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A note on distribution, ethnobotany and economic potential of *Hodgsonia heteroclita* (Roxb.) Hook. f . & Thoms. in North-eastern India

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Hodgsonia heteroclita (Roxb.) Hook. f. & Thoms., one of the high oil yielding Cucurbitaceous species, is traditionally used as food and medicine by several tribal communities inhabiting North-eastern hill (NEH) region of India. These communities comprise a large part of population of this region and still maintain traditional knowledge associated with the local floristic wealth. This species is a promising candidate for commercial exploitation as oil, food and medicinal crop.

Keywords: *Hodgsonia heteroclita*, Cucurbitaceae, Traditional knowledge, High oil yielding species, Economic plant, North-eastern hill region.

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Introduction

Hodgsonia heteroclita (Roxb.) Hook. f. & Thoms. (Family- Cucurbitaceae) was identified as a promising oil yielding cucurbit by Chinese scientists in late 1960s due to high oil content in its seeds. This species is believed to have its origin in North-east India, China (western Yunan) and Malaysia[1, 2], which shows a wide distribution from southern temperate Asia to tropical Asia and found to occur in Bangladesh, China, India, Malaysia and Nepal in between 750-1500 m a.s.l[1, 3-5]. Literature indicates that only two species of *Hodgsonia* Hook.f. & Thoms. (*H. heteroclita* and *H. macrocarpa* Cogn.) are found in the world as well as in India[5,7]. In India, it is distributed in hilly areas of Assam, Arunachal Pradesh, Meghalaya, Manipur, Mizoram, Nagaland, Tripura and Sikkim (Fig. 1) in wild habitat as well as under domestication in homesteads[6]. Besides NEH region (India), this species is widely grown in hills of upper Malaysia, Myanmar, Bangladesh, Vietnam, Java, Sumatra and Thailand[7]. *H. heteroclita* is commonly known as Kadam seed, Kapayang, Lard fruit, Chinese Lardplant and locally as *Thebou-lata* (Assam), *Dapuy* (Arunachal Pradesh), *Kathai* (Manipur), *Mei-soh-mynthar* (Meghalaya), *Thithi, Assa* (Nagaland), *Kha-um* (Mizoram), *Goolur* (Tripura) and *Kat'hior-pot* (Sikkim). In other regions of South-East Asia, it is locally known as *You-zha-guo* (China), *Makal* (Bangladesh), *Darsani* or *Ghinphal* (Nepal), *Béo, Kébao, Murόp rung* (Vietnam), *Makklung* (Laos), *Kāpāyê* (Thailand), *Pepayang* and *Breuh* (Malaysia), *Aroipichung* and

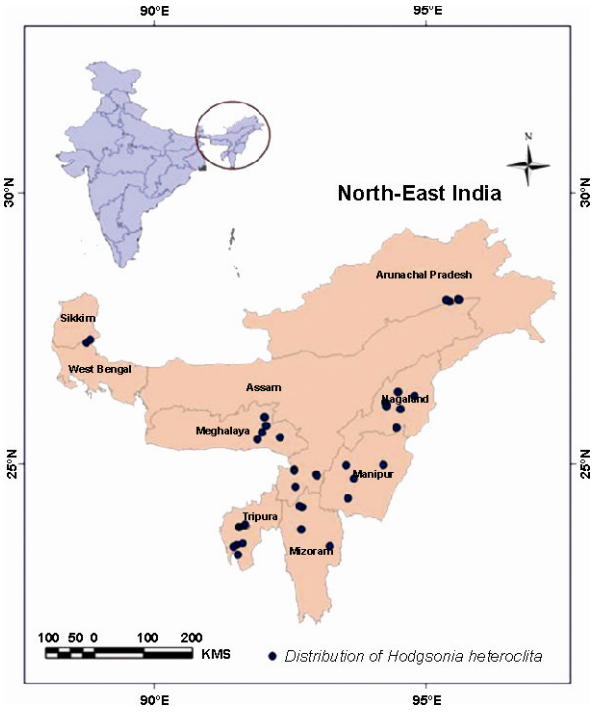

Fig. 1—Distribution of *Hodgsonia heteroclita* in North-eastern hill region, India

