



E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; 7(5): 402-407
Received: 28-07-2018
Accepted: 30-08-2018

Anil Kumar Jena

Assistant professor-Agriculture,
Faculty of Agricultural sciences,
Arunachal University of studies,
Namsai, Arunachal Pradesh,
India

Rimi Deuri

Assistant professor-Agriculture,
Faculty of Agricultural sciences,
Arunachal University of studies,
Namsai, Arunachal Pradesh,
India

Pranamika Sharma

Assistant professor-Agriculture,
Faculty of Agricultural sciences,
Arunachal University of studies,
Namsai, Arunachal Pradesh,
India

Surya Prakash Singh

Lecture-Agriculture, Faculty of
Agricultural sciences, Arunachal
University of studies, Namsai,
Arunachal Pradesh, India

Correspondence

Anil Kumar Jena

Assistant professor-Agriculture,
Faculty of Agricultural sciences,
Arunachal University of studies,
Namsai, Arunachal Pradesh,
India

Underutilized vegetable crops and their importance

Anil Kumar Jena, Rimi Deuri, Pranamika Sharma and Surya Prakash Singh

Abstract

Vegetables are the key component of balanced human diet and also the main drivers in achieving global nutritional security by providing nutrients, vitamins and minerals. This spectacular growth in vegetable production has increased and this was possible due to development of improved varieties/hybrids/ production and protection technologies through systematic research coupled with large scale adoption by the farmers. However, this remarkable production was contributed by only few major vegetables. Although, diverse agro climatic conditions of India permit to grow more than 60 cultivated and about 30 lesser known vegetable crops, not much attention has been given on underutilized vegetables known. The vegetable crops which are neither grown commercially on large scale nor traded widely may be termed as underutilized vegetable crops. The possible reasons for the low utilization of underutilized vegetables, in spite of their recognized importance are due to lack of availability of planting material, lack of awareness on nutritional and medicinal importance and lack of information on production technique of these crops. In this context, there is an urgent need to take up programme on genetic resources exploration, management, utilization and improvement of underutilized vegetable crops to ensure food and nutritional security for future. The climate and soil of India are favourable for the production of different underutilized vegetables. Thus, the government of India has been taking some steps towards highlighting the underutilized vegetables. Finally, it can be concluded that, underutilized vegetables production will meet the shortage of per capita consumption availability there by solve the nutritional problems and at the same time it generates the employment and also increase the income of rural people and finally it could contribute the national economy.

Keywords: Underutilised, vegetables, orphan and minor

Introduction

India is one of the most populous country of the world and toughly accounts for about one-fifth of the world's population with more than 70% of the farming households. The annual population growth rate is around 1.8 percent, whereas, the overall demand for food is expected to grow by 3% or more per annum in the near future. Therefore, the production of food in the region should grow annually @ of about 3.5 per cent to meet the growing food demand. Synergistic interactions among improved technologies, institutional supports, favourable governmental policies and awakening among the farmers are necessary to tackle the various issues. The self-sufficiency does not necessarily mean nutritional adequacy. In fact, considerable imbalances persist in respect of the calories, proteins, minerals and vitamins availability. Further, malnutrition problems are quite widespread in the country. These deficiencies could be minimized to a considerable extent by increased availability of vegetables. Vegetables are the key component of balanced human diet and also the main drivers in achieving global nutritional security by providing nutrients, vitamins and minerals. In India, vegetables alone contribute 58.73% of total horticultural production. India produced 162.89 million tonnes of vegetables from an area of 9.39 million ha. (Arora *et al.*, 1980) [20]. this spectacular growth in vegetable production has increased the productivity to 16.45 t/ha and *per capita* availability to 280 g. This magnificent increase was possible due to development of improved varieties/hybrids/ production and protection technologies through systematic research coupled with large scale adoption by the farmers. However, this remarkable production was contributed by only few major vegetables. Although, diverse agro climatic conditions of India permit to grow more than 60 cultivated and about 30 lesser known vegetable crops, not much attention has been given on underutilized vegetables known. Underutilised crops/plant species as “those species with underexploited potential for contributing to food security, health (nutritional/medicinal), income generation, and environmental services” (Jaenicke and Hoeschle, 2006) [9]. The vegetable crops, which are neither grown commercially on large scale nor traded widely, may be termed as underutilized

However, presently only one fourth is utilized as a major vegetable crops and rest are named as minor, underutilized, rare vegetables, wild edible vegetables or so on. Underutilized or wild vegetables may not be widely known outside of a specific area or region, and there is a perception that they are grown mostly in rural areas. In some places consumption of these plants is not socially acceptable by some community sectors because they are considered to be food for the poor (Jaenicke and Hoeschle, 2006) [9]. Underutilized vegetables have local or regional importance, but generally lack national recognition and appreciation. The under-utilized vegetable crops are the plant species that are traditionally used for their food, fiber, fodder, oil or medicinal properties. However, those species have under-exploited potential to ensure food security, nutrition, health, income generation and environmental services.

