

Status, diversity and potential of indigenous and minor vegetables of North-Western Himalayan region

Indigenous (Traditional) vegetables are the species that are important for the economic, nutrition, health and social sustainability of local communities of that particular area but are yet to attain global recognition. About 20% of population in developing countries suffers from iodine deficiency. Subclinical vitamin A deficiency affects about 25% of children and more than 40% of women are anaemic. More over due to climate change, the indigenous vegetables may play an important role in future. The strategy to combat this problem is to diversify the diet and increase the intake of vegetables and fruits. Indigenous or traditional vegetables of a particular area show very substantive biodiversity, are adapted to specific marginal soil and climatic conditions, and often can be grown with minimal external inputs. Including the production systems of a particular area with traditional vegetables will not only increase the heterogeneity but will also subsequently lead to better resilience to abiotic and biotic stresses. This will help in increasing the socio-economic status of rural, poor smallholders with limited land resources and agronomic inputs. However, they have remained underutilized due to lack of awareness and popularization techniques for utilization.

Common Buckwheat (*Fagopyrum* spp.)

The name buckwheat comes from Anglo-Saxon word 'boc' seed resembles a small beech nut and 'whoet' (wheat). It is an ancient dicotyledonous crop, belonging to family Polygonaceae. Although it is an underutilized crop in India, it still plays an important role in food and nutritional security of rural people. There are about 20 species under genus *Fagopyrum*. Only two species, viz. *Fagopyrum tataricum* (tatar buckwheat) and *Fagopyrum esculentum* are cultivated in India. It is an erect, much-branched annual plant with hollow stems. It can grow from 60–120 cm tall. The seed of buckwheat is an important subsistence food in parts of Asia, where the plant has a history of cultivation going back at least 1,000 years. It is the most widely consumed buckwheat species with its advantages of sweet taste and large, easily de-hulled seed. It is often raised as a leafy vegetable crop in many areas of the Indian subcontinent.

Diversity

There are about 23 species of *Fagopyrum* that occur in the highlands of the Euro-Asia region. A wide range of ecogeographical conditions in the Indian Himalaya has generated tremendous genetic diversity in buckwheat species namely, tartary buckwheat (*Fagopyrum tataricum*), common buckwheat (*Fagopyrum esculentum*) and several wild and weedy forms. In India around 1,050 accessions of buckwheat have been collected from Indian Himalayas

and introduced from other regions. These are maintained as active collection at the National Bureau of Plant Genetic Resources (NBPGR), Regional Station, Shimla (Himachal Pradesh) and also represented as base collection in the Indian National Gene Bank at NBPGR, New Delhi. Himalayas offer a wealth of diversity in terms of landrace populations of buckwheat since the crop is cultivated in large stretch of land of higher hills of Himachal Pradesh, Uttaranchal, Jammu and Kashmir, Sikkim and North-Eastern hills for centuries, and this extent of diversity would suggest need for their continuous collection and devising strategies for *ex situ* and *in situ* conservation.

Distribution

Buckwheat exhibits rich biodiversity including those of wild species. It is distributed throughout the Indian Himalayan region with more diversity in Western Himalayan region than North Eastern region. This may be attributed to the common border of Western Himalayas and Tibet and the probable migration that could have taken place through several trade routes such as silk route. The most important areas where cultivation of buckwheat is most predominant are Kargil and Drass sectors, Gurez valley of Jammu and Kashmir; Bharmaur, Pangi, outer Saraj, Chopal, Dodra Kuar, Neshang, Pooh, Lahaul Spiti, Pin valley of Himachal Pradesh; Pindari valley, Dharma Valley, Jolwan, Jonpur, Kapkote in Uttaranchal; Cooch Behar, Darjeeling in West Bengal; Lanchan Lachoong

in Sikkim; Tawang, Bomdilla and Dirang in Arunchal Pradesh, and also sporadically in Nilgiris and Pilani hills in Southern parts of India.

