

Underexploited Vegetables of Northeastern Region

Underexploited plant species cover an enormous range of plants that have the potential to contribute to nutritional and livelihood security. Northeastern region of the country is blessed with varied climatic conditions which provides habitat to a number of green foods, some of which are still underexploited and their knowledge is confined to some tribal and ethnic communities living in close conformity to the nature. Many of these plant species are found resilient, adaptive and tolerant to adverse climatic conditions. They have remained underexploited due to the lack of awareness and popularization techniques for utilization. There is an increasing interest and demand for indigenous underexploited vegetables reflecting a growing trend within agriculture to identify and develop new crops which are often referred to as neglected and underutilized species. Northeast region has immense potential to claim as the horticultural hub of the country as the agro-climate here favours the growth of many major and underexploited vegetable crops. To harness the full potential of the region, robust strategies coupled with scientific interventions are in need.

THE Northeastern (NE) region, being one of the hot-spot of biodiversity in the Indian gene centre, is also known for its richness in ethnic diversity and traditional culture. Many underexploited vegetable crops of the region are found to exhibit better tolerance to various biotic and abiotic stresses, and provide sustainable production system. Since the underexploited vegetable crops of the region have a long history of safe consumption, the local people are aware of their nutritional and medicinal values. Different agro-ecosystems of the entire NE region possess a rich diversity of vegetable species which has not yet been explored. Apart from the nutritional value, many underutilized vegetables are used for medicinal purposes, and livelihood enhancement. Wide range of diversity in vegetable crops found in the region are *Solanum macrocarpon* (African eggplant), *Solanum xanthocarpum* (yellow-berried nightshade), *Cyphomandra betacea* (tree tomato), *Solanum pimpinellifolium* (currant tomato), *Capsicum frutescens*, (bird pepper), *Capsicum chinense* (bonnet pepper), *Parkia roxburghii* (tree bean), *Allium scheenoprasum* (chive), *Vigna umbellata* (rice bean), *Canavalia ensiformis* (jack bean), *Psophocarpus tetragonolobus* (winged bean), *Vicia faba* (broad bean), etc. Among gourds, maximum variability has been recorded for bottle gourd in fruit shape and size and other several lesser known cucurbitaceous crops like *Cylanthra pedata* (stuffing cucumber), *Luffa* spp. *Cucumis hystris* (wild cucumber), *Luffa graveolens*, *Momordica macrophylla*, *Momordica subangulata* (teasel gourd), *Trichosanthes cucumerina* (snake gourd), *Momordica cochinchinesis* (sweet gourd), *Momordica dioica* (spine gourd),

Sechium edule (chow chow), etc. Besides, many indigenous leafy vegetables used are *Ipomoea aquatic* (water spinach), *Chenopodium album* (Bathua), *Ipomea reptans*, *Amaranthus viridis*, *Amaranthus lividus*, *Amaranthus spinosus*, *Basella rubra*, *Basella alba*, *Rumex rasicarius*, *Brassica juncea*, *Malva verticillata*, etc. A number of *Dioscorea* species viz., *alata*, *bulbifera*, *brevipetiolata*, *esculenta*, *hamiltonii*, *hispida* (Philippine medusa and red hot cat tail), *kamaonensis* (Kumaon Iris), *nummularia* (wild jujube), *pentaphylla* (orangeberry), *puber* and *quinata* (five-leaf chocolate vine) are found abundantly in the region. Delicious edible bamboo shoots which are under cultivation and grown wild are of *Arundinaria callosa*, *Cephalostacham capitatum*, *Bambusa balcana* (female bamboo), *Dendrocalamus giganteus* (giant bamboo), *Dendrocalanus hamiltonii*, etc. The entire Northeastern region is bountiful in vegetable diversity, yet research and development activities to tap these assets for economic development have remained at a very low level. Conservation, management and proper utilization of the bio resources are two important issues that need to be addressed at local, regional and national levels for unleashing the vegetable crops potential of the NE region.

Genetic diversity in Cucurbitaceous vegetables

There are several minor/underexploited cucurbitaceous vegetables, which are grown and consumed by tribals of the region. These are mainly *Cucumis hystris*, *Cucumis trigonus*, *Luffa graveolens*, *Momordica macrophylla*, *Momordica subangulata*, *Trichosanthes cucumerina*, *Trichosanthes khasiana*, *Trichosanthes ovata*, and *Trichosanthes truncasa*. In addition,



Variability in genotypes of *Cucurbita* spp.

wild relatives of several cucurbits are also found with significant genetic variability, such as *Cucurbita*, *Cucumis hardwickii*, *Momordica cochinchinensis*, *Momordica dioica*, etc., providing a reservoir of useful genes. Cucurbitaceous consisting of more than 15 kinds, these vegetables are grown and consumed within the region. Pumpkins abound in number with variations in fruit size, skin, flesh colour, thickness, sweetness, etc. *Cucumis sativus* var. *sativus* cultivated in the region in tropical and subtropical conditions.

