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Review Article

Nutritional and Medicinal Value of Some Underutilized Vegetable Crops of North East India- A Review

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ABSTRACT

To provide safe, healthy and nutritious source of food for poor income group and undernourished population is still a big challenge for our country. On the other hand, there is an increasing demand of antioxidant, calories and protein rich quality, healthy, nutritious food by the health conscious modern people. Underutilized vegetable crops are important source of valuable nutritional and medicinal component. These are cheaper and affordable than the exotic imports. Exploitation of these wild resources is an important way of income and food, especially for the poor farmers who are also underemployed.

Keywords: *Nutritional value, Medicinal value, Underutilized, Vegetables, North East India.*

INTRODUCTION

The Northeastern India is a chicken-necked region connected to the mainland with a narrow corridor and touching the international boundaries of Myanmar, China, Bangladesh, Bhutan and Nepal. The region comprises eight States namely; Assam, Arunachal Pradesh, Meghalaya, Mizoram, Manipur, Nagaland, Tripura and Sikkim. These eight States cover an area of 2, 62,179 sq. km. constituting 8 per cent of country's total geographical area and account for only around 3.76 per cent of the total population and 3.87 per cent of country's output. The common features of the region are ecosystem diversity, poor accessibility, ethnicity and rich biodiversity. About 80% of the population is tribal. The primary factor for their economy is agriculture, contributing up to 45% of the total economy of the region.

Northeast India has a subtropical climate that is influenced by its relief and influences from the southwest and northeast monsoons. Temperatures are moderate in the Brahmaputra and Barak valley river plains which decreases with altitude in the hilly areas. At the highest altitudes, there is permanent snow cover. The southwest monsoon is responsible for bringing 90% of the annual rainfall to the region. April to late October is the months where most of the rainfall in Northeast India occurs with June and July being the rainiest months.

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The vegetable crops which are neither grown commercially on large scale nor traded widely may be termed as underutilized crop. These crops are cultivated, traded and consumed locally. These crops are popular among the people in vermicular names which vary from locality to locality. These are easier to grow and hardy in nature and can withstand adverse climatic and soil condition. Some of these are found to grow in association with cultivated crops while others grow in wild state. Most of them are very rich source of minerals, vitamins, anti oxidant and other nutrients like carbohydrate, proteins and fats, sometimes even more than that of conventional vegetables. Also they are cheap and within the reach of the poorer section. As the local peoples have been consuming these underutilized vegetable for a long time they are very much aware about their nutritional and medicinal values.

The North eastern region of India constitutes one of the biodiversity hotspots of the world supporting around 50% of India's biodiversity. A wide range of vegetable crops are grown in this region which includes solanaceous vegetable, cucurbitaceous, okra, various kinds of beans, tubers and root crops, spices, cole crops and some species of leafy vegetable. The wild relatives that occur in this region have potential for exploitation in crop improvement. In this review nutritional and medicinal values of some of the selected underutilized vegetables of north east region of India are discussed.

Nutritional and medicinal value of some selected underutilized vegetables:

***Alternanthera sessilis* (Ponangani Greens /Alternanthera):** *Alternanthera sessilis* is an important green leafy vegetable species belongs to Amaranthaceae family. Leaves and tender shoots are used as vegetables. The leaves are rich in carbohydrates, proteins, carotene, vit. C, riboflavin, niacin and crude fiber. *A. sessilis* showed of macro and micronutrients availability in RDA percentage as Sodium 95%, Potassium 94.6%, Calcium 63.7%, Phosphorus 6 %, Magnesium 66%, Zinc 89%, Iron 98%, Copper 80%, Manganese 98% and Chromium 32.5% respectively i.e. the plant contains a higher concentration of Iron, Manganese, Sodium and Potassium, moderate levels of Copper and Zinc and lower levels of Phosphorus. (Sree & Vijayalakshmi, 2018). As the minerals Mn, Zn, Mg, Cu, Fe, Na, K, Ca and traces of chromium present in recommended amounts, *A. sessilis* may be beneficial for diabetic patients. Traditionally, the leaves of the plant have been used in the treatment of skin and eye ailments, cuts and wounds and as an antidote for snake bite. (Subhasini et al., 2010). Also used to cool down the body, useful in diarrhoea, fever and anemia.

