).

Akhtar and Begum (2009) reported *Convolvulus arvensis* is used as antidandruff and for skin diseases Figures 5 and 6. Kamal et al. (2009) reported that the whole plant is used as a fodder. It is purgative. The extract is treatment for skin diseases.

MATERIALS AND METHODS

The fresh specimens of the plants were collected from the Department of Botany, University of Peshawar, Pakistan. The specimen was cleaned and washed and dried in air for 15 days and was used for different tests that is, micro-chemical tests. These entire specimens were ground with the help of electric grinder and were mesh to 60 and were preserved in airtight bottles to combat climatic conditions and moisture. Some fresh specimens were used to study morphological characters, while some of them were utilized for different anatomical parameters like vein islets numbers, vein termination number, palisade ratio, general anatomy of the root, stem and leaf and stomatal study. The macro-scopical features of the plant were determined by following Wallis (1985). The anatomy of the root and stem was determined by following Puruis et al. (1966) (Figures 1 and 2). Leaf anatomy was studied following Subrahmanyam (1996), Bokhari (1971), Cotton (1974) and Clark (1960). The vein islet numbers (Figure 3), vein termination number Figure 4, palisade ratio were determined by following Evans (2002). Different chemical parameters like alkaloids, mucilage, anthraquinone derivatives, calcium oxalate, tannin, lignin, starch, fats and oil, cutin, cellulose were determined by following Evans (2002) and protein was determined by following (Johnson, 1940) (Tables 1-4).

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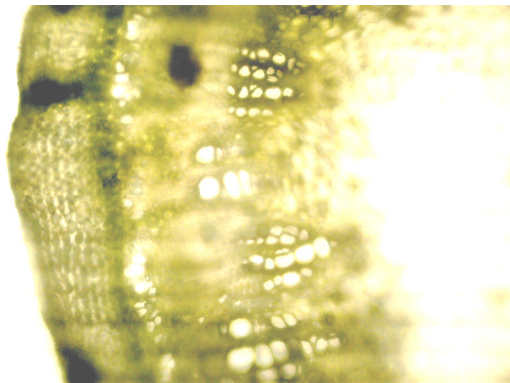


Figure 1. Root of the plant.

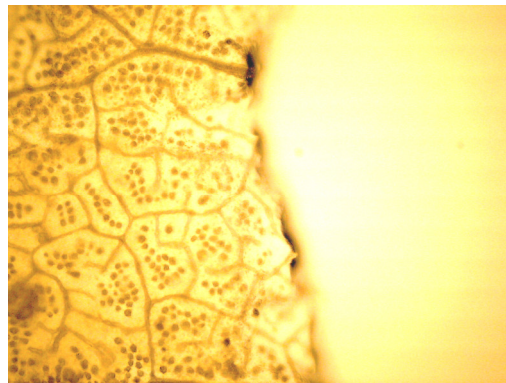


Figure 4. Vein termination number.

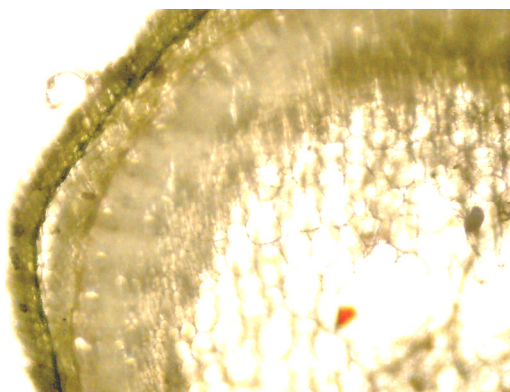


Figure 2. Stem of the plant.



Figure 5. Abaxial side of the leaf *Convolvulus arvensis* L.

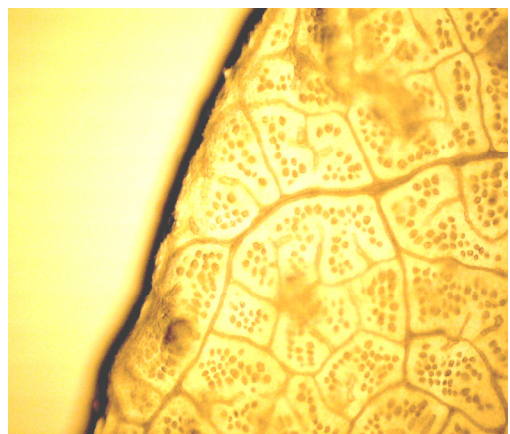


Figure 3. Vein islet number.

