Original Article

Documentation of Edible Flowers of Western Assam

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ABSTRACT

Background: Western Assam are located at the extreme western part of Assam it extends from $89^0 49' 20''$ E to $91^0 48' 16''$ longitude and $25^0 27'$ N to $26^0 54''$ latitude covering the lower Brahmaputra valley. Western Assam is very unique in its bio resources and is inhibited by different Tribes and Communities. The people of this region use various plant items including leaves and tender shoot, flowers of some species which are often seen to be consumed in different forms like fried, curry form or even eaten raw. Besides using edible items these flowers are also used sometimes as a medicine for curing various diseases. Some of these flowers are also seen to be sold in local markets of various parts of Western Assam including Guwahati city for their high demand. Most of these flowers also eaten all over North East India by different tribes.

Objectives: The objective of the present study is to document the plant species used by various communities of Western Assam as an edible flower. This work is very significant because documenting the indigenous knowledge through ethno-botanical studies are necessary for conservation of biological resources as well as their sustainable utilization.

Method: In the study data was collected by field visit in various remote villages and by visiting the local markets of Western Assam. The present research work was conducted during the year on January 2012- June 2014. The present study provides information on their scientific name, family, vernacular name, habit, biological status, time of flowering, mode of preparation, medicinal properties and as well as market value.

Result and conclusion: A total of 35 species of 31 genera belonging to 23 families of edible flowers have been recorded from the study area. There is enormous potential for the use of such edible flowers which bear specific medicinal properties for which there is tremendous demand even in global level.

Keywords: Western Assam, Edible flowers, Tribes, Potentiality.

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INTRODUCTION

Western Assam is rich in floristic composition and diverged in its vegetation types. The land and the climatic conditions of the state are suitable for propagation, growth as well as survival of numerous plant species in the region[9]. Being a part of the state of Assam the Assam Western region is also suitable for the growth and survival of various species. Due to its unique geographic location Western Assam is rich in floristic diversity and one of the largest reservoirs of wild edible plants. Wild food plants are important in many indigenous communities around the world[14,16]. A large number of wild plants are used by various tribes of this region from time immemorial.

The objective of the present study is to document the plant species used by various communities of Western Assam as an edible flower. In this paper an attempt has been made to document all the aspects regarding their scientific name, family, local name, habit, biological status, time of flowering, mode of preparation, medicinal properties and as well as market value. This work is very significant because documenting the indigenous knowledge through ethno-botanical studies are necessary for conservation of biological resources as well as their sustainable utilization.

Western Assam is the diversified region of several tribes and communities where these communities live in unity. Their daily life is most commonly influenced by the forests as well as agricultural activities where they are closely linked with the nature. Traditional health care practices are very common among the different tribes and communities of this region for human welfare. Assam is known for its rich flora and diverse forests and vegetation due to its unique topography, climate and altitude patterns[9]. Several wild edible plants and their various parts are eaten by the tribes of the study area. The tribal people of this region commonly use some of the wild flowers in their regular dish. They consume these edible flowers after boiling or frying, preparing curry or as raw. Various flowers, of course, are consumed following various processes which vary according to the floral species as well as the tribes and communities who use the items. Some of the flowers like flowers of Papaya (*Carica papaya*), Gumhar (*Gmelina arboria*), Ram basak (*Phlogacanthus thyrsiformis*) Pulutus (*Dendrocnide sinuate*) Malabar nut (*Justicia adhatoda*), Midnight horror (*Oroxylum indicum*), Night jasmine (*Nyctanthus arbortristis*) is eaten as curry with rice flour. Sometimes flowers are cooked applying the traditional alkali (locally known as kol Khar, kola Khar or simply Khar) which is prepared by burning the rhizome of banana and collecting his liquid extract after soaking the ash in water. Most of the cases of course the floral recipe are prepared along with small fish or with dry fish. This is a traditional dish which is very popular not only in the study area, but more or less in the whole parts of the state of Assam. Floral items used in such preparation are the species of Papaya (*Carica papaya*) Wild nongmangkha (*Phlogacanthus Curviflorus*), Kanakachu (*Lasia spinosa*) Arum (*Alocasia acuminate*are).

