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An updated review on the Genus *Glochidion* Plant

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Abstract

Nature is the best combinatorial chemist and possibly has answers to all diseases of humankind. Till now, natural product compounds discovered from medicinal plants (and their analogues there of) have provided numerous clinically useful drugs. In India itself, there are more than 1100 medicinal plants grown all over the wild forests. Of these, some 60 geneses are used immensely in medicinal preparations. Glochidion is a very vast genus under which more than 250 species are present. Most of the species under this genus is widely constituted with flavonoids and triterpenoid saponins. This group of plants are well known among the tribes for its anti cancer, hypotensive, diuretic and various other properties.

Key words: *Glochidion*, glocheriosides, glochidioboside, hypotensive, hypoglycaemic, cordate.

INTRODUCTION

Since the dawn of the human civilization, the importance of medicinal plants in the treatment of variety of human ailments has been immense[1]. Herbal medicines have recently attracted much attention as alternative medicines useful for treating or preventing life style related disorders and relatively very little knowledge is available about their mode of action. There has been a growing interest in the analysis of plant products which has stimulated intense research on their potential health benefits[2]. Plants are the essential and integral part in Complementary and Alternative medicine and due to this they develop the ability for the formation of secondary metabolites. Plants are the best source of active secondary metabolites which are beneficial to mankind in treating many diseases[3]. They have been used medicinally for thousands of years by cultures all over the world[4]. In 1940's anti-leukaemia properties of the chemical warfare such as nitrogen mustards were discovered. The activity of these compounds is ascribed to their capacity of biological alkylation. Frequently, however the effective dose of these compounds was almost same as the toxic dose, a fact attributed to the lack of selectivity of the agents these simple alkylating agents are highly reactive and this leads to the indiscriminate reactions. A successful anti-cancer drug should kill or incapacitate cancerous cell without causing excessive damage to the normal cell.

This ideal is difficult or perhaps impossible to attain and that is why cancer patients frequently suffer from unpleasant side effects when undergoing treatment. Plant materials have been used for malignant diseases for centuries[5]. Ethnobotanical interventions about medicinal plants having beneficial effects on various diseases are reported in many plants[6]. This is a comprehensive review describing the plants coming under the genus *Glochidion*, which effectively treats cancer and many other ailments. There are more than 250 species of the plant in the world. Nevertheless, most of the species are yet to be explored or has to be brought to the light of researchers. Several triterpenoids and triterpenoid glycosides and alkaloids are known to be constituents of the plants belonging to the genus *Glochidion*. Neolignan glucoside, glochidioboside, dendranthemsideB and icariside B1, bergenin and benzylalcohol glucoside, blumeol C glucoside, megastigmane glucosides are some of the chief constituents of these plants[6,7]. The plants having triterpenoids are the most widely used for the treatment of inflammation and many other life threatening diseases in the traditional medicine of different cultures[8]. In India a number of medicinal plants and their formulations are widely used for the treatment of various disorders.[9]

Geographical distribution[10]

About 200 species of *Glochidion* is chiefly distributed in Tropical Asia, Pacific islands and Malaysia. A few in Tropical America and Africa.

General morphology[11]

The plants are usually found as trees or shrubs, which are monoecious but rarely dioecious. The leaves are alternate, distichous, or spiral. The petiole is short with leaf blade simple, margin entire and venation pinnate. Flowers are axillary or supra axillary. They are fascicled or in short cymes or umbels, proximal axils with male flowers and distal axils usually with female flowers, usually distinctly pedicellate. Male flowers are characterised with pedicels slender or almost absent. Sepals are 5 or 6, imbricate, petals are absent, stamens are 3–8, connate into an oblong or ellipsoid column, shorter than sepals, anthers are 2-locular, extrorse, linear, longitudinally dehiscent, connectives prolonged into an erect acumen, pistillode absent. Female flowers are characterised with pedicels stout and short or subsessile; sepals are as in male, but slightly thicker; ovary globose, 3–15-locular; ovules 2 per locule, styles connate into a short, thick, cylindrical column, apex lobed or toothed, rarely free. Fruit is a capsule which is globose or depressed globose, prominently longitudinally grooved, sunken at apex, dehiscent into 3–15, 2-valved cocci when mature, rarely unlobed, exocarp leathery or papery; endocarp crustaceous; styles usually persistent. The seeds are not strophiolate, hemispheric or laterally compressed, endosperm is fleshy and cotyledon is flattened.

Morphological characters of some of the species under *Glochidion*[11]

Glochidion lanceolatum

Leaf blade lanceolate or oblong-ovate, 5–7 × 2–3 cm, papery or subleathery, glaucous adaxially, brownish green abaxially, glabrous on both surfaces, base acute or rounded, inequilateral, apex acuminate to caudate-acuminate; lateral veins 6 or 7 pairs., Male flowers: sepals 6, oblong, imbricate; stamens 4(–6), connate; anthers oblong, connectives lanceolate. Female flowers: Sepals 6, oblong, sparsely pubescent on both surfaces; ovary subglobose, pubescent, 5-locular; ovules 2 per locule; styles connate into a long cylindrical column, exserted past sepals, 6-lobed at apex., Capsules depressed globose, 8–10 mm in diameter, glabrous, 8–10-grooved.

Glochidion lanceolarium

Stipules triangular-lanceolate, 2.5–3mm; petiole 3–5 mm; leaf blade elliptic, oblong, or oblong-lanceolate, 6–16 × 2.5–6 cm, leathery, dark green adaxially, yellowish green when dry, base

acute or broadly cuneate, slightly decurved, subequilateral; lateral veins 5–7 pairs., Flowers in axillary clusters. Male flowers: pedicels 8–10 mm; sepals 6, obovate or obovateoblong, ca. 3 mm, yellow; stamens 5 or 6., Capsules subglobose, 12–18 × 7–10 mm, apex usually concave and puberulent to glabrous, 6–8-grooved.

