

## **Rapid survey of plants used by Adi tribe of Bosing-Banggo, East Siang District, Arunachal Pradesh, India**

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### **Abstract**

Plants play vital role in the life of *Adi* people as life support and livelihood resources. Plants are also culturally significant without which different rituals and festivals of *Adi* people remain incomplete. The present study was undertaken to explore the plant resources used by the *Adi* tribe and the associated knowledge.

**Key words:** Arunachal Pradesh, *Adi*, Ethnobotany, Bosing-Banggo, Miri.

### **INTRODUCTION**

Arunachal Pradesh is the largest state in the north – eastern region of Indian sub – continent and covers an area of about 83,743 km<sup>2</sup>. It is located in the extreme eastern tip of India in Trans-Himalayan region between the latitude 26° 28' N and 29° 33' N and between 91° 31' E and 97° 30' E longitude (Mandal *et al.* 2002). The state has 17 districts, out of which six districts are inhabited by the *Adi* community, namely East Siang, Upper Siang, West Siang, Lower Dibang valley, Lohit and Upper Subansiri (Modi 2007). *Adi* is one of the major tribes and consists of 14 sub-tribes, namely *Ashing, Bori, Bokar, Karko, Komkar, Minyong, Millang, Pasi, Padam, Panggi, Pailibo, Ramo, Shimong* and *Tangam* (Mandal *et al.* 2002; Dutta & Ahmad 1995). The *Adi* language spoken by the people belongs to Tibeto-Burman language family (Mandal *et al.* 2002; Singh 1998; Dutta & Ahmad 1995). *Adi* people celebrate different festivals which are essential parts of their socio-cultural life. Festivals reflect the traditions, costumes and life style of the people. The festivals are mainly celebrated for feasts, good harvest of crop, merriment and for narrating the myths, legends, folklores and mythologies.

### **ETHNOBOTANICAL STUDIES IN ARUNACHAL PRADESH**

The state of Arunachal Pradesh falls under the Himalaya Biodiversity Hotspot and harbor a rich diversity of flora and fauna. The native inhabitants of the state include 26 major tribes and 110 sub-tribes (Srivastava 2009; Singh *et al.* 2008; Sarmah 2010). Most of the tribal people still depend primarily on the plant resources for their life support and livelihood. As the state harbor multi-ethnic diversity, it has a great potential for ethnobotanical studies. Major ethnobotanical works published from this region include Tiwari *et al.* (1979), Thothathri & Pal (1987), Tag & Das (2004), Kar (2004), Kala (2005), Angami *et al.* (2006), Das & Tag (2006), Ramashankar & Rawat (2008), Doley *et al.* (2009), Deb *et al.* (2009), Shrivastava (2009), Tiwari *et al.* (2009), Goswami *et al.* (2009), Doley *et al.* (2010, 2014), Sarmah (2010), Rethy *et al.* (2010),

Srivastava & Nyishi Community (2010), Srivastava *et al.* (2010), Nimachow *et al.* (2011), Jeri *et al.* (2011), Namsa *et al.* (2011), Shrivastava *et al.* (2012), Devi *et al.* (2012), Maiti *et al.* (2013), Dutta & Dutta (2013), Singh & Singh (2013), Payum *et al.* (2013), Yakang *et al.* (2013), and Monlai *et al.* (2013).

### Ethnobotanical Studies on *Adi* tribe

Most of the earlier ethnobotanical studies have been conducted by non-natives that lead to misinterpretation of *Assamese* names as *Adi* names. Published ethnobotanical studies on *Adi* tribe are very limited. These include Singh *et al.* (2008), Tag *et al.* (2008), Sharma & Borthakur (2008), Singh *et al.* (2009), Srivastava & Adi Community (2009), Singh *et al.* (2010), Yumnum *et al.* (2011), Singh *et al.* (2012), Nimasow *et al.* (2012), Baruah *et al.* (2013) and Yumnum & Tripathi (2013).