Prospects and potential

The leaves and young shoots are boiled and eaten as spinach. Its perisperms can be used as fuel in producer gas plants. A dye prepared from its hulls is used in textile fabrics. It is useful as a green manure crop for renovation of low productivity land because it grows well on such land and produces a green manure crop in a short time and its cultivation promotes improved soil texture and increases production of fallow crop. It is consumed in many different preparations in different countries. The leaf flour is used in Japan as an additive to some food products, for example ice cream and to declare the functionality of the product. In Russia and Poland, the groats and flour are used to make porridge and soup. In Sweden, it is used to stuff fish. In China, buckwheat is used for the production of vinegar. In Southeast Asia, buckwheat is a staple food in many hilly areas. In Europe and North America, buckwheat flour is generally mixed with wheat flour to prepare pancakes, biscuits, noodles and is used as a meat extender. In Eastern Europe, roasted groats called roasted kasha are cooked and served like rice. The groats are used in the United States as a breakfast cereal. In North-Western Himalayas, its leaves are mostly consumed to make local delicacy known as 'Phafu'. Buckwheat, although is an underutilized vegetable crop, has many advantages for both the grower and the consumer. It has very short growing season and is thus often grown in area with short growing period, or as a second crop. It has the potential of diversifying cropping systems, enhancing human nutrition and contributing to regional economies. The buckwheat fields in flowering can serve valuable source of nectar for bees. Honey produced from buckwheat is typically dark and has a stronger flavor than honey produced from clover and is preferred by consumers. Buckwheat has the ability to establish itself quickly and compete with weeds with minimum fertilizer requirements and can be left from planting to harvest. The cold arid region of Indian Himalaya is highly suitable for buckwheat cultivation. This crop has also been recognized as one of the most important nutraceuticals food.

A lot of information on the origin and distribution of various species of buckwheat has appeared, a great effort is required to search for more variability including the traits of economic importance. The buckwheat of the Himalayan region are geographically unique and the preservation and conservation of the crop in this region should be given emphasis and more knowledge should be gathered about diversity of buckwheat landraces and farming systems in the traditional mountain farming systems. On farm conservation of buckwheat landraces is an important component of crop improvement, human health and conservation.

Pako fern/lingru/vegetable fern (*Diplazium* spp.)

Ferns are mostly considered as ornamental plants but many of these species are edible and eaten either raw or cooked in different parts of the world due to their



Buckwheat

nutritive values. In India, *Diplazium esculentum* (Retz.) Sw. (Family: Athyriaceae) is one of the very popular edible ferns found throughout Asia and Oceania. It is probably the most commonly consumed fern. It is known as *pucuk paku* and *paku tanjung* in Malaysia, *pako* in the Philippines, *dhekia* in Assam "Dhenkir Shaak Bengali", *palo saag*, *ningro* in Nepali and *linguda* in Northern India, referring to the curled fronds. The plant is sold in bundles of fresh aerial parts in the local markets and believed to be the tastiest among other ferns locally used. *Diplazium esculentum* is a vascular plant and belongs to the class of Pteridophyta. It does not produce seeds or bear fruits but is propagated through spores. The plant is mainly terrestrial, growing in open marshy areas, stream banks and canals from sea level to 2,300 m above mean sea level and occasionally on limestone rock. Rhizome erect, rhizome scales dark brown with black margins, up to 10 mm long, margins finely toothed; vegetatively spreading and forming colonies from root buds. Fronds large, tufted, erect. Stipe up to 6 cm long, grooved, pale brown above, darker and more scaly at the base. Lamina 2- to 3-pinnate, up to 0.85 m × 0.6 m, triangular in outline. Pinnules triangular-linear, variable in size, up to 8 × 2.5 cm, dark green, subsessile, very shallowly cut into lobes with rounded apices, margins toothed, glabrous above, but costules and veins below with scattered, pale brown scales; veins free or forked, basal 3-5 pairs of adjacent veins anastomosing below the sinus. Rhachis grooved, subglabrous with small light brown scales especially along the groove. Sori linear, set along most veins; indusium dark brown, thin, margins becoming uneven with age.

