

SUMMARY

The present work on “**Taxonomic and phytochemical study of the medicinally known species of *Glochidion* J.R. Forst. & G.Forst. (Phyllanthaceae) of Assam**” is based on the taxa collected in various regions of Assam through extensive fieldwork and examining their morphological and anatomical characteristics as well as phytochemical analysis of documented medicinally known species of *Glochidion*.

Glochidion J.R. Forst. & G.Forst. is one of the largest genera of the family Phyllanthaceae. During the current investigation, 10 members of the genus *Glochidion* have been collected in Assam. Following a comprehensive investigation, it came to light that some of the species from the literature were now considered synonyms and that others had no information on their distribution inside the current political boundary of Assam. Until now, no taxonomic account of the genus has been accomplished to examine the genus as a whole in the context of phytochemical research, morphology, foliar micromorphology, petiole anatomy, and leaf architecture studies. Consequently, it was anticipated that the investigation offered various facts required for thorough and illustrative taxonomic knowledge of the genus *Glochidion* in Assam.

The fieldwork for the present study was carried out from 2019 to 2023 by obtaining permission from the Assam State Biodiversity Board and the Principal Chief Conservator of Forests (Wildlife), Wildlife Warden, Assam. The specimens were collected randomly at various forest areas of Assam and their GPS coordinates were also taken during the survey. Voucher specimens were deposited in ASSAM herbaria, BSI, Shillong, Meghalaya, India. Identification of the taxa was done by concerning some relevant literature and online taxonomic databases and deposited online herbaria. Using standard methods herbarium preparation, identification, evaluation of morphological, and anatomical analysis of the specimen were done. The present study comprises 10 taxa i.e. 6 species and 4 varieties of the genus *Glochidion* occurring in Assam. Among them, one of the varieties of *Glochidion zeylanicum* (Gaertn.) A.Juss. i.e. *G. zeylanicum* var. *paucicarpum* Chakrab. & N.P. Balakr. is a new distributional record of Assam. Extended morphological descriptions were provided with proper author citations, synonyms, vernacular names, detailed descriptions, habitat, distribution, and specimen examined of the taxa. Whenever required, intriguing insights or facts were presented in the form of a

note. Photographic plates and line drawings of the taxa were also included. A map of the specimen collection site of the study area was also provided. Based on the morphological characters artificial keys were arranged as an aid for identification of the taxa. The leaves of the members of *Glochidion* are found in insect-damaging conditions. Therefore, this character simply can lead to the identification of the taxa.

Reproductive structures are the main characteristics for the identification of this genus. Even though morphological traits can be used to identify a species, certain taxa that fall below the rank of a species are more challenging to identify. Therefore, for easy identification of the taxa micromorphological work also has been carried out for the present study.

Detailed qualitative and quantitative foliar epidermal features using both light and scanning electron microscope of 10 taxa were studied and their comparative analysis was presented along with the photo plates. Distinguishing among the taxa can be made by using both qualitative and quantitative characteristics such as the position of stomata, stomatal shape, stomatal size, stomatal area, stomatal index, shape of the epidermal cell, anticlinal cell wall, papillae, epicuticular wax crystals, types and length of trichomes. An artificial key implies the identification of the species and varieties of the genus *Glochidion*.

The anatomical structures of the petiole of the taxa were compared and photo plates were included in the present account. The artificial key for the petiole anatomy study was provided. The characteristics viz., number and arrangement of vascular bundles, presence or absence of glands, crystals, and epidermal hairs are predominantly convenient for identification of the taxa.

Leaf architectural features of major venation patterns primary, secondary, tertiary, quarternary, quinternary, areole formation, free vein endings, marginal venations, vein islet, and vein termination numbers were compared and presented with photo plates. The artificial key for the leaf architecture study was provided as an aid for taxa delimitation. The micromorphological characteristics resulting from the leaf epidermis, petiole anatomy, and leaf architecture study can be used as diagnostic characteristics to identify and determine the intraspecific taxonomic group.

In India, the genus has been used traditionally mainly in North East region. Thus, the study also brings their ethnobotanical uses consumed by the local people of the study area, hence, no proper documentation of the genus has been done in Assam. Ethnobotanical information of the collected specimen was gathered in the present study. After considering primary and secondary ethnobotanical information or data provided by local villagers and traditional healers in Assam further phytochemical analyses were carried out. Only three species i.e. *Glochidion ellipticum*, *G. multiloculare* and *G. sphaerogynum* were ethnobotanically important species used by different communities in Assam. Majority of the species are administered to cure diseases mainly skin ailments, body swelling, and snake bites in Assam. Qualitative and quantitative phytochemical analyses were performed based on the parts used by these three species. In addition, GC-MS analysis, antioxidant activities, and mineral contents of the selected species were estimated by using standard protocols. From the ethnobotanical study, we can gather more information about the genus and how the members of the genus have been used traditionally.

The genus has long been utilized in medicine to treat a variety of illnesses. It also has the ability to decreases cancer cells and exhibit antioxidant and cytotoxic effects on human cancer cell lines, as well as anticarcinogenic, antitumor, anti-inflammatory, antimutagenic, and antimicrobial properties.

The preliminary phytochemical study of different parts of the extract of *G. ellipticum*, *G. multiloculare*, and *G. sphaerogynum* showed the presence of many important phytoconstituents. All the parts of the studied species possess significant phytoconstituents such as alkaloids, flavonoids, reducing sugar, steroids, phlobatannins, tannins, terpenoids, triterpenoids, saponin, glycosides, and phenol as well as a good amount of concentration of alkaloid, flavonoid, terpenoid, saponin, tannin, and phenolic contents.

The DPPH free radical scavenging and ABTS assays were used to examine antioxidant activity. All the species exhibit potential antioxidant activity. *G. sphaerogynum* bark extract exhibited the highest antioxidant activity as compared to other sample extracts.

The identified volatile compounds by GC-MS of methanolic extraction of the selected species possess important bioactivity components such as antioxidants,

antibacterial, antitumor, antidiabetic, antimicrobial, anti-inflammatory, antifungal, cytotoxic, and various pharmacology properties that create potential benefits in the healthcare sector.

Analysis of the mineral elements showed that Ca has the highest concentration in almost all the selected species followed by Na, K, Fe, Mg, Mn, Zn, Cu, and a lower concentration of Cr, Pb, and Cd. Due to the extremely low quantities of toxic heavy metals like Cr, Pb, and Cd it is profusely noticeable that these plants are free of hazardous contaminants. The plants can also be important mineral-consuming plants since they contain a good quantity of concentration of essential macro and trace elements.

The present study summarizes that the different species of the genus *Glochidion* play a key role for both taxonomy and medicine. Therefore, the current research will help in the stabilization of the taxa and the taxonomic status of the genus as well as their phytochemical knowledge. The present research will give more in-depth knowledge of morphological, micromorphological, anatomical, ethnobotanical, and phytochemical studies. Based on this research work, ecology, physiology, phylogenetics, palynotaxonomy, cytotaxonomy, and pharmacognostical investigations of the genus can be accomplished later.