### METHODOLOGY

The present study was carried out in Bosing Banggo area located in East Siang District of Arunachal Pradesh. Bosing Banggo comprises of five villages namely Yagrunge, Tekang, Sibut, Taki-lalung and Runne. The field work was conducted from November 2011 to January 2012. Prior to the commencement of the study, a visit was made to all the villages to familiarize with the community as well as to select the knowledge partners. The Arunachal Pradesh State Biodiversity Board was informed about the study and Prior Informed Consent (PIC) was obtained from the knowledge partners before documenting the knowledge. The knowledge partners were met individually or in groups and were explained about the purpose and the scope of the study. The information gathered was noted in the field note book. Few knowledgeable persons accompanied the field trips for identification of plants and their uses. Voucher specimens were collected and processed using the wet method of Herbarium preparation. The specimens were processed into mounted on herbarium sheets following standard herbarium methods (Forsberg & Sachet 1965; Jain & Rao 1977; Singh & Subramaniam 2008). The specimens were identified with the help of different floras: *Flora of British India* (Hooker 1872 – 1897), *Flora of Assam* (Bor 1940; Kanjilal *et al.* 1934 – 1940), *Materials for the Flora of Arunachal Pradesh* (Hajra *et al.* 1996; Chowdhery *et al.* 2008; 2009), *Flora of Mizoram* (Singh *et al.* 2002), *Flora of India* (Sharma *et al.* 1993; Hajra *et al.* 1997; Balakrishnan *et al.* 2012) and e-floras of China, Nepal and Thailand ([www.efloras.org](http://www.efloras.org)). The specimens were confirmed by matching at ARUN and FRLH. For family delimitation and updated plant names [www.tropicos.org](http://www.tropicos.org), [www.ars-grin.gov](http://www.ars-grin.gov) and [www.plantlist.org](http://www.plantlist.org) were largely followed. The voucher specimens were deposited in FRLH, Benagaluru.

### ENUMERATION

The plants recorded during the study are tabulated alphabetically along with their binomial names, families, local names, voucher specimens, habit, parts used, type of use and uses in Table 1.

**Table 1:** Plants used by the people *Adi* tribe living in Bosing-Banggo area of Arunachal Pradesh.

Botanical names [Family]; local name; voucher specimen	Habit	Parts used	Type of use	Ethnic uses
<i>Ageratum conyzoides</i> Linnaeus [Asteraceae]; Namsing Ing/Elee; M.C.C.H. 9415	Herb	Leaves	Medicinal	Leaf paste applied on cuts or wounds
<i>Alpinia nutans</i> (Linnaeus) Roscoe [Zingiberaceae]; Gumba-bera; M.C.C.H. 9452	Herb	Whole plant	Religious	Different rituals