Diversity

The genus *Diplazium* comprise 400 species distributed in different regions. The rare fern *Diplazium molokaiense* was reported in East Maui, Hawaii. *Diplazium fimbriatum* has been reported as a new species from Brazil. Several *Diplazium* spp. are known from Thailand (*Diplazium bantamense*, *Diplazium cordifolium*, *Diplazium crenatoserratum*, *Diplazium esculentum*, *Diplazium polypodioides*, *Diplazium riparium*, *Diplazium silvaticum*, *Diplazium simplicivenium*, *Diplazium sorzogonense* and *Diplazium tomentosum*). Indonesia also possesses many *Diplazium* spp. (*Diplazium asperum*, *Diplazium cordifolium*, *Diplazium esculentum*, *Diplazium lomariaceum*, *Diplazium pallidum*, *Diplazium simplicivenium*,

Diplazium sorzogonense and *Diplazium tomentosum*). Nearly 40 species of *Diplazium* are reported in India and upto 17 species have been reported in Sikkim alone. The common *Diplazium* in India include *Diplazium bellum*, *Diplazium dilatatum*, *Diplazium doederleinii*, *Diplazium esculentum*, *Diplazium forrestii*, *Diplazium kawakamii*, *Diplazium latifolium*, *Diplazium laxifrons*, *Diplazium longifolium*, *Diplazium maximum*, *Diplazium medogense*, *Diplazium polypodioides*, *Diplazium sikkimense*, *Diplazium spectabile*, *Diplazium squamigerum* and *Diplazium stoliczkae*. *Diplazium spp.* has also been reported from Western Ghat regions of Maharashtra, Karnataka, Kerala and Tamil Nadu.

Distribution

Diplazium esculentum is an edible fern, pan tropical in distribution and occurs widely and commonly throughout India, China, Cambodia, Laos, Thailand, Vietnam and Malaysia. It grows in gregarious colonies in open marshy areas, stream banks and canals from sea level to 2,300 m. In India it is distributed in West Godavari and Srikakulam districts of Andhra Pradesh; Chakmanglur, Hassan, Kodagu, Shimoga and Uttara Kannada district of Karnataka; Similipal hills, Kalahandi district, Mahendragiri hills, and Berbera forest of Odisha; Kullu, Kangra, Shimla, Kinnaur, Solan and Lahaul Spiti districts of Himachal Pradesh and Poonch, Bhadarwah and Reasi districts of Jammu and Kashmir.

Prospects and potential

Diplazium ferns are considered the most important ferns for human consumption. They show potential as 'functional food' in view of the significant therapeutic and nutritive benefits. The tender uncurling leaves of *Diplazium* are eaten boiled or steamed as a leafy vegetable or raw as a salad with various dressings. It is an appreciated vegetable, being slimy and sweetish after cooking. Occasionally it is used as an ingredient in more complicated dishes. *Diplazium esculentum* is the most palatable and most popular vegetable fern used as human food in the world. It is reported that the edible fronds of this fern are rich in iron, phosphorus, potassium and protein. It is believed by the native tribes in India that *Diplazium esculentum* serves as an appetizer and useful to treat constipation. The decoction of dried rhizomes of this fern serves as laxative, anti-inflammatory, antioxidant, anthelmintic, antimicrobial, cytotoxic and has the capacity to cure haemoptysis as well as cough. The *Diplazium esculentum* is also known for β carotene, folic acid, phytic acid and tannins. An extract of mature



Diplazium esculentum

leaves is applied externally against fever and the leaves are rubbed on the body to get rid of the unpleasant smell of sweat. The pulverized rhizome, soaked in water, is taken against diarrhoea and dysentery. Besides this, *Diplazium esculentum* and *Diplazium proliferum* are also attractive ornamentals in gardens and are widely cultivated for this purpose.

Bathua (*Chenopodium spp.*)

The genus *Chenopodium* belongs to the Amaranthaceae, syn. Chenopodiaceae family. With a few exceptions, the majority of them are annual weeds. The genus includes herbaceous and perennials, and is distributed throughout Asia, America and Europe. Chenopodiaceae has been included as one of the six families that lack clear delimitation or valid synapomorphies. It is erect annual herb up to 1.5 m tall. The young vegetative parts are densely clothed with mealy-white or red-purple vesicles. Stem is angular, ribbed, with longitudinal dark green or red streaks. Leaves are alternate, simple and lower leaves have long petioles, irregularly and coarsely toothed or incised, while higher ones gradually have shorter petioles, elliptical-oblong-lanceolate, less deeply incised or entire. The inflorescence is axillary and terminal leafy panicle consisting of clusters of flowers. Flowers are bisexual, regular with superior ovary. Seed is nearly smooth, lenticular and 1–2 mm in diameter.

