Underutilized Vegetable Crops: Potential sources of nutrition and livelihood security

Abstract

Vegetables are essential components of a balanced diet, offering a myriad of nutrients crucial for maintaining health and preventing diseases. Vegetable has low calorie counts and high fibre content, they aid in weight management by promoting satiety and controlling appetite. Underutilized vegetable crops are ones that are not widely cultivated and consumed compared to other vegetable crops. Underutilized vegetables play a significant role in enhancing dietary diversity, supporting local food systems, and fortifying food security. Cultivating underutilized vegetables enhances the biodiversity, resilience, and sustainability by reducing reliance on a limited range of crops, especially in the face of environmental challenges like diseases, pests, and climate change. Underutilized vegetables contribute to agricultural biodiversity, cultural heritage preservation, and economic opportunities for small-scale farmers. Embracing and promoting the cultivation, consumption, and conservation of underutilized vegetables are imperative for sustaining diverse diets, supporting sustainable agriculture, and addressing malnutrition and micronutrient deficiencies.

Keywords: Livelihood security, Medicinal values, Nutrition, Underutilized vegetables, Uses

Introduction

A Vegetable is a non-reproductive part of the plant derived from the flower. Vegetables are indispensable for a balanced diet, offering a plethora of essential nutrients like vitamins (A, C, and K), minerals (K and Mg), and phytochemicals crucial for overall growth and development of human health. Consumption of vegetable is linked to reduce the risks of chronic diseases such as heart disease, stroke, cancers, and type 2 diabetes due to the presence of antioxidants and anti-inflammatory properties. Vegetable has low calorie counts and high fibre content, they aid in weight management by promoting satiety and controlling appetite. Fibre content in vegetable also fosters digestive health, ensuring regular bowel movements and supporting gut flora. Furthermore, high-water content in vegetables aids hydration, crucial for bodily functions. Vegetables like carrots, spinach, and kale boast compounds vital for eye health, guarding against age-related vision problems. Moreover, vitamins and antioxidants in vegetables contribute to radiant skin by combatting oxidative stress and supporting skin problems. Vegetables play a major role in mood and cognitive function, with nutrients like folate and antioxidants bolstering brain health and protecting against oxidative damage. (Jena *et al*., 2018)

Underutilized vegetable crops are ones that are not widely cultivated and consumed compared to other vegetable crops. Despite often having distinctive flavours, textures, and nutritional perks, they are often passed over due to factors like limited availability, lack of familiarity, and cultural preferences. Underutilized vegetables are vital for fostering dietary diversity, bolstering local food systems, and fortifying food security. They offer a broad spectrum of unique nutrients often absent in more mainstream varieties, enriching overall health and wellness. Cultivating underutilized vegetables enhances the biodiversity, resilience, and sustainability by reducing reliance on a limited range of crops, especially in the face of environmental challenges like diseases, pests, and climate change. Moreover, underutilized vegetable crops cultivation preserves genetic diversity within plant species, crucial for developing resilient crops with desirable traits. Embracing underutilized vegetables also honors cultural heritage, preserving traditional culinary practices and fostering community identity. Economically, underutilized vegetable crops create opportunities for small-scale farmers, tapping into function markets and reducing dependency on commodity crops. Food security view, underutilized vegetable crops provide alternative sources of nutritious food, particularly in regions with limited access to diverse and affordable options, thereby addressing malnutrition and micronutrient deficiencies. Overall, promoting the cultivation, consumption, and conservation of underutilized vegetables is pivotal for sustaining diverse diets, supporting sustainable agriculture, preserving cultural legacies, and bolstering food security on both local and global scales (Chacha and Laswai, 2020).

Underutilized Vegetable Crops

Tree tomato

"Tree tomato (*solanum betaceum*) is also known as Tamarillo which belongs to the family Solanaceae and is originated in South America. The nutritional content in *S. betaceum* contains (10.7 mg), copper (0.05 mg), Iron (0.57 mg), Magnesium (20.6 mg), Manganese (114 mg). Tree tomato is also endowed with various health benefits such as aids weight loss, good for skin, helps control diabetes, soothes inflamed tonsils, lowers high blood pressure, good for heart and eyes" (Kumar *et al*., 2024).

Athalakkai

"Athalakkai (*Momordica cymbalaria*) belong to the family Cucurbitaceae and it is originated from India. It is a good source of potassium (500 mg/100 g), crucial for heart health

and blood pressure regulation. Athalakkai also offers a moderate amount of calcium (72 mg/100 g), supporting bone strength and density and it also provides essential vitamins and minerals such as iron (1.70 mg/100 g), zinc (2.82 mg/100 g), manganese (0.32 mg/100 g), and copper (0.18 mg/100 g), contributing to overall health and well-being. Athalakkai is an excellent source of vitamin C (290.00 mg/100 g), promoting immune function and aiding in collagen synthesis. It is used in the treatment of diabetes mellitus, rheumatism, ulcer, skin disease, and diarrhoea" (Parvathi and Kumar, 2002).

