Peristrophe bicalyculata - A Review

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ABSTRACT

Peristrophe bicalyculata (Acanthaceae) is upto 60-180 cm in height and found almost throughout India, Afghanistan and Africa. It is commonly known as kali aghedi in Hindi and kakajangha in Sanskrit. The herb is used for its anti-bacterial property (tuberculostatic), snake poison, in bone fracture, sprain, fever, cold, cough and for ear and eye treatments. The chemical composition of the dried aerial parts showed 14-methyl-tritriacont-14-en-15-ol and 35-hydroxynonatriacontanal. In this review we have explored the detailed pharmacognostical study of stem and leaf as well as physicochemical parameters, phytochemical screening and leaf constant.

Key words: Peristrophe bicalyculata, Pharmacognostical study, Phytochemical screening

INTRODUCTION

Peristrophe bicalyculata (Acanthaceae) is upto 60-180 cm in height and found almost throughout India, Afghanistan and Africa. It is commonly known as kali aghedi in Hindi and kakajangha in Sanskrit. The herb is used for its anti-bacterial property (tuberculostatic), snake poison, in bone fracture, sprain, fever, cold, cough and for ear and eye treatments. The chemical composition of the dried aerial parts showed 14-methyl-tritriacont-14-en-15-ol and 35-hydroxynonatriacontanal (Singh et al., 2000). The essential oil shows tuberculostatic activity in vitro against the growth of various strains of Mycobacterium tuberculosis (Chopra and Chopra, 1959).

COMMON NAME1,2,8

Hindi : Atrial, Itrelal masi, Nasbhanga
Bengal : Nasabhaga
Marathi : Ghati pitta papada, Rankirayat
Gujarati : Kali-adhedi, Kari-adhedi, Lisi-adhedi
Sanskrit : Kakajangha
Telugu : Chebira
Kan. : Cheebeegida, Cheebeera soppu

DISTRIBUTION3,8,9

Throughout in India in forest as undergrowth, hedges and wasteland, Afghanistan, Tropical Africa. Flowers and fruits: Oct-Apr. Flowered at the end of rains and died early in the dry season.

DISCRIPTION

Macroscopy of plant (Figure 1)1,8-11

An erect, hispid herb or undershrub, 60-180 cm high, found in forest undergrowth, hedges and wasteland almost throughout India. Leaves: Ovate or elliptic ovate, appressed-hairy, acuminate, pubescent, densely lineolate, more or less hairy above, somewhat densely so on the nerves and veins beneath, base usually rounded, main nerves 4-6 pairs. Petioles: 6-15 cm long Stems and Branches: Usually 6-angled, more or less hairy, usually rough on the angles. Flowers: In trichotomous cymes in large lax divaricate pubescent panicles, rose, purple or pink, in lax panicles, panicles axillary and terminal, trichotomously branched. Bracts: Beneath the calyx 2, opposite, often very unequal, the longer of the pair sometimes 1 cm, the shorter 6 mm long, linear, acute, microneate with white membranous margins. Bracteoles: 4,
similar to the bracts but shorter, subequal or sometimes unequal. Calyx: 3-4 mm, long, divided to within about 1.2 mm of the base. Segments are lanceolate- subulate with ciliolate margins. Corolla: Rosy, nearly 1.3 cm long, pubescent outside, upper lip 6 by 3 mm, elliptic oblong, obtuse, entire, lower lip slightly longer, oblong with 3 acute lobes about 1 mm deep. Androceium: Filament hairy, Anther one almost entirely above the other, muticous. Gynoecium: Ovary pubescent at the tip, Stye nearly glabrous. Fruit: Capsules 0.8-1 cm long, pubescent in upper half, shortly beaked, pointed, narrowed into cylindrical stalk. Seeds: 4, orbicular, papilllose, slightly rugose, minutely hairy.

