RESEARCH ARTICLE

GENETIC RESOURCES OF LEAFY VEGETABLES IN TELANGANA: DIVERSITY, DISTRIBUTION AND CONSERVATION

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Abstract: Green leafy vegetables are rich in nutrients and fibre and low in fat and calories and help complete a healthy balanced diet. The kind of plant species used as leafy vegetables varies from region and usually depend up on their distribution and traditional practices. In Telangana, leafy vegetables are cultivated in about 7,673 hectares area largely in the erstwhile districts of Ranga Reddy, Medak and Nalgonda with a production of 52,108 tonnes during 2019-20. The leafy vegetables for which considerable local variability occur are amaranths, bladder dock, curry leaf, drumstick, fenugreek, garden spinach, indian spinach, purslane, roselle, sorrel and spear mint. Information on diversity in leafy vegetable crops with different landrace names that occur/ cultivated and germplasm conserved from Telangana is also given. The scope and future perspective for sustaining leafy vegetable genetic resources is also discussed.

Keywords: Leafy vegetables, Telangana, Diversity, Conservation

INTRODUCTION

Leafy vegetables are a rich source of nutrients and form a major crop group that has been designated as natures' anti-aging wonders' which are the cheapest and abundant source of antioxidants and vitamins as well. The number and kind of plant species used as leafy vegetables varies from region to region and usually depend up on their distribution, traditional practices and beliefs. They have several advantages such as having short duration, amenability to intensive cultivation, ready market and steady income to the farmers in general. The major leafy vegetables are primarily cultivated in the peri-urban areas having considerable market demand. Even though, they form an important source of dietary nutrients, these crops have not yet received the kind of attention they deserve *vis-à-vis* other vegetables such as tomato, potato and brinjal etc. in research and development. Insidiously, there is a significant decline in the number of major and minor green leafy vegetable species traditionally cultivated/ picked from wild for consumption.

MATERIALS AND METHODS

Crop specific and multi-crop specific surveys were undertaken by the National Bureau of Plant Genetic Resources, Regional Station, Hyderabad to collect, salvage and conserve Agri-biodiversity including diversity in leafy vegetable crops from Telangana. The targeted area and tentative route were planned and the materials required for exploration were also equipped following overall collection logistics as suggested by Arora (1981) and Bennett (1970). The sampling procedures for collection of germplasm was followed as suggested by Hawkes (1980) and Brown and Marshall (1995). The sampling, collection site and intervals depended on variation in environmental and edaphic factors and frequency of occurrence. The method followed in most of the cases had been random/ non-random selective sampling for cultivated species. Farmer's field was taken as a unit area and random samples of the populations and biased samples of elite material were collected (Pandravada *et al*., 1996 and 2017). Germplasm samples were also collected from cultivated fields, threshing yards and farm stores as well. Standard passport information was recorded for all the collected accessions for 39 variables. Local elderly farmers were interacted with for documenting associated indigenous traditional and ethnobotanical knowledge. Garmin-12 model of global positioning system (GPS) was used to record the geographical coordinates of the collection sites. DIVA-Geographical information system (GIS) version 7.5 was used for Agri-biodiversity mapping and analyzing data to assess spatial distribution and variability in crop species. The germplasm collections were appropriately processed for medium/ long-term conservation and utilization in crop improvement programmes.

