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A checklist of traditional and wild edible phyto-resources sold in the local markets of Kokrajhar, Assam

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Abstract

A study was conducted at six important markets of Kokrajhar, Assam in northeastern India, which are mostly run by local ethnic tribes and rich in wild phyto-resources of various ethno-botanical importances. The study was conducted during 2017-2018 to find out the important edible phyto-resources which are consumed daily by the local people of Kokrajhar. Regular surveys were conducted at the selected markets at least three times a month. A total of 90 species of traditional and wild edible plants belonging to 81 genera and 52 families have been recorded. The study provides information on their botanical name, family, vernacular name, frequency, habit, biological status, plant parts used, mode of use and also the rate of the plant resources observed. These wild phyto-resources are mainly collected from Charaikhola Wildlife Sanctuary and adjacent areas. Many wild phyto-resources are found to have immense potential as NTFP. Therefore, it is suggested that the high diversity of wild edible phyto-resources needs to be conserved for livelihood sustenance of the local communities and further studies are required for the management of wild forest resources to be exploited continuously by the local people.

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Introduction

Assam along with other states of North East India, is one of the most biodiverse region of India belonging to Biodiversity Hotspot regions of India (Myers *et al*., 2000; Mittermeier *et al*., 2004, Mazumder, 2014). The geographical setting, diversified topography and suitable climatic conditions have made Assam very rich in biodiversity. The primary vegetation type of Assam is tropical covering areas of evergreen, semi-evergreen, grasslands, deciduous forests, grasslands and riverside forests. Kokrajhar is one of the most important districts of Assam as it is the administrative head quarter of BTAD, Assam. Moreover, Kokrajhar is primarily inhabited by tribal peoples and the tribal peoples are known to possess vast traditional and ethnobotanical knowledge.

Kokrajhar is located on the north bank of the river Brahmaputra and shares the international boundary with Bhutan in the north and interstate boundary with West Bengal in the west. On the south it is surrounded by Dhubri district, Chirang and Bongaigaon district on the east. The district lies roughly between 89°46/ E to 90°38/ E longitudes and 26°19/ N to 26°54/ N altitudes. The total area of the district is 3,169.22 sq. km. and a total population of 8,86,999 according to the Census-2011(Narzary, 2013).

Bodo is the major tribal community of Assam mostly concentrated in the Kokrajhar and other three districts of BTAD, Assam. Along with Bodo community other tribes such as Rabha, Garo and Karbi also inhabit Kokrajhar district (Narzary *et al*., 2013). Bodos have depth knowledge about the utilization of wild edible plants. The Kokrajhar district harbours a humid sub-tropical climate which is the characteristic of the lower Brahmaputra Valley of Assam. There is high rainfall and humidity. Forest is one of the prominent features of Kokrajhar district. The estimated area covering reserved forests is 1,719 sq. km. which shows that 55% of the total geographical area of the district is under reserve forest (Narzary, 2013). The soil in the district is fertile and plants grow luxuriantly in natural conditions, due to which district is rich in forest resources and also suitable for crops.

The ethnic tribal people of Kokrajhar have close association with forest and possess good knowledge about forest resources. They subsist generally on the wild forest produce of and have retained their traditional customs and folklores. The wild plant resources are collected and consumed by Bodo people and other tribal communities of this region in their daily diet since the time immemorial. They also earn their livelihood by selling naturally growing wild plant resources in the local markets. One important feature of among the tribal peoples of Kokrajhar is that women play a very important role in the society both socially and economically. In the markets, the trade of wild phyto resources, wild edible animals, food items, handlooms, handicrafts, other household products etc. is controlled mainly by the women.

The study of plants sold in open-air markets play a vital role for ethnobotanical investigation in different parts of the world. (Luczaj *et al*., 2021). Usually, plants that are sold in such places are important to a given culture, e.g. commonly eaten fruits, vegetables or medicinal plants (Nanagulyan *et al*., 2020).

In traditional agrarian societies local market is the major means of goods sold and bought by villagers. Even with the establishment of regular shops, supermarkets etc. in modern societies, open-air markets continue to be the important centre of plant trade both for urban and rural inhabitants. Since, many of the plant resources sold in the markets come from the wild, hence these places are intrinsically linked with the issue of sustainable collection of plant material from wild habitats.