Glochidion zeylanicum

Stipules triangular, persistent; petioles 5–8 mm; leaf blade oblong, ovate-oblong, or ovate, sometimes oblongelliptic, 6–18 × 4–8 cm, leathery, base cordate, subcordate, truncate, or rounded, slightly oblique; lateral veins 5–7 pairs., Flowers in axillary clusters or in short, supra-axillary, pedunculate cymes, usually female flowers inserted at upper part of branchlets, male flowers inserted at lower part of branchlets, or female inflorescence with 1–3 flowers. Male flowers: pedicels 6–9 mm; sepals 5 or 6, connate into a column. Female flowers: sepals as in male; ovary globose, 5- or 6- locular; styles very short, connate into a very brief column., Capsules depressed globose, 8–10 × ca. 5mm, 8-12-grooved. Seeds hemispheric.

Glochidion coccineum

Stipules triangular - lanceolate, pubescent; petiole 3–5 mm, pubescent; leaf blade oblong, oblong-elliptic, or acuminate, leathery, green adaxially, glaucous-green abaxially, brown when dry, nerves sparsely pubescent to glabrous on both surfaces; lateral veins 6–8 pairs., Flowers in axillary clusters, usually male inserted at lower part of branchlets, female inserted at upper part of branchlets. Male flowers: pedicels 5–15 mm, pubescent; sepals 6, biseriate, outer larger than inner, obovate or oblong-ovate, 2.5–4 mm, yellow, sparsely pubescent outside; stamens 4–6. Female flowers: pedicels very short or flowers sessile; sepals 6, obovate or obovatelanceolate, slightly shorter than in male; connate styles subconical., Capsules depressed globose, 6–7 × ca. 15 mm, puberulent, 10-grooved.

Glochidion oblatum

Stipules lanceolate; petiole short, pubescent; leaf blade oblong or oblong-lanceolate, 5–10 × 2–4.5 cm, leathery, glaucous and glabrous adaxially, pubescent abaxially, brown when dry, base rounded or subacute, inequilateral, apex obtuse or acute; nerves very slender, nervules obscure. Flowers in axillary clusters. Male flowers: pedicels short; sepals 6, biseriate, outer larger, obovate or subspatulate, pubescent outside, inner narrower, spatulate, pubescent outside; stamens 4–6, connate, connectives free., Female flowers subsessile; sepals as in male, but inner ones pubescent on both surfaces; ovary broadly ovoid, tomentulose, 4- or 5-locular; connate styles shortly conical., Capsules depressed, 13–17 mm in diameter, pubescent, 4–6-grooved; styles persistent at apex; fruiting pedicels short.

Glochidion arborescens

Stipules oblong; petiole 3–5 mm, robust; leaf blade obliquely ovate or oblong, 5–15 × 3–7.5 cm, leathery, adaxially green, greenish when dry, pubescent or only midvein pubescent, abaxially greenish, reddish brown when dry, base rounded to shallowly cordate, obliquely inequilateral, apex acute or shortly acuminate; midvein and 7-12-paired lateral veins robust., Flowers in pedunculate supraaxillary cymes. Male flowers golden, ca. 3 mm in diameter; pedicels 4–7 mm; sepals 6, oblong, ca. 1 mm; stamens 6, connate into a subcylindric column. Female flowers: pedicels and sepals as in male; ovary ovoid-globose, pubescent; style column shortly conical, ca. 0.5 mm; stigma 3–5-lobed, lobes conical or subulate, erect., Capsules depressed globose, 5–6 × 8–8.5 mm, minutely 8-grooved; fruiting pedicels 6–8.5 mm.

Glochidion hirsutum

Stipules lanceolate, 3–4 mm; petiole 5–7 mm, pubescent; leaf blade ovate, oblong-ovate, or oblong, 7–15 × 4–7 cm, leathery, densely pubescent along nerves, adaxially glabrous at maturity, abaxially densely pubescent, base shallowly cordate, truncate, or rounded, obliquely inequilateral, apex obtuse or acute; lateral veins 6–10 pairs., Flowers usually in pedunculate supra-axillary cymes but apparently sometimes sessile and axillary; peduncle 5–7 mm, pubescent. Sepals 6, biseriate, pubescent outside, outer broader than inner. Male flowers: pedicels 6–10 mm; sepals oblong or obovate; stamens 5–8. Female flowers: pedicels 2–3 mm; sepals ovate or broadly ovate, ca. 2.5 mm; ovary globose, ca. 2 mm in diameter, pubescent, 5- or 6-locular; style column subconical, truncate at apex., Capsules depressed globose, 8–12 mm in diameter, pubescent, 5- or 6-grooved; styles of fruiting pedicels inconspicuous.

Glochidion rubrum

Stipules triangular, ca. 1 mm; petiole 1.5–4 mm; leaf blade ovate, elliptic, oblong, or oblong-lanceolate, 5–13 × 2–4.5 cm, papery to submembranous, glabrous or only nerves puberulent on both surfaces, base acute to obtuse, inequilateral; lateral veins 5 or 6 pairs., Flowers in axillary glomerules, sessile, with linear bracts at base. Male flowers: pedicels 3–4 mm, slender, glabrous; sepals 6, ovate or oblong, ca. 2 mm, glabrous or sometimes sparsely pubescent at base inside; stamens 3, connate. Female flowers: pedicels very short or sessile; sepals 6, ovate-triangular, ca. 2 mm, glabrous on both surfaces; ovary ovoid, 3–4 mm, 3–5-locular, pubescent; style column conical, 1–3.5 mm, sometimes 3-fid at apex, glabrous., Capsules depressed globose, 3.5–4 × 6–10 mm, pubescent, 3–5-grooved.

