

## Diversity of wild edible plants used by the Angami-Nagas in Kohima District of Nagaland, India

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### Abstract

Wild edibles are viable sources of food, medicine, nutrition, as means of livelihoods and other use categories of equal importance for traditional societies including Angami Nagas. The present study documented ethnobotanical knowledge and management of WEPs among the Angami tribe of Kohima district, Nagaland. Personal interviews (semi-structured), group discussions and personal observations were employed to collect data. This report presents the uses of 84 wild edible plants belonging to 68 genera from 40 families. Wild edibles are indispensable source of food security and integral part of their food system. Traditions, beliefs and cultural practice of WEPs utilization among the Angamis contribute towards the conservation of plant resources. Due to population pressure many new areas of forests in the Angami regions have been encroached rapidly for human settlement and for other purposes. There is a need to bring up strategies for sustainable use of wild edible resources and conservation of potential habitats in the Angami regions.

**Key words:** Angami Nagas, Kohima, wild edible plants, livelihoods, conservation

### INTRODUCTION

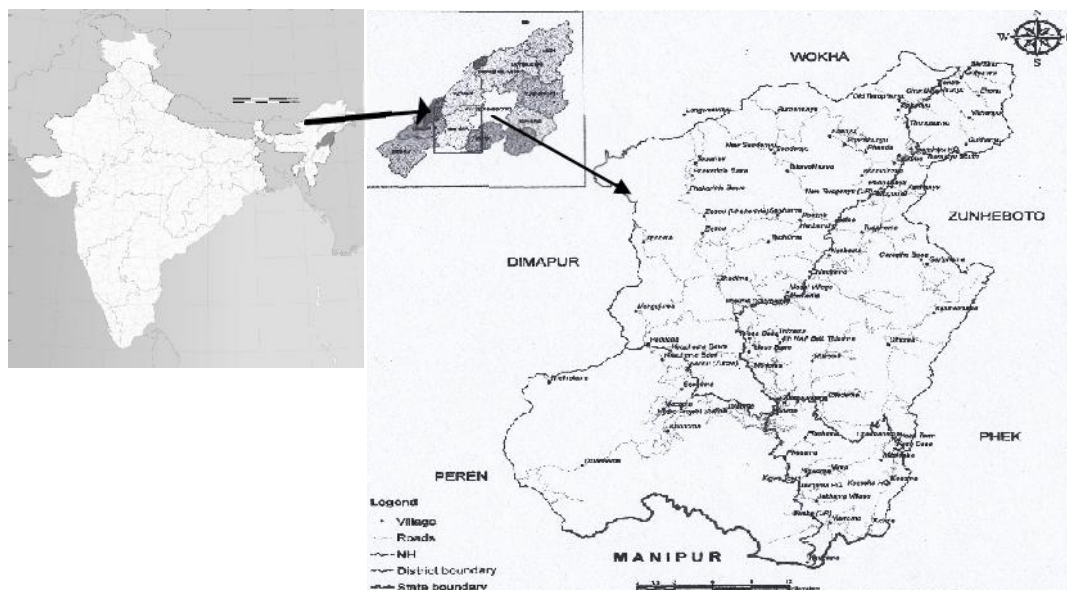
There is growing global interest to investigate and exploit wild edible plant (WEP) resources in traditional societies. Major uses of such plants include food, medicine, nutrition, as means of livelihoods and other use categories of equal importance. There is no unanimity on the definition of WEPs but the term usually refers to species that are not cultivated or domesticated, but available from their natural habitat and used as human food resources (Beluhan & Ranogajec 2010). These plants are gathered from varied habitats like natural forests, wetlands, agricultural fields to human disturbed areas such as roadsides and wastelands. This means WEPs could be potential weeds growing in urban areas to native plants growing in remote wilderness. Wild plants contribute towards food security, nutrition, livelihoods, construction, socio-culture and other needs of human societies in developing countries though its utility of equal intensity is also observed in developed countries (Grivetti & Ogle 2000; Pieroni 2001; Ogle *et al.* 2001; Ogle *et al.* 2003; LaRochelle & Berkes 2003; Dogan *et al.* 2004; Kar 2004; Rai & Das 2004; Sundriyal & Sundriyal 2004; Tardio *et al.* 2006; Das *et al.* 2007; Kalaba *et al.* 2009; Aryal *et al.* 2009; Giliba *et al.* 2010; Sarmah & Arunachalam 2011; Legwaila *et al.* 2011; Kutum *et al.* 2011; Seal 2011, 2012; Dutta 2012). Published reports suggest multidisciplinary implications of WEPs study involving Anthropology, Conservation Biology, Botany, Ethnobotany, Food Science, Nutrition, Pharmacology, and Traditional Medicine.

