

Biocultural value and conservation of “*tara*” tree (*Calamus erectus* Roxb.) at biodiversity hot-spot: A study with *Adi* tribe of Arunachal Pradesh, India

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Arunachal Pradesh is considered as one of the megabiodiversity centres, and lies in eastern Himalayas. State is abode of 26 major tribes (with 110 sub-tribes) who have developed unique cultural bonds with the forest resources across the five distinct climates, thus sustaining tremendous biocultural diversity in the state. With passage of time, now sustainability of biocultural resources and related livelihoods are questioned with various environmental and anthropogenic factors. Present study reports biocultural value of *tara* (*Calamus erectus* Roxb.) for *Adi* tribe and its conservation by them. Study was conducted in selected villages of East Siang district (in subtropical climate) of Arunachal Pradesh. Methods used for data collection include personal interviews, participant observations, transect walking and historical and anthropological records from selected *Adi* members. Results indicated that *tara* is an important resource for making house roof and handicrafts. The handicrafts are important source of income for *Adi* women. In remote villages, a considerable number of *Adi* people depend on *tara* therefore they conserve it. Elderly *Adi* members living in remote villages have greater amount of biocultural knowledge on use of *tara*. Conservation status of *Calamus erectus* was observed to be greater in community forests which are managed by indigenous informal institution- called *Kebang* headed by *Gaon Burha*. The prime need of the time is to plan strategy for participatory conservation of *tara* (*Calamus erectus*) by involving *Adi* people and giving them economic incentives. *Tara* has been in use of *Adi* members of mountain ecosystems for generations with cultural attachment, hence there is a need of policy to promote its use with the help of scientific value addition that may promote economic viability of *Calamus erectus* even in the changing social systems also.

Keywords: *Tara* (*Calamus erectus*), biocultural value, conservation, *Adi* tribe, Arunachal Pradesh

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Arunachal Pradesh is one of the global biodiversity hot-spots of the world.¹ It harbors *ca* 30 per cent of India's flora². Being a largest state among North-Eastern States of India in terms of geographic area (83743 km²), it has very rich biodiversity³ which support livelihoods of the ethnic communities residing in remote nooks and corners of Arunachal Pradesh (a Himalayan state). Majority (95%) of the tribal communities of Arunachal Pradesh depend directly on forest species⁴ to continue their life support system including food and nutrition, handicrafts, ethnomedicines, socio-cultural needs, etc^{5,6}. *Adi* people have been using varieties of plants

accessed from community forest, Jhum- land (slash and burn agriculture) and home gardens for the fulfillment of their multifarious needs^{5,7}.

Arunachal Pradesh lies in Eastern Himalayas between 26° 28' to 29° 30' N latitude and 91° 30' to 97° 30' E longitude. It has borders with Bhutan on the west, Tibet and China on the north, Myanmar on the east and the Indian States like Nagaland and Assam in south. Northeastern (NE) region of India including Arunachal Pradesh occupy 7.7 % of the total geographical area of the country. Over 80 per cent of the state's total area is under forest cover⁸. Out of 26 tribes in state, *Adi* is one of the largest tribe in terms of population. *Adi* reside in subtropical, tropical and sub-temperate regions. This tribe practice jhum

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cultivation and maintain home gardens which help to conserve significant number of plant diversity^{5,10}.

Adi tribe is extremely rich in terms of traditional knowledge and they conserve *tara* plants in home gardens, *Jhum*- land and community forest for use in their day to day needs, thus they add traditional values and thereby ensure conservation of plant species^{4,5}. Generally, *Adi* women are the main custodians of plant biodiversity conservation^{4,7} including *tara*, as they hold a higher degree of ethnobotanical knowledge than men⁹. *Adi* women a significant part to overall livelihood security and plant biodiversity conservation^{10,11}.

In the present paper, an attempt has been made to bring out the identity, unique and unknown biocultural uses of *tara* tree (*Calamus erectus* Roxb.) and record the knowledge difference between different age groups and genders of this culturally associated *Rattan* among *Adi* tribe of East Siang and Upper Siang districts of Arunachal Pradesh state of India.

