

## Diversity of ethnobotanically significant angiospermic weeds in Siang Belt of Arunachal Himalayan Region in India

Momang Taram<sup>1</sup>, Rubu Rinyo<sup>1</sup>, Lemmem Gammi<sup>1</sup>, Kenba Yanggi<sup>1</sup>, Atek Nangkar<sup>1</sup>, Pallabi K. Hui<sup>2</sup>, Sanjay Jambhulkar<sup>3</sup> and Hui Tag<sup>1,4</sup>

<sup>1</sup>Plant Systematics and Ethnobotanical Research Laboratory, Department of Botany, Rajiv Gandhi University, Rono Hills, Doimukh- 791112, Arunachal Pradesh, India

<sup>2</sup>Department of Biotechnology, National Institute of Technology – Arunachal Pradesh, Yupia-791112, Papum Pare, Arunachal Pradesh, India

<sup>3</sup>Nuclear Agriculture & Biotechnology Division, Bhabha Atomic Research Centre, Trombay, Mumbai-400085, India

<sup>4</sup>Corresponding author; E-mail: [huitag2008rgu@gmail.com](mailto:huitag2008rgu@gmail.com)

[Received 11.11.2019; Revised & accepted 22.12.2019; Published 31.12.2019]

### Abstract

With objective to investigate the diversity of ethnobotanically significant angiospermic weeds used among the *Adi* community in the Siang belt of Arunachal Pradesh in their traditional biocultural landscape has recorded a total of 87 weed species. Many of these are economic significant and growing luxuriantly on the roadside, wasteland, jhum land and valleys. Their uses include food, human herbal medicines, veterinary medicines, fish poisoning agent, and use in local customary rituals practices.

**Key words:** Ethnobotany; Angiosperm Weeds; Utilization, Siang Belt; Arunachal Himalaya

### INTRODUCTION

Etymologically, “weed” derives from the old English word for “grass” or “herb,” but during the middle ages the meaning has been changed to indicate an undesirable plant that grows where it is not wanted, especially along the agricultural plots (Rahman 2013). Baker (1965) defines a weed as a plant in any specific geographical area, its populations grow entirely or predominantly in situations markedly in disturbed environments, fast growing and are not always herbaceous (Zimdahl 1992). The notion of weeds as unnecessary plants was originated when man started to intentionally growing plants for food. They invade natural vegetation, usually adversely affecting native biodiversity or ecosystem functioning as well as competing with crop plants for common resources such as water, mineral nutrients, space and light (Heywood 1995; Rahman *et al.* 2011; Maroyi 2013). Some weeds produce chemical substances which are toxic to crop plants but not all the weeds are unwanted. In the rangeland areas, many annual grasses considered as weeds in crops are useful as animal feed. They also serve as food and shelter for wildlife, reduce soil erosion as good soil binders, and are useful for food and medicinal purposes (Neogi *et al.* 1989).

India has a wide range of agro-climates and soil types with highly diverse agriculture and farming systems beset with different types of weeds, which are very common, dominant and wide spread in the crop fields (Dhole *et al.* 2009; Rao & Chauhan 2015). Ethnobotanically important rare, endangered primary forest plant species can be replaced by invasive and exotic weeds, which have higher potential to survive and reproduce in stressed environment (Neogi *et al.* 1989). In the context of India and Northeast India, no systematic documentation

on weed flora are available to date. Hence, this paper aims to discuss on the diversity, distribution, ecology and economic importance of the ethnobotanically significant weed flora recorded from *Adi* inhabited Siang Belt of Arunachal Pradesh based on the ethnobotanical survey conducted during 2017 – 2019 and it is expected that this baseline taxonomic data would be useful for the management of weeds flora in Eastern Himalayan region in more productive and sustainable manner.

## MATERIALS & METHODS

### Study site and local cultural group

Ethnobotanical field study was conducted from 2017 – 2019 in the 8 villages of Siang districts, namely, *Geku, Komkar, Yingkyong, Pasighat, Mebo, Riew, Boleng* and *Kerang* which falls under tropical and subtropical climatic zones of East Siang, Upper Siang and Siang districts of Arunachal Pradesh, India. These districts are predominantly inhabited by the indigenous *Adi* tribal community living in the foot hills and the Bank of Mighty Siang River in the Eastern Himalayan region of India. The *Adi* people of Siang area still practices their age-old traditional faith and belief system called *Donyi-Polo* and practice terrace and jhum agriculture for sustenance of livelihood (Tag *et al.* 2008).