Utilization of WEPs is also prominent among the diverse cultural groups in North Eastern Region (NER) of India. This group of plants is indispensable for subsistence, livelihoods, medicines and cultural practices of the people. There is large body of reports on various aspects of WEPs from different parts of the globe including those from NER. Many studies were devoted to inventory, diversity and dietary use of WEPs (Jain 1963; Kuhnlein & Receveur 1996; Hatloy *et al.* 1998; Singh *et al.* 2001; Khumbongmayum *et al.* 2005; Patiri & Borah 2007; Mao & Odyuo 2007; Sawain *et al.* 2007; Takatemjen *et al.* 2009; Salam *et al.* 2010; Sharma *et al.* 2010; Mozhui *et al.* 2011; Shanglakpam *et al.* 2012; Sharma 2012; Ajesh *et al.* 2012; Abbari *et al.* 2013; Medhi *et al.* 2014). Some reports described utilization of WEPs within different tribes (Rashid *et al.* 2008; Sanglakpam *et al.* 2012; Lokho 2012; Terangpi *et al.* 2013). Beside food and nutrition, wild plants have been exploited by many cultures as famine foods during scarcity of staple food (Minis 1991; Turner 1993; Paul *et al.* 2011). Potentials of WEPs in providing food security, nutrition, income and livelihoods in rural settings is acknowledged around the world (Singh *et al.* 1988; Moreno-Black *et al.* 1996; Bisht *et al.* 2005; Sinha & Lakra 2005; Yesodharan & Sujana 2007; Kar & Barthakur 2007; Pfozo *et al.* 2012; Pegu *et al.* 2013; Chettri *et al.* 2014). Studies on food-medicine overlap have been of recent interest among researchers to explore the possible link between health and wild food consumptions (Jamir & Rao 1982a, b; Pieroni *et al.* 2002; Chetri 2005; Borah *et al.* 2012; Borah *et al.* 2013; Medhi *et al.* 2013).

A review of various reports revealed scant information on WEPs used by the Angami tribe of Kohima district, Nagaland. Wild plants form an indispensable part of their food system and also source of income particularly to poor Angami families. Many wild edibles are integral part of their social, religious and cultural life. However, in recent decades there have been major changes in the food system of the Angamis, mainly because of financial improvement and conversion to Christianity. Many Angamis have adopted western lifestyles with the result that knowledge of traditional wild foods and understanding their cultural uses has gradually declined. In addition, natural habitats of WEPs in Kohima district have been facing serious threats from urbanization and encroachment. There is therefore, urgent need to study WEPs utilized by the Angamis and their food systems. The aims of the present study are to document the diversity of WEPs used by the people of Angami tribe in the Kohima district of Nagaland and the role of WEPs towards their socio-cultural well-being. Traditional management and conservation practices of wild food plant resources are also considered.

## MATERIALS AND METHODS

**The study area and the people:** The Kohima district (25°11' N – 26° N latitude and 93°20' E – 94°55' E longitude) of Nagaland state, with a geographical area of 4041 sq km and located around 1450 m above mean sea level, is considered as the homeland of the Angamis, one of the 17 Naga tribes of the state (Deorani & Sharma 2007). Kohima is the district headquarter and also the capital of Nagaland state. There are over 60 Angami villages in Kohima, and each village consists of 60 – 900 houses (Punyu 2010). Traditional religion of the Angami Naga is animistic in nature which includes belief in multiple deities. Under the influence of missionaries, majority of the Angamis have embraced Christianity and today their animistic religion remains confined to only a few Angami groups. Agriculture is the main occupation and rice is their staple food. The Angamis practice terrace cultivation on the hilly terrains where they produce rice and other minor crops. *Jhum* or slash and burn agriculture though common in the past is becoming rare today (Hutton 2003).



**Fig. 1.** Map of Kohima district showing places (encircled) where field study was undertaken (Source: Nagaland GIS and Remote Sensing Centre Planning and Co-ordination Department, Government of Nagaland).

**Collection of information and analysis of data:** Permission for field study and interview was obtained from village Chiefs. Extensive field study was conducted from March, 2014 to March, 2015 covering different villages of Angami regions, namely Kigwema, Phesama, Lerei colony, Jotsoma, Khonoma and Kohima (Fig. 1). Data collection methods like group discussions, personal interview (semi-structured) and participant observations were included in the study design. A checklist of wild edible plants used by the Angami tribes of Kohima district was prepared through group discussions. Diversity and economic value of wild edibles were recorded through frequent visits to local markets. Plant specimens were collected from wild habitats with the help of informants; a few plants were also collected from local markets. The plants were identified with the help of local floras (Balakrishnan 1981-1983; Kanjilal *et al.* 1934-1940; Bor 1940). Specimens are now retained in the Department of Life Science and Bioinformatics, Assam University, Diphu Campus. Nomenclature and family delimitation for the recorded plants were updated using online database *The Plant List* ([www.theplantlist.org](http://www.theplantlist.org)).