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Bilungking (Indonesia)[5]. It is widely used for food and medicine by different tribal communities of NEH region, viz. *Karbis, Dimasa* (Assam); *Apatani, Bogums, Bomis, Nishi* (Arunachal Pradesh); *Naga, Kukis* (Manipur); *Khasi, Garo, Jaintia* (Meghalaya); *Angamis, Rengma* (Nagaland); *Hajong, Chakma, Tongbe, Riang* (Mizoram); *Bhil, Chaimal, Mizel* and *Orang* (Tripura) since time immemorial. *H. heteroclita* is a semi-woody, dioecious perennial climber grows up to 25-30 m height. Leaves simple, 25-35 x 30-45 cm in diam., coriaceous, 3-5 lobed. Flowers yellow outside, white within, fimbriate fringes up to 15 cm; male flower raceme, female flower solitary. Fruits pomiform, 6-20 x 20-25 cm in diam., compressed globose, reddish brown (on maturity), 10-12 grooved, tomentose. Seeds flattish, 4-6, ellipsoid, 5-8 x 2-4 cm in diam., covered with woody wrappings (2-3 layers) and embedded in spongy and juicy pulp (Plate 1). Flowering and fruiting occur in March-December in different parts of world[1], while in NEH region, the plant begins to flower in March and continues throughout the summer and the fruits ripen in winter (November-December). A key issue in the management of this species is the processing of the fruits and seeds (nuts), respectively for its utilization as food and medicine. The seeds are embedded - usually as twos - in a stone-like structure ('pyrene') which makes extraction of the seeds laborious and thus expensive[3,8,9].

Materials and Methods

A semi-structured questionnaire survey method was adopted to record the distribution and ethno-botanical information on *H. heteroclita* among the tribal communities (N=25) residing in Assam, Arunachal Pradesh, Nagaland, Manipur, Meghalaya, Mizoram, Sikkim and Tripura during the year 2011-12. For this purpose, old experienced folk and local medicine men were interacted. The main focus of present study was to document the local existing knowledge associated with the species and to record local names of plant and plant parts used for various purposes through conducting survey and group interview among the tribal communities. Relevant literature was also surveyed to record its common, local names and ethnic uses. The herbarium and seed specimens (HS20671 and SS2935) are deposited in the National Herbarium of Cultivated Plants (NHCP), National Bureau of Plant Genetic Resources (NBPGR), New Delhi.

Results and Discussion

During the field surveys, it was observed that most of the tribal communities of NEH region were very much acquainted with the different uses of *H. heteroclita*. Though primarily a wild-growing species, the plant was also observed being domesticated in backyards/ kitchen gardens in most of the tribal villages for consumption of its seed (nut) as food and medicine. Its seed are also sold in the local market. *Karbis* and *Dimasa* tribes of Assam use its kernels after roasting or baking and seed oil (62-71 %) for cooking food and preparation of other food items, beverages, etc. *Apatani, Bogums, Bomis* and *Nishi* tribes of Arunachal Pradesh; *Khasi, Garo,* and *Jaintia* tribes of Meghalaya; *Chakma, Hajong, Tongbe* and *Riang* tribes of Mizoram use roasted seeds by mixing these with different food items mainly to garnish vegetarian and non-vegetarian food items. *Naga* and *Kuki* tribes of Manipur and *Angamis* and *Rengma* of Nagaland use a tea spoon of crushed seeds for the treatment of intestinal worms. The roasted seeds/endosperm by mixing with other food items is given to the women and children as energetic food. In Nagaland, *Angamis* and *Rengma* tribes apply the fruit pulp to cure bacterial infections of feet. *Naga* also uses extract of this plant in various types of curry. Seed powder is given in indigestion and stomach pain. *Bhil, Chaimal, Mizel* and *Orang* tribes of Tripura apply leaf juice on fresh cuts and wounds

Plate 1– a. *Hodgsonia heteroclita* in domesticated habitat; b. Fruits and seeds; c. Endosperms

to stop bleeding and also on ulcers. The oil is also used as a base for medicines in Eastern India.

Based on utilization pattern of *H. heteroclita* among the tribal communities of NEH region, it was observed that in all surveyed states, the plant is being used (82-98 %) for both the food and medicinal purposes indicating the close association of the species with their cultural life and frequent availability of plant population in the region (Fig. 2). For both the categories, more than 95 % tribals in Arunachal Pradesh, Manipur and Nagaland hold knowledge about *H. heteroclite* in comparison to tribal communities of other states.The results showed that the tribal communities are the main custodian for maintaining indigenous knowledge on local floristic wealth.

