Pharmacognostical and phytochemical evaluation of *Cactus grandiflorus* (L.) Britton and Rose

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**Abstract**

**Background:** *Cactus grandiflorus* (L.) Britton and Rose, Family: *Cactaceae* is an evergreen shrub with creeping aerial roots, used in Homoeopathy for atheromatous arteries, angina pectoris, and constriction of heart muscles, endocarditis, and heart weakness due to arteriosclerosis. Flowering stems are used in the preparation of medicine. **Objective:** The pharmacognostic and phytochemical studies are carried out to facilitate identification of correct species and standardized raw materials. **Materials and Methods:** Pharmacognostic studies of stem of authentic samples of *Cactus grandiflorus* (L.) Britton and Rose have been carried out according to Trease and Evans, 1983, and Youngken 1959. To determine physicochemical constants, Indian Pharmacopoeia, 1970, was consulted and preliminary phytochemical properties were studied as per methods described by Trease and Evans, 1983. **Results:** Stem available in segments of variable length and thickness, roundish structure with 5 or 6 ridges and furrows with aerial roots, isodiametric cavities in cortex containing mucilage; aggregates of acicular and rhomboidal calcium oxalate crystals scattered in parenchymatous region are the key identification characteristic. Thin layer chromatography of chloroform extract of mother tincture reveals five spots with blue and violet colors. **Conclusion:** The macroscopic, microscopic, physicochemical, and phytochemical analysis of the authentic raw material were indicative to establish the standards for ensuring quality and purity of the drug.

**Key words:** *Cactus grandiflorus* (L.) Britton and Rose, Homoeopathy, Pharmacognosy, Physicochemical studies, Phytochemical studies

**INTRODUCTION**

Family *Cactaceae* composed of about 130 genera and nearly 1500 species belonged to arid lands and adopted to diversity of climates in all over the world, including India.[1-4]

*Cactus grandiflorus* (L.) Britton and Rose (synonyms: *Selenicereus grandiflorus* L., *Cereus grandiflorus* Mill) is a native of Mexico and introduced in Indian gardens, commonly known as night-blooming cereus. It is an evergreen, succulent shrub with creeping aerial roots and is usually a “functional epiphyte” meaning the plant can thrive either as an epiphyte or a terrestrial plant. Stem green to bluish-green, becoming purplish along the ribs, branching, succulent, 5 or 6 angled and armed with clusters of short radiating spines or bristles. The prefix “Seleni” in the botanical name refers to the moon, in allusion to the nocturnal blooms, which are very large and full-bodied, terminal or lateral from the cluster of spines, large having a sweet-smelling vanilla-like fragrance, white in color, about 30 cm in diameter, opening only once in evening and closing again before morning [Figure 1a].[5]

History shows the traditional use of night blooming cereus for the treatment of hemoptysis (coughing up blood from the lungs) and edema (swelling of soft tissues due to the accumulation of excess water). The indigenous people of America have used the night blooming cereus as a topical remedy for rheumatism and itchy rashes; it is also used as internal herbal remedy for worms, cystitis, and fever. The Death Valley Shoshone tribe called this plant “pain in the heart” and used for heart diseases and several other tribes of native Americans use the stem to treat diabetes.[5]

Drug contains about 8 glycosylated flavonoids: narcissin (isorhamnetin-3-β-rutinoside), cacticin (isorhamnetin-3-β-galactoside), rutoside (rutin or quercetin-3-rutinoside),

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hyperoside (hyper or quercetin-3-β-D-galactopyranoside), kaempferitrin (kaempferol-3-β-L-arabinoside), isorhamnetin-3-O-β (xylosyl)-rutinoside, and isorhamnetin-3-O-β-(galactosyl)-rutinoside. In addition, biogenic amines such as tyramine, N-methyltyramine, and N, N-dimethyltyramine (hordenine) have also been found. Further constituents of *C. grandiflorus* (L.) Britton and Rose are mucus, fat, wax, and resinous glycosides.\(^{[6]}\)

For preparation of medicines in Homoeopathy, Flowering Stem is used.\(^{[7]}\) Its authority was mentioned in Allen, T. F., Encyclopedia of Pure Materia-Medica, 1874; Boericke W. Pocket Manual of Homeopathic Materia Medica and Repertory, 2000; Bradford, T. L., Index to Homoeopathic Provings, 1901; Clarke, J. H., A. Dictionary of Practical Materia Medica, 1900\(^{[8-11]}\) for action in the incipiency of cardiac incompetence, heart weakness of arteriosclerosis, on circular muscular fibers, and hence constrictions. It is the heart and arteries, especially that at once respond to the influence of *C. grandiflorus* (L.) Britton and Rose, producing very characteristic constrictions as of an iron band.\(^{[9]}\) In view of the importance of the drug, pharmacognostic and phytochemical studies of stem are carried out to lay down the standards.