## RESULTS AND DISCUSSION

**Diversity of WEPs used by the Angami Nagas:** The present study documented the uses of 84 wild edible plants belonging to 68 genera under 40 families including two species of ferns namely *Diplazium esculentum* and *Pronephrium* sp. (Table 1). Fifty eight species have single use (i.e. food) while other species have uses in addition to food (e.g. medicines and animal feeds). Polygonaceae and Rosaceae represented with highest number of seven species each followed by Cucurbitaceae (6), Amaranthaceae and Lamiaceae (5 each), Leguminosae and Moraceae, (4 each), Apiaceae and Urticaceae (3 each), Araceae, Asteraceae, Brassicaceae, Dioscoreaceae, Malvaceae, Passifloraceae, Poaceae, Rutaceae and Solanaceae (2 each) and rest of the plant families are represented by one species each. Distribution of habit of the plants included herbs, shrubs, trees, climbers and arborescent

**Table 1.** Inventory of wild edible plants in Angami regions in Kohima district, Nagaland.

Scientific name [Family];Excscicatae with date	Angami Name [Tenyiedie]	Part used	Preparations	Other uses
<i>Alocasia machrorrhizos</i> (Linnaeus) G. Don [Araceae]; <i>Akoijam 604</i> , dtd. 28.03.2015		Leaves	Boiled and made chutney	
<i>Alternanthera philoxeroides</i> (Martius) Grisebach [Amaranthaceae]; <i>Akoijam 595</i> , dtd. 28.03.2015	<i>Dzüibou</i>	Shoots	Boiled	High blood pressure (BP); pig feed
<i>Amaranthus</i> sp. [Amaranthaceae]; <i>Akoijam 531</i> , dtd. 03.11.2013	<i>Liza</i>	Leaves, inflorescences	Taken raw; cooked with bamboo shoots, garlic, tomato, dry fish, dry meat and <i>axoni</i> (fermented product of soyabean)	High BP
<i>Amaranthus spinosus</i> Linnaeus [Amaranthaceae]; <i>Akoijam 622</i> , dtd. 24.04.2015	<i>Nietso, Nyiedza</i>	Leaves	Taken raw; cooked with bamboo shoots, garlic, tomato, dry fish, dry meat and <i>axoni</i>	
<i>Amaranthus viridis</i> Linnaeus [Amaranthaceae]; <i>Akoijam 513</i> , dtd. 22.09.2013	<i>Tierhü tiepfü</i>	Shoots	Fried or boiled	
<i>Asparagus racemosus</i> Willdnow [Asparagaceae]; <i>Akoijam 585</i> , dtd. 27.08.2015	<i>Sieprü, seihu, zeiprü</i>	Shoots	Boiled with rice or with chilies, salt, garlic, tomatoes and dry fish	High BP
<i>Bambusa</i> sp. [Poaceae]; <i>Akoijam 596</i> , dtd. 28.03.2015	<i>Kesie, khoprei</i>	Young shoots	Taken in chutney; cooked with pork or boiled with salt and fermented fish	
<i>Bauhinia variegata</i> Linnaeus [Leguminosae]; <i>Akoijam 561</i> , dtd. 25.03.2015	<i>Teguo</i>	Flowers	Boiled with potatoes	
<i>Brassaiopsis</i> sp. [Araliaceae]; <i>Akoijam 543</i> , dtd. 24.04.2015	<i>Zhiedinyü</i>	Young leaves	Boiled with potato and dry meat	
<i>Brassica</i> sp. [Brassicaceae]; <i>Akoijam 505</i> , dtd. 22.09.2013	<i>Saprega</i>	Leaves, stems	Boiled or cooked with rice to prepare <i>Galho</i>	
<i>Cardamine hirsuta</i> Linnaeus [Brassicaceae]; <i>Akoijam 508</i> , dtd. 22.09.2013	<i>Shüguga, Seguoga</i>	Shoots	Boiled with chilies and ginger	
<i>Centella asiatica</i> (Linnaeus) I. Urban [Apiaceae]; <i>Akoijam 599</i> , dtd. 28.03.2015	<i>Gara, Gharie</i>	Whole plants	Taken raw; boiled with rice to prepare <i>Galho</i>	Indigestion, insomnia
<i>Chenopodium album</i> Linnaeus [Amaranthaceae]; <i>Akoijam 619</i> , dtd. 23.04.2015	<i>Therhie, Tierhietiepfü</i>	Leaves	Fried or boiled with potato and dry fish, beef, pork	
<i>Clerodendrum</i> sp. [Lamiaceae]; <i>Akoijam 553</i> , dtd. 08.12.2014	<i>Gathare</i>	Young leaves	Boiled	
<i>Coix lacryma-jobi</i> Linnaeus [Poaceae]; <i>Akoijam 518</i> , dtd. 22.09.2013	<i>Keshi</i>	Leaves, seeds	Boiled	Urinary and kidney problems
<i>Colocasia esculanta</i> (Linnaeus) Schott [Araceae]; <i>Akoijam 593</i> , dtd. 28.03.2015	<i>Dzüiboun</i>	Corm, leaves	Roasted, fried or boiled with dry fish or dry meat or <i>axoni</i> ; boiled and smashed to make chutney	
<i>Curcuma angustifolia</i> Roxburgh [Zingiberaceae]; <i>Akoijam 520</i> , dtd. 22.09.2013	<i>Hutuo, Chiecie</i>	Inflorescence	Boiled with potato and dry meat	