With this study an attempt has been made to enlist the important wild edible phyto resources consumed and sold by local peoples particularly Bodos in the local markets of Kokrajhar, Assam, India, with a view to preserve the traditional knowledge. The study may also help to identify the rare and endemic phyto-resources for their future conservation. Moreover, the traditional knowledge should be converted into scientific knowledge for the sustainable development of the society.

Materials and methods

Study area

The present study was conducted at three important markets of Kokrajhar town. The market places are Kokrajhar town bazaar, daily bazaar and bow bazaar. The market places are locally called as 'bazaar'. The local ethnic people play a significant role in the market as they sell forest produce such as vegetables, traditional medicinal plants, fuel woods and various other NTFPs (Non Timber Forest Products). The 'Kokrajhar town bazaar' is the main and largest. A part of the market is used by the local tribal people for their business. It is situated at the heart of the town where more than 150 women vendors use to sell phyto-resources and other household items.

The market areas where women sell their items are an open market and sell their goods as street vendors. It is held twice in a week on Thursday and Sunday. Bow bazaar is the second largest market and about 40-50 women vendors use to set their stall daily under permanent market shades. In 'Daily bazaar' only 20-25 women vendors run their business daily. This is also an open air market. The number of vendors is not fixed and fluctuates daily. The vendors who are regular, they occupy fix position in the markets. The main feature of all the three local markets is these are primarily run by women. However, sometimes male vendors are also present. The finest element about women vendors is they always keep items in a very systematic way and the items are always clean and fresh.

Survey Method

A market survey was conducted during 2017-18 to understand and record the wild phyto-resources sold in the local markets of Kokrajhar town by the indigenous tribal peoples. Regular visit to the markets was done and enlisted the phytoresources, their usage and parts used, local names and availability at different times of the year. The women vendors selling the wild phyto-resources were interviewed to gather information following the methods as used by Jain (1989) and Martin (1995). The informations were also verified taking assistance of some local informants. The bioresources were categorized roughly as common, frequent or rare according to their availability and encounter rates in the market places. The habit, plant type, biological status and market rates are also recorded for each plant species sold during the survey.

Regular surveys were done in the selected markets at least three times a month. Surveys were conducted at the peak marketing hours i.e. 7.00 to 12.00 hours and 15.00 to 18.00 hours. A total of 70 women were interviewed regarding the local name of the phyto-resources, their use, source, price and place from where they brought the items.

Identification of Plants

All the wild and traditional plants recorded in the markets were collected and identified with the help of Floras (Kanjilal *et al.,* 1934-1940; Barooah and Ahmed, 2014), relevant published papers and books such as Patiri and Borah (2007), Devi *et al.* (2010), Kar and Borthakur (2008), Medhi and Borthakur (2012), Medhi and Borthakur (2013), Medhi *et al.* (2014), etc. The nomenclature and the family delimitation for the recorded plants were updated using the International Plant Name Index (www.ipni.org), The Plant List (www.theplantlist.org) and Herbarium Catalogue, Kew (http://apps.kew.org /herbcat/navigator.do). Edible mushrooms were identified through published literatures and by using mycokeys available at www.mushroomexpert.com, http://www.mycobank.org and www.mycokey.com.

Result and discussion

The Market figures of phyto-resources sold

A large variety of phytoresources are sold in the markets of Kokrajhar by the local tribal people as a means of livelihood for the rural population. . The study highlighted the rich phyto diversity and the traditional knowledge of the use of wild plants as a source of vegetable, fruit, medicinal use and other means by the ethnic communities of Kokrajhar.

The survey recorded 90 species of traditional and wild edible plants belonging to 81 genera and 52 families. The list of plants along with their updated scientific

name, vernacular name, use pattern and part used, mode of use, season, availability in the market, habit, plant type, biological status and market rate are presented in Table 1, 2, 3, 4 and 5.

Out of the total species, 61(75.3%) are dicots, 19(23.5%) monocots, 1(1.2%) pteridophyte and 9 (11.1%) mushrooms. Among the 52 families, 35 belong to dicot families, 9 belong to monocot families, 8 belong to mushrooms and 1 belongs to pteridophyte (Table 6). Highest numbers of plant come under the family Asteraceae i.e. 6 (7.3%), followed by Araceae and Lamiaceae with 5 species each. Poaceae and cucurbitaceae contain 4 species each. 16 families hold 2 species each and 19 families possess single species member only.