Pumpkin (*Cucurbita moschata*), Crape jasmine (*Tabernaemontana divaricata*), Indian shot (*Canna indica*), flower of the Camels foot tree (*Bauhinia* spp.), Agathi (*Sesbania grandiflora*) are eaten as Pokora (locally called bor). Flowers of Oval-leafed pond weed (*Monochoria hastate*) and Drum stick (*Moringa oleifera*) is eaten after frying with egg. Apart from traditional medicinal and nutritional uses there are several reports on the biological and physiological activities of *Moringa oleifera*. These include

hypoglycemic and hypocholesterolemic effects[3,6,11] anti-inflammatory and anti-helmic, analgesic, dyspepsia and in the management of heart diseases, and ulcers[12]. Drum stick plant resembles a leguminous species when flowering[1]. Flower of Water lily (*Nymphaea* spp.) is commonly used after frying, which are believed to be effective against anaemia. Based on our observation during the survey these items are frequently prescribed to the girl child or to the women suffering from anaemia.

It is very significant that the flowers are not only eaten for their delicacy, but also sometime they bear some specific medicinal properties. Most of the edible flowers are bitter in taste (eg. Flower of night jasmine, *Phlogacanthus* spp. etc.) And these are commonly prescribed to prevent stomach problems like indigestion, loss of appetite, jaundice, liver disorder, cold and cough, diabetes, sore throat etc[8].

Floral spadix of *Musa* spp. are very rich in iron content so, this enhances to increase haemoglobin of blood as well as it helps to dry up cut portion or burnt portion of patients. A typical spicy, delicious recipe of *Musa spadix* along with the meat of pigeon is a very common preparation among different tribes and communities of Assam. This recipe is very effective against low pressure, fever, cold and cough[8]. Banana hearts are used in South Asian and Southeast Asian cuisine, either raw or steamed with dips or cooked in soups and curries[5]. Flower of *Cassia siamea* of the family Caesalpiniaceae also used as a vegetable in the study area. Not only this species, but the use of various species of *Cassia* in different countries in different manner would create attention about the plant for their pharmacological, traditional and medicinal values[15]. Flower of Midnight horror (*Oroxylum indicum*) is most commonly eaten by almost all tribes of Western Assam because of its active property to control malaria, jaundice, as well as it bears the property to control the most dangerous cancer. Flower of Drum stick (*Moringa oleifera*), Pumpkin (*Cucurbita moschata*), Arrow leaved Oval-leafed pond weed (*Monochoria hastata*) are energy giving items. Flowers of common Arum (*Alocasia acuminate*) and Kanakachu (*Lasia spinosa*) are the source of calcium. So these are effective for bone development and prescribed to women particularly during pregnancy.

The western Assam, part is located at the extreme western part of Assam it extends from $89^0 49' 20''$ E to $91^0 48' 16''$ longitude and $25^0 27'$ N to $26^0 54''$ latitude covering lower Brahmaputra valley[10]. The different ethnic groups of western Assam are Bodo, Rabha, Garo, Hajong, Modahi, Sarania Kochari, Koch rajbongshi etc, which are of Indo Mongoloid stock of race. Other inhabitants of the region are Kalita, Brahmin, Kayastha, Bengali, Santali etc. Agriculture is the main livelihood of the local people.

MATERIALS AND METHOD

In the study primary data were collected by using a typical questionnaire in various localities of Western Assam. In the field for the collection of data household survey as well as market survey was done extensively by a frequent visit in different seasons of the year.