Botanical names [Family]; local name; voucher specimen	Habit	Parts used	Type of use	Ethnic uses
<i>Averrhoa carambola</i> Linnaeus [Oxalidaceae]; <i>Kordoi</i> ; M.C.C.H. 9411	Tree	Fruits	Edible, medicinal	Ripe fruits eaten fresh and to treat jaundice
<i>Baccaurea ramiflora</i> Loureiro [Phyllanthaceae]; <i>Buri</i> ; M.C.C.H. 9448	Tree	Fruits	Edible	Edible; often sold in market
<i>Bambusa pallida</i> Munro [Poaceae]; <i>Dibang</i> ; M.C.C.H. 9404	Tree	Whole plant	Construction, food, fodder	making houses, fences, household articles e.g. basket ( <i>hupur</i> ) and tong ( <i>megap</i> ); making artifacts during rituals ( <i>Pobang</i> ); tender culms as vegetables; leaves as fodder
<i>Bauhinia purpurea</i> Linnaeus [Fabaceae : Caesalpinioideae]; <i>Ogok</i> ; M.C.C.H. 9431	Tree	Leaves	Food, fodder	As vegetables; fodder
<i>Begonia</i> sp. [Begoniaceae]; <i>Ajing-beying</i> ; M.C.C.H. 9451	Herb	Fruits, stem	Edible	Stems and fruits edible
<i>Bryophyllum pinnatum</i> (Lamarck) Oken [Crassulaceae]; <i>Yepe-tare</i> ; M.C.C.H. 9424	Herb	Leaves	Medicinal	To treat fire wounds; gastric troubles
<i>Caryota urens</i> Linnaeus [Arecaceae]; <i>Tamak</i> ; M.C.C.H. 9436	Tree	Whole plant	Construction, agricultural implements, frame of weaving loom	Fruits edible; stem for houses construction; making ploughs; to make well-crafted sticks for weaving known as <i>sumpa</i> ; fibers use in rat trap and basket ( <i>Tali</i> )
<i>Carex cruciata</i> Wahlenberg [Cyperaceae]; <i>Nipong – taom</i> ; M.C.C.H. 9429	Herb	Whole plant	Religious	Different rituals
<i>Canarium strictum</i> Roxburgh [Burseraceae]; <i>Silum</i> ; M.C.C.H. 9418	Tree	Fruits, resin	Edible, fumigant, medicinal	Edible; to treat cough; resin burnt with charcoal to fumigate against mosquitoes
<i>Calamus flagellum</i> W. Griffith ex C.F.P. Martius [Arecaceae]; <i>Ramang</i> ; M.C.C.H. 9428	Climber	Fruits, stem	Construction, edible	Fruits edible; Fiber from stem as cordage, household articles for e.g. firewood basket ( <i>Ebar</i> ), and vegetable basket ( <i>Roli</i> )
<i>Calamus leptospadix</i> W. Griffith [Arecaceae]; <i>Jeying</i> ; M.C.C.H. 9433	Climber	Fruits, stem	Construction, edible	Fruits edible; Fibers from stem used for construction of houses, granary, baskets and fences
<i>Clerodendrum colebrookianum</i> Walpers [Lamiaceae]; <i>Ongin</i> ; M.C.C.H. 9432	Shrub	Leaves	Food, medicinal	Leaves used as greens; supposed to reduce blood pressure
<i>Crassocephalum crepidioides</i> (Bentham) S. Moore [Asteraceae]; <i>Gende</i> ; M.C.C.H. 9443	Herb	Leaves	Food	As vegetables; fodder
<i>Curcuma caesia</i> Roxburgh [Zingiberaceae]; <i>Kala Haldi</i> ; M.C.C.H. 9438	Herb	Rhizomes	Medicinal	To treat gastric trouble; diarrhea
<i>Dendrocalamus hamiltonii</i> Nees & Arnott ex Munro [Poaceae]; <i>Hurung</i> ; M.C.C.H. 9402	Tree	Whole plant	Construction, food, brewing rice beer	Culms as brewing utensils for rice beer; tender culms as vegetables; leaves as fodder; house construction
<i>Dendrocalamus giganteus</i> Munro [Poaceae]; <i>Bulukang</i> ; M.C.C.H. 9403	Tree	Whole plant	Construction, food	House construction; tender shoot as vegetables; Leaves as fodder
<i>Eryngium foetidum</i> Linnaeus [Apiaceae]; <i>Ori (Ritak)</i> ; M.C.C.H. 9447	Herb	Leaves	Food	To increase the aroma of curries; as salad for its fine flavor and taste
<i>Ficus auriculata</i> Loureiro [Moraceae]; <i>Tapang</i> ; M.C.C.H. 9426	Tree	Whole plant	Religious, edible	Fruits edible; Leaves as fodder; rituals

