

A COMPREHENSIVE STUDY ABOUT NOTONIA GRANDIFLORA AND ITS VARIOUS MEDICINAL APPLICATIONS

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Abstract

Notonia grandiflora (synonym: *Kleinia grandiflora*), a perennial succulent plant in the Asteraceae family, has been traditionally used in various folk medicines for its broad therapeutic properties. *Notonia Grandiflora* has been reported for its ethnomedical applications. “Not only its leaves and stems but also its underground organs” contain “water-storing tissues”. The five crystalline compounds isolated as phytochemicals are known for their reducing and stabilizing properties. Scientific investigations support several pharmacological activities ranging from anti-inflammatory and antioxidant effects to antimicrobial and hepatoprotective actions. This growing body of research on *Notonia grandiflora* reveals its potential in ethnobotanical data, phytochemical findings and pharmacological studies to provide an integrated perspective on its medicinal potential and research gaps.

Keywords:

Notonia Grandiflora,
succulent, anti-
microbial activity,
antioxidant activity,
antibacterial activity.

Introduction

Herbal medicines constitute a significant part of traditional health systems globally. Among these, *Notonia grandiflora*—commonly referenced in regional ethnobotanical literature — has been traditionally valued for its analgesic, antimicrobial, and digestive benefits. It is a perennial succulent belonging to the tribe Senecioneae within the Asteraceae family. The plant grows predominantly on rocky slopes and deciduous forest margins in peninsular India. Tribal healers use its leaves and stems in decoctions, poultices, and infusions to alleviate a range of ailments including joint pain, earache, diarrhea, skin conditions, wounds and urinary disorders. *Notonia Grandiflora* is a perennial succulent plant widely utilized for traditional medicinal purposes. Perennial succulents are plants with drought resistant properties. [1] These plants possess water storing ability as they have thick and fleshy stems and leaves. The word succulent is used from Latin word ‘succus’ which juice or sap. Perennial plants can even survive in unfavorable seasons. This succulent plant is reported for its ethnomedical applications. Not only its leaves and stems but also its underground organs have water storing tissues. There are around 60 different types of succulents. It is a flowering plant native to Southeast Asia, particularly found in countries like Thailand, Malaysia and Indonesia. It has utilized by tribal people in the treatment of joints pains, ear ache, and gastric complaints, for pimples, hydrophobia, urinary disorders, scabies, skin eruptions, ulcers and scorpion bites [2]. Despite widespread traditional use, scientific validation of *N. grandiflora*’s phytochemistry and pharmacological actions is relatively recent. This review collates contemporary research to present an evidence-based understanding of its medicinal potential.

**NOTONIA GRANDIFLORA****SUCCULENTS**

History

Notonia grandiflora belongs to the family Asteraceae, subfamily Asteroideae, a group characterized by twining habits, milky latex, and highly specialized floral morphology. The species was first described during the nineteenth century in systematic surveys of the Indian subcontinent conducted by European botanists. *Notonia grandiflora* was distinguished within the genus due to its large, showy flowers, vigorous climbing habit, and distinctive inflorescence architecture. In the nineteenth century, Researchers revealed that *N. Grandiflora* as a shrub with pale yellow flowers having fleshy stems and leaves [3]. Later, it was investigated for phytochemical behavior and therapeutic actions too.

Taxonomical Classification

The taxonomical classification of *Notonia grandiflora* is given in the Table 1.

Ethno-Botany Of *Notonia Grandiflora*

Ethno medicinal assessment of Irula tribes of Walayar valley of Southern Western Ghats, India revealed its local name as Muyalkathu, its use value as 0.20 and its ailments as in earache [4]. *Notonia grandiflora* is traditionally used in limited folk medicinal practices, primarily for external applications such as wound healing, joint pains, earaches, gastric discomfort, skin eruptions, skin infections, and inflammatory swellings [5]. The plant is traditionally referred as “large-flower Kleinia”. Morphologically, it features fleshy stems, broad leaves, and prominent inflorescences that distinguish it from other plants. The botanical profile of *Notonia grandiflora* is given in Table 2.

Table 1: Classification of *Notonia Grandiflora*

Kingdom	Plantae
Sub-kingdom	Tracheobionta
Clade	Angiosperms
Family	Asteraceae
Sub-family	Asteroideae
Order	Asterales
Genus	<i>Notonia</i> (syn <i>Klenia</i>)
Species	<i>Grandiflora</i>