***Amaranthus viridis* L. (Slender Amaranthus/tropical green Amaranthus):** Commonly called as 'Choulai' in Hindi and 'Khutura' in assamese, *Amaranthus viridis* L. belongs to Amaranthaceae family. An annual herb with stems erect or occasionally ascending, about 10-80 cm long. The tender shoots and leaves are eaten cooked. It is a good source of vitamins and mineral. The proximate analysis of edible portion indicates that it contain (g/100g) ash- 20.20, Moisture 88.01, crude protein 2.29, carbohydrate 7.96, crude fiber 0.25, calorific value 541.33 kcal, ascorbic acid 13.40 mg/100g, β-carotenoid 6.54 mg/100g and minerals like iron 118.13, zinc 6.10, copper 2.40, manganese 224.46, sodium 94.66, potassium 73.08, calcium 66.70 and magnesium 16.70 mg/100g on dry weight basis. The antioxidant activity analysis by DPPH has been found to be 92.95% and phenolic content 2.53 mg/100 g. (Saha et al., 2015). The plants contain an appreciable amount of nutrients and can be included in diets to supplement our daily nutrient needs and to fight against many of the diseases as nutraceuticals. This has been used in Indian and Nepalese traditional system to reduce labor pain and act an antipyretic. The Negritos of the Philippines apply the bruised leaves directly to eczema, psoriasis and rashes etc. Other traditional uses range from an anti-inflammatory agent of the urinary tract, venereal diseases, vermifuge, diuretic, antirheumatic, antiulcer, analgesic, antiemetic,

laxative, improvement of appetite, antileprotic, treatment of respiratory and eye problems, treatment of asthma *etc*. Furthermore, the plant possesses antiproliferative and antifungal properties as well as ribosome inactivating protein, β-carotene and antiviral activity. In addition the whole plant possesses analgesic and antipyretic properties and is used for the treatment of pain and fever, respectively in traditional systems of medicine. (Sharma et al., 2012).

***Chenopodium album* (Bathua):** This is primarily a weed of agronomic and horticultural crops, nurseries and occasionally pastures belongs to Chenopodiaceae family. In India this grows abundantly during winter season and the young leaves and shoots are used as leafy vegetable. In Assam it is popularly known as 'jilmil sak'. *C.album* is very rich in various nutrients like proteins, vitamins like Vit. A, Vit. C, Vit. B complex (Niacin, Riboflavin, Thiamine) and minerals like iron, potassium, phosphorous and calcium. Also rich in omega 3 and omega 6 fatty acids. It has got medicinal properties like anthelmintic, antiphlogistics, antirheumatic, contraceptive, laxative, odantalgic *etc*. Also used in the treatment of bug bites, sunstroke, urinary problems, skin problems etc. It is also rich in substance called saponins and flavonoids which control diabetes, prevent cancer, reduce obesity and protect our heart. It has been found to have antipruritic and anticiceptic (Dai et al., 2002), sperm immobilizing agent (Kumar et al., 2006), cryptomeridiol and 8-alphaacetoxy cyryptomeridiol as growth promoting activity. It has been found to have flavonoid as phenolic amide, hypotensive activity (Horio et al., 1993), cinnamic acid amide, alkaloid chinoalbicin, apocortinoid, xyloside, phenols and lignans. *C. album* extract was found to exhibit excellent antioxidant and free radical scavenging activity when compared with ascorbic acid during in vitro studies. The aqueous extract of *C. album* leaves revealed strongest antibacterial activity on *Staphylococcus aureus* and methanol leaf extract showed strongest antibacterial activity on *Pseudomonas aeruginosa* (Singh et al., 2011).