Diversity

Genus *Chenopodium* comprises 250 species, which are herbaceous perennials belonging to the family Amaranthaceae (syn. Chenopodiaceae). The genus is economically important because many species e.g. *Chenopodium quinoa*, *Chenopodium berlandieri* subsp. *nuttalliae*, *Chenopodium pallidicaule*, *Chenopodium album* and *Chenopodium giganteum* have a long history of domestication as grain, vegetable or forage crops. Among these, *Chenopodium quinoa* is a high protein pseudo cereal and used as staple grain grown in South America, though recently its cultivation is spreading to many other parts of the world. Both *Chenopodium quinoa* and *Chenopodium berlandieri* subsp. *nuttalliae* are allotetraploids, though studies with regard to their exact genomic constitution, mode of origin and phylogenetic relationships with other related wild species are at a preliminary stage.

Distribution

Amaranthaceae is a widespread cosmopolitan family and is spread from the tropics to cool temperate regions, whereas Chenopodiaceae had its centers of diversity in dry temperate and warm temperate areas. Genus *Chenopodium* has a worldwide distribution and contains about 250 species; 21 species have been reported in India. The most widespread species in the Indian subcontinent is *Chenopodium album* L., a common weed in wheat fields in northern India. It is popularly known as bathua in Hindi. Other reported *Chenopodium* weed species in India include *Chenopodium ambrosioides*, *Chenopodium murale*, *Chenopodium opulifolium* and *Chenopodium botrys*. *Chenopodium album* grows as a weed all over India and some names in other Indian languages include Chakvit



Bathua

(Konkani), Vastuccira (Malyalam), Paruppukkirai (Tamil) and Pappukura (Telugu). The common English names are goosefoot and lambs quarters.

Prospects and potential

Bathua has been used in India as green vegetable and for stuffing parathas (layered bread) in north India since ages. The leaves of *C. album* are rich in protein (2.6–6.4%), carotenoids (78–190 mg/kg) and vitamin C (0.5– 2.5 mg/kg). Its flour mixed with wheat flour can be used for making chapatis and when mixed with gram (*Cicer arietinum*) flour, it can be used for making sweets, such as laddoos. In Himachal Pradesh, its grain is used for making a gruel-type dish called phambra or laafi and for making mildly alcoholic beverages such as soora or ghanti. It has also been used in Ayurvedic and local medicines in India as a blood purifier, hepato-protective, laxative, and diuretic, sedative and anthelmintic against round and hook worms. However, it could not emerge as a foodgrain crop, due to large biodiversity provided by Himalayas and it had to compete with other crops like buckwheat (*Fagopyrum esculentum*) and a number of small millets such as barnyard millet (*Echinochloa crusgalli*), proso millet (*Panicum miliaceum*), little millet (*Panicum sumatrense*), kodo millet (*Paspalum scrobiculatum*) and fox tail millet (*Setaria italica*), which have larger grain size, which was one of the criteria used by ancient humans in domesticating plant species. However, people of Andes, South America (Peru, Bolivia, Ecuador, Venezuela, Colombia, Chile and Argentina) domesticated quinoa (*Chenopodium quinoa* Wild) around 3000–4000 years ago and made it a successful grain crop. Quinoa has been an important staple in the Andean culture.

Jangli Palak (*Rumex* spp.)

Rumex nepalensis belongs to Polygonaceae family. It is an herbaceous, perennial plant producing erect, branched stems 50–180 cm tall from a large rootstock. The basal

leaves of *Rumex nepalensis* may be different from those near the inflorescence. The inconspicuous flowers are formed like whorls quite above the leaves. The flowers are hermaphrodite and can act as male or female flowers. The plants have high amount of oxalic acid which gives an acid flavor to its leaves.

Distribution

Members of this genus are very common perennial herbs with a native almost worldwide distribution, and introduced species growing in the few places where the genus is not native. The plant is grown in many parts of India. In India, it is found grown in Assam, Himachal Pradesh, Kashmir, Meghalaya, Western Peninsula and temperate Himalayas.