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RESULTS AND DISCUSSION

The explored area is mainly sub-humid and sub-tropical in nature, the average annual rainfall varied from 1,000 to 1,400 mm and the average annual temperature from 5^0 to 37^0C. Black soils are frequently encountered and the range of soil types includes red loams, red sandy loams and red soil with clay base etc. Telangana had 7,673 hectares area under leafy vegetables with garden spinach, coriander, amaranths, fenugreek, Indian spinach, mesta/ roselle and curry leaf as the main crops with a total production of 52,108 tonnes during 2019-20. Leafy vegetables are grown to a large extent in the erstwhile districts of Ranga Reddy, Medak and Nalgonda in Telangana accounting for 74.9% of the total area with Ranga Reddy alone accounting for 54.5% under these crops in the state. The primary ethnic groups associated with *on-farm* conservation of leafy vegetable landraces are *Gond, Kolam, Koya* and *Lambada*. The important leafy vegetables for which considerable local variability occur are amaranths, bladder dock, curry leaf, drumstick, fenugreek, garden spinach, indian spinach, purslane, roselle, sorrel and spear mint etc. in all the districts of Telangana. The diversity in leafy vegetable crops with different landrace names that occur/ cultivated in districts of Telangana is given in Table-1. The diversity and its distribution, important landraces that was under cultivation, phenotypic diversity for important morpho-agronomic/ descriptors and states, potential of germplasm and status of genetic erosion etc. with respect to Telangana are dealt with for important leafy vegetable crops as follows:

Amaranths

Amaranthus L. is a genus in the family Amaranthaceae consisting of more than 60 species including that of leaf vegetable and grain species (Ray and Roy, 2009 and Shukla *et al*., 2010). In Amaranths, types which are green, completely/ partially purple and spiny generally occur. In Telangana, the following six *Amaranthus* species which are edible generally occur.

Amaranthus blitum (L.) var. *oleracea* Duthie (Guernsey pigweed/ *Totakoora*)

Amaranthus caudatus L. (Pendent amaranth, tassel flower/ *Keikera, Netakoora*)

Amaranthus cruentus L. (Mexican grain amaranth, prince's feather/ *Totakoora*)

Amaranthus spinosus L. (Prickly amaranth/ *Mulla totakoora*)

Amaranthus tricolor L. (Edible amaranth/ *Tota koora, perugu totakoora*)

Amaranthus viridis L. (Green amaranth, wild amaranth/ *chilaka totakoora*)

Generally, *A. caudatus* and *A. tricolor* are popular and cultivated and the remaining species occur as wild and picked as uncultivated greens for consumption for nutritional security by the tribal groups/ farmers/ landless labour. Among the Amaranths, the named landraces that occur include *Bhaji koora, chakravarthi koora, doggali koora, erra totakoora, koya koora, kuppi koora, mulla doggali, mulla totakoora, pedda totakoora, perugu totakoora, puvvu totakoora, rajagiri koora, sirri koora, sirru aku* and *tella totakoora* etc. Amaranths have the third largest area under leafy vegetables in Telangana and is cultivated to a large extent in the erstwhile districts of Ranga Reddy, Adilabad and Medak. Atleast 49 accessions of Amaranths germplasm collections are made during crop specific/ multi-crop explorations undertaken in variability rich pockets of Telangana and the diversity mapping is depicted in Fig.1. Diversity is mainly distributed in Indravelly, Jainoor, Jannaram, Dehagaon, Gudihathnoor, Bela, Bejjur, Sirpur, Wankhidi and Kerameri in Adilabad district, Burgampahad in Khammam and Zaheerabad, Tandur, Kondapur and Siddipet in Medak district. The tribal group Koya is associated with the cultivation, patronage and consumption of Amaranths. Tremendous diversity occur for plant height (short/ medium tall/ tall/ very tall), plant growth habit (erect/ spreading/ drooping), stem colour (yellow/ orange/ green/ pink), stem thickness, stem surface (smooth/ ridged), leaf shape, leaf size, leaf colour (green/ dark green/ purple), markings on the leaves, inflorescence colour (yellow/ yellow-orange/ green/ purple), inflorescence compactness (lax/ intermediate/ dense), inflorescence shape (globose/ semi-drooping/ drooping/ straight), inflorescence spininess (smooth/ glabrous/ prickly/ spiny), seed colour (white/ pink/ brown/ black/ golden), days to flowering and taste etc. The potential of Amaranths especially the grain types in the nutritional and livelihood sustainability of small holder farmers was highlighted.