Common Understanding

Different names are used interchangeably to describe the range of underutilised vegetable crops. Some of these names are, Orphan, abandoned, new, neglected, lost, underused, local, minor, traditional, forgotten, alternative, niche, promising, underdeveloped: these and other terms are often used as synonyms for underutilized species.

To be considered as an 'underutilized vegetable crops', a plant must have the following features:

- Crop must have a scientific or ethno botanical proof of food value.
- Crop must have been cultivated, either in the past or only being cultivated in a specific geographical area.
- It must be currently cultivated less than other conventional crops.
- Crop must have weak or no formal seed supply system.
- Crops are recognized to have indigenous uses in localized areas.
- Received little attention from research, extension services, farmers, policy and decision makers and technology providers.
- May be highly nutritious and/or have therapeutic medicinal or therapeutic properties or other multiple uses.

Importance

Underutilized vegetables are becoming more widely and effectively deployed to address malnutrition, poverty and economic prosperity. They constitute essential biological assets of the rural poor and can contribute to improving the well-being of millions of tribal population. Underutilized vegetables are rich in vitamins, minerals and other health promoting factors including high antioxidant activity. They play a major role in the diversification of diet leading to more balanced source of micronutrients. Furthermore, underutilized vegetables possess resistance to several biotic and abiotic stress the underutilized vegetable crops can also provide nutrition to the poor by meeting the nutrient requirements of vulnerable groups too.

A number of vegetables and particularly underutilized vegetables are natural and rich source of vitamins, minerals and antioxidants. Underutilised vegetables play an important role in the life of rural people; they form an important part of food and nutrition of local population as many of them are traditionally been esteemed for their utilization in terms of medicinal, therapeutic and nutritional values since time immemorial and are consumed either as raw or as cooked vegetables as traditional delicacies and the sales from the surplus of these vegetables add to the income of many rural

families Malnutrition and subsequent food shortage among the poor rural population are conspicuous. They have potential to contribute to poverty elimination through employment opportunities and income generation and also through improved efficiency and profitability of farm household labour use in both rural and urban environments. With the use of underutilized vegetable crops, there is a way to reduce the risk of over-reliance on very limited number of major crops. They can contribute to sustainable livelihoods through household food security as they can widen the food edibility options. They add nutrients to the diet and are sometimes convenience food for low income urban people. They are adapted to fragile environments and can contribute to the stability of agro ecosystems, particularly in the arid, semi-arid lands, mountains, steppes and tropical forests. They provide a broad spectrum of crops to improve productivity and global food security and to meet new market demands.

Potential Role of Underutilised Vegetables

Food security and better nutrition

Many neglected and underutilized vegetables are nutritionally rich and are adapted to low-input agriculture. The erosion of these species, whether wild, managed or cultivated, can have immediate consequences on the food security and well-being of the poor. Their enhanced use can bring about better nutrition. For example, many underutilized vegetables contain more vitamin C and pro-vitamin A than widely available commercial species and varieties. Focusing attention on neglected and underutilized vegetables is an effective way to help maintain a diverse and healthy diet and to combat micronutrient deficiencies, the so-called 'hidden hunger', and other dietary deficiencies particularly among the rural poor and the more vulnerable social groups in developing countries

Increased income for rural poor

The growing demand from consumers in developed and developing countries for diversity and novelty in foods is creating new market niches for neglected and underutilized vegetables. These market opportunities can generate additional income for poor farmers in less-favoured environments where these crops have comparative advantages over major staples or commercial crops. In addition, the ability of modern technologies to transform crops and other plants into diverse products and to extend their shelf-life has created new opportunities to develop new uses and thus to market these species and their products.

Ecosystem stability

Climate change and the degradation of land and water resources have led to a growing interest in crops and species that are adapted to difficult environments such as desert margins, those with poor soil or degraded vegetation, or subject to drought.