Scientific name [Family]; Exsiccatae with date	Angami Name [Tenyiedie]	Part used	Preparations	Other uses
<i>Cucurbita maxima</i> Duchesne [Cucurbitaceae]; <i>Akoijam 594</i> , dtd. 28.03.2015	<i>Rümo</i> , <i>Rümonyü</i>	Fruits, Leaves	Roasted, boiled or fried with spices	
<i>Debregeasia longifolia</i> (Burman f.) Weddell [Urticaceae]; <i>Akoijam 610</i> , dtd. 10.01.2014	<i>Züdou</i> , <i>Tsunyu</i>	Fruits	Fruits are eaten	
<i>Diplazium esculentum</i> (Retzius) Swartz [Athyriaceae]; <i>Akoijam 552</i> , dtd. 08.12.2014	<i>Gachüloü</i>	Leaves	Cooked with potatoes, dry fish or dry-meat, Bamboo shoots and <i>axoni</i>	
<i>Dioscorea bulbifera</i> Linnaeus [Dioscoreaceae]; <i>Akoijam 616</i> , dtd. 24.04.2015	<i>Ruphie</i> , <i>Ciephodzü</i>	Tubers	Boiled	
<i>Dioscorea pentaphylla</i> Linnaeus [Dioscoreaceae]; <i>Akoijam 617</i> , dtd. 24.04.2015	<i>Ciephodzü</i>	Tubers	Boiled	
<i>Docynia indica</i> (Wallich) Decaisne [Rosaceae]; <i>Akoijam 537</i> , dtd. 04.08.2014	<i>Tsiepho</i> , <i>Nhaciepho</i> , <i>Ciepho</i>	Fruits	Dried or made slice the fruits, add sugar and dried it	Diarrhea
<i>Dolichos lablab</i> Linnaeus [Leguminosae]; <i>Akoijam 587</i> , dtd. 27.03.2015	<i>Kecü</i>	Pods, seeds	Boiled	
<i>Elaeagnus conferta</i> Roxburgh [Elaeagnaceae]; <i>Akoijam 605</i> , dtd. 03.04.2015	<i>Pecüsi</i>	Fruits	Raw ripe fruits eaten	
<i>Elatostema lineolatum</i> Wight [Urticaceae]; <i>Akoijam 620</i> , dtd. 24.04.2015	<i>Jothü</i> , <i>gazo</i>	Leaves	Boiled with rice to prepare <i>Galho</i>	
<i>Elatostema</i> sp. [Urticaceae]; <i>Akoijam 547</i> , dtd. 28.03.2015	<i>Gadzo</i> , <i>gazo</i>	Leaves	Boiled with rice to prepare <i>Galho</i>	
<i>Elsholtzia blanda</i> (Bentham) Bentham [Lamiaceae]; <i>Akoijam 592</i> , dtd. 28.03.2015	<i>Neihü</i> , <i>neipfü</i> , <i>rünou</i>	Young shoot, leaves, inflorescence	Used in chutney or cooked with chilies and tomatoes	Kidney and urinary disorder, cold, cough, high BP headache,
<i>Eryngium foetidum</i> Linnaeus [Apiaceae]; <i>Akoijam 598</i> , dtd. 28.03.2015	<i>Dunia</i>	Shoots	Boiled or added to curries and chutney	
<i>Fagopyrum esculentum</i> Moench [Polygonaceae]; <i>Akoijam 509</i> , dtd. 22.09.2013	<i>Garei</i>	Young shoots, leaves	Boiled or cooked with meat and potatoes; cooked with rice to make <i>Galho</i>	Pig feed
<i>Ficus auriculata</i> Loureiro [Moraceae]; <i>Akoijam 611</i> , dtd. 25.03.2015	<i>Khrabvü</i> , <i>Chiede</i> , <i>Habanü</i>	Fruits, leaves	Cooked with rice to make <i>Galho</i>	
<i>Ficus prostrata</i> (Wallich ex Miquel) Buchanan-Hamilton ex Miquel [Moraceae]; <i>Akoijam 612</i> , dtd. 20.10.2014	<i>Chiede</i>	Fruits	Ripe fruits eaten raw	
<i>Ficus semicordata</i> Buchanan-Hamilton ex Smith [Moraceae]; <i>Akoijam 578</i> , dtd. 24.03.2015	<i>Thotsenuo</i>	Fruits	Ripe fruits eaten raw	Diabetes
<i>Fragaria</i> sp. [Rosaceae]; <i>Akoijam 600</i> , dtd. 28.03.2015		Fruits	Ripe fruits eaten raw	
<i>Gynura nepalensis</i> de Candolle [Asteraceae]; <i>Akoijam 504</i> , dtd. 22.09.2013	<i>Lezino</i> , <i>Lizienuo</i>	Leaves, stem	Boiled or cooked with rice to prepare <i>Galho</i> ; also taken raw	Gastric, liver problem, high BP