***Colocasia esculanta* (Arvi/Kochu):** Corms, runners and tender leaves of *Colocasia esculanta* are used as vegetable that belongs to Araceae family and very popular in North east India. Taro tuber are important source of carbohydrates and contain about 70-80% starch, relatively low in protein (1.5%) and fat (0.2%), good source of ash (1.2%), thiamine, riboflavin, iron, phosphorous, zinc and a very good source of vit. B6, vit. C, niacin, potassium, copper and manganese (Quach et al., 2003). The taro leaves are also rich in protein (23%) and minerals like Ca, P, Fe and vitamins. The high level of dietary fiber found in the taro leaf are also advantageous for their active role in the regulations of intestinal transit, increasing dietary bulk and faeces consistency due to their ability to absorb water (Anan & Plahar, 1995). Taro starch is easily digestible, good for peptic ulcer patients, patients with pancreatic disease, chronic liver problems, inflammatory bowel disease and gall bladder disease (Emmanuel et al., 2007). As taro corm have high amount of beta-carotene it will impart vitamin A and antioxidant property in the body. The tubers contain anthocyanins, cyanidin 3-glucoside and in common with flavonoids, the related anthocyanins are reputed to improve blood circulation by decreasing capillary fragility to improve eyesight, to act as potent antioxidants, to act as anti inflammatory agents, and to inhibit human cancer cell growth (Wagner, 1985). *Colocasia* (curry from corms and runners) is used as remedy for piles and tonsillitis by Koch–Rajbongshi, Bodo, Rabha tribes of north Kamrup district of Assam (Das et al., 2006).

***Cyphomandra betacea* (Tree tomato/tamarillo):** It is a semi woody perennial shrub belonging to solanaceae family with a height of 2-3 m, flowers are pink and pentamerous. Fruit is a berry with orange, red and reddish brown, oval, have a diameter of 9-12 cm. Fruits have higher content of juice and the ripe fruits are used either raw or made *chutney* by the local tribal people. It contains

good amount of protein 1.60g/100g, Vit. A (4.80 mg/100g DW), Vit. C (55.90 mg/100g DW), 11.20mg/100g calcium, 17.80 mg/100g sodium and phosphorous 410.60 mg/100g. (Mutalib et al. 2017). It also contain good amount of pectin and fiber which helps in preventing constipation, reduce cholesterol level in blood and control sugar level of people with diabetes. Tree tomato exhibit a higher antioxidant activity as compared to common and Cherry tomato for which it is considered as a good substitute for tomato (Noor Atiqah et al., 2014). Many phytochemicals have been reported by researchers in *Cyphomandrea* like 2-methyl (1, 3, 4) oxadiazole, 2, 3-dihydro-3, 5-dihydroxy-6 –methyl-4H-pyran-4-one and thiazole which has anti-inflammatory, antibacterial and antifungal properties. Thiazole is also reported to have anticancerous properties. Literature has revealed that *C. betacea* has a significant amount of phenolics, flavonoids, anthocyanin, and carotenoid which contribute to the antioxidant activity of the fruit extracts. The acceptable amount of phytochemicals in the fruits showed that *C. betacea* is one of the richest sources of antioxidant, phytonutrients and has anti-cholinesterase properties that can enhance human health (Hasan & Bakar, 2013).