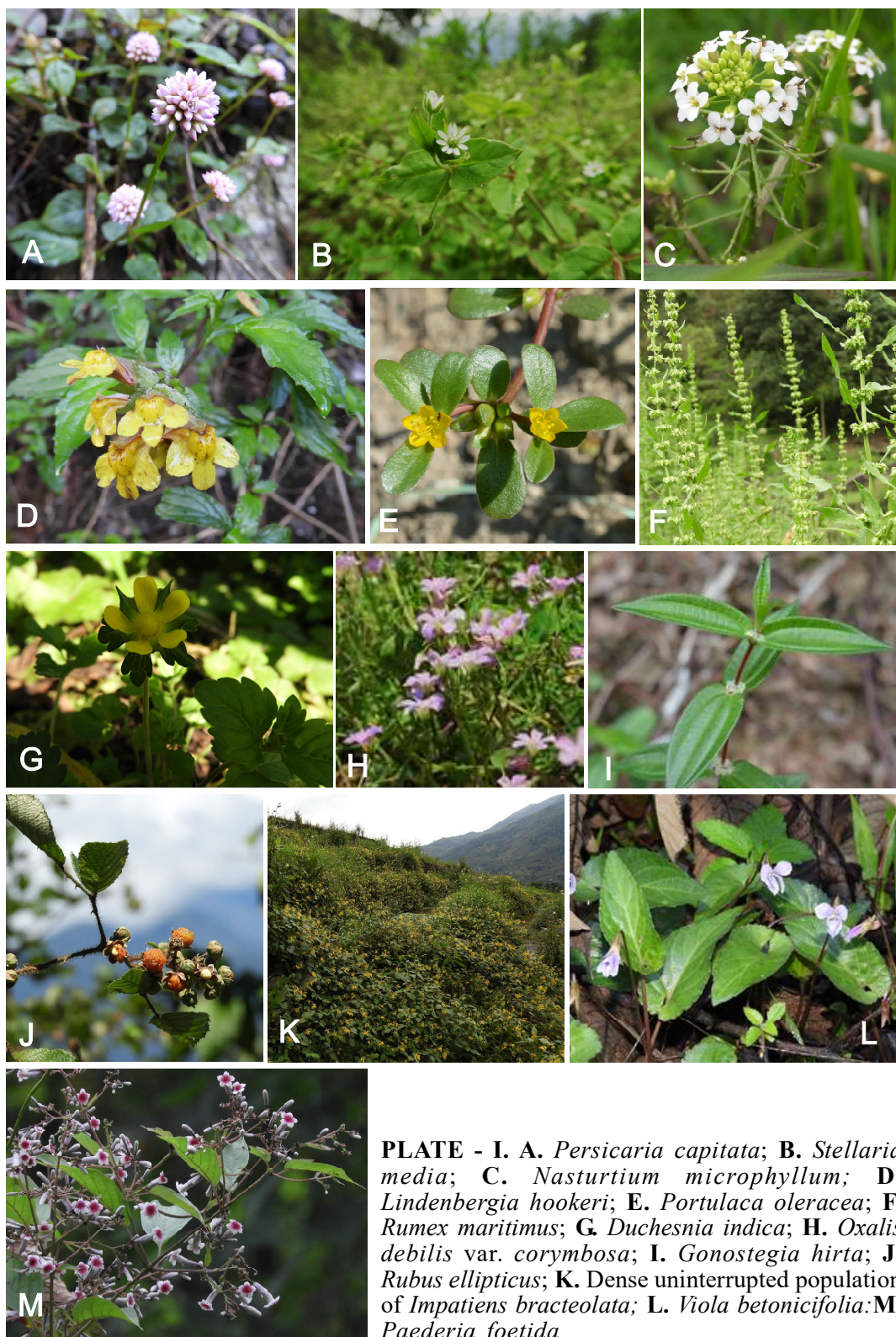
### Ethnobotanical documentation of weeds flora

A total of 100 respondents from 50 household covering 8 villages of *Adi* localities were interviewed following the method suggested by Martin (2008). Prior Inform Consent (PIC) was taken from the potential informants before start of the work. Ethnobotanical uses of weed flora encountered were recorded in the structured questionnaire format and field notebook, and live photos of each species were captured. The voucher specimens were collected, dried, mounted, labelled and preserved following the method suggested by Jain and Rao (1977). Each plant was identified using standard regional and national floras, including *Materials for the flora of Arunachal Pradesh* (Hajra *et al.* 1996; Giri *et al.* 2008; Chowdhery *et al.* 2009); *The Flora of British India* (Hooker 1872 – 1897) and e-flora of India. The accepted scientific names were verified in the website [www.theplantlist.org](http://www.theplantlist.org) hosted by Royal Botanic Garden Kew UK and Missouri Botanical Garden, St. Louis, and Plants of World Online (POWO) hosted by RBG Kew. Voucher specimens were deposited in the Herbarium of Arunachal University (HAU), Department of Botany, Rajiv Gandhi University for future consultation.