Scientific name [Family];Exsiccatae with date	Angami Name [Tenyiedie]	Part used	Preparations	Other uses
<i>Hibiscus cannabinus</i> Linnaeus [Malvaceae]; <i>Akoijam 613</i> , dtd. 03.04.2015	<i>Gakhro</i>	Leaves	Boiled; cooked with rice to make <i>Galho</i> or cooked with meat	
<i>Hibiscus sabbarififfa</i> Linnaeus [Malvaceae]; <i>Akoijam 525</i> , dtd. 22.09.2013	<i>Gakhro, Gakhruo</i>	Leaves, inflorescences	Boiled; cooked with rice to make <i>Galho</i> or cooked with meat	
<i>Houttuynia cordata</i> Thunberg [Saururaceae]; <i>Akoijam 512</i> , dtd. 22.09.2013	<i>Gathaii, Gatha</i>	Whole plant	Taken in chutney or raw	Blood purifier
<i>Impatiens arguta</i> Hook. f. & Thomson [Balsaminaceae]; <i>Akoijam 515</i> , dtd. 22.09.2013	<i>Gaii</i>	Tender leaves	Boiled or cooked with meat and <i>axoni</i>	
<i>Ipomoea batatas</i> (Linnaeus) Lamarck [Convolvulaceae]; <i>Akoijam 519</i> , dtd. 22.09.2013	<i>Dzümü, Dzümou, Phimu</i>	Leaves, roots	Boiled	Pig feed
<i>Leucosceptrum canum</i> Smith [Lamiaceae]; <i>Akoijam 583</i> , dtd. 27.03.2015	<i>Teizü</i>	Flowers	Boiled	
<i>Luffa cylindrica</i> (Linnaeus) Roemer [Cucurbitaceae]; <i>Akoijam 601</i> , dtd. 28.03.2015	<i>Pfhushü, Mepfü</i>	Fruits	Boiled with dry meat, fish, potatoes and <i>axoni</i>	
<i>Lycopersicon esculentum</i> Miller [Solanaceae]; <i>Akoijam 577</i> , dtd. 24.03.2015	<i>Bengenuo, bienyieno</i>	Fruits	Boiled with tomatoes, dry meat or dry fish	
<i>Manihot esculenta</i> Crantz [Euphorbiaceae]; <i>Akoijam 614</i> , dtd. 03.04.2015	<i>Seidzümou, Seiphimu</i>	Leaves, roots	Boiled; also make chips and fried	Pig feed
<i>Mahonia pycnophylla</i> (Fedde) Takeda [Berberidaceae]; <i>Akoijam 591</i> , dtd. 28.03.2015	<i>Nthuo</i>	Fruits	Ripe fruits eaten raw	
<i>Maesa indica</i> (Roxburgh) de Candolle [Myrsinaceae]; <i>Akoijam 590</i> , dtd. 28.03.2015	<i>Kourhie</i>	Fruits	Ripe fruits eaten raw	Body lotion or shampoo; cooling head
<i>Melastoma malabathricum</i> Linnaeus [Melastomataceae]; <i>Akoijam 558</i> , dtd. 04.08.2014		Fruits	Ripe fruits eaten raw	
<i>Mentha spicata</i> Linnaeus [Lamiaceae]; <i>Akoijam 597</i> , dtd. 28.03.2015	<i>Mayinha</i>	Leaves, young shoots	Taken raw or in chutneys; boiled with potatoes, tomatoes, dry fish and <i>axoni</i>	
<i>Momordica balsamina</i> Linnaeus [Cucurbitaceae]; <i>Akoijam 572</i> , dtd. 25.03.2015	<i>Kariela</i>	Fruits	Boiled with dry meat, potatoes and <i>axoni</i> ; also fried	
<i>Momordica charantia</i> Linnaeus [Cucurbitaceae]; <i>Akoijam 573</i> , dtd. 25.03.2015	<i>Keriela</i>	Fruits	Boiled with dry meat, potatoes and <i>axoni</i> ; also fried	
<i>Momordica foetida</i> Schumacher [Cucurbitaceae]; <i>Akoijam 607</i> , dtd. 03.04.2015	<i>Keriela</i>	Fruits	Boiled with dry meat, potatoes and <i>axoni</i> ; also fried	
<i>Morus alba</i> Linnaeus [Moraceae]; <i>Akoijam 581</i> , dtd. 27.03.2015	<i>Khravü</i>	Fruits	Ripe fruits eaten raw	
<i>Ocimum tenuiflorum</i> Linnaeus [Lamiaceae]; <i>Akoijam 517</i> , dtd. 22.09.2013	<i>Nieco, Nietso</i>	Leaves, flowers	Added in curry	Fever, high BP, headache, skin disease,

