



ISSN: 2319-5967

ISO 9001:2008 Certified

International Journal of Engineering Science and Innovative Technology (IJESIT)

Volume 3, Issue 4, July 2014

Understanding Significant Value of Rhododendron arboreum Smith Scarleti of Sikkim, India

Laydong Lepcha*, B.C. Basistha, Sushen Pradhan, K.B. Subba, Rajdeep Gurung, N.P. Sharma

Abstract: *Rhododendron arboreum* is one of the renowned *Rhododendron* plant species of Sikkim. It is vastly known for its scenario beauties and remained as attractive flower tree plant. *Rhododendron arboreum* is medicinally and economically a very important plant species. But, with the unceasing approaches of indecent factors and features the species is under threat in the state. In the study vital research was concluded by contributing an extensive field visit in natural habitat elevations of Sikkim. The morphological studies were conducted along with all the geographical and medicinal parameters. In order to authenticate the database local experts and scientific literatures were equally compared and analyzed. The main objective of the study was to analyzed the significant value of *Rhododendron arboreum* and promote the importance of this species in the state, which ultimately helps to build a perception of conservative parameter of this species in the state.

Index Terms: Antidiabetic, GIS map, Morphology, Rheumatism, Rhododendrons, Species.

I. INTRODUCTION

Rhododendrons are the Natural legacy of Sikkim. Growing mostly in sub-alpine and alpine regions they covers complete hillsides in a blaze of beauty. The route to Dzungri, west, the Singalila trail and the Yumthang valley in North Sikkim are covered with rhododendron shrubs and trees. There are 36 species of *Rhododendron species* found in Sikkim, among these, *Rhododendron arboreum* Smith Scarleti, is the pioneer species with significant values in its ingredients.

Rhododendron arboreum belongs to the family *Ericaceae* and are mainly inhabited in the Himalayas from Kashmir to Bhutan & in the hills of Assam & Manipur at altitudes of 1200-400 m [1]. This plant holds the Guinness Record for World Largest *Rhododendron* & is widely popular for its medicinal benefits & economic value [2]. In Sikkim the species are known with a local name *Eetok Koong* (Lepcha Primitive Tribe) and *Laligurans* (Nepali) and are mainly found in an altitude range between 1700-3400 meters. *Rhododendron arboreum* is one of the most impressive *Rhododendron species* in the Himalaya.

The bark of *Rhododendron arboreum* is found to be as richest source of single triterpenoid substance taraxerol ($C_{30}H_{50}O$) & ursolic acid acetate ($C_{32}H_{50}O_4$). The substance leuco-pelargonidin ($C_{15}H_{14}O_6$) can be produced from the acetone extract of the bark [3]. With the constant increases of mitigation crisis, caused by the various environmental ailing factors like climate change and anthropogenic activities the species *Rhododendron arboreum* are under vulnerable stage.[4]. Himalayan *Rhododendrons* are now in definite danger of elimination unless immediate resurrection measures are made [4][5]. This study on *Rhododendron arboreum* could be inspiring steps to observe the importance of the species and extends as viable example of species for treasuring natural resources of the state, as well as to raise conservation aspects for its natural habitats in the state. The main objective of the study is to conduct extensive field visit in an elevated mountains of Sikkim and acquire authentic morphological and anatomical database, geographical location of *Rhododendron arboreum* and understand the significant value by observing a comparative study from various documented database. The study will helps to develop a genuine documentation, inspiration and conservation perceptions for this valuable plant species of Sikkim.

II. MATERIALS & METHODOLOGY

Field study

To undergo and procure authentic database, major field surveys were conducted in various crucial locations of *Rhododendron species* in Sikkim, such as Barsey *Rhododendron* sanctuary in Western Himalaya, Lachung, Yumthang valley in Northern Himalaya and Changu-Kupup-Memechu valley in Eastern Himalaya.



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GIS Map

The geographical map of studied fields were prepared by using GIS software, Arc GIS software, version 10.0, from the State Remote Sensing Centre, Sikkim State Council of Science & Technology.

Species Image

The image of the *Rhododendron arboreum* were taken by using camera, 14.2 Megapixels Nikon Coolpix, 7Xwide.

Morphology & Anatomy

The morphological studies were conducted in the field by referring and comparing a research book on *Rhododrons of Sikkim*. The morphological and anatomical measurements were done by using scales.

Medicinal information

The medicinal background of the *Rhododendron arboreum* were collected from the *local natives* residing in the elevation region of Sikkim where the species are inhabiting. Various research articles were also cited to understand its significant values including medicines.