Glochidion triandrum

Stipules ovate-triangular, 1–1.5 mm, fulvous pubescent; petiole 2–4 mm, sparsely pubescent; leaf blade oblong-elliptic or lanceolate, 4–13 × 2–4.5 cm, papery, membranous, or thickly papery, adaxially green, only midvein sparsely pubescent when young, glabrous at maturity, abaxially glaucous and white pubescent or densely so, base broadly cuneate or obtuse, slightly inequilateral, apex acuminate, acute, or obtuse; midvein and 5–7-paired lateral veins slightly elevated adaxially, prominently elevated abaxially., Flowers in axillary clusters, 5 or 6 per cluster, male inserted at lower part of branchlets, female at upper part of branchlets. Male flowers: pedicels 6–7 mm, slender, with ovate-triangular ca. 1 mm bracteoles at base; sepals 6, biseriate, obovate, ca. 2 mm, pubescent; stamens 3, connate. Female flowers subsessile; sepals as in male, ca. 1.5 mm, concave inside; ovary ovoid, pubescent, 4- or 5-locular; style column cylindrical, dilated at apex., Capsules depressed globose, ca. 4 × 5–10 mm, sparsely pubescent, usually styles persistent, 8–10-grooved; fruiting pedicels 5–6 mm. Seeds triangular, ca. 3 mm, brownred, lucid.

Glochidion medogense

Stipules ovate-subulate, ca. 5 mm, ciliate on margin; petiole ca. 5 mm; leaf blade oblong or ovate, 8–16 × 4–7.5 cm, thinly leathery, smooth and glabrous adaxially, only midvein and 7–9-paired lateral veins elevated and pubescent abaxially, base slightly obtuse or rotund, inequilateral, apex acute to acuminate or shortly so., Flowers axillary. Male flowers: pedicels filamentous, ca. 5 mm, glabrous; sepals 5, ovate, ca. 1.5 × 1 mm; stamens 3, connate. Female flowers: pedicels 6–12 mm; ovary globose, glabrous, 5-locular; styles 5-fid., Capsules depressed globose, 7–9 mm in diameter, concave at apex, 10-grooved; style column cylindrical, persistent, 5-fid at apex, lobes linear; fruiting pedicels 1–2 cm.

Glochidion nubigenum

Stipules ovate-triangular, ca. 3×2 mm; petiole 8-10 mm, pubescent; leaf blade broadly elliptic, ovate, oblong, or oblong-lanceolate, 12–20×4.5-7.5 cm, papery, abaxially puberulent on nerves, base obtuse or rounded, usually inequilateral, apex acuminate or caudate-acuminate; midvein and 8-11 paired lateral veins elevated on both surfaces., Flowers in sessile axillary clusters with 6–10 female and 2 male flowers. Male flowers: pedicels short; sepals 5, oblong, apex acute; stamens 3, connate. Female flowers: pedicels 1.5–2.3 cm; sepals 5, broadly ovate; ovary broadly ovoid, 6–8-lobed, concave at apex; styles persistent, apex lobed., Pericarp thinly crustaceous. Seeds ovoid or globose, red.

Glochidion eriocarpum

Stipules subulate, 3–4 mm; petiole 1–2 mm, villous; leaf blade ovate, narrowly ovate, or broadly ovate, 4–8 × 1.5–3.5 cm, papery, densely yellowish or gray-villous, but denser abaxially, base obtuse, truncate, or rounded, zygomorphic, apex acuminate or acute; lateral veins 4 or 5 pairs., Flowers axillary, solitary or in 2–4-flowered clusters. Male flowers inserted along lower parts of branchlets; pedicels 4–6 mm; sepals 6, oblong-obovate, 2.5– 4 mm, apex acute, sparsely pubescent outside; stamens 3, connate. Female flowers inserted at upper part of branchlets, subsessile; sepals 6, oblong, 2.5–3 mm, villous on both surfaces; ovary depressed globose, densely pubescent, 4- or 5-locular; style column cylindric, erect, ca. 1.5 mm, 4- or 5- lobed., Capsules depressed globose, 8–10 mm in diameter, densely yellowish or gray-villous, 4- or 5-grooved, with a cylindric, persistent style column.

Glochidion heyneanum

Stipules triangular, ca. 3 mm; petiole 3– 4 mm; leaf blade orbicular, ovate, elliptic, oblong, or ovatelanceolate, rarely obovate, 3.5–12 × 3–6 cm, papery or thinly leathery, base acute, apex obtuse or acute to acuminate, with a mucro; lateral veins 4–6 pairs., Flowers in bisexual axillary clusters. Male flowers: pedicels 2–6 mm; sepals 6, ovate or narrowly ovate, biseriate, outer 3 pubescent on both surfaces, inner 3 pubescent outside only; stamens 3, connate into a cone. Female flowers: pedicels ca. 1 mm; sepals as in male; ovary globose, 4–7-locular; style column obconical, shallowly 4-fid at apex. Fruiting pedicels ca. 1 cm., capsules depressed globose, ca. 4 × 8 mm, 4–7-locular, usually with persistent styles. Seeds triangular, red.

Glochidion lutescens

Petiole 3–5 mm; leaf blade elliptic, ovate-lanceolate, or obliquely ovate, 6–14 × 3–7 cm, papery to leathery, abaxially gray-white and puberulent to glabrous, adaxially green, base acute-obtuse to rounded, apex shortly acuminate to obtuse., Flowers in axillary, many-flowered, unisexual or bisexual clusters. Male flowers: pedicels ca. 5 mm; sepals 6, elliptic, ca. 2 mm; stamens 3, connate into a cylindrical column. Female flowers: pedicels 2–3 mm, or subsessile; sepals 6, ovate, outer ones 0.9–2.3 × 0.6–1.2 mm, inner ones 0.9–1.8 × 0.5–1.1 mm; ovary ovoid, 6-locular; style column cylindric or subconical, apex truncate, as long as ovary., Fruiting pedicels 1.5–5 mm; capsules depressed globose, 5–6 × 10–18 mm in diameter, reddish, 6-grooved, puberulent.