Cultural biodiversity

The use of plants has long been an intimate part of local cultures and traditions. Many neglected and underutilized vegetables play a role in keeping alive cultural diversity associated with food habits, health practices, religious rituals and social exchange

List of Underutilized Vegetables

Alternanthera sessilis (Ponnanganni Greens, Gudrisag)

The leaves are eaten as potherb and used for cool down the body useful in diarrhoea, fever, anaemia etc. In Karnataka

and Tamil Nadu, the leaves, flowers and tender stems are consumed as vegetables. Ponnanganni greens are rich in protein, carbohydrate, fat, fibre, carotene, vitamin C, riboflavin, niacin and various minerals. Leaves and tender shoots are used as vegetables. It is mainly propagated by seed.

Sesbania grandiflora pers (Agathi)

Leaves, flower and tender fruits are valued as vegetables or mixed into curries or salads in many countries due to their high nutritious value particularly vitamin A and minerals. Leaves and flowers have nutritional and medicinal properties. However, it is not grown large scale for vegetable purpose. It is mainly propagated by seed. In T.N grown around banana as a wind break, around coconut seedlings as a shade plant. It has also ornamental, food and fodder values. Agathi is a folk remedy for bruises, catarrh, dysentery, eyes, fevers, headaches, smallpox, sores, sore throat, and stomatitis (Duke and Wain, 1981.)^[4].

Portulaca oleracea (Common Purslane)

A succulent prostrate or erect annual (*Portulaca oleracea*) belonging to Portulacaceae with green or purple stem. It is found throughout India as a weed, ascending up to an altitude of 1500 m in the Himalayas, also cultivated as vegetable. It is rich in β carotene, folic acid, Vitamin C and essential fatty acids. One hundred grams of fresh purslane leaves (one serving) contain about 300-400 mg of omega-3 fatty acids, 12.2 mg of alpha-tocopherol, 26.6 mg of ascorbic acid, 1.9 mg of beta-carotene, and 14.8 mg of glutathione (Simopoulos *et al.*)^[26]. It is mainly propagated by seed.

Talinum triangulare (Water leaf)

Water leaf belonging to Portulacaceae, is a soft mucilaginous leafy vegetable grown in the tropics. Like other vegetables, it contains carotenoids such as Lutein and Zeaxanthin which act as a stimulant and in a way influencing the immune cells of the eyes (Shakuntala and Shadaksharaswamy, 1985)^[25]. Consumption of this vegetables helps toward off heart diseases, control blood pressure and cholesterol level, prevent some types of cancer, avoid a painful intestinal ailment called diverticulosis, and guard against cataract and muscular degeneration two common causes of vision loss. Fasyi (2005)^[6]. Waterleaf is eaten cooked as a pot-herb and in soups, as a condiment in sauces or raw in salad, besides, very rich in mineral salts and amino acids as well as having anti-scorbutic properties i.e. prevention against scurvy Disu (2010)^[3]. It is mainly propagated by Cutting/Division.

Ipomoea aquatica (Water spinach)

Water convolvulus or kangkong is an herbaceous aquatic or semi-aquatic trailing type whose tender twigs with leaves are used as vegetable or added to sauces and soups Westphal (1994)^[34]. It is used as vegetable in Kerala and Tamilnadu. It is mainly propagated by seed and herbaceous cutting. Treatment of diabetes. Jayaweera (1982)^[12], Scorpion venom antidote (Malalavidhane *et al.*, 2001)^[17], as emetic, diuretic, purgative, to treating debility, liver complaints [31]. In Indonesia, people believe it has calming effect used as a sleeping tablet. Doctors recommend it to anemia patients due to high Fe content.

Sauropus androgynus (Chekkurmanis)

The plant is reputed for its high nutritive value and therefore it is popularly known as "multivitamin green" and "multi mineral packed leafy vegetable". Chekkurmanis is a rich

source of carbohydrate, vitamins and minerals. In Malayalam, this plant is known as 'Madhurakeera' and in Tamil it is "Thavarai Muringai". It is mainly propagated by Semi hard wood stem cuttings. Juice of leaves of chekkurmanis is pounded with roots of pomegranate and leaves of jasmine are used against eye troubles. The tender shoots and leaves are used for vegetable in Tamilnadu and Kerala. Leaves are very rich in protein, minerals and vitamin A, B, C and also used to give light green colour to pastry and to fermented rice in Dutch East Indies, preparation of soup in Java. It is planted as live fence in garden beds and provides shade to vegetables.