Chow chow

"Chow chow (*Sechium edule*) belongs to the family Cucurbitaceae and is originated in Central America. Chow chow contains Carbohydrates (57.66 g/100g), fat (19.39 g/100g), protein (16.99 g/100g), vitamin A (0.041%), Vitamin C (13.97%), Vitamin E (0.11%). Chow Chow is also endowed with various health benefits such as improves liver function, protects from heart diseases, rich in antioxidants, prevent cancer, supports healthy pregnancy, and aids in weight loss" (Sanwal *et al*., 2008).

Gherkin

"Gherkin *(Cucumis anguria)* belongs to the family Cucurbitaceae and originated in Southern Africa. The nutritional benefits of gherkin contain protein (0.1 g), fibre (0.3 g) and calcium (1%). Gherkin is also endowed with various health benefits such as prevent dehydration, support cardiovascular bone, and skin health and help fight diabetes, and cancer" (Rana *et al*., 2017).

Ivy Gourd

"Ivy gourd *(Coccinia grandis)* belongs to the family Cucurbitaceae and originated in India. Ivy gourd has a good source of dietary fibre (1.6 mg), vitamins B1 and B2 (0.07 mg), calcium (40 mg), and iron (1.4 mg). It regulates blood sugar level, improves immune system, and promotes liver and heart health" (Wasantwisut and Viriyapanich, 2003).

Snap melon

"Snap melon (*Cucumis melo subsp. agrestis var. momordic*a) belongs to the family Cucurbitaceae and originated in Africa. The nutritional benefits of snap melon contain protein (0.04 %), fat (0.1 %), Fe (0.017 mg/100 g), Zn (0.049 mg/100 g). Snap melon is also endowed

with various health benefits such as relieve burning sensation, reduce the risk of cancer and certain other chronic diseases" (Rana and Brar *et al.,* 2017).

Spin Gourd or Teasel gourd

"gourd *(Momordica dioica)* belongs to the family Cucurbitaceae and originated in India. It is great health food as it is rich in proteins and iron and is low on calorie. It contains only 17cal/100g. It's high in fiber and anti-oxidants and thus very useful for easy digestion. The average nutritional value per 100 g edible fruit was found to contain (84.1%) moisture, (7.7 g) carbohydrate, (3.1 g) protein, (3.1 g) fat, (3.0 g) fibre and (1.1 g) minerals. Spine gourd improves heart health, improves immune system, and regulates the blood sugar level" (Jatale *et al*., 2024).

Jack Bean

"Jack Bean (*Canavalia ensiformis*) belong to the family Fabaceae and it is originated in Central America and West Indies. Jack bean is a bushy, semi-erect, annual herb. It has good source of protein (23–34%) and carbohydrate (55%) and contain good source of vitamin C, Ca, Zn, P, Mg, Cu and Ni. It reduces the risk of cancer, improve gut health, helps to reduce the weight, healthier heart, increase the muscle mass, and improves the immune system". (Akpapunan *et al*., 1997).

Kakrol

"Kakrol (*Momordica dioica*) belong to the family Cucurbitaceae and originated in South Asia. Kakrol having high nutritional and medicinal benefits with economic values. *Momordica dioica* as the average nutritional value per 100g edible fruit contains carbohydrates (7.7g), protein (31 g), fat (3.1 g), fibres (3 g) and minerals (1.1 g). It also contains small quantities of riboflavin and niacin" (Jatale *et al*., 2024).

Lima bean

"Lima bean (*Phaseolus lunatus*) belongs to the family Fabaceae and originated in Peru. Lima bean pods are rich in protein, fibre, and nutrients making them as a super food and a good source of iron. Lima bean contains protein (12g), fiber (9g), copper (58%), vitamin C (19%). It helps to enhanced blood sugar control, improve heart health and healthy way to weight loss" (Adebo, 2023).

Rice Bean

Rice Bean *(Vigna umbellate*) belongs to the family Fabaceae and originated in Indochina. The Rice bean seeds are well balanced source of beneficial constituents such as proteins (22.56–25.97%), carbohydrates (50.56–56.87%), minerals, vitamins, poly unsaturated fatty acids (1.87–3.17%) and an excellent source of Vitamin A and C. Rice bean improves the efficiency of digestion, promotes normal function of heart, treatment of anemia, helps in weight loss, eliminates the signs of aging, soothe irritation, heals scars and protect the skin against the effects of UV radiation. (Katoch, 2013).

Sword bean

Sword bean (*Canavalia gladiate)* belongs to the family Fabaceae and originated in Africa and Asia. It has numerous advantageous agronomic characteristics, including high biomass output, tolerance to pest and diseases, drought tolerance. Sword bean contains a lot of protein and antioxidant. Sword bean is a good source of protein, fiber, vitamin C, thiamine and riboflavin and minerals like iron, calcium, and phosphorus. The fiber and complex carbs in sword bean can help control sugar in the blood (Hwang *et al*., 2020).

