

SOME NEGLECTED AND UNDER UTILIZED CROP SPECIES (NUCS) FROM THE HILLS OF SIKKIM, ALONG THE SILK ROUTE

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Abstract

There is a wide range of neglected and underutilised crops, which were historically popular and used by communities; however, over the years, they have lost their status within farming systems and been relegated to the status of neglected and underutilised. The world today relies on a small number of crop species for food, mainly major cereals, leaving an abundance of genetic resources and potentially beneficial traits neglected. These crops were used as traditional foods for centuries but became increasingly neglected when more productive crops became available in farming systems. Many neglected and underutilized crop species (NUCS) are nutritionally rich. But most of these underutilized plants are often available only in the local markets and are practically unknown to other parts of the world. Researchers who have worked with underutilised plants are of the opinion that they play a vital role as food and medicine. They are the genetic resource of any country and have an impact on the nutrition of the population. Survey and documentation plays a vital role to identify the neglected and underutilized crop species (NUCS) plants which may have therapeutic value too. In this students' research project survey and documentation was done during an excursion to Sikkim along major locations of the Sikkim Silk route. 12 (twelve) plants were identified as belonging to NUCS. The present status of two plant species has changed in terms of demand and availability.

Keywords: Documentation, survey, Sikkim Silk route, NUCS, economic importance & availability.

Introduction

Underutilized crops are lesser-known plant species in terms of marketing and research, but well adapted to marginal and stress conditions. Their indigenous potential and ethnobotanical data are well known to local people, whereas, commercial importance and market value is unknown to the public. Indigenous and underutilized crop species have been identified as

valuable for sustainable agricultural productivity [1]. Most of the underutilized plants are often available only in the local markets and are practically unknown to other parts of the world. Many neglected and underutilized crop species (NUCS) are nutritionally rich. Researchers who have worked with underutilised plants are of the opinion that they play a vital role as food and medicine. They are the genetic resource of any country and have an impact on the nutrition of the population. There is a wide range of neglected and underutilised crops, which were historically popular and used by communities; however, over the years, they have lost their status within farming systems and been relegated to the status of neglected and underutilised.

Neglected and Underutilized Crop Species (NUS) emerge as a highly promising solution to fulfil the increasing food and nutritional needs of the growing global population [2]. NUCS are also recognized by FAO as Future Smart Food (FSF) have untapped potential to fight hunger and malnutrition. NUS are known to have important traits to enable resilience in harsher environments such as drought tolerance, adapted to marginal agricultural land, and ability to thrive with low-cost input use [3, 4].

The Global Facilitation Unit (GFU) for Underutilized Species defined them as those crop species with a potential, not fully exploited, to contribute to food security and poverty alleviation and that tend to have the common features like a strong link to cultural heritage, poorly documented and researched, adapted to specific agro-ecological niches, weak or non-existent seed supply systems, traditional uses and produced with little or no external inputs. The underutilized foods can be defined as 'the foods which are less available, less utilized or rarely used or region specific' [5]. There are many underutilized food crops in India and majority are not well known or well documented [6]. According to Bermejo and co workers (1994), today only 150 plant species are cultivated, 12 of which provide approximately 75 percent of the world's food, and four of which produce over half of it [7]. It is often seen that these local plants are better suited for the local harsh climatic and edaphic conditions [2, 8, 9].

The world today relies on a small number of crop species for food, mainly major cereals, leaving an abundance of genetic resources and potentially beneficial traits neglected. These crops were used as traditional foods for centuries but became increasingly neglected when more productive crops became available in farming systems. Most of the underutilized plants are often available only in the local markets and are practically unknown to other parts of the world. There is a wide range of neglected and underutilised crops, which were historically popular and used by communities; however, over the years, they have lost their status within farming systems and been relegated to the status of neglected and underutilised. Many neglected and underutilized crop species (NUCS) are nutritionally rich. In this students' research project survey and documentation was done during an excursion to Sikkim along major locations of the Sikkim Silk route.

Study Site:

Sikkim is a tiny state of India (area 7096 km²) that falls in the eastern Himalaya. Sikkim, lies in geographical coordinates between 27° 00' 46" to 28° 07' 48" N latitudes and 88° 00' 58" to 88° 55' 25" E longitudes. The location of Sikkim state in India is shown in Figure 1. Nestled in the lap of the Himalayas, Sikkim is a small yet ecologically diverse state in northeastern India. Its breathtaking landscapes encompass snowy peaks, lush valleys, and alpine meadows, providing a haven for a wide variety of flora. Within an area of 7096 sq km, the state has 30.77% of forest as protected area comprising of seven wildlife sanctuaries and one national park which is highest in the country. Khangchendzonga National Park, the only National Park

in the state is also the UNESCO World Heritage Site declared in July 2016. Sikkim is divided into North, South, East and West Sikkim (Fig. 2).