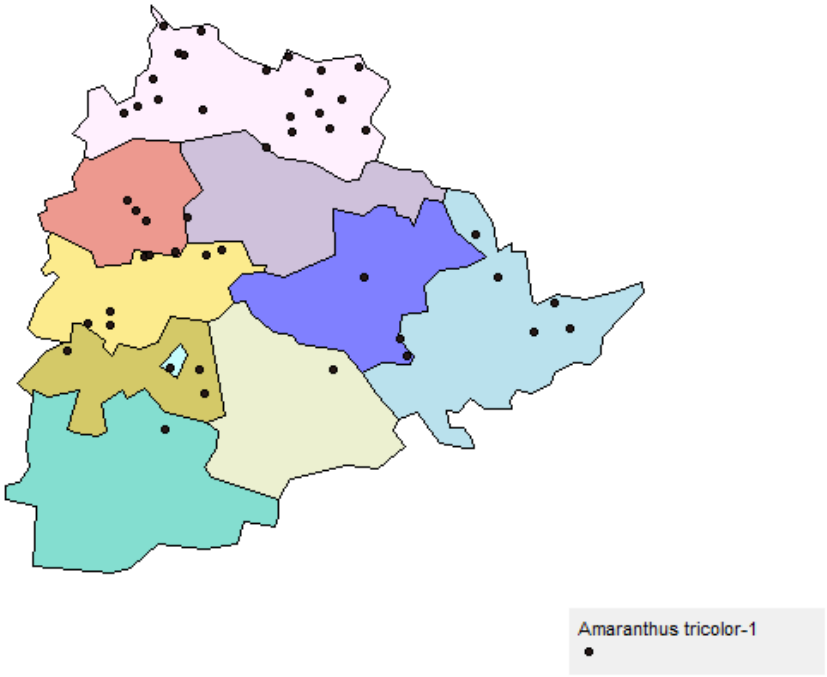

Fig. 1. Diversity mapping for Amaranths and germplasm sampled in districts of Telangana.

Coriander

Coriander (*Coriandrum sativum* L.) belonging to family Apiaceae is one of the important leafy vegetables and its green leaf is extensively used in cooking. It has the second largest area under leafy vegetables in Telangana. It had 436 hectares area and 4,013 tonnes production during 2019-20 and is grown to a large extent in the erstwhile districts of Ranga Reddy, Nizamabad and Medak accounting for 81% of the total area with Ranga Reddy alone accounting for 42.2% under the crop in the state. The diversity rich pockets in Telangana are mainly concentrated in Bazarhathnur, Boath, Chennur, Kadem, Khanapur, Mudhole, Nirmal, Sirpur and Tanoor in Adilabad district, Nekkonda in Warangal, Gandhari and Armur in Nizamabad, Bheemdevarapalli in Karimnagar and Andole and Ramayampeta in Medak district. Atleast 33 accessions of Coriander germplasm collections are made during crop specific/ multi-crop explorations undertaken in diversity rich pockets of Telangana. The important landraces that occur include *Dhania* and *Koththimeera*. Coriander is sine qua non for garnishing, imparting aroma and taste etc. and variability exists for leaf shape and size, aroma, essential oil content and yield potential (Kalidasu *et al*., 2015).

A coriander variety (Rajendranagar Kothimera-1) was developed from a germplasm accession IC512365 especially for leaf with good aroma through pure line breeding by Sri Konda Laxman Telangana State Horticultural University suitable for cultivation in Telangana with a yield potential up to 26.8 q/ha (Leaf).

Curry leaf

Curry leaf/ *Karivepaku* (*Murayya koenigii* (L.) Spreng.) is a tropical to sub-tropical tree native to Asia and belonging to family Rutaceae. Its aromatic leaves are extensively used in curries and other Indian dishes and also used as a medicine. In Telangana curry leaf is grown to a large extent in the erstwhile districts of Khammam, Medak and Nizamabad. Variability occurs for leaf shape and size, aroma, essential oils and yield potential.