Glochidion puberum

Stipules triangular, ca. 1 mm; petiole 1–3 mm; leaf blade oblong, oblong-ovate, or obovate-oblong, rarely lanceolate, 3–8 × 1–2.5 cm, papery or subleathery, gray-green and midvein sparsely pubescent or glabrescent adaxially, greenish and densely pubescent abaxially, base cuneate to obtuse, apex obtuse, acute, shortly acuminate, or rounded; lateral veins 4–8 pairs, elevated abaxially, reticulate nerves prominent., Flowers in axillary clusters, 2–5-flowered, proximal axils mostly to all male flowers, distal axils mostly to all female flowers. Male flowers:

pedicels 4–15 mm; sepals 6, narrowly oblong or oblongobovate, 2.5–3.5 mm, spreading, green to yellowish, densely pubescent outside; stamens 3, connate into a cylindrical column. Female flowers: pedicels ca. 1 mm; sepals 6, as in male, but shorter and thicker, green; ovary globose, densely pubescent, 5-10-locular; ovules 2 per locule; style column annular, shortly lobed in summit., Capsules depressed globose, 8–15 mm in diameter, 8–10-grooved, densely pubescent, reddish when mature, apex with persistent annular styles. Seeds subreniform, 3-angled, ca. 4 mm, red.

Glochidion chademenosocarpum

Stipules triangular, ca. 2.5×1.5 mm, slightly thick, glabrous; petiole 2–3 mm; leaf blade oblong to obovate, $5-8 \times 2.5-4$ cm, papery, glabrous on both surfaces, base acute, inequilateral, apex obtuse. Flowers in bisexual axillary clusters., Male flowers: pedicels ca. 1 cm, slender, sparsely hispid; sepals 6, biseriate, outer obovate, ca. 2.5×1 mm; stamens 3, connate; anthers linear. Female flowers subsessile; sepals 6, biseriate, oblanceolate, ca. 1.5×0.5 mm, glabrous outside, sparsely hispid inside, apex obtuse; ovary depressed globose, ca. 0.5×1 mm; style column cylindrical, ca. 1 mm, slightly thick, 8-grooved at apex., Fruits not seen.

Glochidion kusukusense

Petiole ca. 5 mm; leaf blade lanceolate, $4-6.5 \times 1.5-2$ cm, papery, base acute, oblique, apex acuminate, mucronulate., Male flowers several in axillary clusters; pedicels slender, ca. 5 mm; sepals 6, biseriate, outer oblong, ca. 1.5×1 mm, apex acute, inner smaller than outer; stamens 3, connate into a cone, ca. 0.7 mm. Female flowers, fruits not seen.

Glochidion philippicum

Stipules ovate-triangular, 1–1.5 mm; petiole 4–6 mm; leaf blade ovate-lanceolate or oblong, $5-15 \times 2.5-5.5$ cm, papery or subleathery, shining dark green adaxially, brown when dry, paler abaxially, glabrous on both surfaces, base acute or broadly cuneate, usually oblique, apex acuminate to obtuse; lateral veins 6–8 pairs., Inflorescence an axillary cluster, 4–10-flowered. Male flowers: pedicels 6–7 mm; sepals 6, oblong or obovate-oblong, 1.5–2.5 mm, glabrous, yellowish green; stamens 3, connate into a cylindrical column. Female flowers: pedicels 2–4 mm; sepals 6, as in male; ovary globose, pubescent, 5- or 6-locular; style column shortly conical, 5–7-fid at apex. Capsules depressed globose, $4.5-5.5 \times 8-12$ mm, apex with much impressed and persistent styles, deeply 10–14-grooved, densely to sparsely pubescent., Fruiting pedicels 3–8 mm. Seeds red, hemispheric, 3–3.5 mm.

Glochidion sphaerogynum

Stipules subtriangular, 2–3 mm; petiole 5–8 mm; leaf blade ovate-lanceolate, lanceolate, or oblong-lanceolate, often slightly falcate, $7-10 \times 1.5-3.5$ cm, papery or thinly leathery, abaxially greenish, gray-brown when dry, glabrous or glabrescent on both surfaces, adaxially green, base acute, usually inequilateral; lateral veins 6–8 pairs., Flowers monoecious, in axillary clusters, male in proximal axils, female in distal axils, male and female mixed in central axils. Male flowers: pedicels 6–8 mm; sepals 5 or 6, obovate or elliptic, ca. 2 mm, yellowish; stamens 3, connate, connectives acute. Female flowers: pedicels 2–3 mm; sepals 6, ovate or ovate-triangular, outer larger than inner, ca. 1 mm; ovary ovoid, 4–6-locular, glabrous, ca. 1 mm in diameter; style column depressed globose, ca. 2 mm wide., Capsules depressed globose, ca. $4 \times 8-10$ mm, apex concave and with a persistent depressed globose style column, 8–12-grooved.

Glochidion thomsonii

Stipules ovate-triangular, ca. 3 mm, thick, hard when dry; petiole 2–3 mm; leaf blade oblong or elliptic, $5-13 \times 2.5-4$ cm, leathery, green and smooth adaxially, bluish glaucous abaxially when

dry, base obtuse, inequilateral, apex acuminate to obtuse; midvein and 6–9-paired lateral veins slightly elevated and reddish., Flowers in bisexual clusters, male 1–3 and female many mixed in axils. Male flowers: pedicels slender; sepals 6, elliptic, equal; stamens 3, connate. Female flowers: pedicels shorter; sepals 6, elliptic-ovate; ovary depressed globose, 3- or 4-locular; style column obovate, ca. 2 mm. Fruiting pedicels ca. 5 mm., capsules depressed globose, 1–1.5 cm in diameter, apex depressed and with a persistent obovate style column; style columns shallowly 4- or 5-fid at apex. Seeds red.