Household survey

A survey has been done to document the edible flowers. Household survey was conducted in different villages of the study area in order to assess local depending on selected wild edible flowers during the period of January 2012- June 2014. The survey inquired about the local names of the plants, mode of preparation and all other aspects incorporated with the objectives of our study. Ethno-botanical

studies were carried out using standard methods[13]. Herbariums was prepared from the specimens collected by following the standard herbarium method[7]. Then they were identified following some literature and were confirmed by comparing them with the herbarium of BSI (Shillong) and Central National Herbarium (Kolkata). The specimens were submitted to the herbarium of department of Botany– Goalpara College (Assam).

Market survey

Market survey was also conducted in all the districts of Western Assam, including Baksa, Nalbari, Goalpara, Barpeta, Kokrajhar, Bongaigaon, Chirang and western part of Kamrup district. Surveys were conducted in different times of the year 2012-2014 in the weekly markets of the greater study area. This was done to identify wild flowers which are seasonally available in the markets. Data collected about plants included Vernacular name, mode of preparation and market rate of the edible flowers is recorded and verified carefully from vegetable vendors of market by the assistance of local knowledgeable informants. From the study it was observed that the market rates were varying from market to market, as far as various districts are concerned. Photographs were also taken for some specimens. Ultimately, data were analyzed from information collected from different fields.

RESULT AND DISCUSSION

In the present study flowers of 35 species of 31 genera belonging to 23 families are found to be used as edible items. It was observed that the flowers of the family Caesalpinaceae are having the highest number of edible flower species that is four species. This family is followed by Acanthaceae which is having three species, and then it is followed by Pontedariaceae, Nymphaeaceae, Araceae, Urticaceae, Zingiberaceae, Cucurbitaceae with two species each. All other 14 families are having one species, each of which flowers are edible. These families are Caricaceae, Anacardiaceae, Verbenaceae, Pipilionaceae, Moringaceae, Bignoniaceae, Oliaceae, Bombacaceae, Dilleniaceae, Agavaceae, Memecylaceae, Cannaceae, Malvaceae and Apocynaceae. Most of these floral species are bearing tremendous medicinal properties. Besides being rich sources of nutrients, vitamins, minerals these edible flowers can substitute vegetables, particularly at the time of scarcity. The daily consumption of wild products contributes to overall nutritional well being of tribes[2]. These flowers are consumed cooked or fried and these preparations also help to compensate the day to day calorie requirements.

In the table-1 there is the enumeration of recorded species which includes botanical name, family, vernacular name, habit, biological status, time of flowering and useful part of the flower. The table-2 is incorporated with all other information regarding market rates, mode of preparation and medicinal properties.

It is observed that most of the flowers are eaten fresh just after collecting from the fields. Of course in some cases dried flowers are also used. In these cases the flowers can be consumed in off season also. Mention may be made of flowers of the species of *Gmelina arboria*, *Phlogacanthus thyrsiformis*, *Phlogacanthus curviflorus*, *Justicia adhatoda* and *Nyctanthus arbortristis*. These flowers can be eaten both freshers as well as in sun dried form. It is observed that as traditional practice the collected, dried flowers are preserved in a bamboo container for further use. This practice is having scientific reason that is to prevent fungal infection of the preserved flowers. (See table 1.)

CONCLUSION

It was found that the wild edible flowers have a high demand in the local markets of Western Assam. The fact is that the floral species which were available in and around the surrounding places now are in scarcity. On the other hand a section of people are now a day's much conscious about the medicinal properties of such items. For all these reasons a few years ago, which flowers were not sold in the markets now are seen to be sold in the local markets. Although these flowers were eaten by the ethnic tribes mainly, but now a day's these are often seen to be consumed by all other communities. This is a positive step towards the food security and also management of plant resources by the ethnic tribes of Western Assam. It is also noteworthy that of late, there is high demand for different ethnic foods, particularly in the restaurants of urban areas of Assam.

