

GLOCHIDION VELUTINUM: AN OVRERVIEW

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ABSTRACT

Glochidion velutinum is a small tree or a large shrub which belongs to the family Euphorbiaceae, which is widely distributed in India, Nepal and Pakistan. Velvety Melon Featherfoil and Downy melon feather foil are the common names of the plant whereas it is well known with its synonyms such as *Gynoon heyneanum* and *Phyllanthus nepalensis* etc. The whole plant was reported as medicinally important. The various phytochemicals reported with the plant species are tannins, flavonoid, alkaloid and steroidal saponins etc. Various pharmacological activities also were reported with the particular plant species, including cytotoxicity, anti-diabetic activity, antioxidant activity, anti-bacterial activity. This review work mainly emphasizing on the pharmacological effects of the various plant extracts with special attention to its reported phytochemical constituents. Various databases were referred to include a systematic, relevant and up to date review.

Keywords: *Glochidion velutinum*, phytochemicals, cytotoxicity, antioxidant, antimicrobial, pharmacological effect

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INTRODUCTION

Nature is being the greatest and the most reliable source of medicines which can cure a large variety of ailments and to keep the humans healthier¹. Natural plant products are the best therapeutic agents now a day. This fact is the greatest attraction to many of the research scholars to focus on the potential biological activities of the plant kingdom².

Glochidion velutinum is such a promising plant species which is exhibiting a plethora of biological activity. It belongs to the family of Euphorbiaceae (Table: 01) and is particularly well known with its anti cancer property³. There are more than 250 species under this genus worldwide, while most of them are still unexplored⁴.



Fig:01 *Glochidion velutinum*
Small tree

Fig: 02 Leaves, Fruits and
Male flowers

Fig: 03 Stem Bark

[Picture courtesy⁵]

Glochidion velutinum, is a small monoecious tree or large shrub up to 9 m with subcomplanate branches and leaves. It is mainly seen in India, Nepal, China etc and it is locally known as Matachhar⁶, Chinna usiri, Velvety melon. Traditionally, this plant was widely used in the treatment of diabetes, inflammation, cancer, healing of wounds and diarrhea⁷. A tribal community of far-western Nepal named

'Raute' were used the paste of the bark for correcting the dislocation of bones and the paste of the fruits for curing pimples^{8,9}. The crude extracts of root, stem and leaf exhibit good membrane stabilizing capacity on human RBC¹⁰. The suspected reason for these activities are the phytoconstituents such as alkaloids, tannins, saponins and flavonoid known to be present in it or reported¹¹.

PLANT PROFILE

Binomial name: <i>Glochidion velutinum</i> Wight	
Kingdom	Plantae
Phylum	Tracheophyta
Class	Magnoliopsida
Order	Malpighiales
Family	Euphorbiaceae
Genus	Glochidion
Species	velutinum

Table 01: Plant profile⁽¹²⁾

SYNONYMS

Glochidion velutinum is well known with many of its synonyms⁽¹³⁾ such as follows.

certBradleia ovata Wall.

Diasperus asperus Kuntze

Diasperus heyneanus (Wight) Kuntze

Diasperus nepalensis Kuntze

Diasperus velutinus (Wight) Kuntze

Eriococcus glaucescens Zoll.

Glochidion asperum Bedd.

Glochidion nepalense Kurz

Gynoon heyneanum Wight & Arn.

Phyllanthus asperus Arg.

Phyllanthus heyneanus (Wight) Arg.

Phyllanthus nepalensis Arg.

Phyllanthus velutinus (Wight) Arg.

GEOGRAPHICAL DISTRIBUTION:

A good percent of varieties in *Glochidion* genus is chiefly distributed in Tropical Asia, Pacific islands and Malaysia. A few in Tropical America and Africa. *Glochidion velutinum* is mainly seen in eastern parts of Asia, particularly, China, Pakistan, India, Nepal, Bangladesh, Myanmar, Thailand, Cambodia, Laos, Vietnam¹⁴.

COMMON NAMES¹⁵:

Malayalam : Kayara, Kaira, Chathakkadambu

Tamil : Chinna usiri, Panickaavu

Telugu : Mattachaar

Others : Velvety Melon Feather foil

: Downy Melon Feather foil

FAMILY DESCRIPTION

Plants coming under Euphorbiaceae family are usually found as trees, shrubs or herbs often present with milky sap. They possess simple or stellate hairs, rarely peltate scelees and the leaves are alternate, sometimes opposite or palmate at base usually stipulate. They can be monoecious or dioecious with small flowers, solitary or in clusters, spikes, racemes, panicles or cymes or in cup like cyathia, unisexual actinomorphic. Their Calyx are of 3-6 partly united segments, petals 3-6, stamens 2-many which are free or variously united into a column or bundles. Ovary is superior and 2-4 celled. Styles are 2-4, free or united, simple or bifid with ovules of 1-2 per ceel, acile. Fruits are usually capsule applitting into 2-3 segments, each have 1-2 seeds, occasionally fleshy or leathery and indehiscent seeds often¹⁶.

