Musa balbisiana Colla-Taxonomy, Traditional knowledge and economic potentialities of the plant in Assam, India

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The traditional use of herbs as potential source of food and medicine is well observed among the ethnic groups in different zones of the world. Musa balbisiana Colla, is a robust herb, commonly known as Bhimkol or Athiyakol in Assamese and not a single part of the plant is wasted in the state of Assam, India. Here, this plant is regarded as an asset of household garden and people use various parts of the plant in their daily life as well as in every rites and rituals. As such, this plant has an immense economic potentiality in this region of North East India. A brief summary of the taxonomy, traditional uses of the plant/plant parts and products, based on extensive field observation from different parts of Assam has been documented in the present paper.

Keywords: Musa balbisiana Colla, Taxonomy, Traditional use, Economic potentialities, Koch, Kacharis, Deoris, Mishings, Rabha hasongs, Bodos, Kukis, Karbis, Dimasas, Hmars tribes

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Musa balbisiana Colla is a robust herb belonging to the family Musaceae and occurs both in wild habitat and cultivated in Assam, India. With the genome group ‘BB’ it is considered as one of the parent plants with Musa acuminata Colla (genome group ‘AA’) for the evolution of the indigenous cultivars of Musa L. species under the section Musa. Wild plants with dense seeds are naturally found in the forests whereas in some places it is no longer regarded as wild species as the long-time practice of cultivation and domestication by means of suckers made it a common cultivar. In Assam, it is commonly known as Bhimkol or Athiyakol. Almost every Assamese house is seen to have at least four to five clumps of Bhimkol in their household gardens. All the ethnic groups of Assam customarily use of each and every part of the plant either as food and/or in their religious rites and social occasions. Since immemorial times, the people of Assam consume the fruits of this banana as dietary supplement and for nutrition. Tender inner pseudo-stem and male buds are used as vegetable; leaves and pseudo-stem are used in various ways in rituals and ceremonies. Thus, it is a plant of immense importance for the people of Assam as all parts are used one way or another 1,2.

Traditional uses of Bhimkol or Athiyakol as medicine to treat a number of ailments have been reported by a number of workers 3. The qualitative analysis of the food additive popularly known as kolakhar or kolkhar is prepared from this plant has also been worked out. Use of kolakhar as antacid and to cure various ailments has been reported by Baruah & Kalita (2007) and Kalita & Bora (2008) 4,5. The present paper deals with the first-hand information on the preparation and use of kolakhar and other uses of the plant as vegetable, in ceremonies, in religious rites, etc.

Study area
The state of Assam covering an area of 78,438 sq km is located in between 24°2’-27°6’ N latitude and 89°8’-96°E longitudes in the North eastern part of India. The soil type is alluvial, laterite and forest soil with highly decomposed humus and it is strongly acidic with a pH generally ranges from 4.2 to 5.8. The climate of Assam is typically tropical monsoon rainfall type with high humidity, average temperature 20-25°C and with an average annual rainfall 2584.50 mm. It is endowed with rich diversity both in terms of vegetation and ethnicity. The major ethnic groups in the plains of Assam are Koch, Kacharis, Deoris, Mishings, Rabha hasongs and Bodos and in the hills Kukis, Karbis, Dimasas, Hmars, etc.

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The Assamese cuisine is very much popular and unique for the use of a liquid food additive known as *kolakhar* or *kolkhar* in almost every salty food dishes. Interestingly, this kind of liquid substance is prepared only from the ash made from different parts of banana plant and has been practised in Assam since long past. It is prevalent among the different communities and ethnic groups of the state. There is a folklore explaining that in ancient Assam people used *kolakhar* as soap and detergent to wash cloths and hair.

In Assam this plant is regarded as an asset by every household and people use almost every part of the plant in their daily life. Considering the importance of the plant in the life of the people of the state, a detailed study has been carried out on the preparation and use of *kolakhar* and other uses of the plant.

**Taxonomy of the plant**
- **Kingdom:** Plantae
- **Division:** Angiospermae
- **Class:** Scitaminae
- **Order:** Zingiberales
- **Family:** Musaceae
- **Genus:** *Musa*
- **Species:** *M. Balbisiana* Colla
- **Local names:** Assamese: Athiyakol, Bhimkol.