Jangli palak

Prospects and potential

The leaves of *Rumex* spp. (Polygonaceae) plants are used in traditional medicine for the treatment of several health disorders such as infections, diarrhoea, diabetes, jaundice, oedema, hypertension, diuretic, analgesic and inflammation. It has various pharmacological activities such as antitumor, antibacterial, antiviral, antifungal, antioxidant, antiplasmodial, antinematodal and antiinflammatory activities. Anthraquinones, flavonoids, stilbenoids, naphthalenes, tannins, triterpenoids, carotenoids, polysaccharides have been reported in the *Rumex* spp. It is used as a substitute for rhubarb. A decoction of the root is drunk for the treatment of rheumatism, colic, stomach-ache and abdominal pains caused by intestinal parasites. The leaves are used in the treatment of colic. The plant is also considered to be antidote, depurative and laxative, as well as a medicine for treating coughs and headaches. The root contains 5–13% tannin. It is used for dyeing. Dark green to brown and dark grey dyes can be obtained from the roots of many species in this genus.

Indian Spinach (*Basella* spp.)

Basella alba L. (2n=48) and *Basella rubra* L. (2n=44) are one of the rapidly growing leafy vegetables, also noted by regional names in different regions in Asia viz. Ceylon spinach, Malabar spinach, Saan Choy (Chinese), mong toi (Vietnamese), Alugbati (Philippines), Pui Saag (Bengali), Remayong (Malay) belongs to the family Basellaceae and order Caryophyllales. Although the plant is a perennial climber, it is cultivated as an annual leafy vegetable. It is an important and reliable source of income for marginal and small farmers and tribal folks of India. It is widely adapted to a variety of soils and climates. It thrives well in tropical and subtropical climate. Being a warm season crop, it is extremely heat tolerant and frost tender. It



Basella spp.

can thrive under conditions of moderate soil fertility and can grow in highly acid soils, but is quite responsive to nitrogen fertilizer. It is a minor leafy vegetable and since it is generally grouped together with other greens.

Distribution

It is native to tropical Asia, probably originating from India or Indonesia. The distribution of *Basella* extends from the tropical and subtropical regions mostly America, Africa, Madagascar and south India to New Guinea. It is grown in almost all parts of India, tropical Asia and Africa. It is gaining popularity in some of the tropical and temperate climates of Asia, America, Australia and Europe.

Prospects and potential

The plant is found to be versatile in properties. It can be used as leafy vegetable, ornamental, dye and medicine. Tender shoots with succulent stem along with thick, semi-succulent and mucilaginous leaves are used as leafy vegetable. It is appreciated for its organoleptic characteristics and makes a tasty addition to salads, dips and meals. The leaves are also used for making soups. It has high economic, nutritional and medicinal values. This crop is a valuable income source for marginal and small farmers near the principal urban centers. It plays a vital role in food and nutritional security particularly during the dry periods. It is rich in food value, supplying minerals, vitamins, proteins, carbohydrates and dietary fibre. It is a good source of calcium, iron, vitamin A, vitamin B9 and

vitamin C. *Basella alba* has been used from a long time back for the treatment of many diseases like dysentery, diarrhea, anaemia and cancer. The Ayurvedic treatment in India used *B. alba* leaves and stems for anticancer such as melanoma, leukemia and oral cancer. In India, it has been used for antipruritis and burn, and has been used in Bangladesh for acne and freckle treatment. Stems and leaves are used as mild laxative, diuretic and antipyretic. Roots and leaves have been used for the removal of after birth and stomach pains and for increasing milk production. A decoction of the leaves is a good laxative for pregnant women and children. The boiled leaves along with sorghum flour are an effective antiulcer agent. The roots are used in the treatment of diarrhea, the cooked leaves and stems are used as laxatives. The flowers are used as an antidote to poisons and also as diuretic and febrifuge.

Sonchal (*Malva* spp.)

Common mallow can be found growing erect or prostrate, which may initially cause confusion because it is easy to assume they might be two different species. Mallow's kidney-shaped or palmately-lobed leaves are notably creased, typically with dentate margins. The leaves often show a purple spot in the centre of the base of the leaf and this can also be seen to run down the petiole on some specimens. On other specimens, the purple spotting and coloring is completely absent. Mallow leaves have long petioles. Their deep green foliage hints at a renowned drought tolerance. During flowering, the leaves appear alternately on the stems. Holding a leaf relays the surface coarseness. But tear and crush one, and you discover a family pattern-the mucilage. You will soon experience a slimy and tacky feel between your fingers. All parts of the plant contain mucilage. In bloom, the Malvaceae family plants produce five large notched petals in each open flower. Common mallow has showy pink petals laced with darker-colored strokes. In the centre of the flower lies a pollen-loaded column of fused stamens. This surrounds the stigma, which rises above the column. Mallow is known to freely seed. The round seed pods, known as 'cheeses', soon follow flowering. These were once munched by children on their way to and from school. The pods are held on stalks, close to the flowering stem.