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Table 1. Edible flowers used by the indigenous communities of Assam

S. No.	Botanical name/Family	Vernacular name	Habit	Biological status	Time of flowering	Useful part	Flower colour
1	*Carica papaya* L./Caricaceae	Amita (Ass) Nuful, Moitfol (Koss) Mudumful (Bodo)	Small tree	Cultivated	Round the year	Whole part of flower with inflorescence	White
2	*Spondias pinnata* (L.f.) Kurz (Willd)/ Anacardiaceae	Omora (Ass)	Tree	Cultivated /wild	March - April	Whole part of flower with inflorescence	Greenish white
3	*Musa* sp./Musaceae	Kalful (Ass) Thalir (Bodo), Raphong par (Rabha)	Herb	Cultivated	Whole year	Gynoecium and periant	Flowers creamish covered with dark purple spathe
4	*Gmelina arboria* Roxb./Verbenaceae	Gomari (Ass), Gamrae (Rabha)	Tree	Wild/cultivated	Feb- April	Petal, androecium and Gynoecium	Golden yellow
5	*Phlogacanthus thyrsiformis* (Hardow.)Mabb./Acanthaceae	Bahoka tita (Ass) Basinkha biber goja (Bodo)	Shrub	Wild/ cultivated	Decem-Feb	Petal	Radish
6	*Phlogacanthus curviflorus* Nees/Acanthaceae	Titaful (Ass)	Shrub	Wild	Oct-Nov	Petal	Brick red
7	*Monochoria hastate* (L.) Solms./Pontederiaceae	Jonakiful (Ass)	Aquatic herb	Wild	More or less round the year	Whole part of flower with inflorescence	Purplish blue
8	*Sesbania grandiflora* (L.) Poir/Papilionaceae	Bokful (Ass), Bok par (Rabha)	Shrub	Cultivated/wild	Feb-May	Sepal, petal, Stamen and carpel	Pure white
9	*Moringa oleifera* Lamk./Moringaceae	Sogina (Ass), Togina (Bodo), Sojona (Rabha)	Tree	Cultivated	Feb-March	Sepal, petal, Stamen and carpel	White
10	*Lasia spinosa* L. /Araceae	Sangmora (Ass), Sibru (Bodo)	Harb	Wild	May-July	Spathe	Blackish purple

11	*Alocasia acuminata* Schott. / Araceae	Kosu (Ass) Thasu (Bodo), Rang par (Rabha)	Herb	Wild	May -Sep	Spathe	Yellow
12	*Dendrocnide sinuata* (Bl) Chew./ Urticaceae	Sorat (Ass) Kuma (Bodo)	Shrub	Wild	Aug-Oct	Flower with inflorescence	Light green
13	*Justicia adhatoda* L./Acanthaceae	Boga bahok (ASS), Basikho Jola (Bodo)	Shrub	Cultivated/wild	Dec-April	Petal	Whit
14	*Oroxylum indicum* (L.)Vent./Bignoniaceae	Dingdinga,dingori (Ass), Tokma (Koos), Sibi sereb (Bodo)	Tree	Wild	June-Aug	Petal	Creamish yellow
15	*Nymphaea nouchali* Burm. f./ Nymphaeaceae	Bhet ful (Ass)	Aquatic rhizomatous herb	Wild	Jun-Sep	Petal, Androecium and gynoecium	White
16	*Zingiber zerumbet* (L.) J. E. Smith./ Zingiberaceae	Borahu (Ass)	Rhizomatous herb	Wild	Jun-Aug	Inflofescence	Pale yellow
17	*Nymphaea rubra* Roxb. ex. Andrews	Mokua (Ass),	Aquatic herb	Wild/ Cultivated ornamental	June-Sep	Petal, Androecium and gynoecium	Red
18	*Luffa aegyptica* Mill. ex Hook. f./Cucurbitaceae	Bhol (Ass), Zinga (Rabha)	Climber	Cultivated	May -July	Sepal, petal, androecium and gynoecium	Yellow
19	*Cucurbita moschata* (Duch. ex Lam.) Duch. Ex Poir.	Rongalaw (Ass), Zzaganata (Rabha)	Climber	Cultivated	Feb-March	Peta	Yellow
20	*Nyctanthus arbortristis* L./ Oliaceae	Sawali (Ass), Safali (Bodo),	Small tree	Cultivated ornamental	Sep-Jan	Peal, stamen and curpal	White
21	*Alpinia galanga* (L.) Willd./ Zingiberaceae	Tora baghini (Ass)	Aquatic herb	Wild	June-Aug	Flower	White
22	*Bauhinia acuminata* L./ Caesalpiniaceae	Setto kanchon (Ass)	Small tree	Wild	April-June	Flower	White
23	*Bauhinia purpurea* L./ Caesalpiniaceae	Kanchon	Small tree	Wild	Sep-Nov	Flower buds	Rose purple
24	*Bauhinia variegata* L./ Caesalpiniaceae	Boga katra, Kotora (Ass)	Medium sized tree	Wild	Feb-April	Flower buds	Light pink