Scientific name [Family];Exsiccatae with date	Angami Name [Tenyiedie]	Part used	Preparations	Other uses
<i>Oenanthe javanica</i> (Blume) de Candolle [Apiaceae]; <i>Akoijam</i> 507, dtd. 22.09.2013	<i>Gakra</i>	Leaves	Boiled or cooked with rice to prepare <i>Galho</i> ; cooked with dry meat and <i>axoni</i>	Jaundice, low BP, body wash
<i>Oroxylum indicum</i> (Linnaeus) Kurz [Bignoniaceae]; <i>Akoijam</i> 621, dtd. 24.04.2015	<i>Zaprei</i>	Young shoots, Flower, tender pods	As vegetable; and taken in chutney	
<i>Parkia timoriana</i> (de Candolle) Merrill [Leguminosae]; <i>Akoijam</i> 574, dtd. 25.03.2015	<i>Miakri-rucü, Kuinyümero</i>	Pods, seeds	Taken in chutney	
<i>Passiflora edulis</i> John Sims [Passifloraceae]; <i>Akoijam</i> 580, dtd. 24.03.2015	<i>Beal, Bel</i>	Leaves, young shoots, fruits	Boiled	Blood circulation, dizziness
<i>Passiflora subpeltata</i> Ortega [Passifloraceae]; <i>Akoijam</i> 555, dtd. 04.08.2014	<i>Wild beal, bel</i>	Fruits	Ripe fruits eaten raw	
<i>Persicaria chinensis</i> (Linnaeus) H. Gross [Polygonaceae]; <i>Akoijam</i> 529, dtd. 22.09.2013	<i>Garie</i>	Leaves of tip portion of shoot	Boiled or cooked with potatoes, dal, dry fish, dry meat and <i>axoni</i>	
<i>Persicaria nepalensis</i> (Meissner) Miyabe [Polygonaceae]; <i>Akoijam</i> 516, dtd. 22.09.2013	<i>Prüzie</i>	Leaves of tip portion of the shoots	Boiled or cooked with meat and <i>axoni</i>	
<i>Phlogacanthus</i> sp. [Acanthaceae]; <i>Akoijam</i> 570, dtd. 25.03.2015	<i>Chibinoga</i>	Leaves	Boiled or cooked with rice to make <i>Galho</i>	
<i>Phyllanthus emblica</i> Linnaeus [Phyllanthaceae]; <i>Akoijam</i> 602, dtd. 28.03.2015	<i>Tsiehusi, Ciehu</i>	Fruits	Dried or boiled to make prickles	Hair lotion
<i>Piper</i> sp. [Piperaceae]; <i>Akoijam</i> 569, dtd. 25.03.2015	<i>Kusada, khuchiünya</i>	Leaves	Boiled or cooked with rice to make <i>Galho</i>	
<i>Plantago asiatica</i> subsp. <i>erosa</i> (Wallich) Z. Yu Li [Plantaginaceae]; <i>Akoijam</i> 506, dtd. 22.09.2013	<i>Gapa, Gakra</i>	Leaves, stems	Boiled or cooked; also cooked with rice to make <i>gapa Galho</i>	Diarrhea, diabetes
<i>Polygonum molle</i> D. Don [Polygonaceae]; <i>Akoijam</i> 514, dtd. 22.09.2013	<i>Gazie</i>	Leaves, shoots	Taken raw or in chutney; also boiled or cooked with meat	Pig feed
<i>Polygonum</i> sp. [Polygonaceae]; <i>Akoijam</i> 530, dtd. 22.09.2013	<i>Garie</i>	Leaves	Boiled or cooked with meat, potatoes, pulses and dry fish	
<i>Polygonum</i> sp. [Polygonaceae]; <i>Akoijam</i> 511, dtd. 22.09.2013	<i>Tsüziegare</i>	Leaves	Boiled or cooked with meat, potatoes, chilis and dry fish	
<i>Pronephrium</i> sp. [Thelypteridiaceae]; <i>Akoijam</i> 550, dtd. 04.01.2015	<i>Sucheikomo</i>	Leaves	Cooked with rice to prepare <i>Galho</i> ; makes rice less sticky in <i>Galho</i>	
<i>Prunus cerasoides</i> Buchanan-Hamilton ex D. Don [Rosaceae]; <i>Akoijam</i> 566, dtd. 26.03.2015	<i>Rüzia</i>	Fruits	Ripe fruits eaten raw	Anthelmintic
<i>Prunus persica</i> (Linnaeus) Batsch [Rosaceae]; <i>Akoijam</i> 576, dtd. 24.03.2015	<i>Mekrütsiehu</i>	Fruits	Ripe fruits eaten raw	
<i>Pyrus pashia</i> Buchanan-Hamilton ex D. Don [Rosaceae]; <i>Akoijam</i> 502, dtd. 21.09.2013		Fruits	Ripe fruits eaten raw	