## RESULT AND DISCUSSION

### Weed species diversity and traditional uses

Present investigation has recognized 87 weed species falling under 64 genera and 31 families which belong to Angiosperms which is presented in Table 1. Majority of the species (44%) reported are having local food value while 27 % species are used as medicine, 11% species are used for other purposes, 10% species are used for fodders and only 8% of the total species reported are used for traditional customary rituals. Of the total 87 weed species reported, 42 species are exclusively used as food supplements. These species are widespread in distribution right from road side to invading jhum field, kitchen garden and wasteland in the Eastern Himalaya including the *Adi* belt of Arunachal Pradesh. The edible and ethnobotanically significant weed species reported from current study sites are: *Gynura cosimbua*, *Fagopyrum esculentum*, *Houttuynia cordata*, *Gonostegia hirta*, *Solanum americanum*, *Solanum torvum*, etc. commonly domesticated in the kitchen garden and found in wild in jhum land.



**PLATE - I.** A. *Persicaria capitata*; B. *Stellaria media*; C. *Nasturtium microphyllum*; D. *Lindenbergia hookeri*; E. *Portulaca oleracea*; F. *Rumex maritimus*; G. *Duchesnia indica*; H. *Oxalis debilis* var. *corymbosa*; I. *Gonostegia hirta*; J. *Rubus ellipticus*; K. Dense uninterrupted population of *Impatiens bracteolata*; L. *Viola betonicifolia*; M. *Paederia foetida*

**Table –1.** Checklist of ethnobotanically significant angiospermic weeds in the Siang belt of Arunachal Himalayan Region[Abbreviation used: **F** = Food; **FD** = Fodder; **FH** = Fishing; **RBC** = Rituals beliefs and customs; **VET** = Veterinary; **O** = Others; **TU** = Traditional uses]

Botanical name [Family]; Voucher specimen	Adi Names	T U	Mode of use	Endemism range	Marke- tability
<i>Actephila excelsa</i> (Dalzell) Mull. Arg. [Phyllanthaceae]; LG-134	<i>Kamtar-oying</i>	F	Tender shoots taken as vegetable	-	Yes
<i>Ageratum conyzoides</i> (L.) L. [Asteraceae]; MT-906	<i>Namsing eeing/ Migom Dumpu/ Pakkung eing/ Bongar/ Yabum</i>	M; RCB	Leaf paste applied on cuts and bruises as haemostat; leaf juice taken orally for headache and shivering; Facing of inflorescence direction signify dusk/ dawn	Tropical America and Mexico	No
<i>Ageratum houstonianum</i> Mill. [Asteraceae]; MT-908	<i>Namsing eeing/ Migom Dumpu</i>	M; RCB	Leaf paste used as haemostat on cuts and bruises; movement of inflorescence direction signifies dusk / dawn	Central America, Mexico	No
<i>Amaranthus spinosus</i> L. [Amaranthaceae]; GM-142	<i>Tapi-Pilee / Gubor</i>	F	Tender shoots taken as vegetable	Trop. America, Mexico	Yes
<i>Amaranthus viridis</i> L. [Amaranthaceae]; GM-143	<i>Tapi-pilee/ Gubor</i>	F	Tender shoots taken as vegetable	Trop. America, Mexico	Yes
<i>Ardisia solanacea</i> Roxb. [Primulaceae]; LG-122	<i>Go-yakpin</i>	F	Tender shoots taken as vegetable	Pakistan, India, Sri Lanka, SE Asia, W China	No
<i>Artemisia indica</i> Willd. [Asteraceae]; LG- 116	<i>Eetki-Daali/ fagi Rete/ Laglin</i>	M; RBC	Leaves paste taken orally stomach disorder; twigs used in funerals	East Asia, China, Japan, India	No
<i>Bidens pilosa</i> L. [Asteraceae]; GM-145	<i>Tasso-Lepyo/ Ejar</i>	F	Tender shoots taken as vegetable	America, Eurasia, Africa, Australia, Pacific Island	Yes
<i>Blumea balsamifera</i> DC. [Asteraceae]; LG-119	<i>Eyok aain/ Mine geyin</i>	M	Crushed leaves mixed with Mithun dung and freshly collected stream-water is applied on the forehead to treat malaria	Asia, China, Indo-China, Malaysia	No
<i>Brachiaria eruciformis</i> (Sm.) Griseb. [Poaceae]; MT-932	<i>Taami</i>	FD	Fodder for cattle	Mediterranean to Indo-China, Africa	No
<i>Brachiaria ramosa</i> (L.) Stapf [Poaceae]; MT-937	<i>Taami/ Tarum majit</i>	FD	Fodder for cattle	Africa, Asia	No
<i>Brachiaria reptans</i> (L.) C.A. Gardener & C.E.Hubb. [Poaceae]; MT-933	<i>Taami</i>	FD	Fodder for cattle	Arab peninsula, Afghanistan to Pacific	No
<i>Brachystemma calycinum</i> D.Don [Caryophyllaceae]; MT-912	<i>Okin-Parin</i>	F; M	Leaves are warmed after packing with <i>Phrynium pubinerve</i> leaves and then applied to cure cracked sole	SW China, Nepal	No
<i>Bryophyllum pinnatum</i> (Lam.) Oken [Crassulaceae]; MT-909	<i>Nevi nelaum, Eme kuserang</i>	M	Plant extract applied on affected body part to cure burn and inflammation; leaves eaten raw to clean stomach	S Africa, Madagascar, Asia	No
<i>Cardamine hirsuta</i> L. [Brassicaceae]; MT-917	<i>Oram-Petsik/ Loram pattu</i>	F	Whole plants edible	Europe, N Africa	No
<i>Carex baccans</i> Nees [Cyperaceae]; LG-120	<i>Gemin-Taabeng/ Tapok/ Tabeng</i>	RBC	They believe that <i>Carex baccans</i> and <i>Saccharum aruminaceum</i> came from the same ancestor so both are used together in funeral rituals	India, Sri Lanka, China	No