25	*Bombax ceiba* L./ Bombacaceae	Semolu (Ass)	Tree	Wild / cultivated	Feb-April	Petal	Red
26	*Cassia siamea* Lam./Caesalpiniaceae	Sia sonaru (Ass)	Tree	Wild	Round the year	Whole flower	Yellow
27	*Dillenia pentagyna* Roxb./ Dilleniaceae	Oxi (Ass)	Tree	Wild	Mar-May	Complete Flower	Creemellow
28	*Yucca aloifolia* L./ Agavaceae	Degar goch (Ass)	Rosettee Herb	Cultivated	Mar-June	Whole flower	Creemish white
30	*Canna indica* L./ Cannaceae	Parijat (Ass)	Herb	Wild / cultivated	April-Sep	Petal	Red/dark yellow
31	*Tabernaemontana divaricata* (L.) R. Br./ Apocynaceae	Kothona (Ass),	Small tree	Wild / cultivated	Whole year	Whole part of flower	White
32	*Hibiscus rosa-sinensis* L./ Malvaceae	Joba (Ass)	Small tree	Wild	Whole year	Petal with reproductive parts	Red
33	*Eichhornia crassipes* (Mart.)Solms./Pontederiaceae	Panimateka (Ass), Pankhar (Rabha)	Aquatic herb	Wild	More or less round the year	Flowers with inflorescence	Purple
34	*Girardinia diversifolia* (Link.)Fries./Urticaceae	Horusorat (Ass)	Herb	Wild	April-July	Flowers with inflorescence	Greenish white
35	*Baccaurea ramiflora* Lour./Euphorbiaceae	Lateku (Ass)	Small tree	Wild/cultivated	Dec-March	Flowers with inflorescence	Greenish white