Fig. 1. The state of Sikkim



Fig. 1a. The map of Sikkim

Study sites along the Sikkim Silk Route:

Sikkim Silk Route or the Old Silk Route is the route that connects India and China. This route was used during first century AD for trade purposes. During the excursion for the Semester III and V Botany Hons students of Gurudas College, Kolkata-54 some important halts along the Sikkim Silk route were chosen for our night stay and day study areas viz. Aritar, Rishikhola, Nimachen, Phadamchen and Zuluk Fig. 3 shows the important locations along the Sikkim Silk route. Nestled in the lap of the Himalayas, the Silk Route Circuit of Sikkim is a captivating journey that weaves through the pristine landscapes, ancient trade routes, and vibrant cultures. Offering a perfect blend of history, adventure, and natural beauty, this circuit takes travellers on a memorable odyssey through some of Sikkim's most breathtaking destinations.

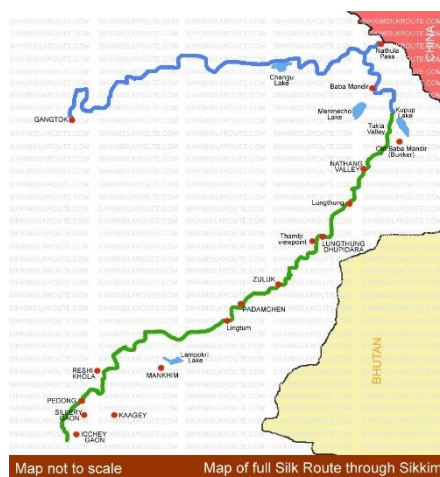


Fig. 2. The Silk route of Sikkim showing major study sites along the route viz Aritar, Rishikhola, Nimachen, Phademchen and Zuluk.

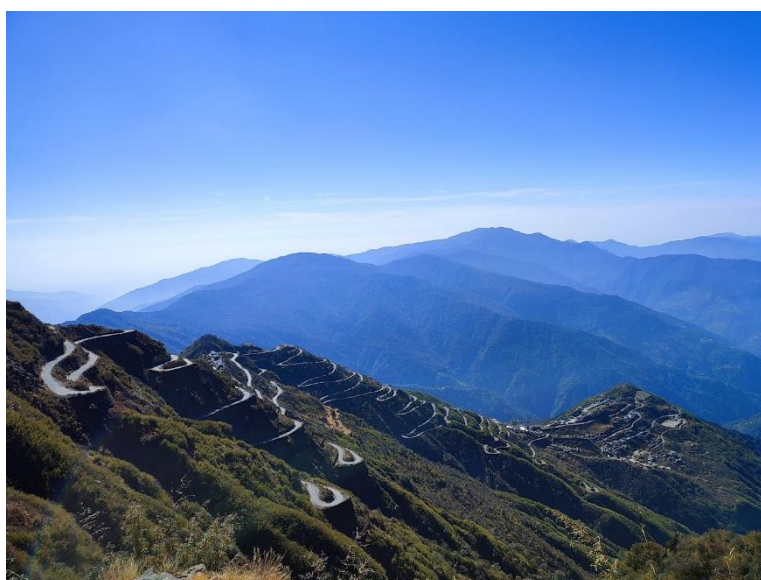


Fig. 2a. The panoramic zigzag winding roads of Silk route seen from Zuluk.

Materials and Methods: The students had to collect the local flora for making herbarium specimens as part of their curriculum of Botany Honours under Calcutta University. During the course of wild plant collection for herbarium preparation, documentation on the NUCS plants were done. Information about their common usage was gathered from the local people. Students of Botany Hons. of Gurudas College had gone for an excursion to Sikkim in November, 2022. Survey as well as discussion with local people revealed that some local plants were nutritional rich and had other uses. Geo-tagged photographs were taken of these plants. Some of the plants were found cultivated in the kitchen gardens of the local people and some grew wild along the slopes.