Fenugreek

Fenugreek/ *Menthikoora* (*Trigonella foenum-graecum* L.) is an important leafy vegetable belonging to family Fabaceae. It is used in cooking, as a medicine, as an ingredient in spice blends and a flavouring agent in foods, beverages and tobacco. In Telangana, fenugreek is grown to a large extent in the erstwhile districts of Ranga Reddy, Karimnagar and Medak. Variability occurs for leaf shape and size, fibre ness, bitter principle and yield potential.

Garden spinach

Garden spinach/ *Paalakoora, palak, dumpa bachhali* (*Spinacia oleraceae* L.) is very popular having the largest area under leafy vegetables in Telangana. It is grown to a large extent in the erstwhile districts of Ranga Reddy, Medak and Nalgonda. Atleast 19 accessions of spinach germplasm collections are made during crop specific/ multi-crop explorations undertaken in diversity rich pockets of Telangana. Variability occurs for leaf shape and size and petiole length, pigmentation and yield potential.

Indian spinach

Indian spinach (*Basella alba* L.), which belongs to family Basellaceae, is a popular leafy vegetable

widely grown in Telangana. It is a perennial, either trailing or bushy, succulent with tender leaves. In Telangana, Indian spinach is grown to a large extent in the erstwhile districts of Ranga Reddy, Khammam, Warangal and Nalgonda. Atleast 19 accessions of Indian spinach germplasm collections are made during crop specific/ multi-crop explorations undertaken in diversity rich pockets of Telangana. Diversity is mainly distributed in Khammam, Nalgonda and Nizamabad districts of Telangana. In Indian spinach, the named landraces that occur include *Bachchali, erra bachchali, mayalu, nalla bachchali, pulla bachchali* and *tella bachchali* with Medak, Khammam, Nalgonda and Nizamabad being the important districts for landrace diversity. Variability occurs for leaf shape and size, pigmentation, taste (sour/ non-sour/ plain), yield potential and completely purple types (*Erra bachchali*) which are rich is anthocyanins also occur. Preliminary characterization and evaluation of Indian spinach germplasm for agro-economic and quality traits was taken up by Thirupathi Reddy *et al*. (2014 b). The climate suitability mapping for cultivation of Indian spinach in India was studied and worked out by Thirupathi Reddy *et al*. (2015 c) using MaxEnt modelling.

Kenaf and Roselle

Kenaf (*Hibiscus cannabinus* L.) and roselle (*Hibiscus sabdariffa* L.), which belong to family Malvaceae, are known by various names with the former as Ambari hemp, bimlipatnam jute, deccan hemp, kenaf and mesta/ *gogu, gongoora* and the later as Jamaica sorrel, red sorrel, roselle/ *Erra gogu, erra gongoora* etc. and are very popular green leafy vegetables across Telangana. It is grown to a large extent in the erstwhile districts of Ranga Reddy, Medak and Khammam.

In kenaf, the named landraces that occur include *Erra pundi, nalla pundi, pundi koora, tella pundi* with Medak being an important district for landrace diversity and in roselle they include *Ambadi, erra punti, lal ambadi, punti, tella ambadi* with Adilabad being an important district for landrace diversity. Atleast 105 accessions of kenaf/ roselle germplasm collections are made during crop specific/ multi-crop explorations undertaken in variability rich pockets of Telangana and the diversity mapping is depicted in Fig.2. Diversity is mainly distributed in Indravelly, Boath, Adilabad, Gudihathnoor, Bellampally, Nirmal, Kerameri, Neredigonda, Tamsi, Ichoda and Mudhole in Adilabad district, Kunavaram, Burgampahad, Chinturu, V.R.Puram, Dummugudem and Manuguru in Khammam, Narsampet in Warangal, Kamareddy, Banswada and Armur in Nizamabad, Choutuppal and Chityal in Nalgonda, Mallial and Siricilla in Karimnagar, Serilingampally in Ranga Reddy, Amangallu in Mahaboobnagar and Patancheru and Ramayampeta in Medak district. The tribal groups, Gonds and Lambadas are mainly associated with the cultivation, patronage and consumption of kenaf/ roselle crops. Generally, kenaf and roselle are cultivated as inter crops with cowpea, sunnhemp, garlic, onion, pigeon pea, sorghum and spinach in mixed farming situations. The production potential and genetic variability of landraces of roselle for key agro-economic traits under high density planting and one time harvesting system was elucidate.

