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# ASSESSING ETHNOBOTANICAL VALUES AND THREAT STATUS OF WILD ASPARAGUS (STEMONA TUBEROSA LOUR.): A CASE STUDY IN EASTERN HIMALAYA, INDIA

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***Abstract***

*The paper presents taxonomy, habitat, distribution, threat status, conservation strategies and usage pattern of Stemona tuberosa Lour. (Family Stemonaceae), a lesser known liana species. A less known medicinal use of this species recorded from Indian Himalaya is reported. The methodology for use from roots and tubers are provided along with photographs of the plant.*

***Keywords:*** *Stemona tuberosa; Traditional use; Medicine; Threat; Conservation; Meghalaya; India.*

## Introduction

The family Stemonaceae is represented with 4 genera, viz. *Pentastemona* Steenis, *Stichoneuron* Hook.f., *Stemona* Lour. and *Croomia* Torrey, widely distributed in East Asia, Indo-Malaysia and North Australia, however, J.D. Hooker [1] reported only first 3 genera in 'Flora of British India'. The Genus *Stemona* Lour. is represented with 25 species [2] in the World, occurring from southern Asia and Malaysia to northern Australia [1-2], only 2 species are reported so far from India [3].

The *Stemona tuberosa* Lour., often called 'Wild Asparagus' (Fig. 1), was first described under genus *Roxburghia* Roxb. as *Roxburghia gloriosoides* Roxb. collected from Circars near Rajhmundry in Andhra Pradesh by William Roxburgh [4] in 1795. Carey, editor of Roxburgh's 'Flora Indica' included name *Roxburghia viridiflora* without authorship for the plant from Chittagong sent by Buchanan-Hamilton in 1798. There was also disagreement about the family name Stemonaceae. Roxburghiaceae was proposed as early in 1832 by Lindley. Several authors argued that because *Stemona* Lour. is an older name for *Roxburghia*, Stemonaceae would be the appropriate family name [5]. The systematic position of *Stemona* Lour. was for a while a riddle and over time it has been compared with quite a range of families usually monocotyledonous, such as Araceae, Dioscoreaceae, Liliaceae, Smilacaceae, Taccaceae and Pandanales [6], however, the same species is also compared with Asclepidiaceae [7].

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**Fig. 1.** Wild habit of *Stemona tuberosa* Lour.

## Methodology

Field tours undertaken and basic information on different tribes of Eastern Himalayas collected from the State Forests Departments, and from forest officials of the Northeast India. For the ethno-botanical record, discussions were held at different places in different states with the headman's of surrounding villages, medicine man, Priest, Kobiras and head of the family. During the meetings, information on ethnobotany of plants, their local names, plant parts used, and methodology were recorded. Many field trips in different seasons (2007-2011) were undertaken for collection of plant samples along with the photographs and GPS data. Herbarium sheets were prepared and the voucher specimens deposited in ASSAM herbarium, Shillong. The extensive ethnobotanical work have been done on various tribes such as *Khasi, War Jaintia, Adis, Karbi, Pnar, Mikir, Apatanis, Nyshis, Monpas, Hill Miris, Yobins* and *Khamptis Hill Miris, Yobins* and *Khamptis* of Northeast India [8-14]. Previous works on the use of traditional medicine in Eastern Himalayas showed widespread use of indigenous remedies by both rural and urban communities.

The paper deals with taxonomy, habitat, distribution, threat status, conservation strategies and usage pattern of *Stemona tuberosa* Lour. in the Eastern Himalayas.

### *Taxonomic treatment*

*Stemona tuberosa* (Fig. 2) Lour., Fl. Cochinch. 2: 404. 1790; Hook.f., Fl. Brit. India 6: 298. 1892; S. Karth. et al. in Fl. Ind. Enumerat.-Monocot. 287. 1989; H. J. Chowdhery & et al., Mat. Fl. Arunachal Pradesh 3: 193. 2009. *Roxburghia gloriosa* Pers., Syn. Pl. 412.1805. *Roxburghia stemona* Steud., Nom. Bot. ed. 2, 2: 475. 1841. *Roxburghia viridiflora* Sm., Exot. Bot. 1: 111.1805. Vern. '*Tamsam* (G)'

Lianas 3-6 m long, stems woody near base, branches terete; roots and tubers fleshy, cylindrical; tubers 15-27 × 2-3 cm, cream coloured. Leaves usually opposite, broadly ovate or ovate to lanceolate, 10-25 × 5-15 cm, acuminate at apex, cordate at base, membranous, shining, margin slightly undulate; lateral nerves 7-13; petioles 6-10 cm long. Inflorescence axillary, racemes 1-3 flowered, peduncle 3-8 cm long. Perianth subequal, lanceolate, 3.5-7.5 × 0.7-1 cm, greenish with several purplish veins; bracts small, lanceolate, 0.5-1 cm long, greenish with many purplish nerves.