GENUS DESCRIPTION

Glochidion is mainly evergreen trees or shrubs where leaves are alternate, pinnately veined, entire and stipulate. They are monoecious and its flowers are in axillary clusters. Male flowers have 6 sepals, no petals, no disc-glands, 3-8 stamens, and their filaments connate into a column which dehiscing by vertical slits. Female flowers have sepals (6-12), petals (0), ovary 3-15 celled, styles connate and usually columnar lobed at apex, sometimes globose or broad and flat. Fruits are woody capsule, 3-15 lobed, seeds 3-15 each with a red ari-like coat.¹⁶

SPECIES DESCRIPTION

Glochidion velutinum is a large shrub or tree to 10m and the shoots densely pale tomentose. Leaves are ovate broadly elliptic or obovate, 4.5-8 x 2-5cm, acute or bluntly apiculate base cuneate or rounded. They become dark brown on drying, densely pubescent beneath petioles 2-3mm. Male flowers are on pedicels 4-8mm, stamens 3, whereas female pedicels 2-5mm, styles forming a slender pubescent column obscurely toothed at apex. Capsules are depressed with globose 9-13mm, conspicuously 8-12 lobes pubescent¹⁶.

BOTANICAL DESCRIPTION¹⁷

Habit : A monoecious small tree or a large shrub of about 6-10 m height

Trunk \ bark: Bark brown, scaly when mature and blaze pink.

Branch lets : Branch lets terete and tomentose.

Leaves: Leaves simple, alternate, distichous stipule caducous and leaving scar

petioles up to 0.5 cm long, planoconvex in cross section, tomentose

lamina 14.5 x 5 cm, ovate to elliptic-oblong, unequal sided, apex acute with mucronate tip, base asymmetric, margin entire, tomentose beneath

secondary nerves 6-8 pairs, nerves hairy on both surfaces

tertiary nerves horizontally percurrent

Flowers : Inflorescence axillary clusters, tomentose

flowers unisexual, monoecious.

Fruit& seed : Capsule depressed 3-6 locular, lobed.

Key identification

Features : Shrubs or small trees with flexuous, velvety-pubescent branches.

: Leaves ovate- elliptic, sub acute, pubescent along nerves. Stamens 3.

: Calyx of female flowers deeply lobed, style villous.

: Schizocarp distinctly stalked, depressed globose, 8-lobed

PHYTOCHEMICAL STUDIES:

Various parts of the plants such as leaves, stem, root were subjected to the preliminary phytochemical investigations and different phytochemical constituents such as Tannins, Alkaloids, Flavonoid, Starch, Saponins, carbohydrates etc were found¹⁸.

Islam et al had reported the presence of carbohydrate, alkaloid, steroid, tannin, flavonoid and saponin in the methanolic, ethyl acetate and n-hexane extracts of the leaves of *Glochidion velutinum*¹⁹. Sandhya S et al reported that carbohydrate, protein, alkaloid, tannins, steroids and saponins were present in the Petroleum ether extract, Chloroform extract, N-Butanol extract and Methanol extracts of roots of *Glochidion velutinum*²⁰.

More interestingly, both the bark and leaf extracts had shown the absence of Triterpenoid^{19,20}, whereas the *Glochidion* genus mainly possesses triterpenoidal saponins¹ in many of its species such as *Glochidion hohenuckeri*²¹ and *Glochidion ellipticum*²² to provide the various biological potentials.

PHARMACOLOGICAL POTENCY

CYTOTOXICITY

Glochidion velutinum have a folklore claim for Anti cancer activity³. A recent work on the investigation of cytotoxicity of the leaves of *Glochidion velutinum* on eggs of *Artesia saline* through Brine Shrimp lethality bioassay (BSLA)²³ by using various extracts of the leaves (20 mg of extract in 400 µL of pure Dimethylsulfoxide [DMSO], and sea water [3.8% NaCl] to a total volume of 20 mL) was done. The work was concluded that, cytotoxic activity of the plant with LC50 values of 428.47µg/ml, 651.92 µg/ml and 598.54µg/ml respectively for Methanol, Ethyl Acetate and n-Hexane extracts and a concentration dependent increment was observed in the percent mortality. Here, methanol extract of the leaf was said to be toxic, ethyl acetate and n-Hexane extracts as weakly toxic on the basis of their LC₅₀ values. Finally, they had suggested for an extensive research work to derive the active constituent responsible for this activity¹⁹.