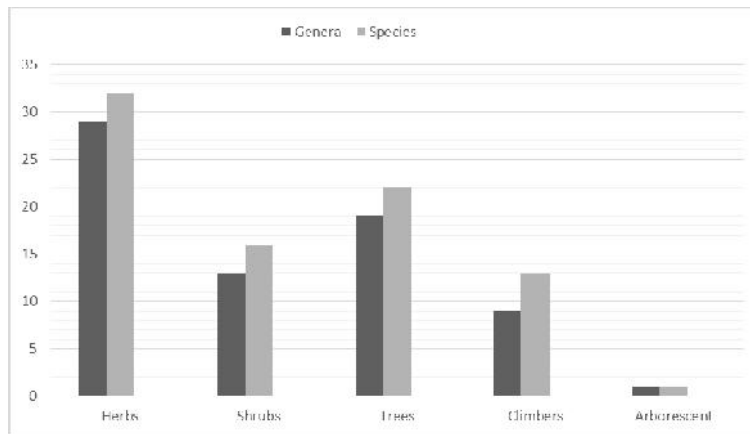
Scientific name [Family]; Exsiccatae with date	Angami Name [Tenyiedie]	Part used	Preparations	Other uses
<i>Rhus chinensis</i> Miller [Anacardiaceae]; <i>Akoijam</i> 584, dtd. 27.03.2015	<i>Zomhou</i>	Fruits, seeds	Added to several curries, mostly meat curry to improve digestion; taken raw; seeds are boiled with salt and drink the soup	Indigestion, dysentery, dry skin, food poisoning, allergy, dandruff
<i>Rubus ellipticus</i> J.E. Smith [Rosaceae]; <i>Akoijam</i> 582, dtd. 27.03.2015	<i>Ruomvü</i>	Fruits	Ripe fruits eaten raw	
<i>Rubus idaeus</i> Linnaeus [Rosaceae]; <i>Akoijam</i> 588, dtd. 28.03.2015	<i>Mvütie</i>	Fruits	Ripe fruits eaten raw	
<i>Rumex nepalensis</i> Sprengel [Polygonaceae]; <i>Akoijam</i> 545, dtd. 25.03.2015	<i>Merhügakre</i>	Leaves	Plane boiled and boiled with dry fish, potatoes and chilies	
<i>Saurauia</i> sp. [Actinidiaceae]; <i>Akoijam</i> 567, dtd. 25.03.2015	<i>Gaphenhe</i>	Leaves	Boiled	
<i>Sechium edule</i> (Jacquin) Swartz [Cucurbitaceae]; <i>Akoijam</i> 503, dtd. 22.09.2013	<i>Bisüku</i>	Tender shoots, fruits	Boiled	
<i>Solanum anguivi</i> Lamarck [Solanaceae]; <i>Akoijam</i> 535, dtd. 04.08.2014	<i>Ciepfhü</i>	Fruits	Boiled	
<i>Spilanthes acmella</i> (Linnaeus) Linnaeus [Asteraceae]; <i>Akoijam</i> 510, dtd. 22.09.2013	<i>Kavega</i>	Leaves, stems	Fried or boiled	Toothache, stomach worms
<i>Stachytarpheta jamaicensis</i> (Linnaeus) Vahl [Verbenaceae]; <i>Akoijam</i> 615, dtd. 10.01.2015		Leaves, young shoots	Boiled with rice to prepare <i>Galho</i> or plane boiled	Gastric; pig feed
<i>Tamarindus indica</i> Linnaeus [Leguminosae]; <i>Akoijam</i> 565, dtd. 25.03.2015	<i>Keteltenga</i>	Fruits	Made into pickle	
<i>Zanthoxylum armatum</i> de Candolle [Rutaceae]; <i>Akoijam</i> 618, dtd. 24.04.2015	<i>Ganya</i>	Leaves, fruits	Boiled or cooked with meat potatoes; seeds taken in chutneys	Constipation, fever, skin disease
<i>Zanthoxylum rhetsa</i> (Roxburgh) de Candolle [Rutaceae]; <i>Akoijam</i> 557, dtd. 23.04.2015	<i>Ganya</i>	Leaves	Boiled or cooked with potatoes and meat; seeds taken raw	
<i>Ziziphus jujuba</i> Miller [Rhamnaceae]; <i>Akoijam</i> 563, dtd. 25.03.2015		Fruits	Ripe fruits eaten raw	

species of Bamboo (Fig. 2). Notable medicinal species are *Coix lacryma-jobi* (urinary problems), *Elsholtzia blanda* (kidney & urinary bladder disorder, cold, cough, headache), *Ficus semicordata* (diabetes), *Gynura nepalensis* (gastric problems), *Houttuynia cordata* (blood purifier), *Spilanthes acmella* (tooth ache, stomach worm).

Almost all parts of plants are consumed such as leaves, stems, tubers, young shoots, roots, rhizomes, inflorescences, flowers, fruits and seeds. There is amazing diversity of culinary knowledge among the Angamis but consumption of fried foods is very rare. Most plants are eaten boiled and a few species are taken raw. Other methods of food preparation include roasting, baking and drying. Fermented foods are common, the most popular being *dacie/dzacie/axoni*, which is a fermented product of soyabean. Meat is revered delicacy; it is cooked alone or with plants like *Amaranthus* sp., bamboo shoot, *Brassaiopsis* sp.,



*Chenopodium album*, *Colocasia esculenta*, *Curcuma angustifolia*, *Fagopyrum esculentum*, *Hibiscus sabdariffa*, *Oenanthe stolonifera*, *Persicaria chinensis*, *Polygonum molle*, *Zanthoxylum armatum* and *Zanthoxylum rhetsa*.