**ROOT**

**Macroscopy**

Roots: Occur upto 0.7 cm thick and upto 4 cm long cylindrical with branched lateral roots, dirty brown. Fracture: Fibrous odor and taste: Not characteristic

**Microscopy**

Cork: Poorly developed, consisting of 2-4 layers of tangentially elongated, thin walled cells. Epidermis: Consisting of single layered cells. Cortex: 2° cortex narrow, consisting of 5-7 layers of elliptical or tangentially elongated, thin walled, parenchymatous cells. 2° phloem narrow, consisting of sieve elements and parenchyma, Phloem rays not distinct. 2° xylem consisting of pitted vessels, fibres, tracheids and parenchyma. Vessels occur singly or in groups of 2-4 or more and arranged radially throughout 2° xylem, vessels with simple pits, tracheids thick-walled and lignified.

**Powder characteristics**

Dirty brown, shows parenchymatous cells, aseptate fibres and pitted vessels.

**IDENTITY, PURITY AND STRENGTH**

Foreign matter: NMT 2% Total Ash: NMT 9% Acid insoluble Ash: NMT 2% Alcohol – soluble extractive: NLT 3% Water soluble extractive: NLT 7%

**Dose**

1-5 g in powder form.

**Properties and action**

Rasa: Tikta, Kasaya Guna: Sara, Picchila Virya: Sita Vipaka: Katu Karma: Pittahara, Kaphahara, Varnya

**Important formulation**

Aragvadhadi Kvatha Curna.

**STEM**

**Microscopy (Figure 2)**

The transverse section of stem shows epidermis which is single layered, flattened tangentially and fitted closely along their radial walls with a cuticle extending over it. It is followed

**PHARMACOGNOSTICAL STUDIES**

Anuradha U., Kumbhojkar M.S. and Vartak V.D. have repored six species, viz. *Glossocardia bosvallea*, *Justicia procumbens*, *Haplanthus verticillaris*, *Oldenlandia corymbosa*, *Peristrophe bicalyculata* and *Rungia repenes* used as ‘Pittapapada’ by local people of Pune and neighbouring destricts. Their taxonomical status, vernacular names and precise uses are given. For easy identification of the market drug samples, an artificial key is devised on the basis of exomorphic characters of leaves.

Kumar K.A. and Nisteswar K. have described the folk uses of *Tribulus terrestris*, *Viscum orientale*, *Rivea ornata*, *Coldenia*...
Sabu P.M. and Ghouse A.K.M. have showed the morphological variations of *Peristrophe bicalyculata* Nees as induced by pollutants resulting from coal burning. It is a common wasteland weed, which is widely used as a cattle fodder. The noxious substances and gases emitting from the thermal power plant change the environmental conditions towards the worse and affect the vegetation in more than one way. The plant studied, shows significant reduction in overall plant growth, leaf number, floral organs and biomass.15

Begum M. and Sarker A.K. have found the cystolith as a parameter in delimiting different taxa of the family Acanthaceae (in bangladesh). The characteristics of cystolith (shape, size, occurrence, etc.) are considered to be important taxonomic criteria for the identification of various angiospermic taxa. Thus, the study of 30 species of Acanthaceae from Bangladesh revealed that cystolith of various sizes is present in the following taxa: *Andrographis paniculata*, *Peristrophe bicalyculata*, *Beloperone guttata*, *Cardenthra difformis*, *Gendarussa vulgaris*, *Lepidagathis incurva*, *Rangija pecinata*, *Ruellia tuberosa*, *R. prostrata*, etc; whereas, it is absent in the following: *Nelsonia canescens*, *Adhatoda zeylanica*, *Hypoestes triflora*, *Thunbergia grandiflora*, *T. erecta* and *T. laevis*. The occurrence, distribution, shape, size and other aspects of cystolith studied in the family Acanthaceae have been presented.16

**Quantitative microscopy of leaf**12
The palisade ratio, stomatal number, stomatal index, vein islet number and vein termination number of leaves are given in Table – 1.