III. RESULTS & DISCUSSION

According to the above methodologies following results were gathered in the study:

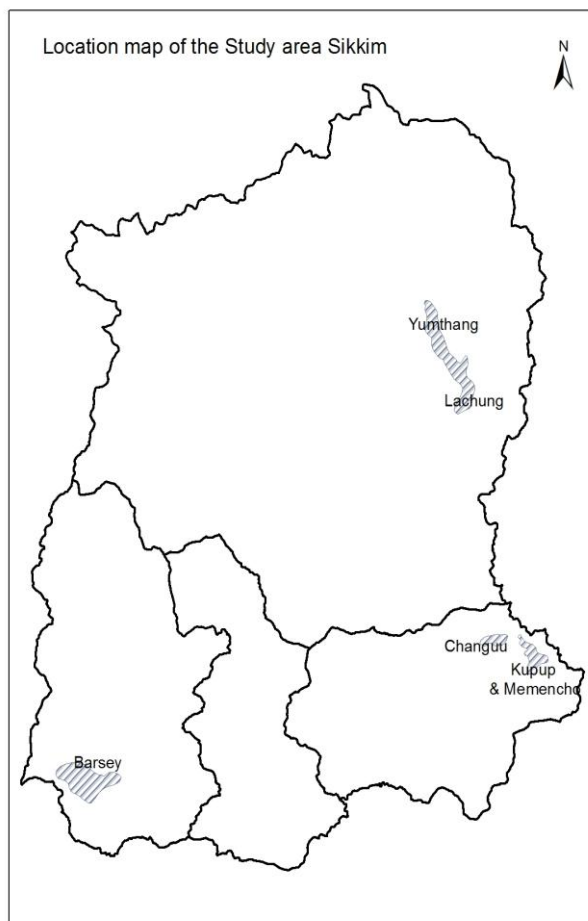


Fig.1 Location map of studied areas in Sikkim.



Fig. 2 *Rhododendron arboreum* recorded in Barsey, West Sikkim.

| Name | Synonym | Altitude | Locations in Sikkim | Morphology/Anatomy |
|---|--|----------------------|---|--|
| Rhododendron arboreum Smith Scarleti | Rhododendron arboreum Smith var. nilagirica (Zenk) Cl.; Rhododendron nilagiricum Zenk. | 1700-3400 meters. | Barsey Rhododendron sanctuary in Western Himalaya, Lachung, Yumthang valley in Northern Himalaya and Changu- Kupup-Memechu valley in Eastern Himalaya | Leaves: oblong-lanceolate. 10-20 cm long and 3.6 cm wide. Flowers: Color ranges from deep scarlet, to red. 20 blossoms, Anthers- ovate, Style-capitate. Fruit: Capsule is curved in form. Seeds: Dark brown. |

Table 1: *Rhododendron arboreum*

| Medicinal Uses | Other uses |
|---|--|
| Antidiabetic purpose [2]. | Flowers & leaves are fitted in long ropes made of munja grass & tied around the houses including temples as decorations [1]. |
| Dye of dried leaves of <i>Rhododendron arboreum</i> has been used in gout & rheumatism [6]. | The flowers being sweet & sour taste are used in the preparation of squash, jams, jellies and local brew [2]. |
| The dried flowers are supposedly highly efficacious in checking diarrhoea and blood dysentery [7]. | The leaves are used to get rid of bed lice. |
| The young leaves are used as medicinal and applied on the forehead to alleviate headache [8]. | The stem wood is used for making 'khukri' handles, packsaddles, gift-boxes, gunstocks and posts [10]. |
| The fresh and dried corolla that is acid-sweet in nature is given when fish bones get struck in the gullet [9]. | Flowers & leaves are fitted in long ropes made of munja grass & tied around the houses. [1] |