***Diplazium esculentum* (Vegetable fern):** It is one of the top preferred rhizomatous edible fern under Athyriaceae family in North east India grown wild in tropical, subtropical and temperate forest. In Sikkim it is known as 'ningru' and 'dhekia saak' in other parts of north eastern region. The upper shoots are cooked and used as vegetable which are rich in iron, phosphorous, potassium and protein. The mineral content have also been reported to be several times greater than that is present in many commercial fruits. (Badola, 2010). The proximate analysis of edible portion indicates that it contain ash- 14.42 ± 0.01g/100g, Moisture 71.74 ± 0.417 g/100g, crude protein 18.32 ± 0.028 g/100 g, crude fiber 4.45± 0.013 g/100g, ascorbic acid 23.59± 0.05 mg/100,β-carotenoid 4.65±0.03 mg/100g and minerals like iron 38.20 ± 0.07 ,zinc 4.30 ± 0.26,manganese 21.11±0.87, sodium 29.00±1.38, potassium 74.46 ± 1.36, calcium 52.66 ± 0.49 and magnesium 15.30±0.20 mg/100g on dry weight basis (Saha et al., 2015). The fronds also possess medicinal properties like acts as mast cell stabilizer and can prevent anaphylatic shock (Das et al., 2012) have laxative effect (Kagyung et al., 2010). Plant decoction is used for hemoptysis and cough (Rahmat et al., 2003). Literature also revealed that the plant is also used for the treatment of dysentery, glandular swelling, indigestion, diarrhoea and various skin infections (Lense, 2012).

***Enhydra fluctuans* (Water cress):** *Enhydra fluctuans* Lour, a tropical herb, commonly known as helencha/harkuch or helosi(assamese), belonging to family Asteraceae, is gaining lot of importance for its therapeutic potentials. This is an edible semi-aquatic herbaceous vegetable plant with serrate leaves, generally available during summer. The plant is a prostrate herb, quite glabrous sometimes pubescent glandular. The tender leaves and stem are fried or boiled and taken with boiled potato, salt and mustard oil. The plant possesses nutritional value including- Protein, ß-carotene, saponins, cholesterol, glucoside, enhydrin and so on. The leaves are slightly bitter, cure inflammation, skin diseases, laxative, bronchitis, nervous affection, leucoderma, biliousness and good in small pox. It is reported that plant possesses antioxidant, hepatoprotective, CNS Depressant, analgesic and antidiarrheal activity. The leaves extract of *Enhydra fluctuans* is an effective antibacterial against *Escherichia coli, Pseudomonas aeruginosa, Staphylococcus aureus* and *Micrococcus luteus*. (Ali et al., 2013). Leaves are also used by the local people to treat ring worm (Das et al., 2006).

***Houttuynia cordata* (fish mint/chameleon plant/heart leaf):** *Houttuynia cordata*, also known as 'Mosundary' in assamese grows in moist, shady locations. A herbaceous perennial plant belongs to family piperaceae that can grow to 0.6–1 meter, leaves are alternate, broadly heart-shaped, flowers are greenish-yellow and borne on a terminal spike. It

normally blooms in the summer. It is commonly grown as a leaf vegetable and is used as a fresh herbal garnish. In northeastern India, it is commonly used in salads or cooked with other vegetables, along with fish as fish curry and as a garnish over side dishes. The tender roots can also be ground into chutneys along with dry meat or fish, chilies, and tamarind. *H. cordata* is a medicinal and edible herb with an aromatic smell that has long been used in Asia to treat pneumonia, hypertension, constipation, and hyperglycemia via detoxification, reduction of heat and diuretic action. There is accumulating evidence of multiple pharmaceutical effects of *H. cordata*, such as anti-cancer, anaphylactic inhibitory, anti-mutagenic, anti-inflammatory, anti-allergic, anti-oxidative, anti-viral, anti-bacterial, anti-obesity and anti-diabetic activities. Moreover, metformin, a well-known biguanide antidiabetic agent that has been used for more than 60 years, exerts multiple-properties such as inhibition of hepatic gluconeogenesis, enhancement of insulin sensitivity and augmentation of peripheral glucose uptake. Despite its beneficial impacts, metformin produces a large number of side effects, such as diarrhoea, nausea, cramps, vomiting, bloating, lactic acidosis, and abdominal pain, which usually occur in clinics (Wang et al., 2018). It is used as a remedy for diarrhoea and dysentery in Asia, composes of major active ingredients such as flavonoids, volatile oils and alkaloids. The major identified flavonoids in *H. cordata* are rutin, quercetin, quercitrin, isoquercitrin and hyperin. Flavonoids provide a wide range of pharmacological activities including antiviral, antimicrobial, antioxidant, anti-inflammatory, antileukemic, anticancer, and immunomodulatory effects (Das et al., 2014).