Result

During the few days of the excursion, it was not possible to conduct an extensive floristic survey. So, interaction with the local people made the team aware about the economic importance of certain plants. It was noted that most of these plants have an economic importance in the local hilly area but not so much in the plains. The photographs of the plants

along with a short note with their scientific names and use are mentioned as Fig. 3-13. Photos along the Silk route are shown as Fig. 14 & 15.

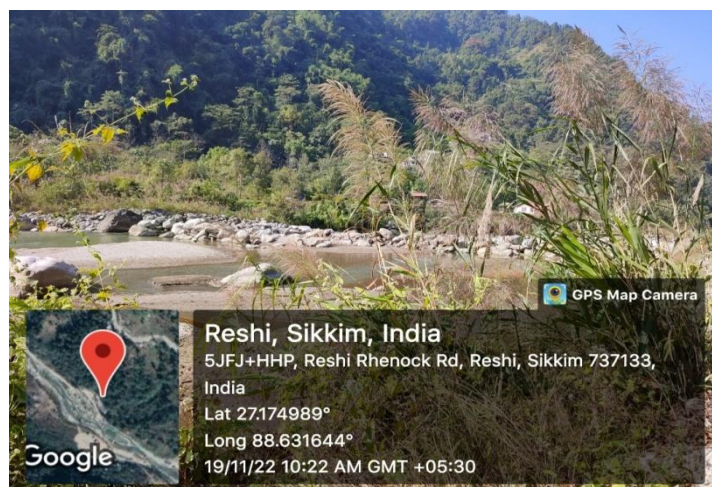


Fig. 3 *Thysanolaena maxima* (Roxb.) Kuntze Vernac. Amliso/ Kuccho gash, belonging to the family Poaceae. Found in Reshikhola near the Reshi river. Fresh roots decoction paste is used to treat boils and as a mouthwash. The inflorescence is used to make the local broom.

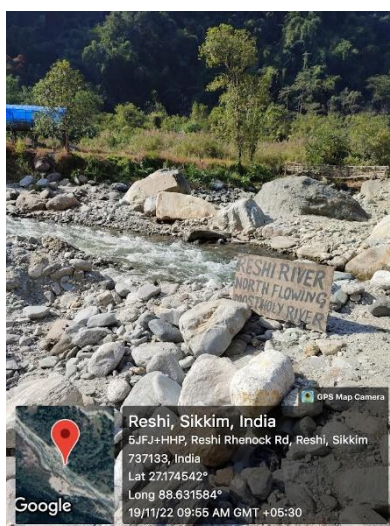


Fig. 4. The Reshi river at Reshikhola



Fig. 5 *Urtica dioica* L. Vernac. Sishnu. This plant belonging to the family Urticaceae is considered as an important medicinal plant [10]. Shoot infusion is used as an expectorant and blood purifier. A decoction of this plant with pulses is said to be highly nutritious. It is often

used for persons recuperating after long periods of ill health. This plant is common in the hills of Sikkim. The photograph was taken in Phadamchen.



Fig. 6 *Solanum betaceum* Cav. Vernacular Ruk Lambara or in English tamarillo. Fruit used to make pickles. This plant belongs to the Solanaceae family and the local taken on translation means tree tomato. The plant is a sturdy small tree. The fruit is nutritious and considered to be a good source of Vitamin C. This plant was found in the kitchen garden of local people. This photograph was taken in Phadamchen.



Fig. 6a The ripe fruit (berry) of *Solanum betaceum* Cav. Vernacular Ruk Lambara or in English tamarillo.



Fig. 7 *Equisetum diffusum* D. Don. Vernac. Kurkure Jhar. This pteridophyte is common in the higher altitudes of Sikkim. Boiled Concoction of roots and rhizome is taken on empty stomach for the treatment of Urinary tract infection (UTI). The photograph was taken at Nimachen.



Fig. 8 *Sechium edule* Swartz. Vernacular Isskush, English Squash. The fruit of this plant belonging to the family Cucurbitaceae is the most economically part. The pepo fruit is consumed locally as a nutritious vegetable. Some decades ago, the fruit was found only locally and plant grew along the slopes of the hills. In recent times the plant is cultivated and the fruit is sold in the markets of the plains. It is also available as a vegetable in the markets of Kolkata. Root, stem and leaf of *Sechium edule* Swartz. are also edible and also used by local people, but these are not found easily in the markets of the plains. This plant was a common sight in the hills of Sikkim. The photographs were taken at Aritar.



Fig.8a Fruit (pepo) of *Sechium edule* Swartz. Vernacular Isskush, English Squash. The photographs was taken at Phadamchen.