**Fig. 2:** Distribution of habit groups of WEPs used by the Angami Nagas of Kohima district of Nagaland.

### Role of WEPs in livelihoods:

Besides food, WEPs are potential sources of cash income for many poor Angami families. Primary collectors of WEPs are rural villagers but collection is mainly done by men. So, men are expected to have good knowledge about the distribution of plants, seasons of availability and methods of extraction. Many villagers collect seasonal wild foods from forests and other habitats and sell them in whole sale to the retailers in markets. Some of the villagers directly sell their collections in markets at the same rate as that of retailers. Most of the Angami vendors have permanent seats in the vegetable markets but many poor villagers who come from other neighbouring districts sell WEPs on foot paths or road sides in the main town of Kohima. Wild plants are often costlier than the farm products as many people still prefer to eat wild foods for the obvious reason of being organic and palatability. Following are some of the most preferred wild edible plants sold in local markets of Kohima- *Alternanthera philoxeroides*, *Amaranthus* sp., *Bambusa* sp., *Cardamine hirsuta*, *Centella asiatica*, *Clerodendrum* sp., *Colocasia esculenta*, *Cucurbita maxima*, *Diplazium esculentum*, *Elsholtzia blanda*, *Hibiscus sabdariffa*, *Houttuynia cordata*, *Oenanthe stolonifera*, *Parkia timoriana*, *Passiflora edulis* and *Plantago asiatica* subsp. *erosa*.

### Management of WEPs:

Due to population pressure wild plant resources are over exploited and many new forest areas are under rapid encroachment for human settlements. No specific management practice was observed among the Angamis for the conservation of biodiversity. But, their traditions, religious beliefs and use patterns of plant resources have elements of sustainability. The Angami tribe observes many restrictions on plant use through taboos or *gennas* (Angami *kenna*: forbidden or prohibited), folklores and superstitions. These restrictions indirectly contribute towards conservation of indigenous floras of Angami regions. Unfortunately such traditional practices are lacking among the modern Angamis particularly due to acculturation. A few examples of such Angami *kennas* are enumerated below:

- (i) It is forbidden to burn wood of trees used for construction of houses. The underlying belief for this *kenna* is that, it will make the timber of houses more liable to conflagration. This *kenna* leads to the preservation of the building materials from waste (Hutton 2003).
- (ii) Use of the tree *hetho* (*Erythrina fulgens*) as firewood is *kenna* because wood of the plant is used for making statues of unrecovered corpses who died during war (Hutton 2003).
- (iii) Angamis also observe a superstitious belief of not planting a prickly shrub (i.e. *Euphorbia antiquorum*) as hedge because cutting or touching the plant is said to cause storm or cause stomachache when someone at a distance is abusing his properties (Hutton 2003).
- (iv) One Angami folklore depicts the fig tree as the chief priest of the trees; so fig is considered sacred its felling or cutting is forbidden (Hutton 2003).

The ancestral practice of alder (*Alnus nepalensis*) based *jhum* cultivation in Khonoma village of Kohima district provides the source of livelihoods and timbers and firewood for the people living there. Alder trees are cultivated in *jhum* fields for maintaining the soil fertility. People usually cut alder trees (*Alnus nepalensis*) at a height of around 2.0 – 2.4 m for timbers and firewood and leave the trunks for a few years till many new coppices sprout from those. These new coppices developed provide firewood for the villagers (Cairns 2007). This is a very important ancestral practice that will help to reduce pressure on forests for firewood.

It has been observed that both social organizations and Government Departments like Forest Department made efforts for management of WEPs. There are many social organizations in the Angami regions such as Angami Public Organization (APO, the largest organization), Angami Youth Organization (AYO) and Angami Student Union (ASU). Each Angami village has these three organizations and each of these organizations is under the control of a *Gaon Bura*, who is the village Chief. And all the village chiefs are again under the control of Deputy Commissioner of Kohima district. Any suggestion for the conservation will be discussed with the concerned village Chiefs along with its council representatives comprising of six members, where decision will be taken for its implementation. One such efforts of the social organization for conserving biodiversity is the setting up of Biodiversity Reserved Area in Kigwema village of Kohima district. Several restrictions have been imposed in the area like poaching, cutting of timbers, hunting, collection of fire woods and burning. Moreover, villagers are also restricted from collection of wild edible plants for commercial purposes. Prompt actions are taken against the defaulters as per resolutions of village committee. Further, many other villages established protected area by putting restrictions on overexploitation of forest products. Efforts of social organizations have been effective in protecting biodiversity at village level.

## CONCLUSION

The present communication is the first systematic study on wild edible plants used by the Angami tribe of Kohima District of Nagaland. Wild plants are integral part their food basket and also indispensable for the continuation of socio-cultural traditions and food systems. Wild edible plants are also important resource for livelihoods for many poor Angami families. But, the Angami food systems have undergone changes under the influence of modern food culture. Though the Angamis practice no specific method of conservation, their traditions,

beliefs and the pattern of utilizing wild plants have important elements of sustainability. There is a need to bring up strategies for sustainable use of wild edible resources and conservation of potential habitats in the Angami regions. Capitalizing on wild edibles can augment food production and bring local development but a balance between extraction and conservation is the key for sustainability.

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