Botanical name [Family]; Voucher specimen	Adi Names	T U	Mode of use	Endemism range	Mark- tability
<i>Centella asiatica</i> (L.) Urb. [Apiaceae]; LG-139	<i>Kiiling Kiipum</i> , <i>Golgi- Sipum</i> , <i>Dolgi/ Jorgang</i> <i>taek</i>	M	Paste of whole plants taken orally to treat gastritis	Asia	Yes
<i>Chenopodium album</i> L. [Amaranthaceae]; LG-129	<i>Jili-Mili/ Taye</i>	F	Tender shoots taken as vegetable	Europe, Eurasia to India	Yes
<i>Chenopodium giganteum</i> D.Don [Amaranthaceae]; LG-103	<i>Amateng</i>	F	Tender shoots taken as vegetable	Himalayas to Korea	Yes
<i>Chromolaena odorata</i> (L.) R.M.King & H.Rob. [Asteraceae]; LG-126	<i>Ingkir</i>	M	Leaf -paste applied on cuts for blood clotting	America	No
<i>Crassocephalum crepidioides</i> (Benth.) S.Moore [Asteraceae]; LG- 115	<i>Eeli/ Jogen/ Telimbabo/ Gendeh</i>	F	Tender shoots taken as vegetable	Africa	Yes
<i>Cynodon dactylon</i> (L.) Pers. [Poaceae]; MT-936	<i>Taami / Tarum majut</i>	FD	Fodder for cattle	E Africa, Australia	No
<i>Dinebra retroflexa</i> (Vahl) Panz. [Poaceae]; MT-934	<i>Taami</i>	FD	Fodder for cattle	Africa	No
<i>Drymaria cordata</i> (L.) Willd. ex Schult. [Caryophyllaceae]; MT- 929	<i>Pipi, Perok taiter/ Kumting karlor</i>	M	Paste of whole plant used locally to cure ringworm	Mexico, West Indies, S Africa, C & S America	No
<i>Duchesnea indica</i> (Jacks.) Focke [Rosaceae]; LG 118	<i>Eki-Tangkin/ Pamik taang</i>	F	Ripe fruits edible (watery)	E & S Asia, Afghanistan to Russian Far East, Malaysia	No
<i>Eclipta prostrata</i> (L.) L. [Asteraceae]; LG-137	<i>Keharaj/ Donyi Hangkang</i>	M	Plant decoction taken orally to cure dysentery	America ,India, Nepal, China, Thailand, Brazil	No
<i>Eragrostis minor</i> Host [Poaceae]; MT-935	<i>Taami</i>	FD	Fodder for cattle	Eurasia, Africa	No
<i>Erigeron canadensis</i> L. [Asteraceae]; LG-127	<i>Ingkobodong/ Eedong</i>	F	Tender shoots taken as vegetable	N & C America	No
<i>Euphorbia hirta</i> L. [Euphorbiaceae]; MT-902	<i>Korek oying</i>	FD; M	Whole plant used as pig- fodder; leaves taken orally against flies	Trop. America	No
<i>Fagopyrum esculentum</i> Moench [Polygonaceae]	<i>Okung, Lompuk</i>	F	Tender shoot taken as vegetable	Native to C & N Asia	Yes
<i>Gnaphalium polycaulon</i> Pers. [Asteraceae]; MT-923	<i>Paaput</i>	F	Leaves edible	Mesoamerica, S America, West Indies	No
<i>Gynura cusimbua</i> (D.Don) S.Moore [Asteraceae]; MT-910	<i>Ogen</i>	F	Leaves edible	China, Tibet, India, Myanmar, Nepal, Thailand, Bangladesh, Bhutan	Yes
<i>Houttuynia cordata</i> Thunb. [Saururaceae]; MT-930	<i>Roram</i>	F; M	Whole plant made into chutney; use in stomachache	SE Asia	Yes
<i>Hydrocotyle javanica</i> Thunb. [Araliaceae]; LG-140	<i>Kiling-Kiipum</i>	O	Whole plants used to stupefy fishes	NE India, SE Asia, Fiji	No
<i>Impatiens bracteolata</i> Hook.f. [Balsaminaceae]; MT-907	<i>Nanor -Tangkor</i>	F	Tender shoots edible	E. Himalaya to Myanmar.	No
<i>Laphangium affine</i> (D.Don) Tzvelev [Asteraceae]; MT-922	<i>Paaput</i>	F	Leaves edible	Temperate region of China, Korea, Japan, Taiwan, high altitude tropical region of India , Nepal, Thailand	