Distribution

This species is globally distributed in temperate and subtropical Eurasia, introduced and naturalised in North America. Within India, it is found from Kashmir to Kumaon up to an altitude of 2400 m. Bihar and parts of the Deccan Peninsula, mostly as a weed. It is also cultivated in gardens.

Prospects and potential

As with many wild food plants, the common mallow also has a long history of medicinal use. Due to its high mucilage content, mallows make excellent soothing demulcent herbs, especially for cases of inflammation, either for the urinary, digestive or respiratory systems. Pregnant women or new mothers may like to know that mallow leaves can provide useful amounts of iron,



Sonchal

as well as being quite high in zinc and most vitamins. Creative cooks can substitute mallow for spinach in many dishes, including soups, salads, gnocchi and quiche. Mallow also makes a great addition to soups, whereby the mucilage helps to thicken them. During the war of 1948, when Jerusalem was under siege, mallow was an important famine crop, and one that is still celebrated on Independence Day every year with a traditional dish made from mallow leaves. In China, mallow roots are a popular and a common ingredient in making hearty, yet medicinally potent soups and broths. The seed pods can be substituted for most of the egg white if desiring to make mallow meringues.

Tarad (*Dioscorea* spp.)

It is a non woody vine, twining, glabrous and attains 10–15 m height. It has shallow, fibrous root system which is mostly confined to the top 1 m of the soil. Tubers are usually single which vary in size and shape, often very large cylindrical or clavate in shape or globose, stout and short, pyriform, lobed or fingered and fasciated or curved. The colour of the skin vary from brown to black, with white, cream or purplish flesh. Leaves are mostly opposite, sometimes alternate on branches of rapid growth. Inflorescences are axillary, unisexual, pendulous. Staminate inflorescences are paniculate that contain numerous male flowers. Pistillate inflorescences are racemose, with few flowers. Fruits 3 locular capsule, 2-3 cm wide, each locule flattened like a wing, with 2 seeds inside.

Diversity

The family Dioscoreaceae includes about 4-6 genera and 870 species. The members of this family are often herbaceous climbing vines. The circumscription of this family remains controversial. While some authors define this family in a strict context including only the genera *Dioscorea*, *Tamus* and *Rajania*, others define this family in a broader context, also including the genera *Avetia*, *Trichopus*, *Stenomeris* and *Tacca*. The genus *Dioscorea* includes about 350 – 800 species distributed largely in the tropics, but

also in the warm and temperate regions. Species in this genus are dioecious, twining and herbaceous to woody vines with single or clustered large tubers, some of which are edible and are known as yams.

Distribution

Yams (*Dioscorea* spp.) are important food security crops for millions of small-scale farmers in the tropical and subtropical regions of Africa, Asia, the Pacific, the Caribbean and Latin America. It is locally called as 'Tarad' in Northern India. *Dioscorea alata* (known as the 'greater yam' or the 'winged yam') is one of the major cultivated species with wide geographical distribution. Several traits of *Dioscorea alata* make it particularly valuable for commercial cultivation. These include high yield potential, ease of propagation, early growth vigour for weed suppression, and long storability of tubers. Tubers possess a high nutritional content with an average crude protein content of 7.4 %, starch content of 75–84 %, and vitamin C content ranging from 13.0 to 24.7 mg/100g.

Prospects and potential

Dioscorea species with nutritive and antioxidant content not only enrich the diet of the local rural and local people but also make them ethnomedicinally important. Tubers of different species of *Dioscorea* are used for curing various diseases and ailments in different formulations. Most of the tubers of *Dioscorea* are used for birth control and skin infections. Tubers and vegetative parts of these species are used either in single or in multiple formulations. This chemical can be made in the laboratory into various steroids, such as estrogen and dehydroepiandrosterone (DHEA). The root and the bulb of the plant are used as a source of diosgenin, which is prepared as an 'extract,' a liquid that contains concentrated diosgenin.