Sandhya et al had investigated all the parts of the plant such as leaf, stem and root for the evaluation of the cytotoxic property of the *Glochidion velutinum*. The various plant parts were powdered and

extracted with Petroleum ether, Chloroform, n-Butanol and Water. Cytotoxicity evaluation was done with Trypan blue exclusion method on Daltons Lymphoma Ascites (DLA) and Erlisch Ascites Carcinoma (EAC) cell lines and Brine shrimp lethality test. These are the two preliminary screening techniques for the cytotoxicity studies of the extracts and here it showed an excellent result for *Glochidion velutinum* extracts with 90-100 % cytotoxicity at a concentration of 50, 100 and 200 µg/ml. n-Butanol extract of stem showed more activity among all the extracts¹⁸.

ANTI OXIDANT ACTIVITY

Antioxidant activity of the plant extract is of great interest for the researchers, because of the free radicals like reactive oxygen species which can be responsible for the cure of several diseases such as Heart disorders, stroke, arteriosclerosis, cancer, aging and much more²⁴. All the parts of the plant such as leaf, stem and root were used in this investigation to evaluate the antioxidant property of the *Glochidion velutinum*. The various plant extracts were made up with Petroleum ether, Chloroform, n-Butanol and Water for different parts of the plant. Total Phenolic content, Superoxide radical scavenging, Hydrogen peroxide scavenging, inhibition of hydrogen peroxide induced erythrocyte hemolysis and FRAP assay were involved here to evaluate the anti oxidant potential of the extracts, which

was expected to be attributed due to their high polyphenol content²⁵.

A similar work on antioxidant activity, a comparative study of non-polar and polar solvent extracts of *Glochidion velutinum* was done by employing DPPH free radical scavenging assay²⁸, where the scavenging of free radical was indicated by the color change of deep violet color to pale yellow or colorless. 1.56 to 800 µg/ml of the crude extract was observed for free radical scavenging against a standard Ascorbic acid solution of 1.56 to 50 µg/ml. All the four extracts were showed significant difference in their antioxidant activity which is evident from their LC₅₀ values, 30 µg/ml, 25.4 µg/ml, 0.755 µg/ml, 2.6 µg/ml respectively for hexane, chloroform, methanol and ethanol extracts.

Total Phenolic content determination by Folin-Ciocalteu reagent (FCR) based colorimetric method²⁶ at 765 nm also had performed by using Gallic acid as the standard whereas Quercetin was the standard used for the total Flavonoid estimation by colorimetric method involving Aluminium chloride²⁷. Hexane, Chloroform, Ethanol and Methanol extracts were subjected to that particular study. Of the various extracts, Methanol and ethanol extracts exhibited higher total Phenolic content (29.89 ± 2.28 and 17.9 ± 1.26 mg/gm GAE [Gallic acid equivalent] respectively) as well as Flavonoid content (48.12 ± 2.28 and 30.22 ± 2.84 mg/gm QE [Quercetin equivalent]) and thus possess better antioxidant activity²¹

ANTIDIABETIC ACTIVITY

Diabetes mellitus is a group of metabolic disorder associated with hyperglycemia, glycosuria etc. A study on the evaluation of the *in-vivo* anti-diabetic activity of the leaves of *Glochidion velutinum* by employing alloxan (140 mg/kg) induced diabetes with *Albino wistar* rat models. This was performed to know the efficacy and the safety of local herbal drugs as an anti-diabetic agent. Methanolic and the aqueous extracts of the plant were subjected to the study. 400g/kg of crude aqueous extract as well as the methanol extracts of the leaves were injected to both the normal rats and alloxan induced diabetic male rats. After the oral administration of the extracts, blood glucose levels of the rats were monitored at a time interval of 0,2,4,6 and 8 hour each day, up to 15 days. This particular research work provided scientific evidence to the significant anti-hyperglycemic activity exhibited by both the extracts of the leaves which are comparable to that of the standard drug Glibenclamide 0.28 mg/kg. Blood sugar level was decreased to 155 ± 4 and 160 ± 4 mg/DL from 314 ± 5 mg/DL by the methanolic and aqueous extract respectively over 15 days²⁹.