**Fig. 2.** Collected tubers and roots of *Stemona tuberosa* Lour.

Stamens erect, inserted at base of perianth; filaments free, red, deeply grooved in front, crenulate at margins; anthers basifixed, adaxially appendaged; connective extended into a perianth-like appendage, linear-lanceolate, green. Capsules ovoid-oblong, 3.2-5.5 × 1.5-2.5 cm, compressed; seeds usually 5-8, appendages on or near funicle, arillate.

*Fl. & Fr.*: June- September.

*Ecology*: Grows in moist shady places along the forest margins in tropical as well as in subtropical forests between 300-1500 m msl; occasional in Meghalaya.

*Distribution*: India (north-eastern states, north Tamil Nadu and coastal Andhra Pradesh), Australia, Bangladesh, Cambodia, Laos, Malaysia, Myanmar, Philippines, Thailand and Vietnam.

*Specimens examined*: Meghalaya, Peak forests, 12.10.2009, *B Singh & Party* 118596 (ASSAM); Barapani Experimental Garden, *BK Sinha & B Singh* 114770A (ASSAM).

*Forest type in which the species occur*: Tropical to Subtropical forests.

*Habitat characteristics*: A common liana in the understorey region in the tropical to subtropical zone.

*Associated species:* It is found in association with other species like *Aristolochia tagala* Cham., *Calamus floribundus* Griff., *Alpinia malaccensis* (Burm.f.) Rosc., *Mikania micrantha* Kunth., *Vernonia volkameriifolia* DC., *Entada rheedei* Spreng., *Ficus hispida* L.f., *Balakata baccata* (Roxb.) Esser and *Actephila excelsa* (Dalzell) Muell.-Arg.

*Threat status:* Least Concern 'LC'.

*Known use*: Roots are antibacterial, used in curing for tuberculosis in lungs (i.e. pthisis), soothes in human respiratory tract and as antiseptic [15], and gynecological disorders [16]. In China and Japan, tubers are used in traditional Chinese and Japanese medicines for centuries to manage respiratory diseases e.g. bronchitis, pertussis and tuberculosis, and to prevent human cattle parasites, agriculture pests and domestic insects [17-18]. Tubers are also used in Bangladesh for mental disorder, worm, cough and jaundice [19]. Leaves are also used in night blindness.

*Less known use*: Thick roots and tubers are used as medicine for treatment of malaria fever and chronic cough and cold.

### *Duke's Phytochemical and Ethnobotanical Databases*

Dr. Duke's Phytochemical and Ethnobotanical Databases are the primary repositories for the ethnobotanical data of different plant species available in the world [20]. Similar, the Council of Scientific and Industrial Research (CSIR) of India have published 11 volumes of books in name of 'The Wealth of India (WOI)', which list the medicinal values of different plant species available in India. The ethnobotanical data of *Stemona tuberosa* recorded is provided below in Table 1.

**Table 1.** Ethnobotanical data of *Stemona tuberosa* recorded in the Duke's Databases

| Disease | Records |
|---|---|
| *Antiseptic* | WOI 10 |
| *Antitussive* | Keys |
| *Bactericide* | WOI 10 |
| *Cancer* | Hartwell |
| *Carminative* | Bliss, WOI 10 |
| *Cough* | Bliss, Burkill 1966, WOI 10 |
| *Insecticide* | Bliss, Burkill 1966, Uphof |
| *Parasiticide* | Hunan |
| *Pediculicide* | Hunan, Keys, WOI 10 |
| *Phthisis* | Burkill 1966, |
| *Poison* | Keys |
| *Rheumatism* | Altschul |
| *Vermifuge* | Bliss, Hunan, Takeda |

Besides these, there is no any other ethno-botanical information published so far on this plant.

*Known bioactive chemical compounds*: The phytochemical studies revealed that a total of 82 alkaloids have been isolated from the family Stemonaceae, of which 27 alkaloids are from *Stemona* species [21]. These alkaloids include stenine, stemoamide, tuberostemonine, stemoamine, parvistemoline, stemofoline and stemocurtisine groups according to their structural features.