Glochidion wrightii

Petiole 3–5 mm; leaf blade oblong or oblong-lanceolate, often obliquely falcate, 2.5–5.5 × 1.5–2.5 cm, papery, green adaxially, farinose-greenish abaxially, gray-glaucous when dry, base acute, inequilateral, apex acuminate; lateral veins 5 or 6 pairs., Flowers in bisexual clusters. Female flowers subsessile; sepals 6, biseriate, outer wider and thicker than inner, ovate, elliptic, or oblong, ca. 1 mm; ovary globose, 3- or 4-locular; style columns cylindrical, less than 1 mm., Capsules triangular, depressed globose, 6–8 mm in diameter, red, with a persistent style column.

Glochidion ellipticum

Stipules triangular, ca. 2 mm; petiole 2–3 mm; leaf blade broadly elliptic, ovate to lanceolate, 9–15 × 3.5–4.5 cm, papery or subleathery, both surfaces glabrous, abaxially brownish when dried, base obtuse, apex acuminate or shortly so; lateral veins 6–8 pairs., Flowers in bisexual axillary clusters, with many male flowers and few female flowers. Male flowers ca. 3 mm in diameter; pedicels slender, 13–20 mm, pubescent; sepals 6, oblong or obovateoblong, pubescent outside; stamens 3; connate anthers oblongovoid, connectives cuspidate. Female flowers subsessile; sepals as in male; ovary globose, 3- or 4-locular, pubescent to glabrous; style column conical, glabrous., Fruiting pedicels short; capsules depressed globose, 2–3 × 6–8 mm, usually 4-locular, pericarp thinner. Seeds hemispheric, red.

Glochidion daltonii

Stipules triangular, ca. 1 mm; petiole 2–4 mm, puberulent to glabrous; leaf blade lanceolate or elliptic, sometimes falcate, 3–12 × 1.5–3 cm, papery or subleathery, abaxially gray-white, adaxially graygreen, base broadly cuneate, apex acuminate or shortly so; lateral veins 5–7 pairs, elevated below., Flowers in axillary clusters, with 2 bracts at base, male in proximal axils, female in distal axils. Male flowers: pedicels 5–8 mm, connate. Female flowers subsessile; sepals as in male; ovary depressed globose, puberulent to glabrous, 4–6-locular; style column prominently clavate, 3–6-fid at apex., Capsules depressed globose, 1–1.5 cm in diameter, brown when dry, 4–6-grooved, with persistent sepals at base.

Glochidion wilsonii

Stipules ovate-lanceolate, 2– 2.5 mm; petiole 2–5 mm, puberulent to glabrous; leaf blade lanceolate or obliquely lanceolate, 3–10 × 1.5–4 cm, papery, green adaxially, gray-white abaxially, base obtuse or broadly cuneate, apex acute or shortly acuminate; midvein elevated on both surfaces, lateral veins 5 or 6 pairs, raised abaxially., Flowers green, in axillary clusters, male in proximal axils, female in distal axils. Male flowers: pedicels ca. 8 mm; sepals 6, oblong or obovate, 2.5–3 × ca. 1 mm, apex obtuse, margin thinly membranous; stamens 3, connate. Female flowers: pedicels short; sepals as in male; ovary globose, 6–8-locular; style column cylindrical, lobed at apex., Capsules depressed globose, ca. 1.5 cm in diameter, 6–8-grooved, usually with persistent sepals at base. Seeds obscurely 3-angular, red lucid.

Glochidion obovatum

Stipules ovate-triangular; petiole 1.5–2 mm; leaf blade obovate or oblong-obovate, 3.5–8 × 2–2.5 cm, thinly leathery, base cuneate, apex obtuse or shortly acuminate., Flowers in cymes. Male flowers: pedicels 6–9 mm; sepals 6, obovate, 1.5–2 mm; stamens 3, connate. Female flowers: pedicels 3–6 mm; sepals as in male; ovary ovoid, 4–6-locular, glabrous; style column cylindrical, 6-lobed at apex., Capsules depressed globose, ca. 4.5 × 7 mm, 8–12-grooved.

Glochidion ramiflorum

Stipules broadly triangular, midrib elevated abaxially; petiole 4–5 mm, glabrous; leaf blade oblong, elliptic to oblongovate, 10–15 × 4–5 cm, papery, dark green adaxially, green abaxially, brown-black when dry, glabrous on both surfaces, base obtuse, apex caudate-acuminate; midvein elevated on both surfaces, lateral veins 6–9 pairs., Flowers yellowish, in axillary clusters, 4–9 flowers per cluster, branchlets with proximal clusters male, distal clusters female, sometimes male and female mixed. Male flowers: pedicels 4–6 mm, glabrous; sepals 6, biseriata, broadly ovate, ca. 2 × 1.2 mm, glabrous; stamens 3, connate into a cylinder. Female flowers: pedicels short; sepals as in male, but smaller, ca. 1 × 0.7 mm; ovary ovoid, 5- or 6-locular, glabrous., Capsules depressed globose, ca. 6 mm in diameter, 10–12-grooved.

Glochidion suishaense

Petiole ca. 3 mm; leaf blade ovate or obovate to oblong, 4.5–8.5 × 3–4.5 cm, thinly leathery, base cuneate, obtuse, or rounded, apex acute., Flowers in axillary clusters. Male flowers: pedicels slender; sepals 6, obovate, biseriata, outer ca. 3 × 1.5 mm, apex very obtuse, inner ca. 2.5 × 1 mm; stamens 3, connate. Female flowers: pedicels 1–1.5 mm; sepals 6, oblong, biseriata, outer ca. 2 × 1.5 mm, apex obtuse, entire or obscurely dentate, inner ca. 2 × 0.6 mm, entire or dentate; ovary depressed globose, 4-locular, ca. 0.6 × 1 mm; style column obconical, lobed at apex., Capsules depressed globose, ca. 8 × 15 mm, 8-grooved. Seeds red.