M. tuberosa (kasarkaya)

M. tuberosa (Kaasara kaya) is an underutilized vegetable grown wild in southern Tamil Nadu, Rayala seema region of Andhra Pradesh and parts of Karnataka. It is naturally grown in rain fed black soils of dry tracts of Rayalaseema districts of A.P. The crop is valued for its edible fruits, and leaves as vegetable and its tubers are mainly preferred for medicinal purpose. Kasarkaya contained higher amounts of carbohydrate (3.72%), protein (3.26%) fat (1.61%), Fiber (5.63%) and ash (1.25%). tender green fruits of kasarkaya are used to prepare various recipes and pickles. It has been used extensively in folk medicine as a remedy for diabetes (Reddy *et al.*, 2007)^[23] and the fruits are considered as emetic, laxative, antibilious, tonic, stomachic, stimulant and alternative medicine. It is mainly propagated by tuberous root. The fruit is useful in gout, rheumatism and sub-acute cases of the spleen and liver diseases (Koneri *et al.*, 2006)^[14].

Nymphaea spp.

Water lily stems, young leaves, lower buds, flower stalks and rhizomes are used as vegetables. The rhizomes are cooling, sweet, bitter and tonic, and useful in treating diarrhoea, dysentery, and general debility. The flowers are astringent and cardiotoxic. The seeds are sweet, cooling, constipating, aphrodisiac, stomachic and restorative, and are also used as treatment for gastrointestinal disorders and jaundice. Jana (2007)^[10].

Nelumbo nucifera

Nutritionally, Lotus seeds are rich in proteins (10.6-14.8%) (Jaenicke and Hoeschle, 2006)^[9], essential minerals (Ibrahim and Eraqy, 1996)^[8]. In South Indian states, the lotus stem is sliced, marinated with salt to dry, and the dried slices are fried and used as a side dish. In Kerala and Tamil Nadu, this end product is called "Thamara Vathal". Tender rhizomes, stems and leaves of lotus are edible and can be cooked along with other vegetables, soaked in syrup or pickled in vinegar. Lotus seeds are in high demand in Ayurvedic medicinal preparations and widely used in folk medicines to treat tissue inflammation, cancer, diuretics (Liu *et al.*, 2004)^[16], skin diseases and as poison antidote. Different parts of the lotus plant are useful in treatment of diarrhea, tissue inflammation and haemostasis (Yu and Hu, 1997)^[33].

Sechium edule (Chow-Chow)

A native of tropical America, Chow-Chow is a very popular vegetable in the region commonly called Chayote or choko fruits are rich in amino acids and are used as vegetable and snack. Infusions of the leaves are used to dissolve kidney stones and to treat arteriosclerosis and hypertension, infusions of the fruit are used to alleviate urine retention. It possesses hypercholesterolemia and hypoglycaemic properties Moudgil (1997)^[18]. It is a vigorous, scrambling, tuberous-rooted

perennial plant, grown for its starchy, edible fruit and seeds. Fruits, stems, tender leaves & tuberous parts of adventitious roots are eaten. They are much appreciated as a vegetable and are either just boiled or used in stews & desserts (Sharma *et al.*, 1995) ^[29]. This climber can spread to fifty feet, producing huge tubers. It looks like a large, green pear, but having a number of deep folds in the skin. Some varieties have smooth skins, while others have dots of prickly spines on the surface. The flesh is crisp and white with a large white oval seed in the center. Chow-Chow is a fruit but most often used as a vegetable. It is often used in the place of potato.

Dendrocalamus strictus

Young shoots cooked for vegetables. Bamboo shoots have high nutritive value containing low fats and cholesterol and high amount of carbohydrate, proteins, minerals and dietary fibres Devi (2013) ^[2]. At present, over two million tonnes of edible bamboo shoots are consumed in the world each year (Yang *et al.*, 2008) ^[32]. Amino acid content in bamboo shoot is found to be much higher than in other vegetables such as cabbage, carrot, onion and pumpkin (Nirmala *et al.*, 2001) ^[21]. It is used as vegetable in mostly eastern and north east part of india. It is mainly propagated by seeds, rhizome and culm cuttings.

***Solanum torvum* (Turkey berry, Wild eggplant)**

In Tamil Nadu, India, the fruit is consumed directly. Fruits of *S. Torvum* are edible and utilized as a vegetable, regarded as an essential ingredient in the South Indian population's diet. It is mainly propagated by seeds. It is intensively used worldwide in the traditional medicine as poison anti-dote and for the treatment of fever, wounds, tooth decay, reproductive problems and arterial hypertension (Ndebia *et al.*, 2007) ^[19].