The leaves of *H. heteroclita* are reported to have good medicinal properties. The dried leaves are burnt and the smoke is inhaled, or the juice from young shoots and leaves is squeezed into the nostrils to allay irritation from small insects in Malaya and Java[1]. The extract/decoction from boiled leaves is taken internally, both for nose complaints and to reduce fevers. The ashes from burnt leaves are also used to heal the wounds. In Sarawak (Malaysia), seed oil is used to anoint the mother's body after childbirth; it also forms the base of embrocations containing ashes from the leaves of coconut palm and *Kaempferia*. *Hodgsonia* has become a rare species in Asia's tropical forests due to its exploitation for medicinal purposes. Yet, it has a long history of use as excellent oil for cooking and its nuts are liked by local communities. The nuts and oil have a slight taste of pork fat, hence locally it is named as "*pork fat nut*"[8].

The oil-rich seeds of *H. heteroclita* are an important source of food for tribal people. The kernels are occasionally eaten raw, they are slightly bitter in presence of papery covering, possibly due to an unidentified alkaloid or glucoside, but perfectly safe to eat after roasting or baking. More commonly, the seeds are roasted, after which they taste like pork scraps or lard; many mountain peoples consider these roasted seeds for a good delicacy. In addition to eating the seeds alone, the *Naga* incorporate them into various types of curry[7]. Economically, the outstanding feature of *H. heteroclita* is the nutritional value of its seeds. They show very high seed-oil content, high degrees of unsaturated fatty acids, as well as proteins[10]. They are also reported to have a very pleasant taste without covering of kernel[11-12]. In comparison to various other cucurbits grown in NEH region, seed kernel of *H. heteroclita* is a valuable source of fat and protein[7]. Though the flesh of *H. heteroclita* fruit is inedible, the tribal communities residing in hilly areas of NEH region use its oil rich nut/seeds as an important source of food and medicine because its seed also contains various useful nutrients, besides oil (Table 1). Its fat rich endosperm is cooked with food items mainly to increase the taste.

The high amount of linoleic acid (33.9 %) is considered to be an essential component in human diet. It is also precursor of arachidic acid which is supposed to be essential for normal growth and maintenance of skin[13]. Its oil is used as a substitute for

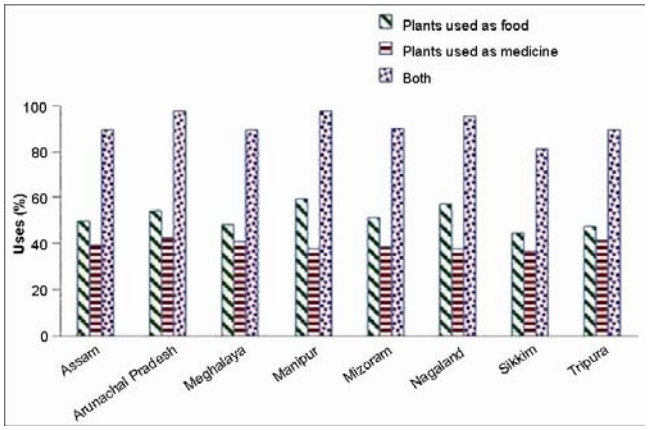

Fig. 2—Utilization pattern of *Hodgsonia heteroclita* among the Tribals of North-eastern India

Table 1—Nutrient and fatty acid composition of *H. heteroclita*

Nutrient composition	Availability (%)	References
Fat/oil	62.71	7
	66.50	14
	60-70	1
	72-77	10
Protein	31.25	7
	21.05	14
Palmitic acid	17.28	7
	37.30	14
Stearic acid	9.36	7
	8.7	14
Oleic acid	27.10	14
	21.76	7
Linoleic acid	33.90	7
	24.60	14
Arachidic acid	6.86	7

coconut oil for cooking in Malaya and as medicinal oil in Borneo[14]. Because of search for new economic species/products as well as the trend towards organic and biodiversity protecting farming systems, the demand of *H. heteroclita* in international market would certainly be increased tremendously as an high oil yielding species in coming years.

Conclusion

Being a high value locally important species in NEH region, *H. heteroclita* needs to be planted in large scale as potential high oil yielding underutilized species in the region so that the socio-economic condition of tribal communities could be up-graded by adding value. Based on the information recorded during current survey, germplasm with high oil content should be collected and conserved on priority for further studies. In addition, the agro-technique of this species should be developed for cultivation and as a source of income. Keeping in view of its value as edible seeds (as nuts), pulp/flower/buds (as garnishing) and roasted seeds/pulp/leaf extract (as medicine) this may be considered as a prospective species for cultivation.

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