Good diversity occurs in kenaf/ roselle for plant height (tall/ very tall/ extra tall), branching habit (single stemmed/ intermediate/ highly branched/ very strongly branched), nodes/ plant, stem colour (green/ purple), stem thickness (thin/ stout/ very stout), stem pubescence (smooth/ hairy/ prickly), leaf shape (unlobed/ partially lobed/ deeply lobed), leaf size (small/ big/ very big), leaf/ vein/ petiole colour (green/ dark green/ purple), stipule (exstipulate/ stipulate), corolla (outer/ inner) colour (yellow/ purple/ pink), spininess (non-spinous/ spinous/ extra-spinous), capsule colour (smooth/ hairy/ bristled) capsule pubescence (smooth/ hairy/ bristled), seed shape (reniform/ sub-reniform/ angular), seed colour (brown/ grey), days to flowering, days to maturity and taste (sour/ normal/ sweet).

Some of the rare morphotypes with interesting diversity augmented in roselle include IC261045 (white epi-calyx and dark purple stems), IC526895 (medium tall, highly branched with medium - large capsules), IC526896 (very tall and highly branched), IC526897 (rare morphotype) and IC526898 (red epi-calyx). Among the germplasm, it was observed that, kenaf genotypes- IC426305 from Bommraspet, Ranga Reddy district and IC261045 from Nalgonda district were found to be moderately resistant to moisture stress. Attempts were made to assess climate suitability for sustainable vegetable roselle cultivation in India based on extrapolating collections from Andhra Pradesh and Telangana using MaxEnt model (Thirupathi Reddy *et al*., 2015 b). The potential of mesta diversity to improve rural economy was studied.

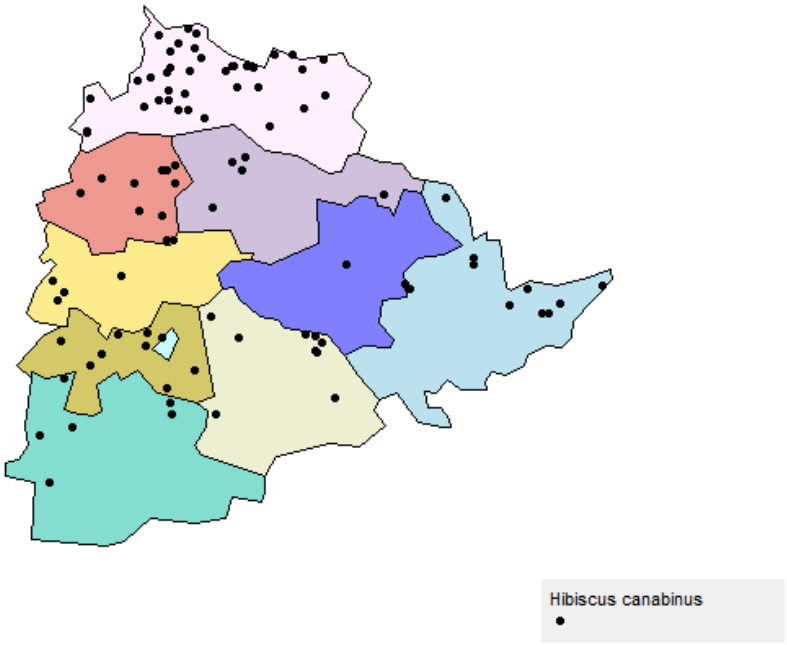

Fig. 2. Diversity mapping for Kenaf and Roselle and germplasm sampled in districts of Telangana.