***Psophocarpus tetragonolobus* (Winged bean)**

A robust, climbing herbaceous perennial tree, it can attain 5 metres in height. The flowers are of different colour; it may be blue, white or purple. The pods are four sided with characteristic wings, and varying length from 6-36 cm (up to 50 cm) containing 5-20 seeds in each pod (Sahoo *et al.*, 2002) ^[24]. The globular shaped shining seeds may be white, yellow, brown, black or mottled and vary in weight from 0.06-0.5g each. All parts of the plant, i.e., seeds, flowers, leaves, pods and tuber-like-roots are edible. The young tender pods can be stewed, boiled, fried, roasted or made into milk. The seeds contain 40% proteins and the roots contain about 20% proteins, which are supposed to be 10 times more than in potatoes or yams. It is mainly propagated by seeds. Winged beans are also rich in carbohydrates and vitamin A (300 to 900 IU). Its tender leaves make good sauce and curry. Flowers have a sweet taste because of the nectar they contain. The tuber-like-roots are eaten after boiling or frying. The plant is a good fodder for cattle. The winged bean has great potential for easing the problem of protein malnutrition throughout the humid tropics. The possibilities of the plant for improving the human diet have not yet been recognized.

***Canavalia gladiata* & *C. ensiformis* (Sword bean and Jack bean)**

Young pods and seeds of Sword bean are used as a green vegetable. Sword bean (SB) (*Canavalia gladiata* Jacq.) is a tropical under-utilized food legume, widely distributed in the Eastern and Western Ghats of South India. Jana (2007) ^[11]. Jack bean is a good source of protein, 23% to 34%, and carbohydrate 55%. The mature jack bean seeds are consumed

by the Indian tribal sects, kurumba, malyali, irula and other Dravidian groups, after cooking. Both are propagated by seeds.

***Ipomoea muricata* (Clove bean)**

Tender fruits are used for cooking. It is used as vegetable in mostly in Kerala. The fruits contain fibre, vitamin C, potassium and calcium. Powdered clove bean are known remedy to fever. Plants juice is sprayed to kill bugs.

***Mucuna pruriens* (Velvet bean)**

Mucuna pruriens is considered one of the most preferred legume vegetables in the tribal people of Nagaland. Cooked fresh shoots or beans can also be eaten. *M. pruriens* is sometimes used as a coffee substitute it is mainly propagated by seeds. The plant and its extracts have been long used in tribal communities as a toxin antagonist for various snakebite considered a viable source of dietary proteins (Pugalenthi *et al.*, 2005) ^[22]. Due to its high protein concentration (23-35%) in addition its digestibility, which is comparable to that of other pulses such as soybean, rice bean, and Lima bean (Gurumoorthi *et al.*, 2003) ^[7].

***Parkia roxburghii* (Tree Bean)**

It is one of the most common multipurpose tree species of Mimosaceae family in the north eastern region of India, especially in Manipur and Mizoram. Locally called "Yongchak" in Manipur and Yontak" in Assam, its tree commonly grows in every household of hill region. Tree bean is a much-branched legume of medium height (10-12 m) with bipinnate leaves. The inflorescence head or capitalism's arise terminally with clusters of yellowish white tiny flowers, hanging at the top of long stalks from the branches. 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 (Kumar *et al.*, 2002) ^[15]. The long tender pods of tree bean are most popular and delicious vegetable in Manipur, Assam, Nagaland, Tripura and Mizoram. It is mainly propagated by seeds. Based on local preference, the pods are consumed at different stages of maturity, either fresh or processed. The tender and matured beans are used in various dishes. The beans, after scraping the out skin, are sliced into pieces for use indifferent chutney (Iromba) preparations. Matured flowers and young shoots are also used in curries and salad. The leaves are good source of fodder and green manure. The tree is also of immense use in local medicines. Decoction of bark, fruit skin and leaf is being used to control diarrhea and dysentery.

***Vigna angularis* (Adzuki bean)**

Sprouted beans are used as a vegetable. The sprouts are an excellent source of folic acid, vitamin A and vitamin B. The seeds contain 19.9 g protein per 100 g of seed Duke (1981) ^[5]. The seeds and leaves have medicinal properties. It is mainly propagated by seeds.