Research methodology

During the course of present study, six villages from Upper Siang district namely Maryang, Riga, Damroh, Dambuk, Pekimodi and Dishang, and equal number of villages namely Miram, Napit, Yagrun, Sibut, Balek and Gune from East Siang district (Pasighat valley) were selected randomly. Twelve *Adi* members (6 men and 6 women) of different age groups ranging from 25-70 yrs (young, middle and old age) were selected randomly from each village. The sampling was done with the help from Village Panchayat Secretary (elected member by adult voters of a village) who had the voter list of each member of village with correct identity of a person and his/her age. Therefore, 48 *Adi* members of each category from young (25-40.0 yrs), middle (40.1-56.0 yrs) and old age (56.1-70.0 yrs) were selected randomly. Thus, total sample of *Adi* members taken for interview was 144 comprising 72 men and 72 women. Objective of sampling of two districts and different age groups of *Adi* members was to measure knowledge variability about biocultural value of *tara* plant.

Transect walk was conducted with the help of selected elder *Adi* members of each village and *Gaon Burha* and his two colleagues- called *Co-Gaon Burha*. Purpose of transect walk was to see the ecology and plant distribution patterns of *tara* tree in three habitats viz. home garden and *Jhum*- lands, and also in the community forest- called *Morang*, where

tara is conserved at community level. Selected respondents were interviewed using personal interview with open-needed questions. The aspects relating to biocultural uses and ecology of *tara* was measured on four point continuum as complete knowledge with score '3', partial knowledge with score '2', least knowledge with score '1' and no knowledge with score '0'. Significance of knowledge difference between different age group and gender was tested applying 'Z' statistics. The calculation of total number of *tara* plants was made through applying focus group discussions (FGD) in each village with the help of *tara* plants' owner and *Gaon Burhas* of a village. Further, this team has helped to ascertain the real plant population by individual plant counting in each habitat. Prior informed consent (PIC) has been obtained from the *Gaon Burha* (community head) of each village to publish the recorded data.

Results and discussion

Physical attributes

Calamus erectus Roxb.

Stem erect, stout, 4-6 m high (Fig. 1), densely tufted; internodes 5-7.5 cm long; 2.5 – 3 cm in diameter (Fig. 2). Apical part of *tara* is crowded (Fig. 3). Leaves 4-6 m long (Fig. 4); young petioles furfuraceous; spines on full grown petioles more than 12.5 mm long; leaflets, few, concolourous, subequidistant, linear – lancolate, 45-6-x 2.7-5 cm, 1-nerved; margins and midrib beneath remotely ciliolate; spines of petiole, rachis and lower spathes in half whorls, flat, straight, pale. Spadices branched, 30-60 cm long, elongate ending in a flagellum; spikes 15- 25 x 1.2 cm across the imbricately coriaceous spathels.; spathels cymbiform, acute. Flowers *ca* 8.5 mm long; calyx acutely 3-toothed; corolla 3- times longer than calyx; stamens free, filaments broad, erect. Fruits ovoid – oblong, *ca* 2.5 cm long, subtended by the spreading perianth; scales trapezoid, dark brown, with a yellow base (Fig. 5).

Distrib.: India: Arunachal Pradesh (East Siang and Upper Siang districts), Assam, Manipur, Meghalaya, Sikkim; up to 750 m Bangladesh (Chitagong, Sylhet), Myanmar (Pegu).

Exsiccata: India: Arunachal Pradesh: East Siang District, Pasighat Valley, *Ranjay K. Singh* 1192 dt June 19, 2008 (Herb. Department of Extension Education and Rural Sociology, College of Horticulture and Forestry, Pasighat).



Figs. (1-5)—(1) Mr. Tate Jamoh- a traditional knowledge holder of Sibut village showing culms of tara conserved in community forest; (2) Culm of tara; (3) Apical portion of tara plant; (4) Close view of foliage of tara leaf and (5) Fruits of tara

Traditional knowledge about use and ecology of tara

The *Adi* people of Maryang, Damroh and Riga villages of Upper Siang district use leaves of *tara* to make roof of traditional houses. Whereas, the tender fruits are eaten by women. The bark of stem is used in making mat, while stem and leaf are utilized in making handicrafts. This handicraft based adaptation provides income to *Adi* women. Use of fruits and stem are found to be relatively higher among the *Adi* people living in higher regions of Upper Siang district. The percentage of use of *tara* is recorded still more (45.3 ± 13.2) among *Adi* members of villages of Upper Siang district than the *Adi* members (24.2 ± 14.7) living in villages of Pasighat valley (East Siang district) (Table 1).