Table 2: Botanical Profile

Parameter	Details
Common Name	Large-Flower Kleinia
Vernacular Names	Marathi: Vander Roti Tamil: Attukaal chedi, Illaikalli, Naainaakku, (Muyalkatu)
Botanical Name	<i>Notonia grandiflora</i>
Family	Asteraceae (Sunflower family)
Synonyms	<i>Kleinia grandiflora</i> , <i>Senecio indicus</i>
Habit	Fleshy condiment, little branched above
Stem	Pale brown; 0.6–2 m tall; glaucous; hairless; with prominent leaf-scar rings
Leaves	size 6–22.5 × 2.5–15 cm; hairless; glaucous (especially beneath); base narrowed and sub-petiolate
Inflorescence	Flower heads bell-shaped; 3–6 in short terminal corymbs or 15–20 in long, lax, branched panicles
Flower-head Size	5–6 mm across (periphery)
Involucre	Bell-shaped, 2–3 cm broad; bracts pale green, 8–12, linear-lanceolate; size 1.3–1.8 × 2.5–3.5 mm; banded; sub-membranous with purplish margins
Florets	Greenish-white; 1.7–2 cm long; tubular
Achenes	Slightly compressed; 5–7 mm long; hairless
Pappus	White, persistent; 1.5–1.75 cm long

active components of notonia grandiflora with their properties

Isolation of the alcoholic extract obtained from the fresh leaves of *Notonia grandiflora* yielded five crystalline compounds. These included two flavonoid glycosides—kaempferol-3,7-di-rhamnoside and kaempferol-7-rhamnoside—as well as lupeol, β -sitosterol, and succinic acid. The active constituents identified in *Notonia grandiflora* are presented in Table 3.

Table 3: Active components in *Notonia grandiflora* with properties

Name of Active components	Active components in <i>Notonia grandiflora</i> with properties
Flavonoids and Flavonoid Glycosides	Kaempferol-3,7-di-rhamnoside; Kaempferol-7-rhamnoside; Kaempferitrin * Antioxidant, free-radical scavenging, anti-inflammatory, and membrane-protective effects
Triterpenes and Sterols	Lupeol (pentacyclic triterpene); β -Sitosterol (phytosterol); Friedelin; Lupenone * Lupeol: Anti-inflammatory, analgesic, anticancer potential; β -Sitosterol: Anti-inflammatory, immunomodulatory, lipid-lowering effects; Friedelin: Antimicrobial and antioxidant activities
Phenolics and Phenolic Derivatives	Simple phenols and complex phenolic compounds * Antioxidant, antimicrobial, and potential anti-inflammatory effects
Alkaloids, Tannins, Saponins, and Glycosides	Alkaloids, tannins, saponins, steroids, glycosides, and carbohydrates * Antimicrobial, anti-inflammatory, and cytoprotective effects
Terpenes and Volatile Constituents	α -Pinene, β -Pinene, Germacrene D, α -Caryophyllene * α - & β -Pinene: Antimicrobial and anti-inflammatory effects via microbial membrane disruption; Caryophyllene: Analgesic and anti-inflammatory actions

Theraupetic Actions of *Notonia Grandiflora*

1. Antimicrobial Activity:

The whole plant found effective against microorganisms namely *Staphylococcus aureus*, *Shigella shigae*, *Salmonella typhi*, *Escherlchia coli*, *Pseudomouas aeruginosa* and *Proteus mirablis*. At 1:10 dilution, the essential oil of fresh plant showed good activity against *S. Shigae*, *S. Aureus*, and *P. Mirablis* compared to standard antibiotic used. Good activity was observed by hexane and alcohol extract against *P. Mirablis*. Friedelin, which was separated from the plant's hexane extract, showed efficacy against this pathogen at 1000 ppm. Overall, this paper showed invitro antibacterial and antimicrobial activity of *Notonia Grandiflora* [6].

2. Antifungal activity and Antibacterial activity:

For the preliminary phytochemical screening and antimicrobial activity, the aerial parts of *Notonia grandiflora* DC were extracted in stages with ethanol, hexane, and chloroform using Soxhlet extraction method . After vacuum drying, the extracts were screened for antifungal activity (against *A. Niger* and *A. Fumigatus*) and antibacterial activity (against *S. Aureus*, *B. Subtilis*, *E. Coli*, and *K. Pneumoniae*) using the agar disc diffusion method. Additionally, the minimum inhibitory concentration required to inhibit microbial growth was assessed. Several phytoconstituents present in the extracts were identified through preliminary phytochemical screening. The extract effectively inhibited *S. Aureus*, *A. Niger*, *A. Fumigatus*, *K. Pneumoniae*, and *E. Coli* [7].

3. Antipyretic activity:

Using brewer's yeast-induced pyrexia model, methanolic and aqueous extract were used in rats. Both extracts showed positive results in inhibition of temperature elevation as compared to standard drug paracetamol. The Methanolic extract showed a peak antipyretic activity at doses of 200 mg/kg b.w. This was tested on rats and both extract inhibited rise in temperature compared to standard drug paracetamol [8].

4. Anticorrosion properties:

The leaf extract of *Kleinia grandiflora* showed corrosion inhibition property. The temperature elevation on the corrosion behaviour of mild steel was studied in the range of 308 to 328 K. It was observed that with increase in concentration of extract the inhibition efficiency also increased. The leaf extract acted as an effective inhibitor for the corrosion of mild steel in a sulphuric acid medium [9].