Fig.9 *Cyclandra pedate* (L.) Schrad. Vernacular Chuchey Karela or sweet gourd of the family Cucurbitaceae is used as a vegetable and is said to be easy on the stomach. The fruit is consumed as a vegetable. Like the squash, this plant was available mostly in the hills of Sikkim and West Bengal and was found in the local markets. But as connectivity of the hills with the plains became better and faster this vegetable is now common in the local markets of the plains. It is found in Kolkata too. Now it is a common plant grown not only in kitchen

gardens of the local people but also grown extensively and fruit sent for sale in the plains. The photograph is taken in Phadamchen.

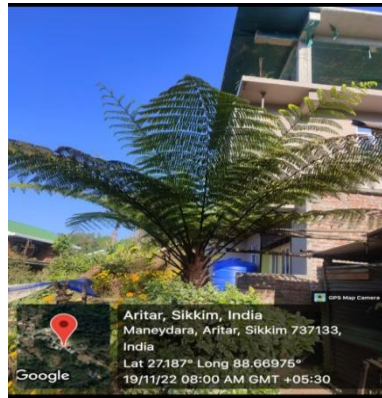


Fig. 10. *Cyathea spinulosa* Wall. Ex Hook., a pteridophyte has soft pith and roots are used in preparation of local drinks. Fronds are used as fodder and thatching. This plant is only found in the higher altitudes. It is commonly known as tree fern. This photograph is taken in Aritar.



Fig. 11. *Poncirus trifoliata*(L.) Raf., commonly known as hardy orange belonging to the family Rutaceae were found in some areas during the excursion. The hesperidium is consumed by the locals.

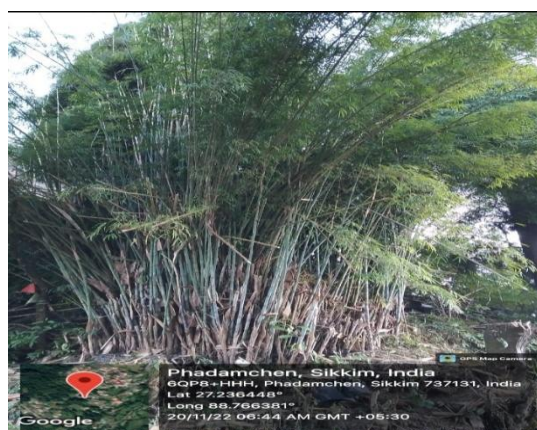


Fig. 12 *Bambusa pallida* Munro. This semi wild bamboo species found in Phadamchen. It is locally known as Deo Bans. The bamboo is used for making supports and house building mainly and also used for making traditional toys



Fig. 13. *Ficus auriculata* Lour. of the Moraceae family is quite common in the hills of Sikkim. It is known as Nebhara in the local language. The fruits are edible and the leaves are used as fodder.



Fig. 14. On the way to Zuluk from Phadamchen

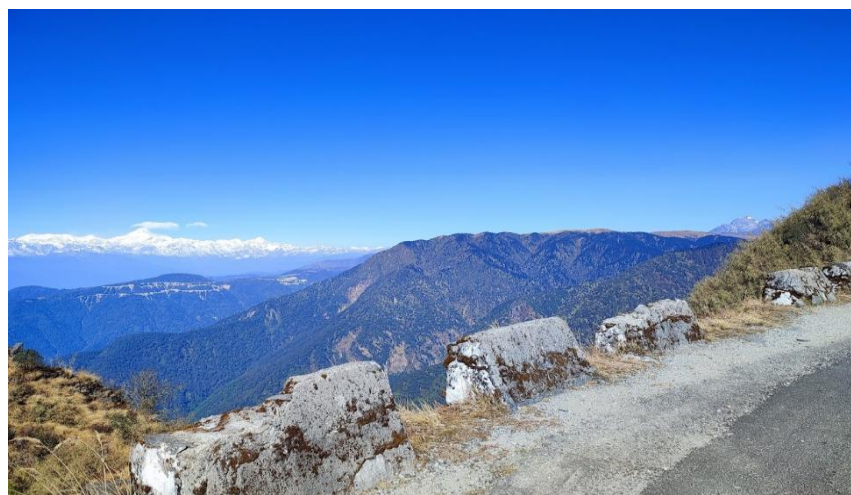


Fig. 15a The majestic Himalayas from Tambi view point at an altitude of 11,200 feet above sea level.