***Vigna umbelata* (Rice bean)**

Rice bean, also known as Climbing bean, Mountain bean, Oriental bean, Haricot bean, Red bean and Jerusalem pea, is a highly branched annual with erect semi-erect stem tending to be viny. In India, it is known by different vernacular names such as moth, rajmoong and satrangi mash. It has axillary raceme inflorescence with bright yellow flowers occurring in clusters. Pods are slender and somewhat curved. Rice bean is

a multipurpose legume, considered as neglected and underutilised (Joshi *et al.*, 2008) ^[13]. Young pods, leaves and sprouted seeds are boiled and eaten as vegetables. In India, its distribution is mainly confined to the tribal regions of the hilly areas of north-eastern hills and the Western and Eastern Ghats (Arora *et al.*, 1980) ^[11]. The nutritional quality of rice bean has been reported to be the best among all the traditional pulses (Arora *et al.*, 1980) ^[11]. On account of its high protein and appreciable quantities of two limiting amino acids: methionine and tryptophan. It is mainly propagated by seeds. It contains high quality of vitamins: thiamine, niacin and riboflavin. Calcium and iron contents are also appreciably high (Singh *et al.*, 1980) ^[27]. Phytin-phosphorus which generally inhibits the phosphorus availability and lowers the protein digestibility in most of the Asian pulses is low in this bean.

***Dioscorea bulbifera* (Aerial yam, Air potato)**

The bulb is eaten on peeling off the hard back after cooking. Aerial yam has been used as a folk remedy to treat conjunctivitis, diarrhea, and dysentery, among other ailments. Useful in syphilis, gonorrhoea, hydrocele. Goiter, piles, dysentery. It is used as vegetable in South Indian states. It is propagated by bulbil.

Constraints for the Development of Underutilized Vegetable Crops

- Lack of awareness among the farming community about the nutritional and medicinal value of underutilized Vegetable crops.
- Lack of researches
- Lack of desirable seeds and planting material.
- Limited application of advance on-farm agro techniques.
- Lack of application of innovative and novel technologies such as biotechnology, plasticulture for enhancement of productivity.
- Lack of about post-harvest management practices.
- Limited and inadequate marketing supports & infrastructure facilities for transportation, storage and processing.
- Poor recognition of these crops in horticulture promotion programmes.
- Improper institutional arrangements and limited role played by financial Institutions in setting up of agro industrial and horticulture based industrial Units.

Strategies for the Development of Underutilized Vegetable Crops.

Domestication of potential wild species through homestead cultivation should be encouraged for avoiding over-exploitation from natural sources. Supports are required in terms of multiplication of planting materials and their distribution besides providing market access through marketing network for perishables. Underutilized vegetable crops are nutritionally rich and adapted to low input Horticulture. More R & D efforts in these will add substantially to food security and nutrition vis-à-vis human welfare. Limited number of species needs to be targeted for detailed research and development in underutilized vegetable crops by national programmes focusing on their conservation and use. Research needs to be geared up both on species/crops important for subsistence farming and those exhibiting potential to become commodity crops. Underutilized Vegetable crops are mainly grown/managed under traditional farming Systems by diverse ethnic communities. Increased

focus to document indigenous knowledge is required such as through ethobotanical studies. Such emphasis will help tap value additions as much of native diversity is put to multipurpose uses. Strategies need to be worked out particularly at national and regional levels to develop and make available promising selections/varieties, overcoming constraints of production of good seed material, planting material, *in-vitro*/tissue cultured material etc. This would boost production, meeting local needs, promoting domestic markets and thereby, enhance income generation of small farming communities. Systematic local specific crop planning in accordance with agro-climatic suitability of the region need to be done. Rapid expansion of infrastructure facilities with priority on market development, transport and communication needs to be done. The yield and quality of these crops are poor which hamper the productivity. Hence, some criteria need to be developed for commercial exploitation of underutilised vegetable crops. The criteria maybe high productivity, market demand, freedom from serious insect-pest and diseases, easier postharvest management, high nutritive value and availability of production. At the very onset, there is a necessity to make the farming community aware about the nutritional importance of unexploited vegetable crops, i.e., fruits, vegetables and medicinal plants Sharma (2003) ^[28]. For this, extension agents can organize special awareness camps/campaigns, exhibition, etc., at micro and macro level conveying theme of unexploited horticultural crops. Similarly, use of mass media like radio, TV, newspaper and other printed literature can play an effective role in creating awareness among the farmers. For proper exploitation and better economic returns from underutilized vegetable crops emphasis should be given on developing processing units in this area. It would also provide employment opportunities to the rural folk. Genetic erosion is very serious problem in Underutilised vegetables. And many land races will become extinct if these are not conserved soon. Likewise, efficient production technology and post-harvest management are necessary to make the commercial cultivation of non-traditional horticultural crops feasible. The availability of underutilised vegetable crops will go a long way in overcoming the malnutrition of the people living in these rural areas.