***Momordica cochinchinensis* (Sweet gourd):** *M. cochinchinensis* is very popular and widely grown cucurbitaceous vegetable in north east India. Immature tender fruits and leaves are used as vegetable. Fruits are rich in proteins, Vit. C and Vit. A. Fruits and leaves has medicinal properties too. Fruits are used in ulcers, piles, sores and obstruction of liver and spleen. They are good for those suffering from cough and indigestion. Unripe fruits act as appetizer and astringent. Seeds are used in chest problems and stimulate urinary discharge. Roots are rich in saponin and bessisterol which may be used in pharmaceutical industry.

***Murraya koenigii* (Curry leaves):** The plant belongs to Rutaceae family and highly valued for its leaves which are used for flavouring and spicing of food. A very popular spice herb known for its aroma is used in dal, curry, as chutney by the local people. The leaves have been found to contain high amount of carbohydrate, fair amount of protein and fiber, low amount of fat, a fair content of Vit. A and vit. B3 (niacin), rich in magnesium, calcium, sodium and trace amount of potassium and zinc. Presence of these minerals maintain electric potential in nerves, strong bone and teeth formation, electrolyte balance in body, boosting immunity and restoring dehydration. Phytochemical viz. flavonoid, phenols, saponins, alkaloid, tannins and glycoside are also found in leaves. With these content of antioxidant, flavonoids and phenols, curry leaf posses anticancer, cardioprotective and antitumour property (Igara et al., 2016). *Murraya koenigii* has hepatoprotective, cardioprotective, antioxidant, antidiabetic, anticancer, antibacterial, antiviral properties. Curry leaves have the richest source of carbazole alkaloid such as koenigine, mahanimbine and mu online extracted from the leaves which have been found to demonstrate anticancer and antioxidant properties (Kirupa & Kariitha, 2015). People of north east use curry leaves with the concept that it keeps health good. It has protective effect on kidney (Ghose & Parida, 2015).

***Paederia foetida* L. (*syn. Paederia chinensis* Hance, *Paederia scandans* (Lour.) /Skunk vine**

P. foetida is a climber belonging to Rubiaceae family and its leaves emit characteristic pungent odour upon smearing. It is available round the year and locally known as 'bhedai lota'.Young leaves and tender twigs of the plants are consumed as vegetable, suitable

with fish. Several reports document the dual use of the wild plant as food and medicine. Presence of high amounts of protein (5%), fat (1%), carbohydrate (3%), dietary fiber, minerals (nitrogen, phosphorus, potassium, iron, magnesium, calcium, zinc, copper, and manganese), vitamin C (271 mg per 100 g), and phenolic content increase its nutritional and medicinal values. Traditionally Assamese people use *P. foetida* for allergy, in gastralgia, post natal pain and bleeding, diarrhoea and dysentery and abdominal pain. Similarly in Arunachal Pradesh it is used against urinary disorder, kidney stone and digestive problem, gastric trouble, to clean stomach and against stomach swelling and diarrhoea, gastritis and loose motion by the tribal communities. Many studies revealed the therapeutic properties of *P. foetida* as anti-diarrhoeal activity, hepatoprotective activity, anti-inflammatory activity, antitussive activity, anti-arthritic activity, antioxidant activity, neurodegenerative disorders, anti-ulcer activity, analgesic, and others. The aerial parts of the plant contain iridoid glycosides (paederoside, asperuloside and scandoside), alkaloids (paederine a and b), essential oil and volatile compounds (linalool).Studies revealed that the diverse activity of iridoid glycoside viz. anti-oxidant, antibacterial, analgesic, anti-inflammatory, diabetic, and hepatoprotective. The other major constituents present in the plant are ursolic acid, β-sitosterol, oleanolic acid, arachidic acid. It has been postulated that presence of these triterpenoids (ursolic acid, oleanolic acid and their derivatives), saturated fatty acid (arachidic acid) and β-sitosterol may be responsible for its anti-ulcer activity. The plant extract of *P. foetida* is used in many polyherbal formulations especially those meant for arthritis patients (Chanda et al., 2013).