Ethno medicinal uses of 16 species of *Dioscorea* have been documented for their therapeutic properties for curing various ailments such as cough, cold, stomach ache, leprosy, burns, fungal diseases, skin diseases, contraceptive, dysentery, arthritis, rheumatism, etc and among these species *Dioscorea alata*, *Dioscorea pentaphylla*, *Dioscorea bulbifera* and *Dioscorea villosa* show maximum medicinal properties. *D. deltoidea* is quite exceptional because extract of its tubers is mostly used as a detergent to wash clothes and as an insecticide. It is not used for culinary purpose because of the presence of hard and fibrous tubers and its poisonous nature. Again consumption of *Dioscorea*



Dioscorea pentaphylla



Dioscorea alata

Tarad (*Dioscorea* spp.)

bellophylla lowers blood cholesterol and thereby reducing the chances of heart attacks. *Trinervia* can cure chronic diarrhoea, asthma and diabetes. *Dioscorea hamiltonii* is used in religious rites. It is seen that tubers or rhizomes of almost all the species are edible. They are eaten boiled or roasted or as vegetables or cooked with mushrooms and other vegetables in curries. The most preferred and valuable edible species recorded are *Dioscorea alata*, *Dioscorea esculenta*, *Dioscorea pentaphylla*, *Dioscorea pubera*, *Dioscorea bulbifera*, *Dioscorea aculeata*, *Dioscorea sativa* and *Dioscorea arachnida*.

Chulai (*Amaranthus spp.*)

It is commonly called as Chulai belonging to family Amaranthaceae. It is primarily used as pot herb. It is most common leafy herb grown in India during summer and rainy season. Most of the *Amaranthus* spp. are originated from India or Indi China region. Among leafy types *Amaranthus tricolour* L. is the main cultivated species of India. It is an annual herbaceous plant, 30–60 cm in height. It has stout stems, much branched, with angular, glabrous leaves arranged spirally, simple elliptic to lanceolate. Leaf colour dark green, light green or red. Terminal leaves may be red, purple, yellow or variegated. Inflorescences borne terminal and axillary, globose cluster up to 2.5 cm in diameter, upper clusters form a terminal spike, male and female flowers intermixed. Flowers unisexual, subsessile. Male flowers have three stamens, female flowers have superior single celled ovary with three stigmas. Fruit ovoid-urceolate capsule.

Distribution

Tropical Asia, mainly South Asia, more variability in the Himalayas and northern plains of India; also Bangladesh, Sri Lanka; partially domesticated and grown in home gardens. Leaves boiled as soup, or chopped and cooked as a vegetable; also *A. viridis*, the green amaranth. *Amaranthus* spp. (Amaranthaceae). South/Southeast/East Asia; also sporadic distribution in the Pacific Islands. The amaranth-vegetable genepool has several species grown as pot herbs, in backyards, kitchen gardens/home gardens - *Amaranthus blitum*, *Amaranthus dubius*, *Amaranthus tricolor/gangeticus*, *Amaranthus graecizans*, *Amaranthus polygonoides*, *Amaranthus spinosus*, *Amaranthus viridis*. Most of these have sporadic distribution with native or introduced diversity being grown for local use; some like *Amaranthus paniculatus/Amaranthus tricolor* are more popular with wider distribution and diversity of local and improved types.

Diversity

Diversity of *Amaranthus* (Family Amaranthaceae) can



Chulai

be observed from sea level to high altitudes even in the worse climatic conditions, and they are rich in micro nutrients and bioactive compounds. In the rural areas of India, amaranths occupy an unparalleled position and are been used in a large number of culinary preparations.

Prospects and potential

The cultivated amaranths are utilized as food grains, leafy vegetables, and forage crops in diverse geographic areas, such as America, China, Greece, Italy, Russia, Nepal, and India. The superior nutrition, drought tolerance, disease and pest resistance, high yield in production, and increasing rate of consumption have made this crop more attractive for cultivation in developing countries such as India. Compared with traditional crops, this pseudo cereal is rich in protein (17–19% of dry weight) with double the amount of essential amino acids than wheat grain protein. It is considered to have medicinal properties and is used against external inflammation and bladder distress. It is also reported to improve the kidney function and aid digestion. The roots of red spinach are used as a remedy for dysentery. It is highly recommended for consumption by patients with colon cancer, diabetes mellitus, high blood cholesterol.

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