Botanical names [Family]; local name; voucher specimen	Habit	Parts used	Type of use	Ethnic uses
<i>Glycine max</i> (Linnaeus) Merrill [Fabaceae : Papilionoidae]; <i>Rontung</i> ; M.C.C.H. 9434	Climber	Fruits	Food	Seeds edible
<i>Gynura crepidioides</i> Bentham [Asteraceae]; <i>Ogen</i> ; M.C.C.H. 9444	Herb	Leaves	Food	As vegetable; fodder
<i>Gymnocladus burmanicus</i> C.E. Parkinson [Fabaceae]; <i>Dikang</i> ; M.C.C.H. 9421	Tree	Fruits	Shampoo, soap	As soap; as shampoo to kill head louse
<i>Gynocardia odorata</i> R. Brown [Achariaceae]; <i>Taki-hidik</i> ; M.C.C.H. 9422	Tree	Fruits	Stupefy fish	Fruits for fish poisoning
<i>Litsea cubeba</i> (Loureiro) Persoon [Lauraceae]; <i>Rayil / Tayir</i> ; M.C.C.H. 9420	Tree	Fruits	Food	As salad
<i>Livistona jenkinsiana</i> W. Griffith [Arecaceae]; <i>Ta-eek or Tek</i> ; M.C.C.H. 9408	Tree	Leaves, fruits	Construction, edible	Leaves as roofing materials for houses and for making hat ( <i>Ebong</i> ); petiole as rope; pericarp of ripe fruits eaten raw or as salad; nuts edible
<i>Maesa montana</i> A. de Candolle [Primulaceae]; <i>Nyanur, Eyum-jajum</i> ; M.C.C.H. 9416	Shrub	Whole plant	Edible, religious	Fruits edible; different rituals
<i>Morus alba</i> Linnaeus [Moraceae]; <i>Yumbat</i> ; M.C.C.H. 9442	Shrub	Fruits, leaves	Edible, rearing silk worm	Fruits edible; Leaves for rearing silk worm
<i>Pandanus furcatus</i> Roxburgh [Pandanaeae]; <i>Tako</i> ; M.C.C.H. 9445	Tree	Fruits, leaves	Edible, mat making	Fruits edible; Leaves for making mats ( <i>kurpyak</i> )
<i>Phrynium capitatum</i> Willdenow [Marantaceae]; <i>Ekkam</i> ; M.C.C.H. 9404	Herb	Whole plant	Religious, household uses	Different rituals: leaves for wrapping food items and preparation of rice beer ( <i>Apong</i> )
<i>Piper betle</i> Linnaeus [Piperaceae]; <i>Pan</i> ; M.C.C.H. 9435	Climber	Leaves	Edible, medicinal	Leaves edible; to burst the boils on the skin.
<i>Pouzolzia hirta</i> (Blume) Blume ex Hasskarl [Urticaceae]; <i>Oyik</i> ; M.C.C.H. 9439	Herb	Leaves	Food	As greens
<i>Pueraria lobata</i> (Willdenow) Ohwi, Jisaburo [Fabaceae : Papilionoidae]; <i>Ridin</i> ; M.C.C.H. 9405	Climber	Stem	Medicinal, religious	Different rituals; helps in blood clotting
<i>Raphidophora tetrasperma</i> J.D. Hooker [Araceae]; <i>Talo</i> ; M.C.C.H. 9427	Climber	Whole plant	Religious	Different rituals
<i>Ricinus communis</i> Linnaeus [Euphorbiaceae]; <i>Akirokmi</i> ; M.C.C.H. 9410	Shrub	Leaves	Medicinal, rearing silk worm	To treat back pain and swelling; to rear silk worm
<i>Rubus rosifolius</i> Smith ex Baker [Rosaceae]; <i>Inbung – garung</i> ; M.C.C.H. 9440	Shrub	Fruits	Edible	Fruits edible
<i>Rubus alceifolius</i> Poirer [Rosaceae]; <i>Tahin</i> ; M.C.C.H. 9441	Climber	Fruits	Edible	Fruits edible
<i>Saccharum spontaneum</i> Linnaeus [Poaceae]; <i>Tapi</i> ; M.C.C.H. 9417	Shrub	Whole plant	Edible, religious	Tender flowers edible; different rituals
<i>Saurauia napaulensis</i> A.P. de Candolle [Actinidiaceae]; <i>Tan</i> ; M.C.C.H. 9406	Tree	Whole plant	Edible, religious	Tender flowers edible; different rituals
<i>Sauropus androgynus</i> (Linnaeus) Merrill [Euphorbiaceae]; <i>Gam-Oying</i> ; M.C.C.H. 9430	Shrub	Leaves	Food, fodder	As vegetable; fodder