Table 1. Diversity of underutilized cucurbits in Northeastern region

States	Diversity in crops species
Assam, Nagaland, Meghalaya, Arunachal Pradesh, Mizoram, Manipur, Tripura, Sikkim	Pointed gourd, <i>Cucumis sativus</i> , <i>Cucurbita pepo</i> , <i>Cucurbita moschata</i> , <i>Cucurbita ficifolia</i> , <i>Cucumis callosus</i> , <i>Cucumis melo</i> var <i>momordica</i> , <i>Luffa</i> spp., <i>Momordica dioica</i> , <i>M. acutangula</i> , <i>Luffa</i> spp., <i>Momordica cochinchinensis</i> , <i>Trichosanthus anguina</i> , <i>Trichosanthus dioica</i> , <i>Benincasa hispida</i> , <i>Lagenaria siceraria</i>
Meghalaya, Manipur, Nagaland, Arunachal Pradesh	Tree tomato
Meghalaya, Manipur, Mizoram, Sikkim, Arunachal Pradesh	Chow-chow

Chow-chow (*Sechium edule*): Chow-chow is a very popular vegetable in the region commonly called squash and grows abundantly without much care and attention in the high hills of Meghalaya, Manipur, Mizoram, Nagaland and Sikkim. Chow-chow produces large starchy edible roots in addition to fruits. It is a vigorous, scrambling, tuberous-rooted perennial plant, grown for its starchy, edible fruit and seeds.



Fruit variability in Chow-chow

Diversity in *solanaceous* vegetables

In *Solanaceous* vegetables, the region is very rich in diversity for *Solanum melongena*, with several genotypes having excellent quality of soft flesh, less seeds and large fruit size. Additionally, wild species, such as *Solanum gilo*, *Solanum torvum*, *Solanum indicum*, *Solanum khasianum*, *Solanum macrocarpon* and *Solanum xanthocarpum*. *Solanum khasianum* is an important species of medicinal value (solasodine content) and *Solanum torvum*, extensively used in the Ayurvedic medicine system. These species have also been found to possess resistance to shoot and fruit borer, and soil born diseases, respectively. *Solanum pimpinellifolium*, naturalized to this region, has also expressed resistance to late blight and tomato leaf curl virus. Chillies are known to grow well in the warm to hot and humid climate of Arunachal Pradesh, Assam, Sikkim, Meghalaya, Manipur, Mizoram, Nagaland, and Tripura. Due to the long history of cultivation, out-crossing, and popularity of the crop, large genetic diversity has evolved in the form of a number of local landraces, with great variability for fruit shape, size, colour, and bearing; semi perennial and perennial habit; and pungency. *Capsicum annum*, *Capsicum lutescens* and *Capsicum Chinense* form important food crops in the region. *Capsicum minimum* syn. *Capsicum fastigiatum* (Bird eye chilli) is cultivated across the NE region.

Tree tomato (*Cyphomandra betaceae*): Tree tomato is a perennial shrub, grown as a backyard crop in Meghalaya and Sikkim. It is popularly known as *Sohbainon-dieng* in Khasi. The inside pulp of the fruit is light orange and consumed as delicious chutney when raw or after roasting and peeling off the skin.



Diversity in *Solanum* spp.



Variability in *Capsicum* spp. in Northeastern region

Table 2. Diversity of *Solanum* species in Northeastern Hilly region

States	Species
Arunachal Pradesh, Assam, Manipur, Meghalaya, Sikkim, Tripura, Mizoram, Nagaland	<i>Solanum macrocarpon</i> , <i>Solanum xanthocarpum</i> , <i>Solanum indicum</i> , <i>Solanum mammosum</i> , <i>Solanum khasianum</i> , <i>Solanum torvum</i> , <i>Solanum berbisetum</i> , <i>Solanum ferox</i> , <i>Solanum spirale</i> , <i>Solanum sisymbirifolium</i> , <i>Solanum kurzii</i> , <i>Solanum gilo</i>

Table 3. *Capsicum* species and their characteristics

Species	Economic traits
<i>Capsicum annum</i>	Source of commercial dry and green chilli
<i>Capsicum annum</i> var. <i>avicular</i>	Wild type
<i>Capsicum annum</i> var. <i>grossum</i>	Less capsaicin
<i>Capsicum annum</i> var. <i>longum</i>	Use to produce condiments
<i>Capsicum chinense</i>	Closely related to <i>Capsicum frutescens</i>
<i>Capsicum eximium</i>	Wild type, pseudo self incompatible
<i>Capsicum frutescens</i>	Highly pungent
<i>Capsicum minimum</i>	Cultivated in almost all NEH region
<i>Capsicum pubescense</i>	Worthful to transfer of gene