The plants sold in the markets are categorized according to their usage, such as vegetables, fruits, medicine and other purposes. Several mushrooms are also recorded that are used as vegetables and kept separately under the category 'mushrooms'. Examination of the use pattern of all the recorded plants show that 52 numbers (51%) of higher plants including one pteridophyte are used as vegetable. 24 numbers (24%) of fruits are found to sell in the markets. 12 plants (12%) are sold for their medicinal values and are used in different traditional healing practices. 8 numbers (9%) of wild mushrooms are also sold as vegetables and 5 plants (5%) are sold for different purposes (Fig. 1).

Three plants of other category such as *Sida cordifolia, Hyparrhenia hirta* and *Thysanolaena* sp. are exploited as local broom. Remaining two i.e. *Curcuma aromatica* and *Clerodendrum infortunatum* are used in celebrating a traditional festival called 'Bwisagu'. It is also observed that many plants are utilized as both vegetable and medicine or some fruits also possess medicinal properties. *Acmella paniculata* is used as vegetable and medicine, *Averrhoa carambola* is used as fruit and medicine, *Calamus rotang* is used as fruit and vegetable, *Centella asiatica* is used as vegetable and medicine, *Dillenia indica* is used as vegetable and medicine, *Garcinia pedunculata* is used as fruit and medicine, *Garcinia xanthochymus* is used as fruit and medicine, *Hydrocotyle sibthorpioides* is used as vegetable and medicine, *Nymphaea rubra* is used as fruit and vegetable, *Terminalia bellirica* is used as fruit and medicine, *Terminalia chebula* is used as fruit and medicine.

Their growth habit includes tree, shrub, herb, climber, creeper and large grass. Herbaceous plants make up the highest proportion of edible plants with 39 species (48.1%), followed by trees with 19 species (23.2%) and shrubs with 11 species (13.6%).

Different plant parts such as young shoots, leaves, tubers, flowers and whole plants are sold in the markets and mostly found to be utilized as vegetables. However, tender shoots and leaves find priority as vegetable.

In terms of availability in the markets, most of the plats belong to rare category (48.1%), followed by frequent (39.5%) and common (12.3%) respectively. Large numbers of plants are seasonal, while only some are found to occur round the year. Moreover, majority of the seasonal plants occur during summer.

Considering the biological status, the recorded plant resources have been categorized as wild, semi wild, cultivar and weed. Documented data show that most plants fall under wild category (51.9%), subsequently comes semi wild (23.5%), then cultivar (21%) and lastly it is weed (3.7%).

Market price of the commodities is the most important criteria for a market which is related to the economic well-being of the vendors. Among all the plant resources available in the market, the mushrooms hold the highest market price compared to vegetables, fruits and medicinal plants. *Termitomyces eurhizus* and *Volvariella volvacea* are sold at highest price of Rs. 320/- per Kg. *Hodgsonia macrocarpa,* a medicinal fruit is sold at second highest price of Rs. 200/-.Although, the demand for wild vegetables are generally high; they are sold at comparatively low price.

Ethnobotanical and economic significance of the phyto-resources

Kokrajhar is very significant district of state Assam, India which is primarily inhabited by tribal communities such as Bodo, Rabha and Garo. Indeed Bodo is the largest tribe of entire North East part of India. Kokrajhar is also rich in forest covers harbouring wealthy flora and fauna. Like other tribal communities, Bodos are also forest dwellers and possess a rich traditional knowledge system in the line of ethnobotany, ethnomedicine, ethnomycology, ethnic food habit, etc. In the studied markets of Kokrajhar town also, the traditional and wild edible plants are mostly sold by Bodo people. The markets are open air markets. The most striking feature of the studied markets is - the vendors are primarily women. Thus, women control the economy of the families and possess extensive traditional knowledge which is the key asset for livelihood. The Bodo and other tribal people are generally poor. They try to collect their livelihood by selling wild phytoresources collected from various natural habitats. Our view point in this regard is that these small poor sections of people should be identified and provided a dedicated market area for them in the main vegetable markets of large towns and cities by the Government.

The traditional knowledge with reference to the diverse use of plant species as food, medicine, household use etc. is preserved generation after generation among different communities and they depend mainly on the forest resources for their subsistence (Sundriyal and Sundriyal, 2004; Patiri and Borah, 2007; Devi *et al*., 2010; Medhi and Borthakur, 2012; Baro, 2015; Konsam *et al*., 2016; Nanagulyan *et al*., 2020; Chaudhury *et al*., 2021). The traditional knowledge of the use of wild edible plants is valuable for the conservation of biodiversity, cultural heritage of one community and also plays an important role in community health care system which can be exploited for the development of new alternative drugs. Therefore, the identification, documentation and conservation of indigenous traditional knowledge about the wild plant resources are crucial to secure a viable future for ever increasing population.