Another study which was done with Streptozotocin-Nicotinamide induced type 2 diabetic rats also proves the activity of the plant extract. Diabetes mellitus was induced by 60mg/kg Streptozotocin and 120 mg/kg Nicotinamide on overnight fasted rats³⁰. Here, ethanolic extract of *G. velutinum* leaves, at a dose of 200 and 400

mg/kg to the rats were administered and a significant rate of blood glucose level reduction, comparable to the standard drug Glibenclamide 10mg/kg, was reported for induced diabetic rats in comparison with the diabetic control rats. Both the doses of ethanolic extract resulted in a noticeable alteration in the lipid profile, SGOT, SGPT levels than that of the diabetic control rats. This work also supporting the anti diabetic activity of the methanolic extract of the plant where it shows more activity for 400 mg/kg dose than that of 200 mg/Kg extract with a percentage reduction of 52.19 ± 2.71 and 31.90 ± 4.05 respectively³¹.

ANTIUROLITHIATIC ACTIVITY

The process of stone formation in the kidney, bladder, and urethra is called as Urolithiasis. No any side effects were reported yet with the herbal drug usage in Urolithiasis and it is the major attracting feature for having more herbal remedies. Methanolic extract of dried leaves of the *Glochidion velutinum* was employed as a preventive measure in the Urolithiasis induced in the rat models for this research. 0.75% ethylene glycol and 1% ammonium chloride were employed to induce Urolithiasis³² for 21 days in rats and the efficacy of the drug was tested against 250 and 500 mg/Kg of the extract while 750mg/kg Cystone was the standard drug used here. Then the levels of calcium, phosphate, oxalate in 24 hour urine and kidney along with BUN, creatinine, uric acid in serum were measured. Histopathological analysis of kidney was also

done. Conclusion of the work was the significant reduction in the stone formation rate observed in calculogenic rats by the methanolic extract of the dried leaves of *Glochidion velutinum* which is confirming the nephroprotective effect of *Glochidion velutinum*³³.

ANTI BACTERIAL ACTIVITY

A recent work employing high throughput antibacterial method by using the dye resazurin (1 ml of 0.01% dye) as an indicator of bacterial growth exhibited a good profile for the aqueous extract of stem bark (0.1 to 10 mg/ml) of *Glochidion velutinum* as an anti bacterial agent. This particular work was done to evaluate the anti bacterial activity of the selected medicinal extract against various strains such as *E. coli*, *B. subtilis*, *P. aeruginosa* and *S. aureus* (multi-drug resistant strain) by incorporating the evaluation of drug susceptibility by combined measurements of microtitre-plates, colorimetric and haemocytometric assays. In the preliminary screening, aqueous extract shows activity against *Staphylococcus aureus*, *Bacillus subtilis*, *Pseudomonas aeruginosa*, with a Minimum Inhibitory Concentration (MIC) of 200, 190, 110($\mu\text{g/ml}$) and Minimal Bacterial Concentration (MBC) of 250, 250, 200($\mu\text{g/ml}$) respectively for each organism) with streptomycin and tetracycline as reference antibiotics³⁵.

A similar work was done to have a preliminary antibacterial screening of *Glochidion velutinum* extract ⁶ by the disk

diffusion method using nutrient agar medium. The paper disks of 6mm diameter were made from sterile Whatman-1 filter paper followed by the impregnation with 500 μg of hexane, chloroform, methanol and ethanol extracts. Disks were then gently placed on the agar plates seeded in the test micro organism, where the zones were previously marked. From the results of antibacterial activity, it is evident that the methanol and ethanol extracts of the leaves exhibited better activity than the hexane and chloroform extracts⁶.

CONCLUSION:

This review work was an attempt to postulate the phytopharmacological characters of *Glochidion velutinum*, a promising natural weapon. Even though *Glochidion* is a very vast genus containing more than 250 species of well known potentials and folklore claims, we have to say *Glochidion velutinum* is not yet explored well as per the reported works. Most of the species coming under *Glochidion* genus are expected to provide their pharmacological effects due to the widely constituted Flavonoid and Triterpenoid Saponins. However, the phytochemical screening of this particular plant species indicates the absence of Triterpenoids and the presence of Polyphenols, which attributing the appreciable antioxidant properties. These facts also making an interesting platform for the upcoming researchers to discover the actual phytochemistry behind this plant. The significant results reported by the

various extracts as cytotoxic, antioxidant, antidiabetic, anti urolithiatic and antibacterial agent will boost up our confidence level to go ahead with this plant species to fasten the access of this novel molecule to enhance the human health

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