**Botanical description, habitat and distribution**

Tall and robust herb up to 7.5 m, leaf sheaths forming the pseudo-stem, suckering close to parent plant up to 6-10 suckers, arranged vertically; mature pseudo-stem up to 6.25-7.20 m tall and up to *ca.* 40.5 cm in diam. at base, light green with moderately waxy sheaths, underlying colour cream with pink purple pigmentation on the inner surface, pseudo-stem shiny, sap watery. Petiole green up to 71 cm long, canal margins curved inward, bases without pigmentation or sparse dark brown blotches in some cases, waxy. Leaves intermediate, lamina 280 × 78 cm, adaxially green, shiny, abaxially green with powdery touch, base symmetric, both sides rounded, midrib dorsiventrally green. Inflorescence hanging vertically; female flower forming the fruits; male bud present, ovate, very waxy, bract with large shoulder, apex obtuse, bracts red-purple externally and bright pink-purple internally, pigmentation uniform and continuous until the base at lower surface of the bract, lifting two bracts at a time, not revolute before falling, male flower 12-13 per bract in two rows, falling before the bract; compound tepal *ca.* 5.4 cm with thickened keel and very developed lobe, cream with the presence of pink; anthers 5, anther lobes *ca.* 3.7 cm long, stamen exerted; stigma color cream, ovary straight, cream in color. Fruits curved towards stalk, compact with 5-6 hands, average 12-13 fruits in two rows per hand, fruit straight, not ridged, pedicel *ca.* 3 cm long, glabrous, apex bottle necked; immature fruit peel green, mature peel colour yellow. Seeds present, 0.7 cm in diam., 55-60 seeds per fruit (Fig. 1, A-E).

Terrestrial in habitat and occurs in tropical evergreen forests of plains and hills of Assam. The plant is native to Southeast Asia including China, India, Indonesia, Malaysia, Myanmar, Nepal, New Guinea, Philippines, Sri Lanka and Thailand.

**Methodology**
First-hand field data were collected and observation was recorded among different ethnic groups of the state during April-May, 2014. Field studies were carried out
through unstructured interviews among the local people following the standard methodologies. They were asked to narrate and to demonstrate the detail procedures of preparation of kolakhar. The information was recorded along with voucher specimens and processed into herbarium specimens following the standard herbarium techniques. The specimens on which this study is based have been deposited in the Herbarium of Botany Department, Gauhati University (GUBH). Secondary data collected through scrutiny of literature were also added. During the study, Prior Informed Consents (PIC) had been taken from the knowledge providers.

Results and discussion

Traditional uses along with associated traditional knowledge are described below:

Use in food preparation

**Kolakhar or Kolkhar:** Khar is one of old and popular ingredients of many of the food dishes of Assamese cuisine. It is prepared from the ash of the fruit peels of Bhimkol and that’s why it is widely known as kolkhar and kolakhar in different parts of Assam. At first the peels of mature and ripe fruits are removed and they are sun dried until the water in them completely dries up. Then, these sundried fruit peels are burnt to ash and are collected. Water is allowed to leach out through the ash kept in a perforated container. Usually, half part of a coconut shell is used as a leaching container. The shell is half filled with the ash and water is allowed to pass through it and the dripped liquid is collected in a container below. The liquid product collected is locally called as kolkhar. Sometimes the pseudo-stem, the rhizome and inflorescence parts are also used to get the ash for preparation of kolkhar and kolakhar and for this the plant parts are sliced and dried before burning to get the ash. The kolkhar can be preserved for long time in ready to use form in glass/earthen airtight container (Fig. 2, A-E). Chemical Composition (gm/kg ash) of Kolakhar obtained from different parts of *M. Bulbisiana* Colla as determined by Deka & Talukdar (2007) is as follows:

<table>
<thead>
<tr>
<th>Plant parts</th>
<th>Carbonate (CO$_3^{2-}$)</th>
<th>Chloride (Cl)</th>
<th>Potassium (K$^+$)</th>
<th>Sodium (Na$^+$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruit peel</td>
<td>105.00</td>
<td>33.56</td>
<td>186.50</td>
<td>7.00</td>
</tr>
<tr>
<td>Pseudo stem</td>
<td>119.40</td>
<td>13.40</td>
<td>142.00</td>
<td>19.00</td>
</tr>
<tr>
<td>Rhizome</td>
<td>161.40</td>
<td>6.62</td>
<td>233.60</td>
<td>2.00</td>
</tr>
<tr>
<td>Inflorescence</td>
<td>178.80</td>
<td>8.08</td>
<td>255.70</td>
<td>7.00</td>
</tr>
</tbody>
</table>

**Kolpassala:** Kolpassala is a very good delicacy prepared from the innermost, soft part of the pseudo-stem of a tender plant of Bhimkol. It is believed that the consumption of kolpassala during spring season, i.e., March-April month or more particularly during the spring festival of Assamese people (named as ‘Bohag-Bihu’) is considered good for health (Fig. 2, F & G).

**Koldil:** Koldil is the male bud with inflorescence of banana plant. The flowers along with the inner fleshy spathe of Bhimkol are one of the most popular vegetable of Assamese people. Although, the inflorescences of other species of *Musa* are consumed but the male buds of Bhimkol are mostly preferred for less acrid taste (Fig. 2, I).

**Kol:** Kol is the fruit of the banana plant which is a very popular nutritious baby food in ripe form in Assam. Also the ripe fruits are used as dietary supplement to patients (Fig.1, B).