Purslane

Purslane (*Portulaca oleracea* L.) which belongs to family Portulacaceae is an annual, succulent, herbaceous, cosmopolitan species known by various names, as Common purslane/ *Gangapaavili koora, peddapayili koora* etc. and is an important and commonly consumed green leafy vegetable especially by the small and marginal farming families/ landless labour in Telangana. In purslane, the named landraces that occur include *Barre payala, ganga payala, nalla payala, pappu koora, sanna payala* with Medak being an important district for landrace diversity. Atleast 25 accessions of purslane germplasm collections are made during crop specific/ multi-crop explorations undertaken in diversity rich pockets of Telangana. Diversity is mainly distributed in Papannapet and Zaheerabad in Medak district, Armur and Kamareddy in Nizamabad, Manchala in Ranga Reddy and Parakala and Nellikuduru in Warangal district. Considerable diversity occurs in growth habit (erect/ decumbent), plant height, stem colour (green/ red), branching (diffused), internode length, leaf orientation (alternate/ sub-opposite), leaf colour (green/ green with red margin), leaf shape (variable/ ovate/ ob-ovate/ oval-elliptical), leaf tip (obtuse/ slightly notched), leaf pubescence (glabrous/ smooth), petiole (sessile/ indistinctly petiolate/ short stalked), flower orientation (single/ clusters of two - five), petal colour (orange-yellow/ purple/ white/ white-pink), seed shape (round/ oval), seed colour (brown/ black) etc..

Purslane is described as a power food because of its high nutritive and antioxidant properties. It has better nutritional quality than major cultivated vegetables with higher beta-carotene, ascorbic acid and alpha-linolenic acid (omega-3 fatty acid). Purslane has been shown to contain five times higher omega-3 fatty acids than spinach and highest content of vitamin A among the green leafy vegetables.

Other leafy vegetables

The species diversity in other green leafy vegetables include *Mentha spicata* L. (Garden mint, lamb mint, spearmint/ *pudina*), *Rumex acetosa* L. (Common sorrel, garden sorrel/ *chukka koora*) and *Rumex vesicarius* L. (Bladder dock, country sorrel/ *chukka koora*). In Spearmint, common sorrel and bladder dock local diversity occur for leaf characters, aroma and taste. The potential habitats mapping suitable for cultivation of sorrel in India was studied and worked out by Thirupathi Reddy *et al*. (2015 d) using Maximum Entropy model.

Some of the un-common but important green leafy vegetables for nutrition point of view/ medicinal value include *Alternanthera sessilis* (L.) R. Br. Ex DC. (Dwarf copperleaf, sessile Joyweed, khaki weed/ *ponnaganti koora*), *Talinum cuneifolium* L. (Ceylone spinach/ *ceylone bachchali, seema bachchali*), *Moringa oleifera* Lam. (Drumstick/ *mulakkaya, munaga*), *Tamarindus indica* L. (Tamarind/ *chintha chiguru*), *Plectranthus amboinicus* (Lour.) Spreng. (Indian borage/ *vaamu aaku*), *Chenopodium album* L. (Lamb's quarters, pig weed/ *pappukoora*), *Sauropus androgynus* (L.) Merr. (Chekurmanis, katuk, multi vitamin plant, star gooseberry/ *chekurmanis aaku*), *Cichorium intybus* L. (Chicory, wild endive/ *kasini koora*) and *Lactuca sativa* L. (Garden Lettuce/ *kavu*). Except for *Alternanthera sessilis*/ *ponnaganti koora*, which some times may occur in wild state as well, all the other species are cultivated in fields/ kitchen garden/ pot herbs out of interest/ taste/ special nutritional requirements. The

less known/ wild edible leafy vegetables of Telangana are given in Table 2.

Conservation of germplasm

At least 125 accessions of germplasm of leafy vegetable crops consisting of amaranth (47), bladder dock (14), common purslane (11), roselle (20), spinach (19) and others (Common/ garden sorrel, indian spinach, lamb's quarters/ pig weed, spearmint) (14) from the state of Telangana are in the National Gene Bank at NBPGR under long term conservation.