The marketed wild phytoresources are collected from nearby reserve forest i.e., Chakrasila Wildlife Sanctuary which is just about 5 km away from Kokrajhar town. Resources are also collected from two beels situated within the sanctuary. Some grow in barren lands. Now a days, the demand for wild vegetables are also growing among all section of peoples. This is may be due to increasing health concerns caused as a result of consumption of fertilizer and pesticide infested vegetable. Therefore, the increasing demand leading to extensive collection, associated with brisk habitat loss may lead to loss of biodiversity and pose threat for survival o such plants. Therefore, policies for sustainable management of forest resources are currently required from Forest department of Government of India.

Without wild leafy vegetables, Boro meal is literally incomplete. A variety of green vegetables, roots and tubers, meat, fish, eggs, etc. are consumed in varying quantity in their meals. The most widely used leafy vegetables of Boro kitchen is *Hibiscus sabdariffa*. *Alocasia macrorrhizos* is one of the most common vegetable and consumed throughout the year. The whole plant parts such as young shoot, tender leaves and tubers are eaten as vegetable. Use of aromatic leaves such as *Blumea lanceolaria, Eryngium foetidum and Premna herbacea* are also very common among the Bodo people. The assessment reveals the roots, tubers and flowers are also common vegetable that find its place in diet.

In the study, 8 wild edible mushrooms are recorded which are quite popular and hold high demand in the market. The price of wild mushrooms is relatively high as compared to other plant resources sold in the markets. Termitomyces eurhizus and *Volvariella volvacea* are sold at highest price of Rs. 320/- per kg which are also famous for their flavor and delicacy. This trade of wild mushrooms indicates that the Bodo people are mycophilic and possess exclusive knowledge of identification and consumption of wild mushrooms. Many studies have shown that the tribal people of North East India consume wild edible mushrooms collected from forests (Basumatary and Gogoi, 2016; Ao *et al*., 2016; Kalita *et al*., 2016; Apshahana and Sharma, 2018; Wangdi, 2019).

Therefore, it can be a good opportunity to develop native technology to cultivate wild mushrooms and which will uplift the economic state of the local people. Another prospect for economic development of rural tribal people of Kokrajhar is to bring the broom grass (*Thysanolaena* sp.) under organized cultivation system which is presently grow wild in the locality. Therefore, due to their economic viability, these mushrooms and broom grass can be potentially exploited as Non Timber Forest Products (NTFPs). Moreover, out of these 90 species, many plant resources show high market potential and there is a chance of expansion of commercialization. The value addition of wild vegetables, fruits, medicinal plants, wild mushrooms and other phyto-resources can enhance the market demand of the resources and in turn the income profile of the rural peoples would increase.

Conclusion

From the study it has been revealed that although the three studied markets are situated in the main town of Kokrajhar district, yet quite rich in wild and traditional phyo-resources which are mostly used and sold by Bodo people. Another important feature of the study is that the sellers are mainly women which emphasize the contribution of women towards the development of the Bodo community.

The study makes an effort to elucidate upon the significant role that wild and traditional phyto-resources contribute to improve local economies and bring community development which may encourage for similar and more elaborate future studies involving different tribal communities of Assam that harbor vast traditional and ethnobotanical knowledge. The important issue related to collection and trade of forest based phyto-resources is unsustainable harvesting. Such inherent situations suggest for effective policies and conservation strategies to restore and strengthen traditional management practices with modern sustainable setting. Moreover, these measures would help to improve the livelihoods and food security of ethnic and other rural communities, at the same time empowering them to manage biodiversity and biological resources in the face of climate change. Looking at the demand and delicacy of the wild edible mushrooms sold in the markets, there is huge prospect of developing indigenous technology to bring wild mushrooms under cultivation which would improve both economy and health. This document may serve along with such other reports to instruct policy-makers to bring forth policies for the management of biological resources for economic development in this remote region.

Abbreviation

S= Summer

YR= Year round, Sp= Spring, W= Winter, F= Frequent, C= Common, R= Rare, NTFP= Non-timber forest products

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