Results revealed that in regards to knowledge about the habitats of *tara*, plant characters, harvesting stage of tree, harvesting time of tree (particular season), methods of harvesting, knowledge about use of *tara*'s stem in house making and knowledge about multiplication of *tara* plant, the women held significantly greater amount of knowledge than men (Fig. 6). Only in the case of knowledge on processing of stems of *tara* for making handicrafts, women and men both are similar. This is because of this job is performed most often by both male and female. Further, a gap of knowledge about ecology and biocultural uses of *tara* was observed across the three age groups (Fig. 7). The old age group of *Adi* members held significantly more amount of

Table 1—Trend of changing percentage of use of tara (*Calamus erectus*) plants among Adi members

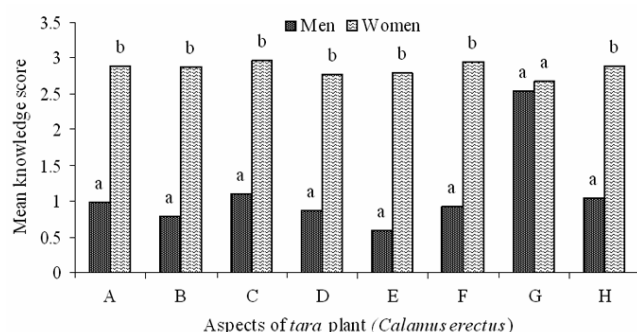
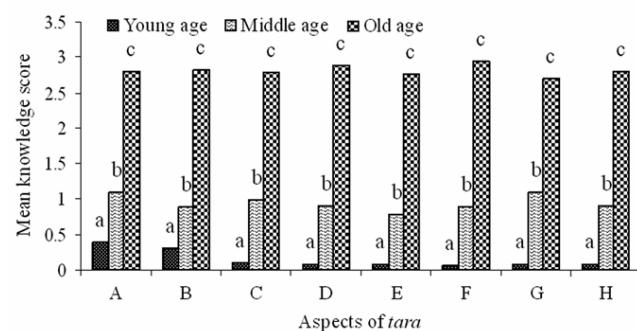
Years	Use percentage of tara	Use percentage of tara
	DTMV	DTPPV
1950	72.32	42.21
1960	68.94	38.29
1970	60.57	32.42
1980	57.29	27.24
1990	48.54	15.98
2000	42.39	9.24
2008*	37.36	4.14
Mean $\pm$ SD	55.3 $\pm$ 13.2	24.2 $\pm$ 14.7

* Study was completed in 2008, that's why the data after 2008 could not be recorded

Note: The data pertaining to percentage dependence of Adi members on tara (*Calamus erectus*) was generated through applying focus group discussion (FGD) in each village

Abbreviations used in table: DTMV= Dependency on tara plant (*Calamus erectus*) in mountain located villages

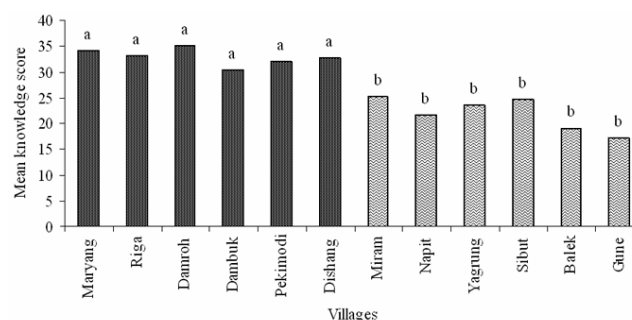
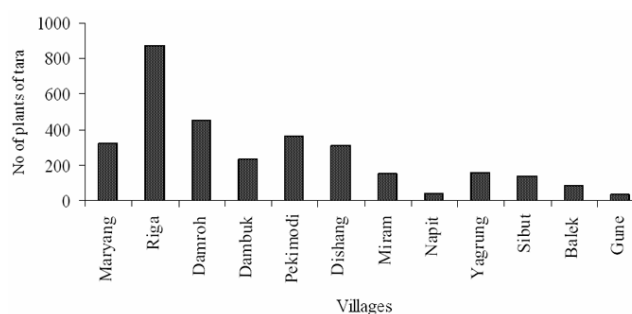
DTPPV= Dependency on tara plant (*Calamus erectus*) in villages of Pasighat valley