Table 1. Distribution of named landrace diversity in leafy vegetable crops in Telangana

District	*Amaranthus* spp.	Indian spinach	Kenaf	Roselle	*Portulaca* spp.
Adilabad	*Bhaji koora, Erra totakoora, Pedda totakoora*			*Ambadi, Lal ambadi, Tella ambadi*	
Khammam	*Errra totakoora, Mulla totakoora, Perugu totakoora, Tella totakoora*				
Medak	*Chakravarthi koora, Doggali koora, Erra totakoora, Koya koora, Kuppi koora, Mulla doggali,Mulla totakoora, Puvvu totakoora, Rajagiri koora, Sirri koora, Sirru aku*	*Erra bachchali, Mayalu, Nalla bachchali, Pulla bachchali, Tella bachchali*	*Erra pundi, Nalla pundi, Pundi koora, Tella pundi*		*Barre payala, Ganga payala, Nalla payala, Pappu koora, Paruppu keerai, Sanna payala*

Table 2. Less known/ wild edible leafy vegetables of Telangana

Species	Family
Abelmoshcus manihot (L.) Medic.	Malvaceae
A. moschatus Medic.	Malvaceae
Abutilon indicum (L.) Sweet	Malvaceae
Acacia concinna DC	Mimosaceae
A. farnesiana Willd.	Mimosaceae
Acalypha indica L.	Euphorbiaceae
Achyranthes aspera L.	Amaranthaceae
Acronychia pedunculata (L.) Miq.	Rutaceae
Adhatoda vasica Nees	Acanthaceae
Aerva lanata Juss.	Amaranthaceae
Aeschynomene aspera L.	Papilionaceae
Alternanthera sessilis DC	Amaranthaceae
Alysicarpus rugosus DC	Papilionaceae
Amaranthus blitum L.	Amaranthaceae
A.gangeticus L	Amaranthaceae
A.paniculatus L.	Amaranthaceae
A.viridis L.	Amaranthaceae
Anisochilus carnosus Wall.	Lamiaceae
Argyreia nervosa (Burm. F.) Boj.	Convolvulaceae
A. strigosa Sant. & Patel	Convolvulaceae
Asteracantha longifolia Nees	Acanthaceae
Asystasia gangetica (L.) Anders.	Acanthaceae
Atylosia scarabaeoides Benth.	Papilionaceae
Alysicarpus vaginalis DC.	Papilionaceae
Arthrocnemum indicum Moq	Chenopodiaceae
Arundinella setosa Trin.	Poaceae
Asystasia gangetica Anders	Acanthaceae
Azadirachta indica A. Juss. Neem	Meliaceae
Barringtonia acutangula Gaertn.	Lecythidaceae
Boerhaavia spp.	Nyctaginaceae
Borreria articularis (Linn..) F.. Williams	Rubiaceae