Botanical name [Family]; Voucher specimen	Adi Names	T U	Mode of use	Endemism range	Marke- tability
<i>Leucas aspera</i> (Willd.) Link [Lamiaceae]; LG-117	<i>Eki sipak</i>	M	Leaf-paste used externally on nose to cure sinus problems	India, Mauritius, Philippines, Java	No
<i>Lindenbergia hookeri</i> C.B.Clarke ex Hook.f. [Orobanchaceae]; MT-925	<i>Pepit namdung</i>	F	Flowers are edible (sour)	E. Himalaya	No
<i>Melastoma malabathricum</i> L. [Melastomataceae]; LG-136	<i>Kasii Rai/ Joger</i>	F; RBC	Fruits edible; its blooming signals that the high time for paddy-seeds broadcasting	Indo-Malaya, Japan, Australia	No
<i>Mikania micrantha</i> Kunth [Asteraceae]; LG-114	<i>Eeli/ Eeing mamang</i>	M	Leave used to cure stomachache and dysentery	Subtrop. N, C & S America	No
<i>Murdannia nudiflora</i> (L.) Brenan [Commelinaceae]; LG- 124	<i>Hodog/ Golgi/ Gorgi roksok</i>	RBC	flowering of the plant signals villagers that it is time to broadcast paddy- seeds; the plant is grown in field as demarcation line	Trop. & subtrop. Asia	No
<i>Nasturtium microphyllum</i> (Boenn.) Rchb. [Brassicaceae]; MT-919	<i>Orgyam/ Patang oying</i>	F	Leaves edible	Middle-east, parts of N Africa, Europe	Yes
<i>Oenanthe javanica</i> (Blume) DC. [Apiaceae]; LG-101	-	F	Tender shoots served as vegetable	Temp. Asia, Trop. Asia, Queensland, Australia	Yes
<i>Oxalis corniculata</i> L. [Oxalidaceae]; MT-926	<i>Piiag-Hiyu, Piak lip</i>	M	Fruit-juice used to cure eye infection	S America	No
<i>Oxalis debilis</i> var. <i>corymbosa</i> (DC.) Lourteig [Oxalidaceae]; MT-927	<i>Piiag-Hiyub, Piak lip</i>	F	Flowers and rhizome edible	C America to Guyana, Paraguay	No
<i>Paederia foetida</i> L. [Rubiaceae] ; GM-146	<i>Yape Taari/ Riki Ringkom/ Yepe ribung</i>	M	Leaves taken orally to cure gastritis	Temp. & trop. Asia	No
<i>Persicaria barbata</i> (L.) H.Hara [Polygonaceae]; LG-107	<i>Diko-Taamu</i>	O	Crushed plants used to stupefy fish	India, Myanmar, China, Pegu	No
<i>Persicaria capitata</i> (Buch.-Ham. ex D.Don) H.Gross [Polygonaceae]; LG-104	<i>Babing-kaling, Mijing kaling, Tasum momi/ Kibu nanung</i>	F	Ripe fruits edible	Asia	Yes
<i>Persicaria chinensis</i> (L.) H. Gross [Polygonaceae]; LG-102	<i>Babing-kaling, Mijing kaling, Tasum momi/ Kibu nanung</i>	O	Crushed plants used to wash hands in the field; plant-paste applied on cuts and wound	Native to trop. to temp. Asia	No
<i>Persicaria hydropiper</i> (L.) Delarbre [Polygonaceae]; LG- 108	<i>Diko-Taamu/ eeing killing</i>	O	Crushed leaves used to stupefy fishes	Australia, New Zealand, temp. Asia, Europe, N America, Africa	No
<i>Persicaria nepalensis</i> (Meisn.) H.Gross [Polygonaceae]; LG- 105	<i>Babing-kaling, Mijing kaling, Tasum momi/ Rungkung</i>	O	Crushed plant used to wash hands in the field	E Africa, including Madagascar, parts of Asia	No
<i>Phyllanthus amarus</i> Schumach. &Thonn. [Phyllanthaceae]; MT- 901	<i>Kobelang/ Eeyup</i>	M	Plant-paste taken orally against jaundice	Mexico to Trop. America.	No
<i>Physalis minima</i> L. [Solanaceae]; LG 131	<i>Jojing belang</i>	F	Ripe fruits edible	Trop. & Subtrop. America	No
<i>Pilea insolens</i> Wedd. [Urticaceae]; MT-940	<i>Tango-Lisak</i>	F	Leaves used in fermentation of <i>Perilla</i> <i>ocymoides</i> seeds	S-E Xizang, China, Bhutan, N India, Nepal	No
<i>Pilea umbrosa</i> Wedd. ex Blume [Urticaceae]; MT-915	<i>Oko-Robo</i>	F	Tender shoots edible	Pakistan, China, N Vietnam	No