Conclusion

Underutilized vegetables embedded with rich nutrient potentials along with ability to stand against adverse climatic conditions may prove boon to all concerns - growers, consumers and environmentalists, provided that they are tamed properly. The possible reasons for the low utilization of underutilized vegetables, in spite of their recognized importance are due to lack of availability of planting material, lack of awareness on nutritional and medicinal importance and lack of information on production technique of these crops. In this context, there is an urgent need to take up programme on genetic resources exploration, management, utilization and improvement of underutilized vegetable crops to ensure food and nutritional security for future. Underutilized vegetables play an important role in the national economy of India. The climate and soil of India are favourable for the production of different underutilized vegetables. Thus, the government of India has been taking some steps towards highlighting the underutilized vegetables. Some GOs and NGOs have been implementing some development projects to increase the underutilized vegetables production. Finally, it can be concluded that, underutilized

vegetables production will meet the shortage of per capita consumption availability there by solve the nutritional problems and at the same time it generates the employment and also increase the income of rural people and finally it could contribute the national economy.

References

- Arora D, Chandel KPS, Joshi BS, Pent KC. Rice bean: Tribal pulse of eastern India. *Economic Botany*. 1980; 34:260-263.
- Devi YR. Bamboo forest resources of and its role in food security. *Agricultural research community centre*. 2013; 34(3):236-241.
- Disu SO. GBURE, the waterleaf vegetable, 2010.
- Duke JA, Wain KK. Medicinal plants of the world. *Computer Index*, 1981.
- Duke JA. *Handbook of legumes of world economic importance*. Plenum Press, New York and London, 1981, 288-291.
- Fasuyi AO. Nutritional potentials of some tropical leafy vegetables meals: Chemical characterization and functional properties of fresh and frozen vegetables. *Food Chemistry*. 2005; 62(1):59-64.
- Gurumoorthi P, Pugalenth M, Janardhanan K. Nutritional potential of five accessions of a south Indian tribal pulse *Mucuna pruriens* var. *utilis*; II Investigation on total free phenolics, tannins, trypsin and chymotrypsin inhibitors, phytohaemag glutinins, and *in vitro* protein digestibility. *Trop. Subtrop. Agroecosys*, 2003; 1:153-158.
- Ibrahim N, Eraqy EW. Protein content and amino acid composition of *Nelumbo nucifera* seeds and its evaluation as hypoglycemic agent. *Egyptian journal of pharmaceutical sciences*. 1996; 37:635-641.
- Jaenicke H, Hoeschle-Zeledon I. Strategic Framework for Underutilized Plant Species Research and Development, with Special Reference to Asia and the Pacific, and to Sub-Saharan Africa. ICUC, Colombo and GFU, Rome, 2006, 33p.
- Jana JC. Use of traditional and underutilized leafy vegetables of Sub-Himalayan Terai region of West Bengal. *Acta Horticulture*. 2007; 752:571-575
- Janardhanan K, Gurumoorthi P, Pugalenth M. Nutritional potential of five accessions of a South Indian tribal pulse, *Mucuna pruriens* var. *utilis*. Part I. The effect of processing methods on the contents of L-Dopa phytic acid, and oligosaccharides. *Journal of Tropical and Subtropical Agro-ecosystems*. 2003; 1:141-152.
- Jayaweera DMA. In: *Medicinal Plants (indigenous and exotic) used in Ceylon*. Part 11, 1982.
- Joshi KD, Bhanduri B, Gautam R, Bajracharya J, Hollington PB. Rice bean: a multi-purpose underutilized legume. In: Smart, J. Haq, N. *New crops and uses: their role in a rapidly changing world*. CUC, UK, 2008, 234-248.