***Methodology for preparation of traditional medicine***

The local tribal peoples of Eastern Himalaya in India, with special reference to garo tribal of Meghalaya, collect tubers and roots of this species from nearby forest areas. Wild tubers are bitter, and therefore, they are being well washed from running water. The washed tubers and big roots are slightly cut from both ends. It is then boiled in water along with some salts for about 15-20 minutes. The cooked tubers are then dried in sunlight for few days till moisture content gets evaporated. The dried tubers or roots are grinded to powder. The powdered tubers along with few pieces of fresh rhizome of zinger (*Zingiber officinale* Rosc.), wrapped in a small piece of betel leaf (*Piper betle* L.) and taken with water after the light food for two to three times in a day to cure malaria fever and chronic cough and cold i.e. asthma and also used to cure in tuberculosis.

***Threat Assessment***

IUCN 2010 Version 8.0 has been followed to evaluate the threat status of the species in Eastern Himalayas. Out of the five criteria data on two criteria could be collected and these data were used to evaluate the threat category of the species. The two criteria used are: A. Declining population (past, present and /or projected); B. Geographic range size, and fragmentation, decline or fluctuations. Considering the population status and the geographic range of the species (Table 2), it was classified as "Least Concern" (A1abcd; B2ab (ii, iv).

Table 2. Population data of *S. tuberosa* used for classification of threatened category under IUCN, version 8.0

| | | |
|---|---|---|
| **A. Population reduction** | A1. <30% decline per generation | a. Direct observation: Many occurrences<br>b. Average density per $m^2$: 2-3 individuals<br>c. Quality of habitat: disturbed, secondary forest<br>d. Exploitation: Extraction of tubers, making rope |
| **B. Geographic range** | B2. Area of occupancy (>2,000 $km^2$) | a. Known to exist at more than 10 locations<br>b. Continuing decline<br>(ii) Area of occupancy: > 2,000 $km^2$<br>(iv) Number of locations or subpopulations: ≥ 10 locations |

## Conservation strategies

Conserving and restoring habitats at a landscape scale is a vital part of nature conservation, especially to make biodiversity robust to environmental change. Biodiversity

losses pose a serious threat to environment degradation and development. Ecologically destructive activities are inefficient because of the resulting resource misallocation and also because of the limited availability of natural capital. In order to bring about sustainable resource conservation and management, it is essential to adopt several different approaches for managing our forests and biodiversity. Future efforts for conservation and management of our natural resources must derive from a set of clear objectives, mechanisms for action, and commitment from all stakeholders. Apart from this, halting the process of degradation and species loss requires specialized solutions and an understanding of ecological processes. Following conservation approaches help in conservation of *S.tuberosa* in natural habitat:

- Indian Himalaya regions are known for tribal indigenous people, who practices short cycles (4-6 years) of jhum cultivation. This system of cultivation causes loss of associated species as well as soil fertility. Therefore, to conserve the indigenous species and its natural habitat, the traditional jhum cultivation practices should be done, which cannot be stopped completely, but the jhum cycle should be increased to 10-12 years. This will help the soil to regain its lost fertility, and allow the indigenous species to grow and establish.
- Awareness programmes for the indigenous tribals, about the importance of *S. tuberosa,* need to be implemented, which would help a lot in the conservation of the biological resources in that area.
- Mining of coal and limestone is also very common in Eastern Himalaya. It could be done in proper scientific ways, so as to put less pressure on the forest areas where wild *S. tuberosa* is growing.
- The tribal committee and other panchayat committees should implement some common rules in collaboration with the forest departments and with non-governmental organizations, for the protection and amelioration of the *S. tuberosa* patches.
- The forest cover area can be spread by plantation of valuable indigenous plant species, especially in coal mining areas, degraded forests and wasteland areas.
- The available forest resources should be used in a sustainable manner, for the sake of indigenous tribal people and of the national economy. There should be proper utilization of wild NTFPs from the reserve area, especially of wild medicinal and other economically important plants.
- Initiative should be taken by the government by allotting demarcated forests areas to the villagers as village forest. This rule will motivate the tribal people to take special care for the protection and rehabilitation thereof and for sustainable resources.
- The forest department should help the tribal communities in preserving the ancient forest patches like sacred groves, so as to maintain the natural biological diversity of such forests.
- The wildlife authorities should pay special attention to the compensatory afforestation programme for the benefit of local tribes and should restore the lost forest areas to compensate the local affected people for their loss.

## Conclusions

We conclude that the disturbance factors, as observed in the Northeast India, are constantly reducing the wild population of *S. tuberosa* and if the necessary conservation strategies are not implemented immediately, those factors will wipe out the entire species from Northeast in the near future, which would be a great loss for the Eastern Himalayas [22]. Therefore there is an urgent need to protect this species to conserve Himalayan plant diversity, not only for ecosystem health but also for the benefit of the local tribes who depend on local plant diversity for their day-to-day requirements.