Glochidion khasicum

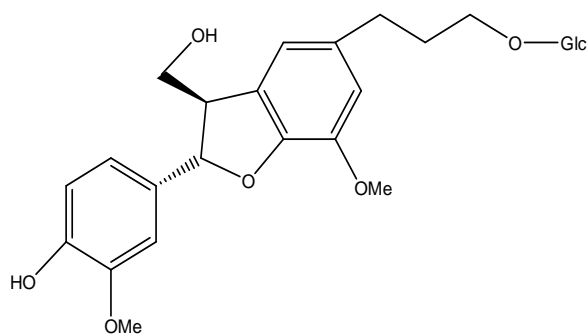
Stipules ovate-triangular, ca. 2.5 mm; petiole 4–6 mm, stout; leaf blade oblong, ellipticovate, or ovate-lanceolate, 7–10 × 2.5–4 cm, leathery, greenish when dry, base acute, decurrent into petiole; lateral veins 5 or 6 pairs., Male flowers in few-flowered axillary clusters; pedicels short; sepals 6, oblanceolate, unequal, 3–3.5 mm; stamens 3, connate, connectives umbonate. Female flowers subsessile; sepals 6, ovateoblong, unequal, 3.5–4 mm; ovary globose, 3- or 4-locular; style column elongate, stout, subclavate, unequally 3-toothed at apex., Fruiting pedicels short; capsules depressed globose, ca. 8 mm in diameter, intruded at apex and base, 3–6-locular, lobes rounded. Seeds hemispheric.

Chemical constituents from *glochidion* sps

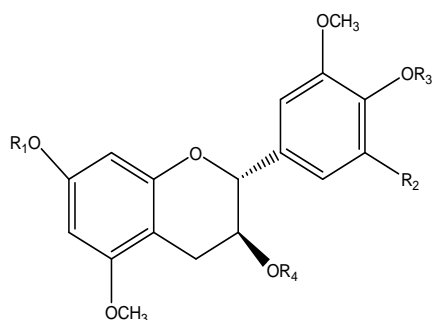
Two new norbisabolane sesquiterpenoid glycosides, glochicoccinosides A and B, together with two known compounds, have been isolated from the rhizomes of *Glochidion coccineum*, but it was found that none of them showed antioxidant and cytotoxic activity[12].

Four lupane-type triterpenoids, glochidonol, glochidiol, lup-20(29)-ene-1 β ,3 β -diol and glochidone were isolated from the stem bark of *Glochidion zeylanicum*. In this Glochidiol exhibited a strong inhibitory effect on mouse skin tumor promotion[13]. From the leaves of the same plant six new butenolide glucoside, named *glochidionolactones* A–F, were isolated along with a known related compound, phyllanthurinolactone[14]. Four flavanol glucosides, named as glochiflavanosides A–D were isolated along with known flavone C-glucosides, vitexin and iso orientin from the leaves of the same species. Five flavonols were isolated and identified as 3-O-(3-methylgalloyl)catechin, 3-O-(3-methylgalloyl) gallocatechin, 3-O-galloyl gallocatechin,

galloocatechin, catechin from *Glochidion hirsutum*[15-17]. Six lupanes lupenone, 3-epi-lupeol, glochidone, glochidonol, glochidiol and lup-20(29)-ene-1 β ,3 β -diol were isolated from the roots and stem wood of *Glochidion eriocarpum*. Glochidonol, glochidiol, lup-20(29)-ene-3 α ,23-diol (3), were isolated from the roots and stem wood of *Glochidion sphaerogynum* showed cytotoxic properties[17]. From the leaves of *Glochidion obovatum*, a new neolignan glucoside, (7S,8R)-dihydro dehydro dico-niferyl alcohol-9'-O- β -glucoside, named as glochidioboside, was isolated along with the known compounds, blumeol C glucoside, benzyl alcohol glucoside, bergenin, dendranthemoside B and icariside B[4]. neolignan glucosides, and tachioside. 2'-O-4''-O-methylgallate are isolated from the leaves of *Glochidion rubrum*[18]. A lignanoid glochinin A and norbisabolane sesquiterpinoids namely glochininD and phyllambelicacid were isolated from *Glochidion puberum*[19].

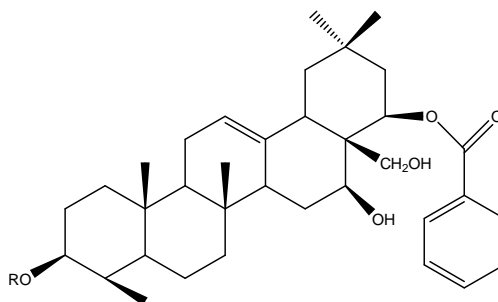


Glochidioboside[4]



Glochiflavanosides A—D

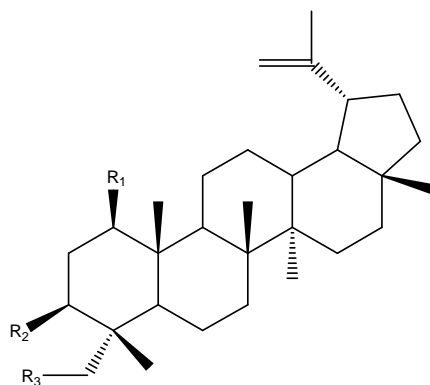
Glochiflavanosides	R1	R2	R3	R4
A	GLC	H	H	H
B	GLC	OCH ₃	H	H
C	H	OCH ₃	H	H
D	H	H	H	GLC



Glocheriosides A and B [17]

Glocheriosides A :R = β -D-glucopyranosyl1-(1 \rightarrow 3)- α -L-arabinopyranoside

Glocheriosides B: R = β -D-glucopyranosyl1-(1 \rightarrow 3)- β -d-xylopyranoside



Triterpenoids saponins

$R_1-R_3=H, R_2=O, \Delta^{1-2}$
 $R_1=OH, R_2-R_3=OH$
 $R_1=R_2=OH, R_3=H$

Table 1: Medicinal Uses of different species of *Glochidion*[20-29]