**MATERIALS AND METHODS**

The authentic sample of stem of *C. grandiflorus* (L.) Britton and Rose was taken from repository and herb garden of Homoeopathic Pharmacopeia Laboratory, Ghaziabad (Uttar Pradesh), India. All the chemicals and reagents used in the study were of extra pure and of analytical grade. Dried samples of the stem were spread on a clean dry plastic sheet and were investigated for different organoleptic features, namely, condition, thickness, color, odor, taste, and fracture by repeated observations up to 2–3 times using a magnifying glass (where required) and recorded. Free-hand section was taken, stained with safranin and fast green and examined under digital microscope and photographed as per Trease and Evans 1983\(^{[12,13]}\) and Youngken 1959.\(^{[13]}\) To determine physicochemical constants for finished product (mother tincture), Indian Pharmacopoeia 1970,\(^{[14]}\) was consulted and mother tincture is prepared as per Homoeopathic Pharmacopoeia of India (1978).\(^{[17]}\) Preliminary phytochemical properties were studied as per methods described by Trease and Evans 1983, and Youngken 1959.\(^{[12,13]}\)

**OBSERVATION AND RESULTS**

**Drug Evaluation**

**Macroscopical evaluation**

Stem available in segments of variable length, thickness, with 5 or 6 angles or ribs, having tufts or clusters of 9–15 acicular spines, spines up to 2–5 mm in length and bears aerial roots, color dark green; odor not peculiar; taste mucilaginous and acrid [Figure 1b].

**Microscopical evaluation**

Epidermis in surface view shows sunken, diacytic stomata, simple circular or oval dermal pores; spine multicellular, multiseriate, containing elongated tapering cells with micro hairs; transsection shows roundish structure with 5 or 6 ridges and furrows; epidermis single layer of papillose cells, covered with thick cuticle; followed by three or four layers of sclerencymatous hypodermis; cortex consists of loosely arranged, irregular shaped parenchyma and oval, isodiametric cavities containing mucilage; aggregates of acicular and rhomboidal calcium oxalate crystals scattered in parenchymatous region; vascular bundles conjoint, collateral, open and arranged in a ring; cambium three or four layered; pericycle sclerencymatous; phloem containing phloem parenchyma, sieve tube; companion cells; xylem with thick-walled xylem parenchyma, vessels with scalariform thickening; medullary rays 6–8 seriate with lignified cells; pith small, parenchymatous containing mucilage cavities and aggregates of acicular and rhomboidal calcium oxalate crystals [Figures 2 and 3].

**Physicochemical analysis (for finished product standard)**

The analytical values in respect of physicochemical constant of finished product were established and results of alcohol content, pH, specific gravity, total solid, and λ max are listed in Table 1.

**Chemical analysis**

Preliminary phytochemical test

Phytochemical screening for the presence and absence of alkaloids, flavonoids, phenolics, sterols, saponins,
provides useful information with regard to its correct identity and helps to differentiate it from the closely related other species of *Cactus*, *Opuntia*, and spiny *Euphorbia*, and it will help to achieve the desired therapeutic value of the drug.

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Conflicts of Interest
There are no conflicts of interest.

REFERENCES


**Cactus grandiflorus L.**

**Fundamento:** Cactus grandiflorus L., Familia: Cactaceae, es un arbusto perenne con raíces aéreas trepadoras, que se utiliza en homeopatía para arterias ateromatosas, angina de pecho y constricción del miocardio, endocarditis y debilidad cardíaca por arteriosclerosis. En la preparación del medicamento, se utilizan el tallos de floración.

**Objetivo:** Realizar estudios farmacognósicos y fitoquímicos para facilitar la identificación correcta de la especie y de la materia prima estandarizada.

**Material y métodos:** Los estudios farmacognósicos del tronco de las muestras auténticas de cactus grandiflorus L. se han realizado conforme a Trease y Evans, 1983 y Youngkeen 1959. Para determinar las constantes físico-químicas, se consultó la Farmacopea India (1970) y se estudiaron las propiedades fitoquímicas preliminares mediante los métodos descritos por Trease y Evans (1983).

**Resultados:** Las características de identificación clave en los segmentos de diferentes longitudes y grosores de los troncos disponibles son una estructura redondeada con 5 o 6 crestas y surcos con raíces aéreas, cavidades isodiamétricas en la corteza que contienen mucilago y agregados de cristales de oxalato cálcico aciculares y romboidales dispersos en la región parenquimatosa. La tomografía en capa fina del extracto de cloroformo de la tintura madre mostró cinco puntos con colores azules y violetas.

**Conclusiones:** El análisis macroscópico, microscópico, físico-químico y fitoquímico de la materia prima auténtica fueron indicativos para establecer los estándares y asegurar la calidad y pureza del medicamento.