Botanical name [Family]; Voucher specimen	Adi Names	T U	Mode of use	Endemism range	Mark- tability
<i>Plantago asiatica</i> L. [Plantaginaceae]; LG-111	<i>Donyi-Borkor</i> <i>Donyi hankeng</i> , <i>Donyi sokang</i>	F	Leaves edible	E China	No
<i>Polygonum molle</i> D.Don [Polygonaceae]; LG-138	<i>Kiibu- Nanung</i>	F	Tender shoots edible	Indian Subcontinent to S. China, W. Malaysia.	No
<i>Portulaca oleracea</i> L. [Portulacaceae]; LG-123	<i>Gubor-Oying</i>	F	Whole plants edible	Australia	No
<i>Gonostegia hirta</i> (Blume ex Hassk.) Miq. [Urticaceae]; MT- 920	<i>Oyik</i>	F; M	Tender shoots edible; leaf-paste used on cuts and wound	Trop. & subtrop. Asia to Australia	Yes
<i>Pouzolzia zeylenica</i> (L.) Benn. [Urticaceae]; MT-921	<i>Oyik</i>	M	Leaf paste used on cuts and wounds	Trop. & subtrop. Asia.	No
<i>Ricinus communis</i> L. [Euphorbiaceae]; LG-121	<i>Gopo-Golo/</i> <i>Perok aki/ Aki</i> <i>rongmik</i>	M	Leaves warm on fire placed paining joints and muscle. Petiole bark used as bandage to cure fractured bone of chicks	N-E Africa	No
<i>Rorippa dubia</i> (Pers.) H.Hara [Brassicaceae]; MT-918	<i>Orgyam, sitong</i> <i>pettu</i>	F	Leaves edible	Indian subcontinent , S China, Malay peninsula	No
<i>Rubia manjith</i> Roxb. ex Fleming [Rubiaceae]; MT- 938	<i>Taman</i>	O	Roots boiled with cotton (for thread) turns red	Africa to trop. Asia, China, Japan, Australia	No
<i>Rubus ellipticus</i> Sm. [Rosaceae]; MT-939	<i>Tangkin /</i> <i>Pakkom Tayin/</i> <i>Pakkom tasing</i>	F	Sweet ripe fruits edible	China, Nepal, Indian subcontinent, Indochina, Philippines	No
<i>Rumex maritimus</i> L. [Polygonaceae]; MT-916	<i>Okung</i>	F	Young leaves edible	Ireland	Yes
<i>Saccharum arundinaceum</i> Retz. [Poaceae]; GM-141	<i>Tapii</i>	RBC	Believed that it is the elder brother of <i>Carex</i> sp. and both are use in rituals during funeral	India	No
<i>Saccharum spontaneum</i> L. [Poaceae]; MT-928	<i>Piko-Pimur/</i> <i>Aasi-Pimur</i>	F	Roasted young inflorescences edible	Sicilia, Africa, Asia to N. & NE. Australia.	No
<i>Scoparia dulcis</i> L. [Plantaginaceae]; GM- 147	<i>Yongin</i>	M	Taken orally against rabies	C & S America	No
<i>Senna alata</i> (L.) Roxb. [Fabaceae]; LG- 109	<i>Donyi Sori</i>	M	Leaf-paste used as antimicrobial medicine for old wounds	N-S & C America	No
<i>Senna tora</i> (L.) Roxb. [Fabaceae]; LG-110	<i>Donyi Sori</i>	M	Leaf-paste used against Ring worm	C America	No
<i>Sida acuta</i> Burm.f. [Malvaceae]; LG-128	<i>Jaru Ane</i>	O	Dried whole plants used as hard broom	C America	No
<i>Solanum americanum</i> Mill. [Solanaceae]; MT-914	<i>Okomamang/Ma</i> <i>ali/ Yanga</i>	F	Tender shoots taken as vegetable	America, Melanesia, New Guinea, Australia	Yes
<i>Solanum torvum</i> Sw. [Solanaceae]; MT-905	<i>Migom kopi,</i> <i>Kodu/ Taleng</i> <i>koe</i>	F	Young fruits tastes bitter, made into chutney	Florida, S Alabama, Brazil, Mexico	Yes
<i>Solanum viarum</i> Dunal [Solanaceae]; MT-924	<i>Peeli-Taang</i>	M	Warmed fruits used in toothache	Brazil, Argentina	No
<i>Solanum villosum</i> Mill. [Solanaceae]; MT-913	<i>Okomamang/Ma</i> <i>ali/ koieer</i>	F	Tender shoots taken as vegetable	Europe, W Asia, N Africa, N America	No
<i>Sonchus oleraceus</i> L. [Asteraceae]; MT-911	<i>Ogon</i>	F	Tender leaves eaten as vegetable	Europe, W Asia	No