S. No.	Name of the plant	Parts used	Disease
1	<i>Glochidion Puberum</i>	All parts	Febrifuge, depurative. Dispersclots, dysentery, diarrhea, rupture, cough,
2	<i>Glochidion Oblatum</i>	stem and root	remedy for dysentery
3	<i>Glochidion eriocarpum</i>	All parts of the plant	urticaria, mastitis, toothache,menorrhagia, dysentery, eczema, enteritis ,cancer.
4	<i>Glochidion velutinum</i>	All parts	Diabetes , cancer, wounds
5	<i>Glochidion zeylanicum</i>	All parts	Coughs, pneumonia, abdominal pain and traumatic injury, refrigerant ,restorative, itches
6	<i>Glochidion hohenackeri</i>	Bark, arial parts	Stomach ailments, CNS depressant, anti-viral, hypotensive, hypoglycemic.
7	<i>Glochidion sphaerogynum</i>	Root and arial parts	As anti cancer agent, influenza, eczema, cns depressant, hypotensive.
8	<i>Glochidion hirsutum</i>	Leaves and roots	Rheumatism, pneumonia and toothache
9	<i>Glochidion ramiflorum</i>	Leaves	Contraceptive
10	<i>Glochidion littorale</i>	Leaves	Decoction is used for stomach ache
11	<i>Glochidion lanceolarium</i>	Leaves	Decoction is used for stomach ache
12	<i>Glochidion assamicum</i>	Whole plant	Hypoglycemic
13	<i>Glochidion fagifolium</i>	Arial parts	CNS depressant, hypotensive.
14	<i>Glochidion heyneanum</i>	Arial parts	CNS depressant, diuretic, anticancer.
15	<i>Glochidion nilgherrense</i>	Arial parts	Hypotensive, diuretic.

Table 2: List of species of plants under the genus *Glochidion* [13, 29-34]

<i>G. acuminatissimum</i> N	<i>G. cauliflorum</i> P	<i>G. glaucops</i> S
<i>G. acuminatum</i> T	<i>G. celastroides</i> S B	<i>G. globosum</i> N
<i>G. acustylum</i> C L N	<i>G. cenabrei</i> P	<i>G. glomerulatum</i> T MA S J B
<i>G. album</i> P	<i>G. chademenosocarpum</i>	<i>G. gracile</i> C
<i>G. alstonii</i> C	<i>G. chlamydogyne</i> N	<i>G. grantii</i>
<i>G. alticola</i> S	<i>G. chondrocarpum</i> N	<i>G. granulare</i> N
<i>G. aluminescens</i> B	<i>G. coccineum</i> T	<i>G. grossm</i> N
<i>G. ambiguum</i> N	<i>G. conostylum</i> N	<i>G. heterocalyx</i> N
<i>G. anamiticum</i>	<i>G. concolor</i>	<i>G. heyneanum</i>
<i>G. andersonii</i> B	<i>G. coronulatum</i> P	<i>G. hirsutum</i> T
<i>G. angulatum</i> SBPCMOLN	<i>G. cupreum</i> B	<i>G. hohenackeri</i>
<i>G. apodogynum</i> N	<i>G. curranii</i> P	<i>G. hongkongense</i> T
<i>G. arborescens</i> T MA S J B C	<i>G. cyrtophyllum</i> S	<i>G. huahuneense</i>
<i>G. assamicum</i> T	<i>G. cyrtostylum</i> S J	<i>G. humile</i> P
<i>G. atalotrichum</i>	<i>G. daltonii</i> T	<i>G. hypoleucum</i> T MA
<i>G. auii</i> B	<i>G. decorum</i> N	<i>G. insectum</i> N
<i>G. azaleon</i> B	<i>G. delticola</i> N	<i>G. insigne</i> T J
<i>G. balsahanense</i>	<i>G. dichromum</i> C	<i>G. insulare</i> MA
<i>G. beccarii</i> S	<i>G. discogyne</i> N	<i>G. intercastellanum</i> N
<i>G. beguinii</i> MO	<i>G. disparilaterum</i> S	<i>G. johnstonei</i>
<i>G. benguetense</i> P	<i>G. disparipes</i> N	<i>G. katikii</i>
<i>G. benthamianum</i> N	<i>G. dodecapterum</i> C	<i>G. kerangae</i> B
<i>G. borgmannii</i> N	<i>G. dolichostylum</i> P	<i>G. kerrii</i> T
<i>G. borneense</i> S J B	<i>G. drypetifolium</i> N	<i>G. khasicum</i> T
<i>G. bourdillonii</i>	<i>G. dumicola</i> N	<i>G. kollmannianum</i> J
<i>G. brachystylum</i> P	<i>G. elaphrocarpum</i> N	<i>G. kopiaginis</i> N
<i>G. breynioides</i>	<i>G. elmeri</i> S B	<i>G. korthalsii</i> B
<i>G. brideliifolium</i> N	<i>G. ellipticum</i>	<i>G. kostermansii</i> L
<i>G. brooksii</i> S B	<i>G. eriocarpum</i> T S C	<i>G. kunstlerianum</i> MA S B
<i>G. brunneum</i> MA S B N	<i>G. eucleoides</i> N	<i>G. kusukusense</i>
<i>G. bullatissimum</i> N	<i>G. falcatilimbus</i> P	<i>G. lalae</i> N
<i>G. butonicum</i> C	<i>G. ferdinandi</i>	<i>G. lanceilimbus</i> B P N
<i>G. cacuminum</i> L	<i>G. formanii</i> C	<i>G. lanceisepalum</i> B
<i>G. cagayanense</i> P	<i>G. frodinii</i> N	<i>G. lanceolarium</i> T
<i>G. caloneurum</i> N	<i>G. fulvirameum</i> J C MO N	<i>G. lanceolatum</i>
<i>G. calospermum</i> B	<i>G. fuscum</i> MA	<i>G. lancifolium</i>
<i>G. camiguinense</i> P	<i>G. galorii</i> N	<i>G. latistylum</i> P
<i>G. canescens</i> P C MO L	<i>G. gaudichaudii</i> MO	<i>G. leiostylum</i>
<i>G. capitatum</i> J	<i>G. gigantifolium</i> P	<i>G. leptostylum</i> N
<i>G. carrickii</i> MA	<i>G. gimi</i> N	<i>G. leucocarpum</i> S
<i>G. carrii</i> N	<i>G. glabrum</i> MO L N	<i>G. leucogynum</i> C
<i>G. castaneum</i> C MO L N	<i>G. glaucescens</i> P	<i>G. ligulatum</i> P