Table 2: Medicinal uses and other uses of *Rhododendron arboreum*

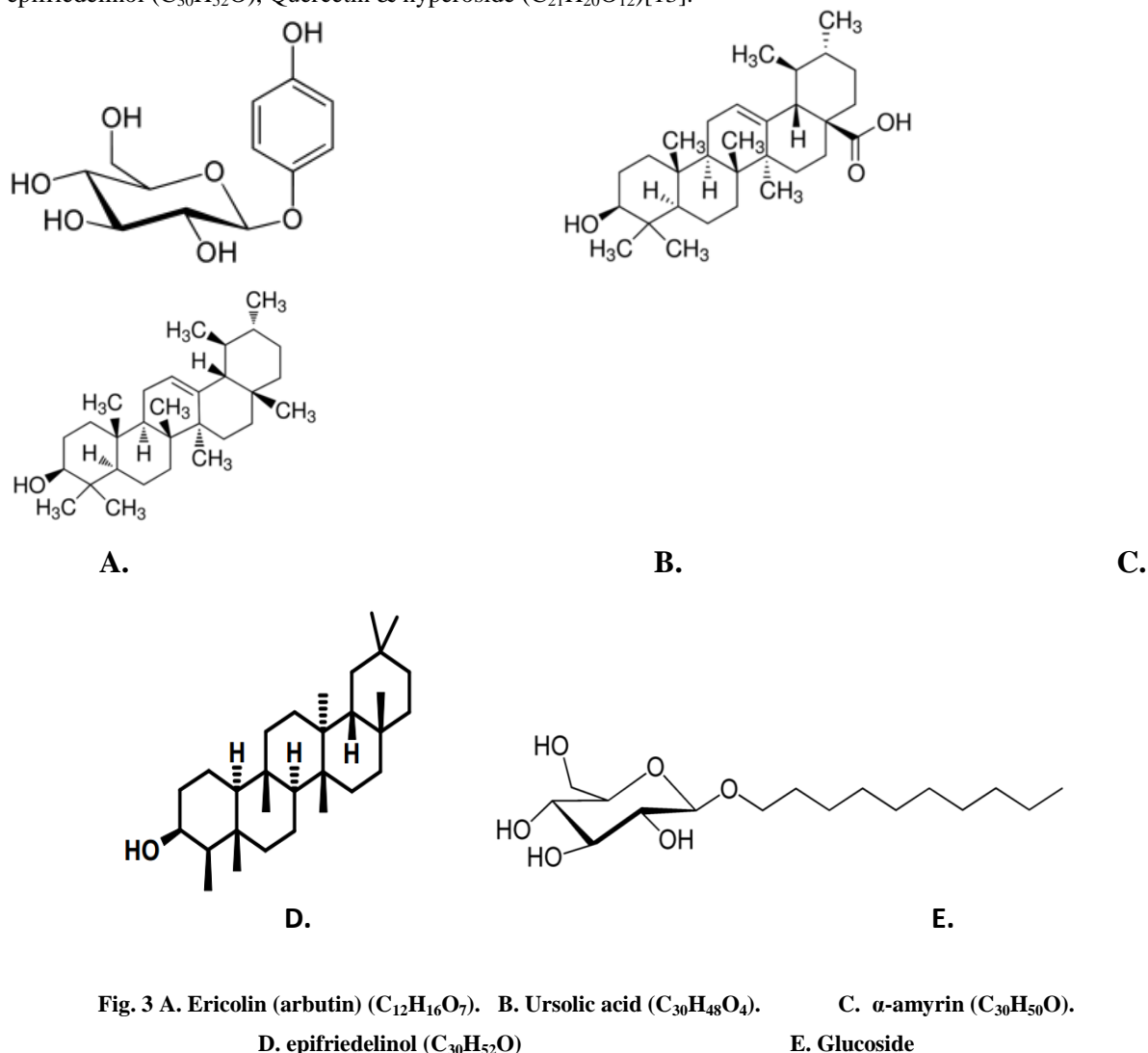
| Readings | Leaf stalk (in cm) | Leaf Breadth (in cm) | Leaf Length (in cm) |
|----------|--------------------|----------------------|---------------------|
| R1 | 2cm | 4.4 cm | 11.4 cm |
| R2 | 1.7cm | 3.2 cm | 10.1cm |
| R3 | 1.9cm | 3.9cm | 11.4cm |
| R4 | 2cm | 3.8cm | 11.3cm |
| R5 | 2.1cm | 4.8cm | 13.4cm |
| R6 | 2.2cm | 4.5cm | 12.5cm |
| R7 | 1.7cm | 3.7cm | 11.2cm |
| R8 | 1.8cm | 3.4cm | 10.9cm |
| R9 | 1.5cm | 3.8cm | 11.5cm |
| R10 | 2.2cm | 4.3cm | 11.5cm |

Table 3: Leaves measurements detail taken live from the field.

| Pedicle (in cm) | Flower breadth (in cm) | Stamen (in cm) | Length (in cm) | Stigma (in cm) |
|-----------------|------------------------|----------------|----------------|----------------|
| 1.7cm | 3 cm | 10cm | 4.5cm | 1cm |

Table 4. Measurement detail of single flower in an inflorescence.