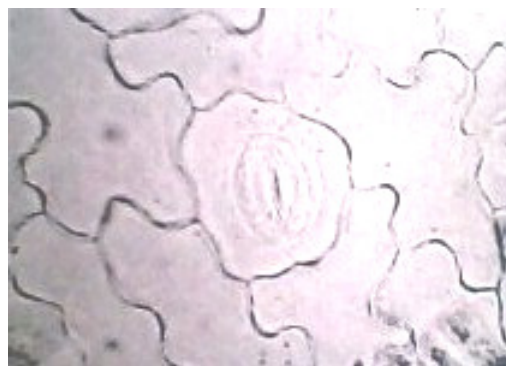


Figure 6. Adaxial side of the leaf *Convolvulus arvensis* L.

RESULTS AND DISCUSSION

Colour of the root was whitish in both fresh and dried forms. Odour of the root was indistinct in both fresh and dried roots. Fresh and dried roots were cylindrical in shape containing number of rootlets. Root growth was

vertically downward. Fracture was fibrous in fresh form and uneven in dried form. Hairy texture was recorded in both fresh and dried samples. Our findings are in line with Yadav et al. (2007) who reported the macro-scopical characters like shape, colour, fracture, surface and taste of the root of the *Chenopodium album*. Stem colour in

Table 1. Macro-scopical features of the different parts of *Convolvulus arvensis* L.

Plant part	Parameters	Fresh	Dry
Root	Colour	Whitish	Whitish
	Odour	Indistinct	Indistinct
	Shape	Cylindrical	Cylindrical
	Rootlets	Present	Present
	Direction of growth	Vertical	Vertical
	Fracture	Fibrous	Uneven
	Texture	Hairy	Hairy
Stem	Colour	Green	Green
	Odour	Indistinct	Indistinct
	Shape	Angular	Angular
	Phyllotaxis	Alternate	Alternate
	Kind	Herbaceous	Herbaceous
	Direction of growth	Prostate	Prostate
	Fracture	Uneven	Fibrous
Leaf	Colour	Upper surface dark green lower surface light green	Both surfaces are light green
	Dimension	Length is 4.2 cm, width is 1.1 cm	Length is 4.1 cm, width is 1.0 cm
	Incision	Nil	Nil
	Composition	Simple	Simple
	Venation	Reticulate unicostate	Reticulate unicostate
	Margin	Entire	Entire
	Apex	Obtuse	Obtuse
	Shape of leaf	Hastate	Hastate

Table 2. Anatomical features of the different parts of the *Convolvulus arvensis* L.

Plant cell	Value	Root		Stem	
		Length (μm)	Width (μm)	Length (μm)	Width (μm)
Epidermis	Minimum	20	14	22	17
	Maximum	43	19	29	20
	Mean	23	16	24	18
Xylem	Minimum	26	17	18	14
	Maximum	39	24	26	19
	Mean	29	19	23	16
Phloem	Minimum	35	22	12	9
	Maximum	56	36	18	14
	Mean	44	30	15	11
Enodermis	Minimum	17	10	12	7
	Maximum	25	15	19	15
	Mean	20	12	15	10
Pericycle	Minimum	12	9	19	15
	Maximum	17	13	27	22
	Mean	14	11	24	18
Pith	Minimum	20	16	14	10
	Maximum	27	19	21	16
	Mean	24	17	16	13

Table 2. Contd.

Cortex	Minimum	26	21	20	14
	Maximum	32	27	28	18
	Mean	29	23	25	15
Parenchyma	Minimum	11	9	30	21
	Maximum	15	12	40	27
	Mean	13	10	34	25

Table 3. Microscopic characteristics of the leaf of *Convolvulus arvensis* L.

S/N	Parameters	Values
1	Vein islet number	21.42 – 24.54
2	Vein termination number	33.54 – 37.83
3	Palisade ratio	15.24 – 19.65
4	Stomatal index (Upper surface)	17.45 – 18.25
5	Stomatal index (Lower surface)	24.23 – 24.56

Table 4. Microchemical screening tests of the different parts of *Convolvulus arvensis* L.

Plant part	Alk	Muc	Anth	Cao	Sap	Tan	Sta	Fat	Pro	Lig	Cut	Cel
Root	+	+	+	-	+	+	+	+	+	-	-	+
Stem	-	+	+	+	+	-	+	+	+	-	+	+
Leaf	-	+	-	+	-	+	+	+	+	-	+	+
Flower	+	+	+	+	-	+	+	+	+	-	-	+

Key: Alk = Alkaloid; Muc = Mucilage; Anth = Anthraquinone derivatives; Cao = Calcium oxalate; Sap = Saponins; Tan = Tannins; Sta = Starch; Fat = Fats; Pro = Protein; Lig = Lignins; Cut = Cutins; Cel = Cellulose.

both the fresh and dried material was green. Indistinct odour was smelled in both fresh and dry stems. Stem shape was angular in both fresh and dried forms. Phyllotaxis was alternate and herbaceous. Prostate growth was recorded in stem. Fracture was uneven in fresh form and fibrous in dried form. Badami et al. (2007) reported the macro-scopical parameters like colour, taste, odour, surface texture and shape of the heartwood of *Caesalpinia sappan*. Thus, our results agree with them. Leaf colour of the upper surface was dark green and that of the lower surface was light green in fresh form while in dried leaves both surfaces are light green. The length of leaf was 4.2 cm and width was 1.1 cm in fresh leaves but in dried leaves the length was 4.1 cm and width was 1.0 cm.