Botanical name [Family]; Voucher specimen	Adi Names	T U	Mode of use	Endemism range	Marke- tability
<i>Spermacoce alata</i> Aubl. [Rubiaceae]; LG-113	<i>Eeing / Tagin mikki</i>	FD	Whole plant used as pig- fodder	S Mexico, C America, Caribbean	No
<i>Spermacoce ocymoides</i> Burm.f. [Rubiaceae]; LG-112	<i>Eeing</i>	FD	Whole plant used as pig- fodder	Trop. to SW Pacific	No
<i>Spilanthes acmella</i> (L.) L. [Asteraceae]; MT-903	<i>Marshang Haali, Aying Marshang</i>	F	Leaves edible	Trop. & S countries mainly India, S America	Yes
<i>Stellaria media</i> (L.) Vill. [Caryophyllaceae]; LG-125	<i>Hosir Oying</i>	F	Whole plants edible	Europe, Africa	Yes
<i>Themeda villosa</i> (Lam.) A. Camas [Poaceae]; GM-144	<i>Tase</i>	O	Dried leaves use for roofing	Trop. & subtrop. Asia	No
<i>Thysanolaena latifolia</i> (Roxb. ex Hornem.) Honda [Poaceae]; LG-135	<i>Kanggam/ Jaru Ane/ Kamgang</i>	RBC; O	Believe that in course of evolution the tail of <i>Bos frontalis</i> was originated from plant inflorescence; mature inflorescence use as soft broom	Trop. & subtrop. Asia	Yes
<i>Urtica ardens</i> Link [Urticaceae]; LG-130	<i>Jimang/ Matpe Pereng</i>	M	Infected wounds of <i>Bos frontalis</i> is beaten with nettle leaf to kill the infectious organisms	Himalayas to SE Tibet.	No
<i>Urtica dioica</i> L. [Urticaceae]; MT-904	<i>Matpe pereng/ Peji pamang</i>	M	As in <i>U. ardens</i>	Europe, temp. Asia, W-N Africa	No
<i>Viola betonicifolia</i> Sm. [Violaceae]; LG-133	<i>Jortung / Japjor</i>	F	Whole plants edible	S Asia, E Australia, Tasmania	No
<i>Viola pilosa</i> Blume [Violaceae]; LG-132	<i>Jorsing/ Japjor Peaak sungar</i>	F	Whole plants edible	Trop. & temp. Asia	No
<i>Youngia japonica</i> (L.) DC. [Asteraceae]; MT-931	<i>Rungdum/ Rumdum/ Rukjub mikki</i>	O	Dried leaves are smoked as substitute to tobacco	E Asia	No

### Ethnomedicinal uses

Of the total 87 weed species reported, 27% of them are being used in traditional ethnomedicinal practices of the *Adi* community for the treatment of different ailments such as Gastrointestinal disorder, cuts and wound, burns and inflammation, malaria, toothache, jaundice, files, sinus, crack sole, ringworm, sprain and rabies. Majority of the total species reported are used for treatment of Gastro-intestinal disorder, cuts and wound, burns and inflammation and malaria, whereas few species such as *Urtica dioica* and *Urtica parviflora* were found to be used in ethno-veterinary medicinal practices for the treatment of infected wound of their livestock population.

### Animal fodder and forage

Domestication of animal is the primary occupation in the rural localities to sustain the economy and human livelihood. Present investigations have revealed a total of 9 weedy species exclusively used by the rural farmers as livestock fodder for the ruminant cattle, such as Mithun, Cow, and Goat. Some of the species are luxuriantly growing in the wild without any agronomic care and are non-toxic, but rather nutritious which are mostly foraged by the ruminant animals.

### Weed plant in traditional rituals

*Adi* community being the followers of indigenous *Donyi-Polo* religious group uses several plant species while worshipping Gods and Goddesses like *Kine Nane*, *Doying Bote*, *Gumin*



*Soyin*, *Pedong Nane*, and *Dadi bote*, which is performed with invocation of hymns as per their existing ritual traditions. Present investigation have revealed a total of 8 weedy species which are widely used in traditional rituals, and also associated with local folk belief systems. Weeds species namely, *Thysanolaena latifolia* and *Chenopodium giganteum* are mentioned in folklores since time immemorial which are deeply associated with indigenous faith and belief systems of the *Adi* community.