- Koneri R, Balaraman R, Saraswati CD. Antiovolatory and abortifacient potential of the ethanolic extract of roots of *Momordica cymbalaria* fenzl.in rats. *Indian Journal Pharmacology*. 2006; 38:111-114.
- Kumar SK, Suresh VR, Nagachen SV, Singh Raghmani TH. Tree bean: a potential multipurpose tree. *Indian Horticulture*, Oct-Dec, 2002, 10-11.
- Liu CP, Tsai WJ, Lin YL, Liao JF, Chen CF, Kuo YC. The extracts from *Nelumbo nucifera* suppress cell cycle progression, cytokine genes expression, and cell proliferation in human peripheral blood mononuclear cells. *Life Sciences*. 2004; 75(6):699-716.
- Malalavidhane S, Wickramasinghe SM, Jansz ER. An aqueous extract of the of the green leafy vegetable *Ipomoea aquatica* is as effective as the oral hypoglycaemic drug tolbutamide in reducing the blood sugar levels of Wistar rats. *Phytother Res*. 2001; 15:635-637.
- Moudgil M. Comparative nutritional evaluation of chayote (*Sechium edule*) and bottle gourd (*Lagenaria siceraria*) of Palam valley of HP. *Himachalyan Journal of Agriculture and Research*. 1997; 25:72-75.
- Ndebia EJ, Kamga R, Nchunga-AnyeNkeh B. Analgesic and anti-inflammatory properties of aqueous extract from leaves of *Solanum torvum* (Solanaceae), *AJTCAM*. 2007; 4:240-244.
- NHB. *Indian Horticulture Database*. National Horticulture Board, Gurgaon, Haryana, India, 2015.
- Nirmala C, Madhoo SB, Sheena H. Nutritional Properties of Bamboo Shoots: Potential and Prospects for Utilization as a Health Food. *Comprehensive Reviews in Food Science and Food Safety*. 2001; 10:153-169.
- Pugalenth M, Vadivel V, Siddhuraju P. Alternative food/feed perspectives of an underutilized legume *Mucuna pruriens* Utilis-A Review. *Linn Journal of Plant Foods and Human Nutrition*. 2005; 60:201-218.
- Reddy RVSK, Subbaiah YPV, Reddy MGD. Exploit kaasara kaya (*Momordica tuberosa*) for diversification of vegetables. *Acta Horticulture*. 2007; 752:577-79.
- Sahoo J, Panigrahi R, Moharana T. Winged bean: A promising under exploited pulse crop for the farmers. *Indian Farming*, May, 2002, 26-28.
- Shakuntala MN, Shadaksharaswamy M. *Foods (Facts and Principles)*. Wiley Eastern Limited: New Delhi, India, 1985, 301.
- Simopoulos AP, Norman HA, Gillaspys JE, Duke JA. "Common purslane: a source of omega-3 fatty acids and antioxidants," *Journal of the American College of Nutrition*. 1992; 11(4):374-382.
- Singh SP, Mishra BK, Chandel KPS, Pant KC. Major food constituents of rice bean (*Vigna umbellata*). *Journal of Food Science and Technology*, 1980; 17:23.
- Sharma DV, Transfer of technology for increasing the scope of underexploited horticultural crops. Winter School on "Exploitation of Underutilized Horticultural Crops, 5-25th November, Department of Horticulture, College of Agriculture, MPUAT, Rajasthan. 2003, 313-320.
- Sharma MD, Newstrom-Lloyd L, Neupane KR. Nepal's new chayote gene bank offers great potential for food production in marginal lands. *Diversity*. 1995; 11:7-8.
- Shakuntala MN, Shadaksharaswamy M. *Foods (Facts and Principles)*. Wiley Eastern Limited: New Delhi, India, 1985, 301.
- Uawonggul N, Chaveerach A, Thammasirirak S, Arkaravichien T, Chuachan C, Daduang S. Screening of plants acting against *Heterometrus laoticus* scorpion venom activity on fibroblast cell lysis. *Journal of Ethnopharmacology*. 2006; 103:201-207.
- Yang Q, Duan Z, Wang Z, He K, Sun Q, Peng Z. Bamboo resources, utilization and ex-situ conservation in Xishuangbanna, South-eastern China. *Journal of Forest Resource*. 2008; 19(1):79-83.
- Yu J, Hu WS. Effects of neferine on platelet aggregation in rabbits. *Acta Pharcology Sinica*. 1997; 32:1-4.
- Westphal E. *Ipomoea aquatica* Forsskal. In: Siemonsma, J.S. and Piluek, K. (Eds.). *Plant Resources of South-East Asia No. 8 – Vegetables*. PROSEA Foundation, Bogor, Indonesia, 1994, 181-184.