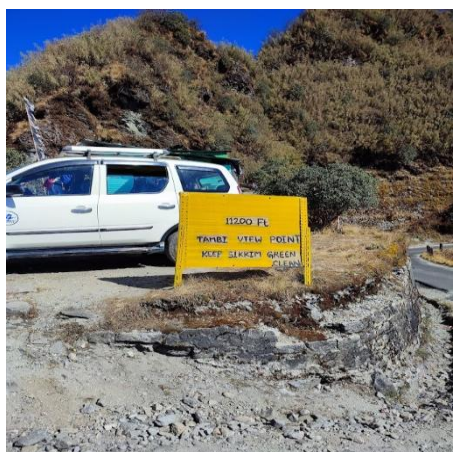


Fig. 15b The Tambi viewpoint

Discussion

The Sikkim Himalaya harbours as many as 190 wild plants suitable for human consumption [11]. Review of the literature available revealed that some of the species are rich in nutrients and have some proven medicinal values and the promotion of their use would help in combating malnutrition and improving the health status of the local populations. The six most prominently used fruit species viz. *Baccaurea sapida*, *Diploknema butyracea*, *Eriolobus indica*, *Spondias axillaris*, *Machilus edulis* and *Elaeagnus latifolia* [11]. Underutilized crops should constantly be promoted in order to increase food security. A number of international research groups have been formed to focus on the UUCs that have been enlisted: International centre for underutilized crops (ICUC), Global facilitation unit (GFU), Convention on biological diversity (CBD), Crops for the future (CFF). More research on diverse local NUCS may provide a more diversified agricultural system and food sources. Recent research has shown that some wild fruits of Sikkim show great potential for cultivation due to their high antioxidant content, good fat, medicinal biochemicals, and even higher fruit yield per tree compared to commercial plant varieties, making them horticulturally competent for cultivation [12].

During the survey and documentation during the excursion a few plants were identified that the local people used. Many of these plants are not readily available in the markets of Kolkata. Semi-domesticated wild edibles like tree tomato or 'rukrampeda' (*Cypomandrabatacea*), bee (*Solanum incanum*), sweat gourd or Chuchey Karela (*Cyclandra pedate* (L.) Schrad.). There are two notable exceptions where the vegetables grown exclusively in these hilly tracts over two decades ago are now found in the market places of the plains. The vegetables are Isskush (vernacular. Nepali) or Squash (vernacular Bengali), scientific name *Sechium edule* Swartz. Squash was not found readily in the markets of Kolkata about 20 (twenty) years ago. But of late it is common sight in the markets of Kolkata, though of course only the fruit of *Sechium edule* Swartz. is available in the markets of the plains of West Bengal. In the hilly tracts of Sikkim the roots and leaves of Isskush or *Sechium edule* Swartz. are considered a delicacy and is readily available in the local markets. Another vegetable, sweat gourd or Chuchey Karela (*Cyclandra pedate* (L.) Schrad.) once found predominately in the hills are known found in the vegetable markets of the plains.

The two plants *Cyclandra pedate* (L.) Schrad. and *Sechium edule* Swartz are classic examples how the status of underutilized plants can change with higher demand and better marketing. These two plants were even a few decades ago were found only in the hills. Now they are being cultivated and sent to the plains. Over years the people of the plains have also

developed an acquired taste for these two vegetables. This in turn has increased the demand for them. So these two plants that were often cited as underutilized plants are now considered as plants of high economic importance. They are cultivated extensively to cater to the high demand from the plains.

Conclusion Survey and documentation plays a vital role to identify the neglected and underutilized crop species (NUCS) plants. Discussion with the local people aids in the documentation process. The local use of these plants needs to be documented for posterity. Some of these plants may have therapeutic value too. The status as neglected plants often changes once these uses of these plants are passed on to others beyond the local communities. The places along the Sikkim Silk route are popular tourist destination these days. More and more people beyond the local community are getting acquainted with these local plants. It is now seen that some of the plants that were restricted only to the hilly parts of Sikkim are now found in the markets of the plains. As connectivity improves between the hills and the plains there is a greater chance of selling these once neglected crops in the markets of the plains. More research on exploiting the large reservoir of diverse local minor and underutilised crop plants may provide a more diversified agricultural system and food sources necessary to address food and nutrition security concerns in the face of climate change.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this work.

Acknowledgement

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Limitation of the study: As this study was part of a undergraduate students' research study undertaken during the five-day excursion to Sikkim it is not a comprehensive floristic account of that area

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