<i>G. littorale</i> T MA S J B P L	<i>G. oogynum</i> N	<i>G. societatis</i>
<i>G. llanosii</i>	<i>G. oxygonum</i> MO	<i>G. sorsogonense</i>
<i>G. lobocarpum</i> L N	<i>G. pachyconum</i> N	<i>G. sphaerogynum</i> T
<i>G. loerzingii</i> S	<i>G. palawanense</i> P	<i>G. stenophyllum</i> MO
<i>G. longfieldiae</i>	<i>G. paludicola</i> N	<i>G. striatum</i> N
<i>G. longistylum</i> P	<i>G. papenooense</i>	<i>G. styliferum</i> B
<i>G. lucidum</i> MA S J P C MO N	<i>G. pauciflorum</i>	<i>G. stylosum</i> MA
<i>G. lutescens</i> S J B P C MO L N	<i>G. peltiferum</i> S	<i>G. subangulatum</i>
<i>G. luzonense</i> S P	<i>G. penangense</i> MA	<i>G. subfalcatum</i> P
<i>G. macrocarpum</i> S J L N	<i>G. perakense</i> T MA N	<i>G. submolle</i> L N
<i>G. macrostigma</i> MA S B	<i>G. phellocarpum</i> S	<i>G. suishaense</i>
<i>G. macrophyllum</i>	<i>G. philippicum</i> J B P C MO LN	<i>G. sumatranum</i> S C MO L
<i>G. magnifolium</i>	<i>G. philippiense</i>	<i>G. superbum</i> T MA S J B
<i>G. malindangense</i> P	<i>G. phyllanthoides</i> P	<i>G. symingtonii</i> MA
<i>G. manono</i>	<i>G. phyllochlamys</i> N	<i>G. tannadnse</i>
<i>G. marchionicum</i>	<i>G. physocarpum</i> S	<i>G. taitense</i>
<i>G. marianum</i>	<i>G. pitcairnense</i>	<i>G. temehaniense</i>
<i>G. marinarum</i>	<i>G. plagiophyllum</i> L	<i>G. tenuistylum</i> B
<i>G. medogense</i>	<i>G. pleiosepalum</i> N	<i>G. ternateum</i> MO
<i>G. mehipitense</i> B	<i>G. pomiferum</i> N	<i>G. tetrapteron</i> MA S
<i>G. meijeri</i> S	<i>G. prinoides</i> J	<i>G. thomsonii</i>
<i>G. merrillii</i> P	<i>G. psidioides</i> P	<i>G. thorelis</i>
<i>G. microbotrys</i> MA	<i>G. pubicapsa</i> S B P	<i>G. timorensis</i> L
<i>G. mindorensis</i> B P MO L	<i>G. pubicarpum</i>	<i>G. tomentosum</i>
<i>G. mitrastylum</i> N	<i>G. pulgarensis</i>	<i>G. tooviiianum</i>
<i>G. molle</i> J B P C MO	<i>G. punctatum</i> B	<i>G. triandrum</i> P
<i>G. moorei</i>	<i>G. pyriforme</i> N	<i>G. trichogynum</i> P
<i>G. moluccanum</i> C	<i>G. quinquestylum</i>	<i>G. trichophorum</i> P
<i>G. monostylum</i> B	<i>G. raivavense</i>	<i>G. triloculare</i>
<i>G. mop</i> N	<i>G. ramiflorum</i>	<i>G. trusanicum</i> B
<i>G. muscisilvae</i> N	<i>G. rapaense</i>	<i>G. ultrabasicole</i> C
<i>G. myrtifolium</i>	<i>G. reticulatum</i> P	<i>G. urceolare</i> N
<i>G. nadeaudii</i>	<i>G. retinerve</i> N	<i>G. urophyllodes</i> P
<i>G. nesophilum</i> N	<i>G. robinsonii</i> P	<i>G. varians</i> S
<i>G. nitidum</i> B P	<i>G. rubrum</i> T MA S J B P	<i>G. velutinum</i>
<i>G. nobile</i> N	<i>G. rugulosum</i> N	<i>G. wallichianum</i> T MA
<i>G. novoguineense</i> MO L N	<i>G. sablanense</i>	<i>G. weberi</i> P
<i>G. oblatum</i> T	<i>G. seemannii</i> Müll.Arg.	<i>G. williamsii</i> B
<i>G. oblongifolium</i> N	<i>G. sericeum</i> MA S J B	<i>G. wilsonii</i>
<i>G. obovatum</i>	<i>G. singaporensis</i> MA S B	<i>G. wisselense</i> P L N
<i>G. obscurum</i> T MA S J B C L	<i>G. sinicum</i>	<i>G. wonenggau</i> C
<i>G. oogynum</i> N	<i>G. sisparensis</i>	<i>G. woodii</i> P
<i>G. wrightii</i>	<i>G. xerocarpum</i> P C MO L N	<i>G. xestophyllum</i> MA B
<i>G. zeylanicum</i> J		

CONCLUSION

The plants coming under the genus *Glochidion* is chemically constituted with the constituents like triterpenoid saponins, sesquiterpenoids, glycosides and alkaloids which vary from one plant to another. Hence it can be considered that these plants may possess a lot of medicinal value which may be in one way or the other beneficial for the human well being. Much attention can be given in complete exploration of the different species of this genus as they have not yet come in the limelight of the researchers.

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