**Physicochemical parameters**12
The results of the physicochemical parameters are given in Table – 2.

**CHEMICAL CONSTITUENTS**10,17-21
Flowers contain petunidin-3-rhamnogluicoside, roots contain volatile oil, stem and root contains sterols and fatty acids, in stem methanolic extract shows free amino acids and sugars,
seed contain mucilage, leaf and stem contains alkaloids and aerial parts contains 14-methyltritriacont-14-en-15-ol and 35-hydroxynonatriacontanal. (yields – 40 mg and 601 mg respectively, from 4 kg of air-dried aerial parts.)

**PHYTOCHEMICAL STUDIES**

Sharma B., Lukka K.V. and Baxi A.J have done the chemical investigation of stem and root of *Peristrophe bicalyculata* (Retz.) Nees. which showed the presence of at least 4 sterols and 3 fatty acids isolated by TLC and reverse phase chromatography respectively. From methanolic extract of stem 5 free amino acid and 4 free sugars were isolated.22

Singh R.S., Pandey R.P., Singh B.K. and Singh R.G. have done the isolation and spectral data of new 14-methyltritriacont-14-en-15-ol and 35-hydroxynonatriacontanal from aerial parts of *Peristrophe bicalyculata*.23

**Phytochemical screening**22

The results of preliminary phytochemical screening of petroleum ether, chloroform, acetone, methanol and water extracts of aerial parts of *Peristrophe bicalyculata* are presented in Table – 3 and 4. The qualitative chemical tests revealed the presence of phytosterols, carbohydrates, protein, amino acids, flavanoid and phenolic compounds.

**TLC (root)**10

TLC of Alcoholic extract on Silica Gel ‘G’ plate using Toluene: Ethyl acetate (93:7).

→ Shows under U.V. (366 nm) five fluorescent zones at Rf 0.15, 0.30, 0.52, 0.90 and 0.98 (all light blue).

→ On exposure to 12 vapor 6 spots appear at Rf 0.07, 0.15, 0.30, 0.43, 0.57 and 0.98 (all yellow).

→ On spraying with Vanillin – H₂SO₄ reagent and heating the plate for 10 min at 110’c 5 spots appear at Rf 0.07, 0.30, 0.43, 0.57 and 0.98 (all violet)

**PHARMACOLOGICAL AND TOXICOLOGICAL STUDIES**

Qureshi S., Rai M.K. and Agrawal S.C. have evaluated the effect of extract of 18 plant species, viz., *Acorus calamus*, *Adhatoda vasica*, *Amomum subulatum*, *Andrographis paniculata*, *Boerhaavia diffusa*, *Cassia occidentalis*, *Centella asiatica*, *Cymbopogon citratus*, *Hemidesmus indicus*, *Hyptis suaveolens*, *Malvestrum sp.*, *Passiflora edulis*, *Pergularia daemia*, *Peristrophe bicalyculata*, *Shuteria hirsuta*, *Solanum nigrum*, *Tecoma stans* and *Verbascum chinense* on the growth of *Microsporum gypseum*, *Chrysosporium tropicum* and *Trichophyton terrestre*. The sensitivity of the keratinophilic fungi was evaluated by dry-weight method. The maximum inhibition of mycelial growth was shown by *M. gypseum* (86.62%) followed by *T. terrestre* (81.86%) and *C. tropicum* (74.06%) when treated with *S. hirsuta* whereas the minimum inhibition was exhibited by *M. gypseum* (0.29%), *C. tropicum* (0.16%) and *T. terrestre* (1.76%) when tested with the extract of *P. edulis*, *A. vasica* and *B. diffusa* respectively.24

**Table 2: Numerical Data for Aerial Parts of Peristrophe bicalyculata**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mean (%w/w)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Ash</td>
<td>14.78% ± 0.1591</td>
</tr>
<tr>
<td>Acid Insoluble Ash</td>
<td>1.68% ± 0.0530</td>
</tr>
<tr>
<td>Water Soluble Ash</td>
<td>10.15% ± 0.0353</td>
</tr>
<tr>
<td>Alcohol Soluble Extractive Value</td>
<td>4.42% ± 0.0368</td>
</tr>
<tr>
<td>Water Soluble Extractive Value</td>
<td>9.65% ± 0.7634</td>
</tr>
</tbody>
</table>