### Commercially important weeds

A good share of 20 % of the recorded 87 species are commercially important, which are frequently harvested and sold in markets as food and medicinal items. These sellers are mostly the marginal farmers, mainly women to sustain their livelihood. These species are also extensively harvested in some places for vermicomposting to produce organic manure in Kitchen Gardens for ensuring organic crop production.

### CONCLUSION

It is concluded that *Adi* people of Siang district are rich in traditional knowledge and local skills related to wise use of weed flora available in their bio cultural landscape. The weed flora luxuriantly growing almost everywhere in Siang Districts of Arunachal Pradesh are being converted into economically productive and livelihood based support items by the local residents by employing them in diverse uses such as food, human medicine, veterinary medicine, organic manure, rituals and belief systems.

### Acknowledgements

The authors are thankful the DBT New Delhi for funding under Twinning programme and BRNS DAE BARC Trombay for fund support to RGU. They are also thankful SERB DST New Delhi and GBPIHESD under IERP programme for fund support to NIT, Arunachal Pradesh for conducting present research. All the authors are thankful to the local informants of *Adi* community residing in 8 villages of Upper Siang, Siang and East Siang districts of Arunachal Pradesh for sharing their valuable ethnobotanical knowledge system during field visits.

### LITERATURE CITED

- Baker, H.G. 1965. Characteristics and modes of origin of weeds. In: Baker, H.G., Stebbins, G.L. (eds.), *The Genetics of Colonizing Species*. Academic Press, New York. Pp. 147 – 172.
- Chowdhery, H.J.; Giri, G.S. & Pramanik, A. 2009. *Materials for the Flora of Arunachal Pradesh*. Vol. III. Botanical Survey of India, Calcutta.
- Dhole, J.A; Dhole, N.A. & Bodke S.S. 2009. Ethnobotanical studies of some weeds of crop fields of Marathwada region, India. *Ethnobot. Leaflet*. 13(1): 1443 – 1452.
- Giri, G.S.; Pramanik, A. & Chowdhery, H.J. 2008. *Materials for the Flora of Arunachal Pradesh*. Vol. II. Botanical Survey of India, Kolkata.
- Hajra, P.K.; Verma, D.M. & Giri, G.S. 1996. *Materials for the Flora of Arunachal Pradesh*. Vol. I. Botanical Survey of India, Calcutta.
- Hooker, J.D. 1872 – 1897. *The flora of British India*, Vols. 1 – 7. L.Reeve & Co Ltd, Ashford, Kent. London
- Jain, S.K. & Rao, R.R. 1977. *A Handbook of Field and Herbarium Methods*. Today and Tomorrow Printers and Publishers, New Delhi.

- Maroyi, A. 2013. Use of weeds as Traditional vegetables in Shurugwi District, Zimbabwe. *Journal of Ethnobot. Ethnomed.*, 60(9): 1 – 10.
- Martin, G.J. 2008. *Ethnobotany: A Methods Manual, People and Plants Conservation Series*. Earthscan, UK and USA. Pp. 10 – 160.
- Neogi, B; Prasad, M.N.V. & Rao, R.R. 1989. Ethnobotany of some weeds of Khasi and Garo Hills, Meghalaya, Northeastern India. *Econ. Bot.* 43(4): 471 – 479.
- Rahman, A.H.M.M. 2013. A Checklist of Common Angiosperm Weeds of Rajshahi District, Bangladesh. *Intn. Invent. J. Agri. Soil Sci.* 1(1): 1 – 6.
- Rahman, A.H.M.M; Islam, A.K.M.R & Rahman, M.M. 2011. *The Family Asteraceae of Rajshahi Division, Bangladesh*. VDM Verlag Dr. Muller Publishing House Ltd., Germany.
- Rao, A.N. & Chauhan, B.S. 2015. Weeds and weed management in India - A Review. Chapter 4. In: Rao, V.S.; Yaduraju, N.T.; Chandrasena, N.R.; Hassan, G. & Sharma, A.R. (eds.), *Weed Science in the Asian-Pacific Region*. An AsianPacific Weed Sci. Soc. Public. Indian Soc. Weed Sci., Jabalpur, India. ISBN 13: 978-81-931978-0-6. Pp. 87 – 118.
- Tag, H; Murtem, G; Das, A.K. & Singh, R.K. 2008. Diversity distribution of ethnobotanical plants used by *Adi* tribe of East Siang district of Arunachal Pradesh, India. *Pleione* 2(1): 123 – 136.
- Zimdahl, R.L. 1992. *Fundamentals of Weed Science*, 2<sup>nd</sup> edn., Academic Press, San Diego, CA.
- <http://www.theplantlist.org>
- <http://www.plantsoftheworldonline.org/>