Chillies variability in fruiting, colour and shape in the region



Ripened fruit of Tree tomato

Diversity in leguminous vegetables

The region is known for several wild forms and high variability in rice bean (*Vigna umbellata*) with profuse branching, higher seeds per pod, higher number of pods per peduncle, bold seeds and high grain yield and higher polymorphism has also been recorded in local landraces for seed colour. Additionally, *Vigna radiata* var. *sublobata* is known for yellow mosaic virus resistance, whereas *Vigna umbellata* var. *radiata* is known for resistance to diseases and insect pests. In French bean, climbing or pole type is popular among the tribals, since it is used for mixed cropping with maize. Jack bean (*Canavalia ensiformis*) is cultivated; winged bean (*Psophocarpus tetragonolobus*) is

Table 4. Diversities of legumes vegetable in Northeastern Hilly region

States	Diversity in crops/species
Manipur, Assam, Arunachal Pradesh, Mizoram, Meghalaya, Tripura, Nagaland, Sikkim	<i>Canavalia ensiformis</i> , <i>Dolichos lablab</i> , <i>Phaseolus vulgaris</i> , <i>Phaseolus coccineus</i> , <i>Vigna umbellata</i> , <i>Vigna radiata</i> var <i>sublobata</i> , <i>Vigna umbellata</i> var <i>radiata</i> , <i>Canavalia ensiformis</i> , <i>Psopocarpus tetragonolobus</i> , <i>Vicia faba</i> , <i>Parkia roxburghii</i> , <i>Canavalia gladiata</i> , <i>Dolichos falcatus</i> , <i>Dolichos biflorus</i>



Flowering & fruiting in Broad bean



Fruiting in winged bean



Flowering & fruiting in tree bean



Coloured pod-Indian bean



Variability in sword bean

confined to the humid subtropical parts of the region. Broad bean (*Vicia faba*) is grown successfully in Manipur and Arunachal Pradesh. *Atylosia geonsis*, *Atylosia scaraboides*, *Canavalia gladiata*, *Mucuna monosperma*, *Mucuna nivea*, *Mucuna utilis*, *Dolichos biflorus*, *Bauhinia purpurea*, *Vigna vexillata*, etc. are the legumes species of Northeast region. Tree bean (*Parkia roxburghii*), is one of the most common of multipurpose tree species.

Jack bean (*Canavalia ensiformis*): It is a bushy, semi-erect, annual herb, 2-3 m tall and the tips of its branches tend to twine under shade. Leaves are trifoliate and shortly hairy. Pods are 10-30 cm long and 2-2.5 cm broad. The pods are pendent, ribbed near suture and 10 to 25 seeded. Young green pods are eaten as a cooked vegetable. The young leaves may be cooked and eaten as a potherb.

Winged bean (*Psopocarpus tetragonolobus*): Mainly found in Assam, Tripura and Meghalaya. A robust, climbing herbaceous perennial, flowers are of different colours; it may be blue, white or purple. The pods are four sided with characteristic wings and vary in length from 10-30 cm containing 5-15 seeds in each pod. All parts of the plant, i.e., seeds, flowers, leaves, pods and tuber-like-roots are edible. Flowers have a sweet taste because

of the nectar they contain. The tuber-like-roots are eaten after boiling or frying.

Tree bean (*Parkia roxburghii*): It is one of the most common multipurpose tree species of Mimosaceae family in the Northeastern region, especially in Manipur and Mizoram. Locally called 'Yongchak' in Manipur and 'Yontak' in Assam, its tree commonly grows in every household of the region. The fruits in early stages are soft, tender and bright green in colour. They turn blackish when fully mature in March-April. Pods are formed in clusters of 10-15, each measuring 25-40 cm in length and 2-4 cm in breadth. Based on local preference, the pods are consumed at different stages of maturity, either fresh or processed.

Diversity in underutilized leafy vegetables in Northeastern region

The important leafy vegetables include Lai sag (*Brassica juncea*), lafa (*Malva verticillata*) and water spinach. In addition to these a wide variety of indigenous leafy vegetables are also available. These are amaranth (*Amaranthus* spp), poi (*Basella rubra* and *Basella alba*), sorrel (*Rumex rasicarius*), etc. Other indigenous leafy vegetables