**Table 3: Qualitative Chemical Examination of the Plant Extracts Obtained by Successive Solvent Extraction**

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Constituent</th>
<th>Petroleum Ether</th>
<th>Chloroform</th>
<th>Acetone</th>
<th>Methanol</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alkaloids</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>Dragendorff’s Reagent</td>
<td>*</td>
<td>–ve</td>
<td>–ve</td>
<td>–ve</td>
<td>*</td>
</tr>
<tr>
<td>b)</td>
<td>Mayer’s Reagent</td>
<td>*</td>
<td>–ve</td>
<td>–ve</td>
<td>–ve</td>
<td>*</td>
</tr>
<tr>
<td>2</td>
<td>Carbohydrate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>Molisch’s Test</td>
<td>*</td>
<td>*</td>
<td>–ve</td>
<td>+ve</td>
<td>+ve</td>
</tr>
<tr>
<td>b)</td>
<td>Fehling’s Solution Test</td>
<td>*</td>
<td>*</td>
<td>–ve</td>
<td>+ve</td>
<td>+ve</td>
</tr>
<tr>
<td>3</td>
<td>Glycosides</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>Anthraquinone Borntrager’s Test</td>
<td>*</td>
<td>*</td>
<td>–ve</td>
<td>–ve</td>
<td>–ve</td>
</tr>
<tr>
<td>b)</td>
<td>Steroids Liebermann-Burchard’s Test</td>
<td>+ve</td>
<td>+ve</td>
<td>+ve</td>
<td>–ve</td>
<td>*</td>
</tr>
<tr>
<td>c)</td>
<td>Saponin Foam Test</td>
<td>–ve</td>
<td>–ve</td>
<td>–ve</td>
<td>–ve</td>
<td>–ve</td>
</tr>
<tr>
<td>d)</td>
<td>Flavanoid Shinoda Test</td>
<td>–ve</td>
<td>–ve</td>
<td>–ve</td>
<td>+ve</td>
<td>–ve</td>
</tr>
<tr>
<td>e)</td>
<td>Cardiac Legal’s Test</td>
<td>*</td>
<td>*</td>
<td>–ve</td>
<td>–ve</td>
<td>–ve</td>
</tr>
<tr>
<td>4</td>
<td>Fixed Oil and Fats</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>Spot Test</td>
<td>–ve</td>
<td>–ve</td>
<td>–ve</td>
<td>–ve</td>
<td>–ve</td>
</tr>
<tr>
<td>5</td>
<td>Phenolic Compounds and Tannins</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>FeCl₃ Solution</td>
<td>–ve</td>
<td>–ve</td>
<td>–ve</td>
<td>+ve</td>
<td>–ve</td>
</tr>
<tr>
<td>6</td>
<td>Protein and Amino Acids</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>a)</td>
<td>Biuret’s Test</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>+ve</td>
<td>+ve</td>
</tr>
<tr>
<td>b)</td>
<td>Ninhydrin Test</td>
<td>*</td>
<td>*</td>
<td>+ve</td>
<td>+ve</td>
<td></td>
</tr>
</tbody>
</table>

* Test was not performed
Khan and Shahid Shaukat S. have carried out the Bioassays with *Achyranthes aspera L.* and demonstrated that aqueous root and shoot extracts against *Triticum aestivum*, a cultivated species and four field associates viz. *Cenchrus pennisetiformis, C. setigerus, Chloris barbata* and *Peristrophe bicalyculata* impeded or reduced germination of test species. The suppression of germination in shoot extract was in the order: *C. barbata < T. aestivum < C. setigerus < C. pennisetiformis < P. bicalyculata* and root extract suppressed germination in order: *C. barbata < T. aestivum < C. setigerus, P. bicalyculata < C. pennisetiformis*. Shoot extract was inhibitorior than root extract. Reduction in seedling growth was species specific.²⁵