Cassia spp.	Caesalpiniaceae
Celosia argentea L.	Amaranthaceae
Chlorophytum laxum R. Br.	Liliaceae
Cleome gynandra L	Capparidaceae
Cocculus hirsutus (L.) Diels.	Menispermaceae
Commelina spp	Commelinaceae
Corchorus trilocularis L	Tiliaceae
Cyprus spp.	Cyperaceae
Dalbergia paniculata Roxb.	Papilionaceae
Dioscorea pentaphylla L.	Dioscoreaceae
Dregea volubilis Benth.	Asclepiadaceae
Embelia ribes Burm f.	Myrsinaceae
Erythroxylum monogynum Roxb.	Erythroxylaceae
Euphorbia hirta L.	Euphorbiaceae
Gisekia pharnaceoides L.	Aizoaceae
Glinus lotoides L	Aizoaceae
Gnaphalium indicum L.	Asteraceae
Gymnema sylvestre R. Br.	Asclepiadaceae
Gynandropsis pentaphylla DC.	Capparidaceae
Homonoia riparia Lour	Euphorbiaceae
Hygrophila salicifolia Nees	Acanthaceae
Hyptis suaveolens Poit.	Lamiaceae
Impatiens latifolia L.	Balsaminaceae
Ipomoea spp.	Convolvulaceae
Justicia spp.	Acanthaceae
Lannea coromandelica (Houtt.) Merr.	Anacardiaceae
Leea indica (Burm.) Merr.	Vitaceae
Leucaena glauca Benth.	Mimosaceae
Leucas aspera (willd.) Spr.	Lamiaceae
Lippia nodiflora Rich.	Verbenaceae
Leptadenia reticulata Wt. & Arn.	Asclepiadaceae
Lumnitzera racemosa Willd.	Combretaceae
Maesa chisia Buch.	Myrsinaceae
Martynia annua L	Martyniaceae
Malvastrum coromandelianum L.	Malvaceae
Melilotus indica L.	Papilionaceae
Melochia corchorifolia L.	Sterculiaceae
Mukia maderaspatana L.	Cucurbitaceae
Merremia emarginata Burm. f.	Convolvulaceae
Mollugo cerviana Seringe	Aizoaceae
Momordica cochinchinensis Spreng.	Cucurbitaceae
Mussaenda frondosa L.	Rubiaceae
Nelumbo nucifera Gaertn.	Nymphaeaceae
Nothosaerva brachiata Wt.	Amaranthaceae
Nymphaea stellata Willd.	Nymphaeaceae
Ocimum americanum L.	Lamiaceae
O. gratissimum L.	Lamiaceae
Oplismenus composites (L) Beauv.	Poaceae
Ottelia alimoides Pres.	Hydrocharitaceae
Oxalis corniculata L.	Oxalidaceae
Pavonia odorata Willd.	Malvaceae
Pergularia daemia (Forsk.) Chiov.	Asclepiadaceae
Phyllanthus acidus Skeels.	Euphorbiaceae
Physalis minima L.	Solanaceae
Pistia stratiotes L.	Araceae
Polygonum glabrum Willd.	Polygonaceae
Pogostemon parviflorus	Lamiaceae
Portulaca tuberosa L.	Portulacaceae

Polygala chinensis L.	Polygalaceae
Randia spinosa Poir.	Rubiaceae
Rothia indica (L.) Druce	Papilionaceae
Rumex acetosella L.	Polygonaceae
Salvadora persica L.	Salvadoraceae
Securinega leucopyrus (Willd.) Muell.	Euphorbiaceae
Solanum indicum L.	Solanaceae
Solanum nigrum L.	Solanaceae
Sphaeranthus indicus L.	Asteraceae
Spondias pinnata (L. f.) Kurz.	Anacardiaceae
Tephrosia purpurea Pers.	Papilionaceae
Teramnus labialis Spreng.	Papilionaceae
Thespesia populnea Soland.	Malvaceae
Trianthema portulacastrum L.	Aizoaceae
Trichodesma indicum R. Br.	Boraginaceae
Triumfetta annua L.	Tiliaceae
Typha angustifolia L.	Typhaceae
Urginea indica Kunth	Liliaceae
Vallineria spiralis L.	Hydrocharitaceae

CONCLUSION

Intensive cultivation of leafy vegetables in the peri-urban system using agricultural inputs is perfectly suitable for high productivity and this system needs to be encouraged and promoted under diversification of the crop species (Sunil *et al*., 2015). Whereas, the patronage of a wide range of uncultivated species by the majority of tribal households as green leafy vegetables and their associated indigenous traditional knowledge (ITK) appears to be the cornerstone for livelihood and nutritional security. The utilization pattern of harnessing of the local green leafy vegetables by the tribal groups is a tribute to their knowledge encompassing synchronization of their livelihoods with the ecosystem. Most of the green leafy vegetables are harvested and consumed directly by the households without any form of trade because of localized availability and consumption traditions within their environs. The utilization/ ITK of some of the uncultivated plant species by the tribal groups needs to be validated considering the immense benefits in view of their rich nutrient status, hardiness and perennial nature. Such initiatives can effectively used to combat vitamin and micro-nutrient deficiencies in all regions of similar situations.

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