Fig. 6—Knowledge gap about biocultural and ecological aspect of Tara (*Calamus erectus*) among men and women Adi membersFig. 7—Knowledge gap about biocultural and ecological aspect of tara plant (*Calamus erectus*) among young, middle and old age Adi members

knowledge than middle and young age members. Though, there was a significant difference in biocultural knowledge of tara plant in between the remotely located villages of Upper Siang district and the villages of East Siang district located in Pasighat valley- which are near the town (Fig. 8). This shows that there is erosion in biocultural and ecological knowledge about tara plant among the younger generation of Adi tribe. It also reflects that knowledge of biocultural uses and ecology of tara plant vary from one social system to other. The traditional social system where modern developmental activities are not yet altered, the Adi members have greater amount of knowledge and dependency on the tara plant than the social system where modern development has affected traditional life style of Adi community.

Conservation of tara

It has been observed that tara plants are conserved relatively in a better way and at a larger scale, more in the villages located in remote corners of Upper Siang district, as compare to villages located near town Pasighat (East Siang district- Fig. 9). Further, it was observed that conservation of tara plant was more in community forest (in 12 villages total plant

Fig. 8—Knowledge status of Adi members about tara plant (*Calamus erectus*) in different villages of Pasighat valley (East Siang district) and mountains (Upper Siang district)Fig. 9—Number of tara (*Calamus erectus*) plants being conserved by Adi members in different villages

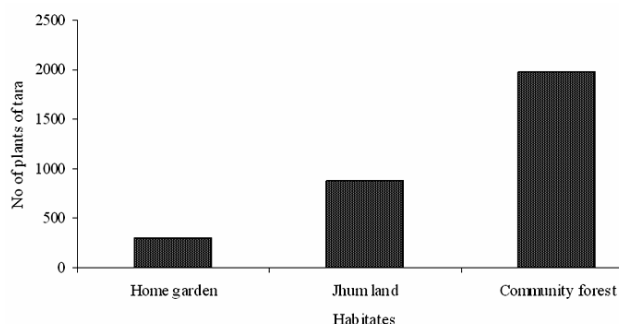


Fig. 10—Number of tara plant (*Calamus erectus*) being conserved by Adi members in different habitats

population 1971) followed by Jhum- lands (871) and then home gardens (305) (Fig. 10). Thus, these three habitats were recorded to be major habitats for conservation of tara. During our FGDs, the reason of conserving tara plants more in community forest was revealed by the Gaon Burhas (who are responsible for taking any decision on harvest and management of tara plants from community forest at village level). They have revealed that first of all community forest covers more geographic area in each village and which is the property of village people. This forest is not allowed to be slash and burn under jhum cultivation system. Secondly, if anyone willing to harvest tara plants from community forest, he/she has to get prior permission from the Gaon Burha of a village. Otherwise, the accused person posing threat by putting misuse or unauthorized harvest, is to be imposed a fine by the Kebang (indigenous institution of village), headed by Gaon Burha⁵.

This difference in conservation of number of tara plants in two different locations might be on account of the variability of adaptation and livelihood options, and use material in making houses and handicrafts. The Adi people living in Pasighat valley, plant more number of toko-patta (now a days) which is used in making houses and handicrafts items¹², whereas the same tribe living in Upper Siang district still depends more on tara. Hence, due to heavy dependency on this tree, the utilitarian values have inculcated interest to conserve this species at greater extent in Upper Siang district.