No incisions were observed in both fresh and dried leaves. Composition was simple in both fresh and dried samples. Venation was reticulate and unicostate in both fresh and dried leaves. Margin, in both fresh and dried leaves was entire. Apex of the leaf was obtuse in both fresh and dried samples. Shape of the leaf was hastate in both fresh and dried forms. While describing *Solanum nigrum* leaf for such standards, Vidhu et al. (2007)

reported that it was simple, 2.5 to 8.5 cm long and 2.5 cm wide, ovate, or oblong, sinuate, toothed or lobed, narrow at both ends, petiolate, thin and pubescent. Dorsal surface is green in colour but the ventral surface is slightly pale. Venation is reticulate. The odour is characteristics and the taste is bitter. Thus, our results support their findings.

Epidermis of the root is rectangular in shape and is compactly packed. The mean length of the epidermal cell is 23 μ ; mean width is 16 μ . Epidermis is then followed by the cortex. Mean length and width of the cortical cell is 29 and 23 μ respectively. Endodermis lies inner to the cortex. Mean length and width of endodermal cells are 20 and 12 μ , respectively. Single layer of pericycle with mean length (14 μ) and width (11 μ) is situated internal to endodermis. Xylem with mean length (29 μ) and width (19 μ) and phloem with mean length (44 μ) and width (30 μ) forming the vascular bundles of the studied plant species.

Pith is located in the center of the vascular bundle with mean length (24 μ) and width (17 μ). There is thin walled parenchymatous cell. The mean length and width are 13 and 10 μ . Epidermis of the stem is spherical in shape and

is compactly packed. The mean length and width of the cell are 24 and 18 μ , respectively. Epidermis is followed by the cortical cells with mean length (25 μ) and width (15 μ). Inner to the cortex is endodermis. Mean length and width are 15 and 10 μ respectively. Pericycle is composed of single layer; the mean length and width of cells are 24 and 18 μ . Xylem cells mean length and width are 22 and 16 μ . Mean length and width of phloem are 15 and 11 μ . Pith is located in the core of vascular bundle having 16 and 13 μ mean length and width respectively. There is thin walled parenchymatous cell; the mean length and width are 34 and 25 μ . Ferris et al. (2002) reported co-efficient of variance, stomatal density, stomatal index, epidermal cells area and number of epidermal cells per leaf. Kanwal et al. (2006) reported parenchyma cells, fibers, vessels, needle like elongated crystals and oil droplets in *Pongamia pinnata*. Khan et al. (2001) reported epidermal cells, collenchyma, tracheids and fibers in *Cyrtomium caryotideum*.

The vein islet number ranged from 21.42 to 24.54, vein termination number from 33.54 to 37.83 and palisade ratio from 15.24 to 19.65, the stomatal index of the upper surface of the leaf from 17.45 to 18.25 and that of the lower surfaces from 24.23 to 24.56 in the investigated plant species. Our results are in line with Kumar et al. (2008) who reported the vein islet number (13), vein termination number (18) and stomatal index (3.6) of the *Portulaca oleracea*. Our findings also agree with Abere et al. (2009) who recorded the palisade ratio, stomatal number and stomatal index of the upper and lower surfaces, vein islet number and vein termination number of *Dissotis rotundifolia*.

Alkaloid was observed in roots and flowers while absent in stems and leaves. The inflorescence of *Verbascum* species contains mucilage (Gurbuz et al., 2005). Our results agree with them because mucilage, starch, fat, protein and cellulose were present in all parts of the plant. Yadav et al. (2007) reported flavonoids, saponins, steroids, alkaloids, carbohydrates and proteins in *Chenopodium album* root. In the present endure Anthraquinon derivatives were found in root, stem and flower but absent in leaf. Ca-oxalates were absent in root and determined in other parts of the plant. Saponin was present in root and stem but absent in leaf and flower. Thus our findings agree with them. Tannin was present in root, leaf and flower but absent in stem. All parts of the plant contained no lignin. Cutin was recorded in stem and leaf and was absent in root and flower. Badami et al. (2007) reported alkaloids, carbohydrates, proteins and amino acids, steroids, glycosides, saponins, tannins and fixed oils in *C. sappan*. Our results support their findings.

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