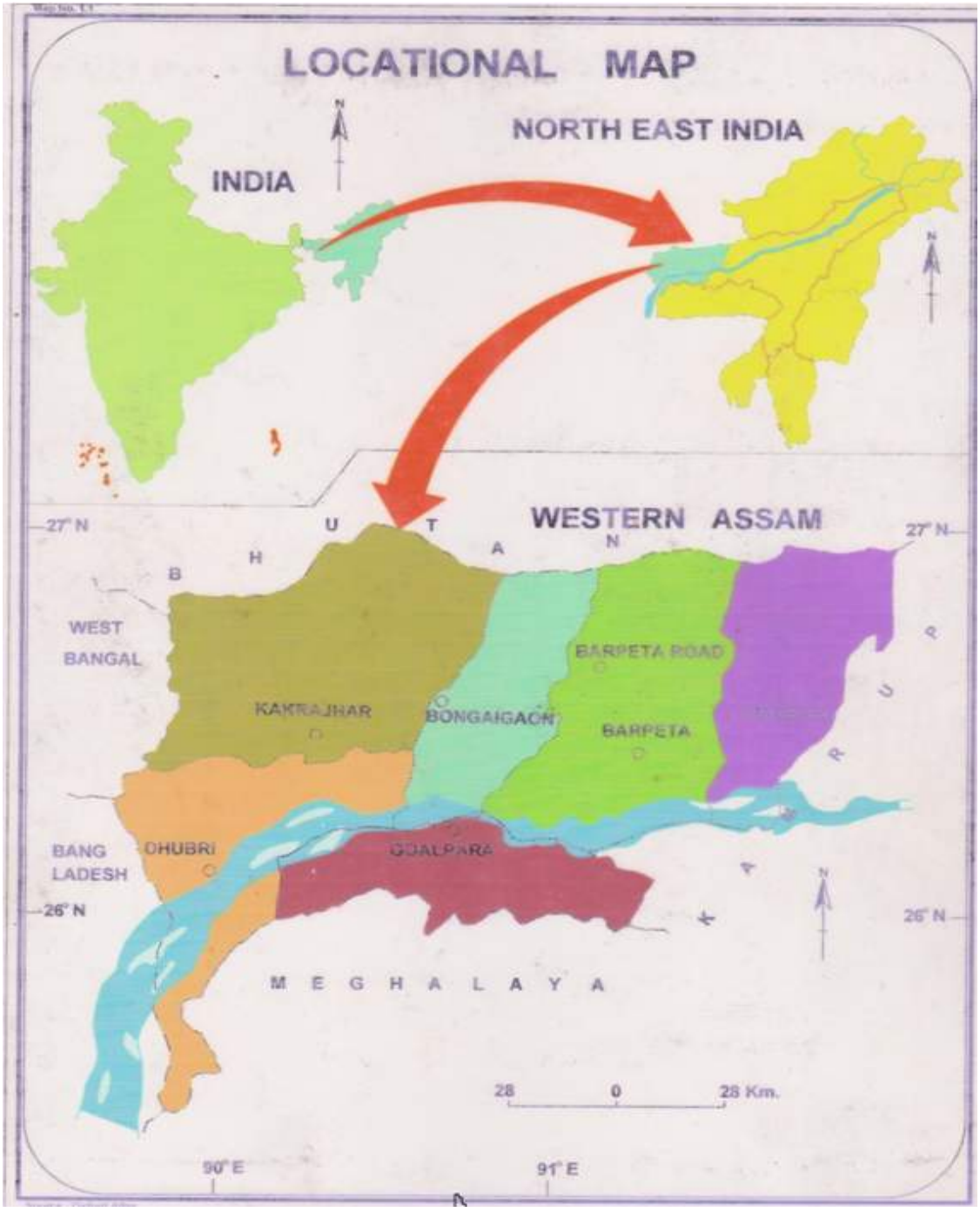

Figure 1. Locational map of western Assam[4]

Figure 2. Dry flower of *Phlogacanthus thyrsiformis*

Figure 3. Blooming flower of *Monochoria hastata*

Figure 4. Flower of *Phlogacanthus curviflorus*

Figure 5. Flower of *Oroxylum indicum*

Figure 6. Tribal women selling floral garland of *Oroxylum indicum* in daily market of Goalpara town

Figure 7. Spadix of *Musa* sp. and flower of *Moringa oleifera* in daily market

Figure 8. *Gmelina arborea* in full bloom condition

Figure 9. Edible spadix of *Alocasia acuminata* in vegetable market of Tamulpur of *Baksa* district

Figure 10. Edible inflorescence of *Spondias pinnata*

Figure 11. *Justicia adhatoda* flowers

Figure 12. Fleshy edible beautiful flowers of *Bombax ceiba*

Figure 13. Edible ornamental flower of *Bauhinia purpurea*

Figure 14. Beautiful flower of *Nyctanthes arbor-tristis*

Figure 15. Flower of *Carica papaya*