Conclusion

We concluded that tara (*Calamus erectus* Roxb.) is a bioculturally important tree species for Adi people living in Upper Siang district. This species is an important resource for making house roof and

handicrafts. The handicrafts are important source of income for Adi women. *Calamus erectus* is gradually vanishing from Pasighat valley (from the villages located near the town). Though, a considerable number of populations of *Calamus erectus* were found to be still maintained in remote villages inhabited by Adi people, because, this group of people still depend more on *Calamus erectus*. Elderly Adi members living in remote villages have greater amount of biocultural knowledge about use of *Calamus erectus* while, members of same villages with middle to young age had relatively less knowledge about biocultural use of *Calamus erectus*. This is an indication of knowledge erosion and effect of traditional and changing social systems in conservation of plant species and related knowledge. Conservation status of *Calamus erectus* was observed to be greater in community forests which are managed by indigenous informal institution- called Kebang headed by Gaon Burha. The prime need of the time is to plan strategy for participatory conservation of *Calamus erectus* by involving and Adi people and giving them economic incentives. This policy is urgently needed in remote locations where still tara is under conservation. This policy will help to retain optimum plant population of *Calamus erectus*. Tara has been in use of Adi members of mountain ecosystems for generations with cultural attachment, hence there is a need of policy to promote its use with the help of scientific value addition that may promote economic viability of *Calamus erectus* even in the changing climate and social systems also. *Calamus erectus* could help rural women as an adaption to climatic variability and weather anomalies. However, to strengthen *Calamus erectus* based adaptation in handicraft, scientific intervention and value addition would be required.

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References

- 1 Myer N, Muttermeier R A, Muttermeier CA, Fornseca G A B da & Kent J, Biodiversity hotspots for conservation priorities, *Nature*, 403 (2000) 853-858.

- 2 Nayar MP, Hotspot of Endemic Plants of India, Nepal and Bhutan, (S B Press, Trivendrum), 1996.
- 3 Yumnam JY, Rich biodiversity of northeast India needs conservation, *Curr Sci*, 95(3) (2008) 297.
- 4 Singh RK & Adi Women, *Biocultural Knowledge Systems in Eastern Himalaya*, (NISCAIR, CSIR, New Delhi), 2010.
- 5 Singh RK, Pretty J & Pilgrim S, Traditional knowledge and biocultural diversity: Learning from tribal communities for sustainable development in northeast India, *J Environ Plann & Manag* 53 (4) (2010), 511, 533.
- 6 Singh RK, Barter system, biodiversity and livelihoods of tribal communities: Cultural diversity and conservation in eastern Himalaya, Arunachal Pradesh, *Curr Sci*, 98(10) (2010) 1280-1282.
- 7 Singh RK & Srivastava RC, Biocultural Knowledge and Adi Community: Conservation and Sustainability in Biodiversity Hotspot of Arunachal Pradesh, *Curr Sci*, 96(7) (2009) 883-884.
- 8 Anonymous, *Basic Statistics of North Eastern Region*, North Eastern Council Secretariat, E & M Cell, Government of India, Shillong, 2002, 43.
- 9 Mishra S, Singh RK & Singh A, Dynamics of traditional foods and livelihood of Adi women in varying socio-ecological systems of Arunachal Pradesh: A source of learning and inspiration, In: *The new vultures of food: Marketing opportunities from ethnic, religious and cultural diversity*, edited by Lindgreen A & Hingley MK, (Gower Press, London, U.K), 2009, 203-222.
- 10 Singh Ranjay K, Singh A & Bhardwaj R, *Namdung (Perilla ocymoides)*: A bioculturally rich plant in food and livelihood security of Adi women in Arunachal Pradesh, Eastern Himalaya. *Indian J. of Trad Knowl*, 11(1) (2012):143-149.
- 11 Singh RK, Traditional ecological knowledge and institutions in conservation of critically endangered biodiversity: Learning from traditional communities in eastern Himalaya, Arunachal Pradesh. Paper presented in XIII *World Forestry Congress*, at Buenos Aires, Argentina from 18-23 October, 2009.
- 12 Singh Ranjay K, Srivastava RC Adi Community & Mhukherjee TK, 'Toko-Patta' (*Livistona jenkinsiana* Griff): Adi community and conservation of culturally important endangered tree species in eastern Himalaya. *Indian J Trad Knowl*, 9(2) (2010): 231-241.