

CHAPTER 10

Review on *Pentatropis capensis* (L.f.) Bullock: A Least Explored Traditional Plant of India

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ABSTRACT

Pentatropis capensis (L.f.) Bullock, a member of the Apocynaceae family, is a slender, twining herb traditionally used in Ayurveda and Siddha systems of medicine. Ethnobotanical records indicate its application in the treatment of various ailments including inflammation, skin diseases, epilepsy (*Apasmara*), and gynecological disorders. Morphologically, the plant is characterized by ovate, semi-succulent leaves, extra-axillary inflorescences, and purplish flowers with a distinctive corona. Pharmacological evaluations of *P. capensis* and related species have revealed significant antioxidant, analgesic, anti-inflammatory, and antimicrobial properties, supporting its traditional therapeutic use. These activities are attributed to its diverse phytochemical profile, including flavonoids, alkaloids, saponins, terpenoids, steroids, and phenolic compounds. GC-MS analysis of related taxa has further confirmed the presence of bioactive constituents such as 1,6-anhydro- α -D-glucopyranose and propane derivatives. Despite its traditional significance and promising pharmacological profile, detailed phytochemical and clinical investigations on *P. capensis* remain limited, highlighting the need for further scientific exploration.

Keywords: *Pentatropis*, secondary metabolites, traditional therapeutics, bioactivity

INTRODUCTION

The genus *Pentatropis* R.Br. ex Wight & Arn. (Apocynaceae) comprises six species distributed across Africa, Madagascar, Arabia, India, Pakistan, Sri Lanka, and Australia (Jagtap and Singh 1999). In India, the genus is represented by two species: *Pentatropis capensis* (L.f.) Bullock and *Pentatropis nivalis* D.V.Field & J.R.I.Wood. Morphologically, members of this genus are characterized as slender, twining herbs or undershrubs with semi-succulent leaves and small purplish flowers. The flowers possess a rotate corolla and a corona made up of five erect, laterally compressed lobes, each bearing an upcurved spur at the base (Ambika et al. 2021). Among them, *P. capensis* is noted for its significant medicinal value, with the whole plant traditionally used as an antifungal, antiseptic, coolant, and in the treatment of various skin ailments. It is commonly referred to by folklore practitioners as Kukka bachchataay, used to treat ailments such as headache, body ache, running nose, and upper respiratory infections. It is mentioned in the Caraka Samhita and is used in formulations such as Chyavanprash, Trayausanadi Ghrita, and for the treatment of conditions like epilepsy and gynecological disorders (Tomar and Jawanjal 2019; Menaga et al. 2021). The plant is described in various classical lexicons as an emetic, rejuvenative, strength-promoting, analgesic, anti-inflammatory, and anti-greying, and is beneficial in treating disorders such as inflammation, blood disorders, vitiligo, skin diseases, and abdominal disorders (Saralla et al. 2012; Tomar and Jawanjal 2019). Phytochemical studies have revealed the presence of active constituents like n-octacosanol, α -amyrin, friedelin, β -sitosterol, and salicylic acid (Nagabhusan and Kotresha 2010). Despite the traditional uses and phytochemical and pharmacological potential remaining underexplored, there is a need for further pharmacological validation.

TAXONOMY

Pentatropis capensis is a twining perennial herb or undershrub, often seen climbing over other vegetation. Its leaves are broadly oblong to ovate-elliptic in shape, measuring between 1 to 3.5 cm in length and 0.5 to 2.5 cm in width. The leaf apex is typically obtuse with a small pointed tip, while the base is rounded or cordate. The leaves are semi-succulent in texture, with some specimens exhibiting signs of secondary thickening. Petioles are short, ranging from 4 to 7 mm in length. The inflorescence is extra-axillary and



Plate 1: Vegetative parts of *P. capensis*, a) Leaves, b) Flower

consists of solitary clusters that are generally shorter than the adjacent leaves. Peduncles are up to 2 mm long, and the pedicels can range from 1.2 to 13 cm. Each flower has calyx lobes about 1.5 mm long, and the corolla is nearly completely divided, with lobes measuring 3.5 to 6 mm. The corona features five erect, laterally compressed lobes with upcurved spurs, each 2 to 2.5 mm long. The fruit is a fusiform follicle, 3.7 to 6.8 cm long, containing ovate seeds approximately 6×3 mm in size, with a truncate apex and slightly crenulated base. Each seed bears a coma measuring 1.2 to 2 cm (Saxena and Bramham 1995; Ambika et al. 2021; Plate 1).