Kumar Sushil, Bagehi Gurudas and Darokar Mahendra Pandurang have identified the seeds of coprophilous plants (*Peristrophe bicalyculata*) growing in bovine cattle dung (fresh or decomposing upto 15 days old) for antimicrobial potency and abiotic stress.²⁶,²⁷

Rathi A., Rao C.V., Khatoon S., Rawat A.K.S. and Mehrotra S. have examined ethanolic (50%/v/v) extract of *Peristrophe bicalyculata* for anti inflammatory and analgesic activity in experimental animal models like 1% carrageenin, cotton pellet granuloma, tail flick reaction time, analgesy-meter induced pain and acetic acid induced writhing in doses of 50, 100, 200 mg/Kg body weight. The experimental results revealed the % suppression 12.25-24.49% in carrageenin induced inflammation and decreased 16.62-39.44% granulation in cotton pellet induced granuloma.²⁸

Hoda S., Afaq S.H. and Tajuddin have shown that the drug ‘Chaksini’ (*Peristrophe bicalyculata*) is a lesser known drug. It is used in wound healing in traditional Unani medicine. Pharmacological screening of analgesic and anti inflammatory effect of drug are reported. The aqueous extract exhibited wound healing effect.²⁹

Hoda S., Mohammad A., Afaq S.H. and Tajuddin have carried out the pharmacological studies of “Chaksini” (*Peristrophe bicalyculata* Nees) in relation to psychosomatic disorders. The gross behaviour, spontaneous motor activity, pentobarbitone sodium induced narcosis and supramaximally electric shock seizure tests were carried out. The aqueous extract has CNS depressant activity. The effect is probably due to water soluble glycoside present in drug.³⁰

**CLINICAL STUDIES**

Tajuddin, Afaq S.H. and Hoda M.S. have reported that *Peristrophe bicalyculata*, an erect spreading shrub of controversial identity, is very effectively being used by Unani physicians for the treatment of nervous disorders like hysteria and leucoderma. A multidisciplinary research oriented study has been carried out on the plant which include establishment of its botanical identity after cultivation in the department as well as physico chemical standards for purity of drug. The details of results of pharmacognostical and phytochemical studies along with some pharmacological effects are discussed.³¹

**USES¹⁻⁵,2¹,3²,3³**

Infusion is used as insecticidal. Poultice is used in skin troubles. Essential oil shows tuberculostatic activity in vitro. Plant macerated in an infusion of rice said to be antidote to snake poison. Paste of whole plant along with common salt is used externally in bone fracture and sprains. Leaf paste is externally used to treat bone fractures and pains. 2 Drops of juice of freshly collected and washed leaves is poured into eyes twice daily in cases of conjunctivitis for 2-3 days. Leaf extract is used for fever, cough and colds. It is also used in malarial fever, flatulence of cattle. Mucilage medicines are used for ear treatments, eye treatments. It is also used as fodder for horses and as green manure. The honey collector applies the fresh juice of whole herb on body and collects the honey. According to them, its specific smell and taste repel away the bees. Astringent decoction mixed with honey destroys worms originating and affecting teeth. Roots are used as bandaging and as sedative. Roots of the plant applied to ulcerative wounds for 3 days to remove their suppuration, pain and fetid odor. The seeds carry a certain amount of mucilage which on drying can be stretched out into a fine thread. This is used in Senegal for fishing out foreign bodies from eyes and ears.

**CONCLUSION**

We conclude from vast literature study and experimental result analysis that *Peristrophe bicalyculata* is a traditional remedy for tuberculosis, antidote to snake poison, in bone fracture and sprains, for treatment of hysteria and leucoderma, anti-inflammatory and analgesic activity and in psychomotor disorder. Taking great concern of useful benefits of the plant, it can be advocated as a safe, highly important, medicinal plant for general mankind.

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