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## References


[1] J.D. Hooker, **Flora of British India** (Editors L. Reeve & Co.), Vol 6, 5 Henrietta Street, Covent Garden, London, 1892.

[2] H. Santapau, A.N. Henry, **A Dictionary of the Flowering Plants in India**, Publications and Information Directorate, CSIR, New Delhi, 1973.

[3] P.J. Bora, Y. Kumar, **Floristic Diversity of Assam**, Daya Publishing House, Delhi, 2003.

[4] W. Roxburgh , **Plants of the Coast of Coromandel**, Bulmer & Co., London, 1795.

[5] K. Krause, *Stemonaceae,* **Naturlichen Pflanzenfam** (Editors A. Engler and K. Prantl), W. Engelmaann, Leipzig, 1930, pp. 438-462.

[6] J.F. Veldkamp, *The Weal and Woe of Roxburghia (Stemonaceae),* **Flora Malesiana**, Vol 14, National Herbarium Nederland University Leiden Branch, Netherlands, 2007.

[7] J. Sims, *Roxburghia gloriosa*, **Green-flowered Roxburghia**, Sherwood, Neely & Jones, London, 1812.

[8] A.A. Ahmed, S.K. Borthakur, **Ethnobotanical Wisdom of Khasis (Hynniew Treps) of Meghalaya**, Bishen Singh Mahendra Pal Singh, Dehra Dun, India, 2005.

[9] U.P. Albuquerque, *Re-examining hypothesis concerning the use and knowledge of medicinal plants: a study in the Caatinga vegetation of NE Brazil*, **Jounal of Ethnobiology and Ethnomedicine**, **2**(30), 2006, pp. 1186-1746.

[10] A.A. Mao, T.M. Hynniewta, M. Sanjappa, *Plant wealth of Northeast India with reference to ethnobotany,* **Indian Journal of Traditional Knowledge**, **8**, 2009, pp. 96-103.

[11] G.J. Martin, **Ethnobotany: A Method Manual**, Chapman and Hall, London, 2005.

[12] B. Singh, R. Shanpru, *Ethnobotanically important plants in Sacred Forests of Meghalaya*, **Annals of Forestry**, **18**(2), 2010, pp. 270-282.

[13] B. Singh, S.J. Phukan, B.K. Sinha, V.N. Singh, S.K. Borthakur, *Conservation Strategies for Nepenthes khasiana in the Nokrek Biosphere Reserve of Garo Hills, Northeast, India*, **International Journal of Conservation Science**, **2**(1), 2011, pp. 55-64.

[14] B. Singh, S.K. Borthakur, *Wild Medicinal Plants used by Tribal Communities of Meghalaya*, **Journal of Economic and Taxonomy Botany**, **35**(2), 2011, pp. 331-339.

[15] V.S. Agarwal, **Economic plants of India**, Bishen Singh Mahendra Pal Singh, Dehradun, 2005.

[16] C. Pattanaik, C.S. Reddy, K.N. Reddy, *Ethno-medicinal Survey of Threatened Plants in Eastern Ghats, India*, **Our Nature, 7**, 2009, pp. 122-128.

[17] A. Cuzzupe, **Synthetic Studies towards the Stemona and Ergot Alkaloides**, University of Pittsburgh Wipf Research Group, Pttsburgh, 2005.

[18] Jiangsu New Medical College, **Dictionary of Chinese Traditional Medicine**, Shanghai People's Publishing House: People's Republic of China, 1977, pp 858-861.

[19] A. Biswas, M.A. Bari, M. Roy, S.K. Bhadra, *Inherited folk pharmaceutical knowledge of tribal people in the Chittagong Hill tracts, Bangladesh*, **Indian Journal of Traditional Knowledge, 9**(1), 2010, pp. 77-89.

[20] A.J. Duke, *Phytochemical and Ethnobotanical Databases*, (http://www.ars-grin.gov/duke (accessed 12/01/2012).

[21] J. Ren-Wang, P.M. Hon, Y. Zhou, Y.M. Chan, Y.T. Xu, H.X. Xu, G. Harald, P.C. Shaw, P. Hay, *Alkaloids and Chemical Diversity of Stemona tuberosa*, **Journal of Natural Product**, **69**, 2006, pp. 749-754.

[22] B. Singh, V.N. Singh, S.J. Phukan, B.K. Sinha, S.K. Borthakur, *Contribution to the Pteridophyte Flora of India: Nokrek Biosphere Reserve, Meghalaya*, **Journal of Threatened Taxa**, **3**(12), 2012, pp. 2277-2294.

[23] ***, http://intranet.iucn.org/webfiles/doc/ssc/Red list/Red list Guidelines.pdf accessed on 12/04/2012


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