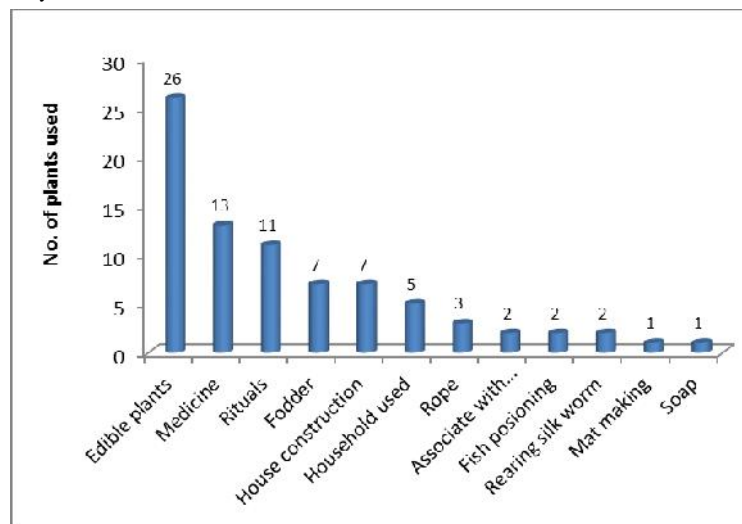
Botanical names [Family]; local name; voucher specimen	Habit	Parts used	Type of use	Ethnic uses
<i>Scoparia dulcis</i> Linnaeus [Plantaginaceae]; <i>Peyong</i> ; M.C.C.H. 9413	Herb	Leaves	Medicinal	Gastric trouble
<i>Senna alata</i> Linnaeus [Fabaceae : Caesalpinioideae]; <i>Donyi gori</i> ; M.C.C.H. 9407	Shrub	Leaves	Medicinal	To treat ringworm; fungal infection on the skin.
<i>Sida acuta</i> N.L. Burman [Malvaceae]; <i>Among jaru</i> ; M.C.C.H. 9423	Herb	Whole plant	Broom	As broom
<i>Solanum viarum</i> Dunal [Solanaceae]; <i>Bengela Tang</i> ; M.C.C.H. 9412	Herb	Fruits	Medicinal	Fruits burnt in the fire and the smoke from the fruit is sucked through a pipe to expel tooth worms
<i>Solanum spirale</i> Roxburgh [Solanaceae]; <i>Bangko</i> ; M.C.C.H. 9401	Shrub	Leaves, fruits	Food, religious	Fruits edible; Leaf as greens; different rituals
<i>Spilanthes paniculata</i> Wallich ex A.P. de Candolle [Asteraceae]; <i>Marsang (Hayo)</i> ; M.C.C.H. 9437	Herb	Leaves	Food, fodder	As greens; fodder
<i>Spilanthes acmella</i> (Linnaeus) Linnaeus [Asteraceae]; <i>Marshang (Halong)</i> ; M.C.C.H. 9425	Herb	Leaves	Food	As greens and salad
<i>Sterculia coccinea</i> Roxburgh [Malvaceae]; <i>Ami Tayam</i> ; M.C.C.H. 9446	Tree	Fruits	Edible	Mature seeds fried or roasted and eaten
<i>Sterculia villosa</i> Roxburgh [Malvaceae]; <i>Harjok</i> ; M.C.C.H. 9449	Tree	Fruits, stem	Edible, cordage	Mature seeds fried or roasted and eaten; fibers from stem as rope
<i>Terminalia chebula</i> Retzius & Willdenow [Combretaceae]; <i>Elekang</i> ; M.C.C.H. 9414	Tree	Fruits	Edible, medicinal	Edible, often sold in market; to treat cough.
<i>Zanthoxylum rhetsa</i> A.P. de Candolle [Rutaceae]; <i>Onger</i> ; M.C.C.H. 9450	Tree	Leaves, fruits	Edible, stupefy fish	Leaf eaten as greens; fruits for fish poisoning
<i>Zingiber officinale</i> Roscoe [Zingiberaceae]; <i>Takeng</i> ; M.C.C.H. 9419	Herb	Whole plant	Edible, religious	Rhizome edible; different rituals

## RESULTS AND DISCUSSION

In the present study 52 plants of ethnobotanical importance have been recorded belonging to 30 families. Fabaceae and Asteraceae contribute 5 species each followed by Arecaceae and Poaceae with 4 species each. An analysis of the life form indicates that shrubs play a major role in the culture of *Adi* followed by herbs, trees and climbers. The plants that have recorded in this study are put into as many as 13 different uses by the *Adi* community (Fig. 1).

### Edible plants

*Adi* of Bosing Banggo consumed fruits, flowers and seeds of 18 different species as greens, spices, salad and fruit. Fruits of two different alien species are used by the *Adi* that belongs to the genus *Rubus* Linnaeus. These varieties in the diet provide nutritional security as these fruits appear in different season and fulfill the nutritional requirement of the local community throughout the year. These fruits are also important as they provide several essential nutrients that are required in trace quantity especially the anti – oxidants. The fruits are mostly relished by the children. Fruits from four different species namely *Baccaurea ramiflora* (*Buri*),



**Fig. 1.** Use categories and number of plants

*Litsea cubeba* (Tayir/Rayil), *Canarium strictum* (Silum) and *Terminalia chebula* (Elekang) are important non timber forest produce that are collected from the forest and sold in the market. Thus the wild edible fruits in and around Bosing Banggo area also provides livelihood opportunities to the *Adi* tribe.

The study also recorded the use of 13 species as vegetables. Six of these wild vegetables species are collected and sold in the market especially by the village women. These wild resources also enhanced the livelihood opportunity for the community. Sarmah & Arunachalam (2011) have studied the contribution of non-timber forest products to livelihood economy in Changlang district of Arunachal Pradesh. Their study indicates wild edibles such as Bamboo shoots and leafy vegetables sold at a higher quantity, which is important from the livelihood point of view and is estimated to be Rs. 9,000 per household per year.