Use in rituals

**Koldong or Khols and Kolpat:** Kaldong or khol is used as serving plate for food items in almost all religious and social occasions in rural areas of Assam (Fig. 2, H). It is made from the sheathing base of the leaf (kolpatuwa) of a mature plant of Bhimkol by cutting into pieces of about 30 cm long and then folding the outer layer. The cut pieces are folded in such a way that looks like a platter used for serving food items. Kolpats are the mature leaves of a Bhimkol plant which are cut into pieces of desired size and used to serve food items. Kolpats are the worshipping place of Assamese people and after every religious function, it is distributed among the people on social and religious occasions but mainly the prasad or offerings to the deities in the Naamghars and other religious rituals. Naamghar is the worshipping place of Assamese people and after every religious function, it is a usual practice that the offerings to the deities which is a mixture of grams seeds, cereals, chopped pieces of ginger, coconut and different kinds of fruits are distributed among the people on kolpats (Fig. 2, J). Thus, traditionally all the rituals are known to be totally eco-friendly and free from pollution.

Medicinal properties

A comparative analysis of physicochemical parameters and bioaccumulation among few species of *Musa* conducted by Mudiar et al., 2014 revealed that the ground water of the *Musa* growing regions under study was found to be safe for drinking purpose. In the plants the accumulation level of potassium and chloride was found to be higher, which causes high alkalinity in them which justify their medicinal uses. Fresh ripe pulp of *M. balbisiana* fruit has antiperoxidative and antioxidant properties which can prevent oxidative stress related diseases.
Pinworm infection

The waxy matter on the ventral surface of the leaf is considered as vermifuge. Cooked rice are wrapped in a piece of such leaf for about 20 min and given to take by the patient.

Again, about 6-month old plant is cut 40 cm above the ground; a hole is made by removing central portion of the pseudo-stem. The hole is covered with a leaf of the same plant and left overnight. Next day, the exudates deposited in the hole are collected in a bottle. Half cup of the exudates is given to take orally twice daily for three days. It is believed to have the capacity to expel intestinal worms.

Infertility in women: A mature plant before flowering is cut 30 cm above the ground and a hole of about 10 cm depth is made in the pseudo-stem. The hole is covered overnight with a leaf of the plant and left overnight. About 6-7 seeds of Hyptis suaveolens (L.) Poit. are soaked in the exudates for an hour and the mixture is taken orally in empty stomach early in the morning. The dose is repeated for three subsequent days using a separate plant in each day.

Jaundice: Inflorescence is boiled with 4-6 crabs in 500 ml of water and the decoction is taken orally once daily for 7-10 days.

Gout: Ash of the fruit bark is made into a paste with the rhizome of Curcuma caesia Roxb. in equal parts and is applied locally by rubbing over the affected body part.

Gastritis: Ash of dried peel of ripe fruit is soaked overnight in water and the filtrate is obtained (i.e. kolkhar). Dry leaf powder of Trichosanthes cordata Roxb. and small amount of common salt is mixed with the filtrate to make pills of about 10 gm each from the mixture. One pill is given twice daily.

Health tonic: Ripe fruit is cut into slices and soaked in 300 ml water for 3-4 hrs and the infusion is taken twice daily for a month.

Cough: Ash obtained from dried peels of ripe fruit is soaked overnight in water and one cup of the filtrate obtained is mixed with a little amount of mustard oil, pinch of common salt and 3-4 cloves of crushed Allium sativum L. The mixture is slightly heated and then given to take with freshly cooked rice.

Dysentery: Half of a ripe fruit is soaked overnight in about 2 L of water. The filtrate obtained is taken early in the morning for three days.

Nutritional properties

Analysis of metal content conducted by Mudiar et al., 2014 explained that vanadium accumulated in the Musa varieties and at higher rate in M. balbisiana. Zinc also found to be accumulating in the plants and especially in M. acuminata in higher amount. Arsenic was not found at significant amount in the plants although the plant growing region has been reported for its high ‘As’ content. Lead and cadmium accumulation was also insignificant in soil and water of experimental area. According to the report, the alkalinity in plants of Musa species is due to the accumulation of higher amount of carbonates of potassium, sodium, etc. The hardness of the samples is because of much higher concentration of magnesium, rather than calcium, especially in dwarf plants. Accumulation of vanadium and zinc significantly in banana plants and their alkalinity makes its consumption in any form, to contribute to our dietary needs. Further, Kolakhar has been found to be an excellent renewable source of potassium carbonate for commercial exploitation as it is rich in K, Na, CO$_3$, and Cl along with few other trace elements.
Conclusion

From the present study it can be summed up that the plant *Musa balbisina* Colla growing in this region is a good source of food, materials for religious ceremonies and medicine to cure a number of ailments and thus associated with life and culture of the people of Assam. The male buds and inner tender shoots are sold in markets and these cost more than INR 30/piece, fruits INR 5/fruit while the food additive and the kind of antacid, i.e., *kolakhar* prepared from the fruit peels has high economic potentialities. It can be preserved for years in glass containers without adding any preservatives and has the possibility to be used as a substitute of common salt for its high sodium and chloride content. Thus, there is a high potential of the plant and its products to be used commercially. Further systematic study for production, standardisation of the pH level of the *Kolakhar* for ready to use form and commercialisation of the packed product may open up new vistas for economic development for the rural people of Assam.

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