Table 5. Diversity in leafy genetic resources in Northeast Hilly region

States	Underexploited leafy vegetables in region
Arunachal Pradesh, Sikkim, Nagaland, Manipur, Mizoram, Assam, Tripura, Meghalaya	<i>Centella asiatica</i> , <i>Plantago major</i> , <i>Houttynia cordata</i> , <i>Fagopyrum cymosum</i> , <i>Eryngium foetidum</i> , <i>Commelina benghalensis</i> , <i>Polygonum alatum</i> , <i>Hibiscus sabdariffa</i> , <i>Diplazium esculentum</i> , <i>Colocasia esculenta</i> , <i>Emilia sonchifolia</i> , <i>Mentha arvensis</i> , <i>Spilanthes acemella</i> , <i>Oxalis corniculata</i> , <i>Basella rubra</i> , <i>Alternanthera philoxeroides</i> , <i>Allium hookeri</i> , <i>Rumex nepalensis</i> , <i>Amaranthus viridis</i> , <i>Rumex acetosa</i> , <i>Brassica juncea</i> , <i>Chenopodium album</i> , <i>Portulaca oleracea</i>



Underexploited leafy vegetables of Northeast region

Table 6. Diversity in *Allium* spp. in Northeast Hilly region

Species	Diversity rich area in region
<i>Allium chinense</i> , <i>Allium hookeri</i> , <i>Allium macranthum</i> , <i>Allium prattii</i> , <i>Allium wallichii</i> , <i>Allium sativum</i> , <i>Allium rubellum</i> , <i>Allium cepa</i> , <i>Allium tuberosum</i>	Assam, Arunachal Pradesh, Nagaland Manipur, Meghalaya, Mizoram

used occasionally are jil milisag (*Chenopodium album*). *Amaranthus viridis*, *Amaranthus lividus*, *Amaranthus retroflexus* and *Amaranthus spinosus* are important leafy types grown in the region.

***Allium ascalonicum* (Shallot):** Usually, it has two cloves and occasionally as many as ten. Shallot bulbs grow in clusters and have a distinctive tapered shape that sets them apart from other members of the alliaceae family. Most often these are of copper brown colour or reddish. Their flavour, sometimes described as a blend of sweet onion and garlic. Height of the plant is about 30-60 cm and have perennial growth habit. No seeds are produced and propagate only by cloves or bullets. Its morphology resembles both with the onion and garlic. The bulblets resembles garlic and its texture and colour with onion.

***Allium porrum* (Leek):** Leek is found in cultivable and wild state. The wild plant is commonly known as 'wild leek' or 'broadleaf wild leek'. Wild populations produce bulbs up to 3 cm across. Plant grown up to 1 m tall, bulb

ovoid, 3-4 cm broad, scaly and scape arising from the centre of the bulb.

***Allium schoenoprasum* (Chives):** Bulb narrowly ovoid, up to 2 cm long, 0.5 cm broad, scaly membranous scales. Leaves 1-2 cylindrical, It looks like a tall tufts of grass. Umbels sub-globose, 3 cm across and have condensed flowers. Unequalpedicels, petals pink, 10-12 mm long, lanceolate, acute. Filaments about half the length of the

***Allium przewalskianum*: Used as vegetable.**

***Allium tuberosum*:** Bulbs cylindrical, 4-6 cm long, light brown when dried, Umbel dense flowered sepals white rarely pink, 6-10 mm long, elliptic. Commonly known as garlic chives, Chinese chives, oriental garlic, Chinese leek related to garlic as it smells like garlic.

***Allium hookeri*:** A medium size herb leaves 12-19. It is common in Manipur, Arunachal Pradesh and Meghalaya. Leaves and bulbs cooked as vegetable. Bulbs are used in same way as onion.

SUMMARY

Considerable diversity exists among the minor and underexploited vegetable crops including variation in plant type, morphological, biochemical and physiological characteristics, reactions to diseases and pests, adaptability and distribution in the Northeast region. Besides, nutritional value, these crops are also used for medicinal purposes, income generation and poverty alleviation in the rural areas. Therefore, there is a need to give more emphasis on research and extension so that the vast potential of underexploited vegetable crops of the region can be exploited through the adoption of improved production technology and value addition.

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Allium ascalonicum

Plant Germplasm Registration

A total of 277 proposals complete in all respect were considered for registration of the 443 proposals received. Finally, 230 proposals belonging to 104 species were approved for registration. Rice with low phytic acid (0.83 g/100 g) and high zinc content in grain (59.1 mg/kg); Maize resistant to turicum blight; Wheat with high hectoliter (weight 80.4 kg/hl) and superior grain appearance; Barley with high beta glucan (7.5% dwb) and high protein (13.2%); Cotton with high ginning outturn percentage (43.9%); Cauliflower resistant to black-rot disease, carries single dominant resistant gene; Wild Bean highly resistant to bruchid; Tuberose with double flower type compactly arranged on short spike, more number of flowers open at a time (7.10) and resistant to root-knot nematode; Mango with polyembryony, tolerant to salt and regular bearing.

Source: ICAR Annual Report 2022-23