These vegetables provide nutritional security to the local community. Studies on wild vegetables in inner Mongolian Autonomous Region, Studies in China have shown that the 90 species of wild vegetables used by the community have high nutritional value. Similar inference was drawn by Sundriyal & Sundriyal (2004) on wild edible plant of Sikkim Himalaya. Three of the vegetables exist in the cultivation in the study area namely, *Glycine max* (Rontung), *Spilanthus acmella* (Marsang) and *Sauropus androgynous* (Gam oying).

### Plants used in rituals

The culture of the *Adi* is intimately woven with the rituals. Every festival celebrated by *Adi* has integral rituals which in turn are linked to specified plant species. The *Adis* have their own beliefs, practices and idiosyncrasies. The *Adi* have their traditional healers called *Miri*. A *Miri* may be a male or female. The *Miris* enjoys a good reputation and status for their service rendered to the community. The *Adi* distinguish between two types of illness; natural and supernatural. The nature of illness is diagnosed by a *Miri* through a divinization process by looking at the liver of the dead chicken, set of leaves or by stone. Rituals are Performed based on the nature of the illness that varies accordingly. The plants used also vary in terms of illness. These folk practices are related to the myths of the *Adis*. Species such as *Phrynium capitatum* (Ekkam), *Pueraria lobata* (Ridin), and *Saurauia napaulensis* (Tan) are used in most of the rituals.

### **Plants associates with belief**

*Raphidophora tetrasperma* (Talo) and *Ficus auriculata* (Tapang) have been closely associated with the belief system of the *Adi* community. The *Adi* strongly believed that if a person cuts the climber of *Raphidophora* Hasskarl and burnt it, he / she would invite the wrath of the evil spirit. Even if the climber is unknowingly cut it should be left unburnt so the person will be saved from the curse. This belief is an ecologically sound belief which prohibits burning of the plant. *Raphidophora* can easily propagate by vegetative cuttings and hence the cut unburnt stem can act as a propagule.

*Ficus auriculata* is associated with the belief system connected to premature death of children due to miscarriage. The corpse of such children are kept inside a bamboo basket and hung on the branch of *F. auriculata*. They also insert the stalk of the fruit in the child mouth which is believed to be the surrogate for mother breast that feed the child. This belief system provides a great emotional comfort to the mother over the grief by symbolically reinforcing that the child is not left alone but being fed. The milky latex of the tree acts as surrogate for milk.

### **Plants used for medicines:**

The study records 13 species of medicinal plants which are used by the *Adi* mostly for their primary health care. The health conditions for which these plants have been used include gastric trouble, cuts and wounds, skin diseases, cough, jaundice and blood pressure. The folk uses of plant such as *Clerodendrum colebrookianum* (Ongin) have scientific evidence. Gupta, Mazumdar & Das (1994) have studied the plant extract and its effect on blood pressure and demonstrated that the plant possess hypotensive properties. Devi & Sharma (2004) have studied the same species and provided evidence for its hypolipidemic and hypoglycemic activity. This study indicates that this is a potential species for bio prospecting and for future commercial applications. This also supports the fact that the plant used by ethnic community is a store house of active chemical ingredients which could lead to discovery of potent drugs.

### **Plants use as construction materials:**

Bamboo plays a major role in construction. Bamboo is widely used for the construction of house and fences around homes, gardens and farms to ward of grazing animals. The *Adi* uses locally sourced materials such as *Livistonia jenkinsiana* for thatching, canes and rattans such as *Calamus flagellum* and *Calamus leptospadix* for rope cordage.

### **Alien plants and their cultural significance:**

The study recorded eight alien plants that are used for different purposes. Three alien plants that are use for medicinal purpose are *Ageratum conyzoides*, *Senna alata* and *Scoparia dulcis*. *Crassocephalum crepidioides* and *Sauropus androgynus* are used as greens and fodder for pig. Two species of *Rubus*, *R. alceifolius* and *R. rosifolius* fruits are relished by the children.

## **CONCLUSION**

The present study revealed only a fraction of traditional knowledge of plants used by the *Adis* of Bosing Banggo area. An elaborate and long term study is required for understanding and documentation of traditional knowledge possess by the *Adi* and its cultural connection. It is also important to conserve the language and the traditional life style to foster the ethnic knowledge for the next generation.

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