***Perkia temoriana/P.roxburghii* (Tree bean):** The long tender pods of tree bean are most popular and delicious vegetable in Manipur, Assam, Nagaland, Tripura and Mizoram, which are consumed either raw or processed. It is a large tree (up to 25-30 m height) with spreading branches (RFRI, 2015), family-leguminoceae and with yellowish white tiny flowers. Soft, tender, bright green fruits turn blackish when mature. The pods are used for preparations of different chutney, matured flowers and young shoots are used in curries and salad. Flowers, tender pods and seeds of this plant are edible and are a good source of proteins, fats, carbohydrates, vitamins and minerals compared to other legumes (Seal, 2011). It is a good source of ascorbic acid (26.0mg/100g), fat (20.28%), proteins (32.82%), minerals (4.45%), Na (51.0), Mg (34.7) and P (160 mg/100g), Ca (97.47), K (2400), Cu (2.3) and Zn (2.77 mg/100g), Fe (57.1 mg/100g) and Mn (35.0 mg/100g) (Singh et al. 2009). The seeds as well as the tender pods are known to cure stomach disorder, abdominal colic, bleeding piles and regulate liver function (Khumbongmayum et al., 2005). The pods are pounded in water are used in cleaning the face and head. Bark extract used for diarrhoea and dysentery. Bark and leaves of the tree bean are used as lotion for sores, skin diseases, eczema and ulcer (Sinha, 2001). Zuhud et al. (2001) reported anti-bacterial properties of tree bean leaf extract against *Escherichia coli, Vibrio cholerae, Staphylococcus aureus and Bacillus cereus.*

***Polygonum chinense* (Syn.*Persicaria chinensis* (L.) /(Chinese knotweed):** Chinese knotweed is a rhizomatous herbaceous twining, perennial plant that can grows 70 cm to 1 m tall when not climbing over other plants or structures, and otherwise it can climb over other vegetation up to 10 m high. Known as Madhusoleng in assamese, Angom yensi in Manipuri and Jaryndem in khasi and belongs to Polygonaceae family. Young leaves are cooked with other vegetables, with dal, in fish curry *etc*. The leaves of *Polygonum chinense* are astringent, rubefacient and vermifuge (Foster & Duke, 1990). *Polygonum chinense* used extensively as a detoxifying ingredient of Chinese cool tea, Contains hecogenin, aurantiamide, stigmastane-3, 6-ione, and 25-r-spirost-4-ene-3, 12-dione, which are anti-inflammatory and antiallergic. Phytochemical screening yielded terpenoids, flavonoids,

tannins, saponins and glycosides. The plant *Polygonum chinense* showed very promising in vitro cytotoxicity, antimicrobial and antioxidant activity. Leaves are found to contain Kamferol, Quercetin, Kampferol–7-O-Glycosides, β-Sitosteroid and acids. The plant is reported to have antimicrobial and antipyretic activity. The plant is traditionally used to treat fever, whooping cough, chest disease and wounds. The water and methanolic extract are reported to posse's analgesic, anti-inflammatory and antimicrobial activity (Srividya et al., 2012). It is a common plant in Malaysia and Vietnam, where it is used in herbal remedies, such as for the treatment of dysentery, enteritis, and sore throat.