TRADITIONAL USES

P. capensis has been extensively used in various indigenous healing practices. These studies have highlighted its therapeutic potential in treating a range of ailments, particularly in rural and tribal communities. In tribal medicine, warmed leaf juice of *P. capensis* is administered as nasal drops to alleviate symptoms such as headaches, runny nose, and body aches (Nagabhusan and Kotresha 2010; Saralla et al. 2012). This practice is prevalent in regions like Gujarat and Odisha, where the plant is known for its efficacy in treating upper respiratory infections. The leaves are traditionally boiled with coconut oil and applied externally to treat cuts, wounds, and various skin diseases (Chowdhury et al. 2014). *P. capensis* is utilized in traditional practices to manage fevers and rheumatic conditions. Its anti-inflammatory properties are harnessed to reduce symptoms associated with these ailments, providing relief in conditions like hydrocele and rheumatism (Saralla et al. 2012; Babre et al. 2018). Tribals and rural populations of Odisha utilise the leaves of the plant as food (Mallick et al. 2020). The plant is employed in traditional medicine to address digestive issues, including ulcers (Menaga et al. 2018). In certain tribal communities, decoctions made from the whole plant are administered to children as anthelmintic agents to expel intestinal nematodes and flatworms.

BIOACTIVE COMPOUNDS

Phytochemical investigations on *P. capensis* revealed a rich presence of bioactive compounds responsible for its medicinal properties. Preliminary phytochemical screening has confirmed the presence of flavonoids, alkaloids, saponins, terpenoids, steroids, and phenolic compounds, each contributing to the plant's pharmacological profile (Reddy et al. 2014). Flavonoids and phenolics are primarily associated with strong antioxidant activity, while alkaloids and saponins are known for antimicrobial and anti-inflammatory effects (Tomar and Jawanjal 2019; Menaga et al. 2021). Moreover, a GC-MS

analysis identified a diverse array of 28 compounds, with major constituents like 1,6-anhydro- α -D-glucopyranose and propane, 1,1,3-triethoxy-, indicating significant bioactivity (Babre et al. 2018).

PHARMACOLOGICAL IMPORTANCE

Pentatropis capensis has demonstrated several pharmacological activities in published studies supporting its traditional medicinal use. Research has shown that various plant extracts, particularly methanolic and ethanolic, possess notable antioxidant, analgesic, antiarthritic activity, and anti-inflammatory properties (Chandrasekaran and Suseela 2011; Chowdhury et al. 2014). The plant showed antimicrobial properties against Gram-positive and Gram-negative bacteria but lack of antifungal activity (Nirmala et al. 2012; Shah et al. 2016). These effects are largely attributed to the presence of flavonoids, alkaloids, saponins, and terpenoids. The antioxidant potential of *P. capensis* helps in scavenging free radicals and protecting against oxidative stress-related damage, which supports its traditional use in formulations like Chyavanprash (Nirmala et al. 2012; Saralla et al. 2012; Tomar and Jawanjai 2019). Its anti-inflammatory activity has been observed through the inhibition of inflammation markers, making it beneficial in treating swelling, pain, and inflammatory skin conditions (Saralla et al. 2012). Although direct in vivo pharmacological studies on *P. capensis* are limited, studies on closely related species within the genus (like *P. microphylla* and *P. nivalis*) show comparable bioactivity, suggesting a conserved pharmacological profile across the genus (Menaga et al. 2021; Gazwi et al. 2023). These findings underscore the plant's therapeutic potential and call for further exploration into its active constituents and mechanisms of action.

CONCLUSION

The traditional utilization of *P. capensis* in Indian medicinal systems is substantiated by its distinctive morphological characteristics and broad-spectrum pharmacological activity. Its phytochemical profile is notably rich in bioactive constituents such as flavonoids, alkaloids, and terpenoids, which are mechanistically linked to its reported antioxidant, anti-inflammatory, and antimicrobial effects. Although preliminary pharmacological evaluations have demonstrated promising bioactivities, rigorous investigations-including the isolation and structural characterization of individual phytoconstituents, as well as controlled preclinical and clinical studies-are imperative to establish its therapeutic efficacy and safety. Systematic exploration of such underrepresented ethnopharmacological resources may facilitate novel drug

discovery and support the conservation of traditional medicinal knowledge systems.

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