Sikkim is considered to be the first model state in India in relevant to the 100% implementation of organic farming and its cultivations. With the constant increase of crisis in the management and implementation in organic farming system, an identification and adoption of appropriate assessment for the organic farming and its cultivation has become a major challenge for the state. In the natural treasury, the understanding and application of significant values of *Rhododendron arboreum* will be an appropriate step towards the management of organic farming and its cultivation in the state. In order to bring out a sustainable development of *Rhododendrons* (conservation and management), it is essential to adopt several different approaches for managing forests and Sikkim Himalaya biodiversity [11]. The international societies like American *Rhododendron* Society, *Rhododendron* Species Foundation, Australian *Rhododendron* Society, International *Rhododendron* Union, etc are working for the development of the species by introducing various approaches. The Government Sikkim has also implemented crucial approaches for the conservation of *Rhododendrons*. With a view to conserve natural habitat of *Rhododendron species* in the state, it has extended the protected areas as biosphere reserves, national parks and sanctuaries [12]. In order to exhibit importance of species the attainment of complete information of species is a primary task. The study observed *Rhododendron arboreum* is upto 14 m in height & 2.4 m in girth. The Phyllotaxy of is Alternate (below) whorled with filaments (up). Corolla (15) was fused campanulate form. The leaves detail is shown in table 3. The green leaves of *Rhododendron arboreum* are reported to be an ingredients of glucoside, ericolin (arbutin) ($C_{12}H_{16}O_7$), ursolic acid ($C_{30}H_{48}O_4$), α -amyrin ($C_{30}H_{50}O$), epifriedelinol ($C_{30}H_{52}O$), Quercetin & hyperoside ($C_{21}H_{20}O_{12}$)[13].



The *Arbutin* ($C_{12}H_{16}O_7$) is used as a skin-lightening agent, which helps to prevent excess formation of Melanin in body. Ursolic acid ($C_{30}H_{48}O_4$) has a variety of biological roles, including anti-inflammatory, anti-oxidative,



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ISO 9001:2008 Certified

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anti-mutagenic, anti-carcinogenic, anti-microbial, anti-atherosclerotic, and anti-hyperlipidemic effects [14] [15]. α -amyrin ($C_{30}H_{50}O$) is used to exhibit various pharmacological activities in vitro and in vivo conditions against various health-related conditions, including conditions such as inflammation, microbial, fungal, and viral infections and cancer cells [16]. It is also proposed as possible biomarkers for the fungal resistance of grapevine leaves (*Vitis vinifera*) [17]

Among the *Rhododendron species* of Sikkim *Rhododendron arboreum* has occupied a special place, which is richly laden with potential explorations of medicines and ecological values. The organic farming and its cultivation in Sikkim could have a genuine symbiosis with sustainable growth and development of *Rhododendron arboreum* in the state.

IV. CONCLUSION

In Sikkim there is existence of 36 *Rhododendron species* within these, *Rhododendron arboreum* is the only species which shows a significant value including medicinal uses. The species is under vulnerable status thus need a careful management for its sustaining in the Himalaya. Acknowledging to its rich and feasible ingredient nature, the *Rhododendron arboreum* could be taken as a good alternative of organic natural resources in Sikkim.

ACKNOWLEDGEMENT

The study acknowledge Bioinformatics Sub-DISC, Sikkim State Council of Science & Technology, Department of Science & Technology and Climate Change, for providing utmost support to this research endeavor. The study also highly acknowledges Department of Biotechnology, Government of India, for providing all the necessary support while doing this research. It also acknowledges, GIS and Remote Sensing Centre, Sikkim State Council of Science & Technology for helping to draw geographical map by using GIS software.

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AUTHOR BIOGRAPHY

Laydong Lepcha is one of the well known biological researchers in Sikkim. He has been working as Information Officer, in Bioinformatics Centre from past 10 years. He has already published various research articles in international and national journals. He is also acting as a reviewer of various journals.

B.C. Basistha is a well know scientific fraternity in the state. He is working as Additional Director in Sikkim State Council of Science & Technology. He has various research publications in journals.

Sushen Pradhan is working as Research Associate in Biotech Hub, Sikkim State Council of Science & Technology. He has published numerous research papers in journals.

K.B. Subba is one of the experienced personals in the field of Tissue Culture in Sikkim. He is working as a Assistant Scientific Officer in Sikkim State Council of Science & Technology. He has published various research papers in journals in relevant of Tissue Culture.

Rajdeep Gurung is working as a Scientist-B, under Patent Information Centre, Sikkim State Council of Science & Technology. He has published various research papers in journals.

N.P. Sharma is working as a Assistant Scientific Officer in Sikkim State Remote Sensing Centre, Sikkim State Council of Science & Technology. He is an expert personal in the field of GIS & Remote Sensing. He has published numbers of journal research papers.