Psophocarpus tetragonolobus **(Winged bean or Goa bean):** A robust climbing perennial belonging to leguminoceae family that grows up to 5 m in height generally grown in home gardens with different colours of flower-white, purple and blue. The pods are four sided with characteristics wings about 50 cm long containing 5-20 seeds in each pod (Sahoo et al., 2002). Seeds are globular. All parts of the plants *viz,* leaves, flowers, pods, seeds and tuberous roots are edible. The young tender pods can be stewed, boiled, fried, roasted and made into milk. Although at one time considered as a "poor man's food", it is now recognized as "A High Protein Crop for the Tropics" (NAS, 1981). Each of the parts contains vitamin A, vitamin C and calcium and iron among other nutrients. The seeds contain 40% proteins and the roots contain about 20% protein, which are supposed to be 10 times more than in potatoes and yams. The flowers and leaves also contain about10-15% protein. Winged beans are also rich in carbohydrate and Vitamin A (300 to 900 IU).

Sechium edule (Chow-chow): Chow-chow is a very popular cucurbitaceous vegetable in the north eastern region. Originated in tropical America, the tender shoots and tuberous roots are also consumed by the people. Locally called as 'squash' it is rich in amino acids. It is vigorous, scrambling, tuberous rooted perennial plant, grown for its starchy edible fruits and seeds. It grows abundantly without much care and attention in the high hills of Meghalaya, Manipur, Mizoram, Nagaland and Sikkim (Rai et al., 2002). Chow-chow is a good source of nutrients and vitamins (Calcium, phosphorous, Vit. A and Vit. C). The fruits and seeds have higher antioxidant activity (Ordonez et al., 2006) and are rich in several important amino acids (aspartic acid, glutamic acid, alanine, arginine, cystein, phenylalanine, glycine, histidine, isoleucine, leucine, methionine, proline, serine, tyrosine, threonine and valine). The softness of the fruit flesh makes it particularly suitable for giving consistency to baby foods, juices, sauces and pastes. Many of these nutritional characteristics make it suitable for hospital diets. Low calorific value of chow-chow fruits could be a best alternative to supplement potatoes especially for diabetic patients. The leaves and fruit have diuretic, cardiovascular and anti-inflammatory properties, and a tea made from the leaves has been used in the treatment of arteriosclerosis and hypertension, and to dissolve kidney stones (Saade, 1996).

Solanum torvum **(Turkey berry):** Edible fruits of *Solanum torvum* are used as vegetable which grows wild in north east India. Fruits are thin fleshed, many seeded, born in cluster, green in colour and yellow when ripes. The small fruits (1 cm in diameter) are consumed after stir fried or boiled and it is a good source of calcium and iron. Researchers reported fruits possess high moisture content (86.23%) and the value for carbohydrate as 7.033%, protein 2.322%, fat 0.278% and crude fiber 3.993%. Higher concentration of minerals like iron (76.869 mg/kg) and calcium (221.583 mg/kg) and other minerals like manganese (19.466mg/kg), copper (2.642 mg/kg) and zinc (21.460mg/kg) were observed. Vitamin A & C content are 0.078 mg/100g and 2.686 mg/100 g respectively. The high iron content of fruit proves the fact that, the fruits truly have hematinic property (Akoto et al., 2015). It is used in traditional medicine as poison antidote and for the treatment of fever, wounds, tooth decay, reproductive problems and arterial hypertension (Ndebia et al., 2007).

Phytochemical studies discovered that the fruit have good concentration of diverse alkaloids, flavonoids, saponins, tannins and glycosides sufficient enough to give pharmacological effect. Therefore, fruits are not only used for nutritional purposes but also fruit decoctions are regarded to be effective for cough ailments and in cases of liver and spleen enlargement (Chah et al., 2000).

CONCLUSION

The north eastern region is bestowed with most congenial climatic conditions for productions of underexploited vegetable crops. Underutilized vegetable crops require special attention to popularize and utilize their nutritional benefit and potential to treat many lifestyle diseases.

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