5. Anti-inflammatory activity:

The water and ethanol extract of leaves of *K. Grandiflora* were used to check its anti-inflammatory property. Its potency was compared with standard diclofenac sodium and found to be more promising. This activity was measured by inhibition of hypotonicity induced human red blood cells (HRBC) membrane lysis in the extract [10].

6. Antibacterial activity:

An herbal ointment was formulated for the treatment of acne using three herbal drugs Liquorice, Turmeric and *Klenia Grandiflora*. These drugs have traditional usage since ancient times for different skin ailments. A standard skin care ointment Soframycin was compared to check physicochemical parameters and their antibacterial activity using disc diffusion method. The three formulations showed equivalent activity identical to soframycin [11].

7. Antioxidant activity:

The pharmacognostic study of root, stem and leaf of *Notonia Grandiflora* was carried out. This plant was used as such without standardization. But this paper has revealed its morphology and anatomical characterization. Physical-chemical parameters, such as the amount of ash, extractive values, and heavy metals, were measured. Numerous pharmacological activities, including analgesic, antinociceptive, anti-inflammatory, antimicrobial, antibacterial, antifungal, and antipyretic properties, have been identified in NG. The stem exhibits an epidermis that is outwardly covered by pith, vascular bundles, cortex, and cuticle. The cortical section of the stem also contains calcium oxalate crystals and signs of leaves and branches. Characteristics of the powder, as well as physicochemical parameters such as extractive values, moisture content, ash content, and heavy metal analysis, were examined. The findings of the current study will be useful in characterization and standardization of the medicinal plant [12].

8. Pharmacological activity:

This plant is not yet standardized as it has been used for many years as a traditional plant. This paper reported it as a perennial succulent plant with a variety of pharmacological activities. In order to identify its purity and quality, its

pharmacognostic evaluation was carried out. Pharmacological activity such as analgesic and antinociceptive, anti-inflammatory, antimicrobial, antibacterial, antifungal, and antipyretic were studied using root, stem and leaf of this plant. Calcium oxalate crystals, as well as leaf and branch traces, were also found in the cortical region of the stem. The leaf lamina revealed palisade cells and spongy parenchyma in the mesophyll area, along with anisocytic stomata. Heavy metal content, extractive value and ash content were also found out. These Physicochemical parameters and powder characters helped to understand the morphology and anatomy of plant which resulted as a diagnostic tool for characterization and standardization of plant [13].

9. Anti-diabetic activity:

Ethyl acetate extract of *Notonia Grandiflora* was used for anti-diabetic activity. This in vivo trial was done on albino wistar rats, which gave significant observations. EANG was administered orally to STZ-induced diabetic rats at doses of 100 and 200 mg/kg body weight for 21 days, with a 40 mg/kg dose given intraperitoneally. The diabetic rats were used to measure the effects of EANG on liver glycogen content, bilirubin levels, blood glucose, body weight, plasma insulin, urea, uric acid, creatinine, haemoglobin (Hb), HbA1C, and liver enzymes. Blood glucose and glycosylated haemoglobin levels were significantly reduced after EANG treatment. It was observed that in diabetic rats, the treatment in a dose-dependent manner restored serum insulin levels, liver glycogen content, and body weight. Following EANG treatment, there was a notable decrease in the activity of liver function enzymes associated with diabetes, as well as blood levels of renal parameters, indicating improved renal function etc [14].

10. Anti-inflammatory activity:

Around 149 herbs were mentioned which are used since ancient times for variety of medicinal purposes. This paper gave the medicinal name, its family, its vernacular name and also its medicinal uses. A total of 149 species of herbs were covered which can be utilised for treatment of various diseases. As stated in the paper *Kleinia grandiflora* is been used for treatment of inflammation [15].

11. Anti-oxidant and Anti-bacterial Activity:

Inhibitory zones were observed against various bacteria which showed the antioxidant and antibacterial properties of these medicinal plants. Discovering hydro alcoholic extracts of leaves found to as metabolites against different bacteria. This extract inhibits H₂O₂ scavenging activity by a significant amount compared to ascorbic acid [16].

Safety And Toxicology

Notonia grandiflora being a medicinal plant used in traditional systems of medicine, but to date, there is no well-documented acute, sub-chronic, or chronic toxicity found about it. It appears to be relatively safe for use.

Conclusion

Notonia grandiflora is a traditionally significant medicinal plant with an emerging scientific basis for several therapeutic applications. Phytochemicals such as flavonoids and triterpenoids appear to underpin its antibacterial, antioxidant, and antidiabetic activities. However, despite promising preliminary data, rigorous clinical trials and comprehensive safety assessments are lacking. *N. Grandiflora* thus represents a compelling subject for continued pharmacological research and phytotherapeutic development.

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