Tree bean

Tree bean (*Parkia timoniana)* belongs to the family Leguminosae and originated in Thailand. Tree bean is one of the multipurpose tree species in North eastern region. The edible parts of tree bean such as flower, pods, and seeds. Tree bean contain good source of protein (32–82%), ascorbic acid (26 mg/100g), fats (20.28%), carbohydrates, and minerals (44%) (Singha *et al*., 2021).

Velvet Bean

Velvet Bean *(Mucuna pruriens)* belongs to the family Fabaceae and originated in Africa. Velvet bean contains crude carbohydrate (64.88 g/100 g), crude protein (23–43 g/100 g), crude lipid (4.1–14.39 g/100 g), crude fiber (5.3–11.5 g/100 g), and ash content (2.9–5.5 g/100 g). Velvet bean helps in lowering cholesterol level, blood pressure and it also have an anticoagulant effect (Boniface *et al*., 2024).

Winged bean

Winged bean (*Psophocarpus tetragonolobus*) belongs to the family Fabaceae. Winged bean is an excellent source of protein, fiber, minerals, vitamins, antioxidants for good health.

Winged bean is high in vitamin C and A, boosting the immune system and helping body fight diseases. These are also a good source of B vitamins which can support a healthy immune system by maintaining healthy cells. Fiber is one of the primary nutrients in winged bean, which helps to nourish the beneficial bacteria in the gut and support a healthy digestive system. Rich iron content present in winged bean boost haemoglobin in red blood cells. The bean possesses adequate amounts of folic acid, essential for pregnant mothers. Furthermore, iron is crucial during childbirth since it reduces the chances of maternal blood loss and low birth weight. They also contain phosphorous, which helps the body to build strong bones. Winged bean is rich in potassium an essential mineral in lowering blood pressure. It helps to balance sodium levels in blood which if too high, will raise your blood pressure (Mohanty *et al.*, 2020).

Elephant foot yam

Elephant foot yam *(Amorphophallus paeoniifolius)* belong to the family Araceae and originated in Island of Southeast Asia. Elephant foot yam contain Zn, P, K, Vitamin B6, Vitamin A and Ca, and constitutes phenols, alkaloids, and flavonoids. It also contains trivial amounts of fat and is water rich. Regular use of Elephant foot yam reduces the levels of bad cholesterol because of the presence of Omega-3 fatty acids. It also boosts immunity of the human body. It has anticoagulant and anti-inflammatory properties which prevents clots in arteries, reduces high blood pressure, hence protecting heart from numerous health conditions. Elephant foot yam is rich in Vitamin C. Elephant foot yam inhibit sudden spike in blood levels, improve insulin production in the body. The presence of high digestive fibre serves as an exemplary detoxifier, uplifting liver health. It enhances functioning of the brain, memory, focus and concentration and prevents neurodegenerative disorders (Ravi *et al*., 2009).

Aerial Yam

Aerial Yam (*Dioscorea bulbifera*) belongs to the family Dioscoreaceae and originated in Africa. It contains moisture (14.74%,) ash (2.56%), fiber (0.35%), carbohydrate (73.62%). It also contains minerals like, Ca, Mg, K, P, and Na. *Dioscorea bulbifera* bulbils are used in treating tumors, as well as wounds. It is also used in treating hernia, hair lice, and skin. It is also used in case of piles, and gut issues like dysentery, ulcers, asthma, diabetes, and cancer. (Olatoye, and Arueya, 2019).

Agathi

Agathi (*Sesbania grandiflora)* belongs to the family Fabaceae and originated in Asia. Agathi leaves are an excellent source of calcium, iron, vitamins (A and C), folate, thiamine, and niacin. The seeds comprise powerful chemo protective agents like leucocyanidin and cyanidin. The seeds contain Saponins and Sesbanimide which possesses strong antibacterial and antimicrobial properties and detoxifies the system (Zarena *et al*., 2014).

Chekurmanis

Chekurmanis *(Sauropus androgynus)* belongs to the family Phyllanthaceae and originated in Indo-Burma region. Chekurmanis leaves contain moisture (73.6 %), energy (103 kcal), protein (6.8 g/100g), lipids (3.2 g/100g), total carbohydrate (11.6 g/100g), total dietary fiber (1.4 g/100g), Ca (570 mg/100g), Fe (28 mg/100g), P (200 mg/100g), Vitamin C (247 mg/100g), Vitamin B1 (0.48 mg/100g), Vitamin B2 (0.32 mg/100g), and Vitamin B3 (2.60 mg/100g). Chekurmanis acts as a cell rejuvenator, and beneficial to circulation, intestinal flora, and for regular bowel elimination (Platel and Srinivasan, 2017).

Water leaf

Water leaf *(Talinum fruticosum)* belongs to the family Boraginaceae and originated in Africa and Asia. Water leaf with a moisture content (8.75%), ash content (25.79%), crude protein (37.28%), crude fiber (13.04%) and a carbohydrate content of (12.70%). The leaf and root extracts of waterleaf are used for treating asthma, fresh cuts, scabies, anemia, and high blood pressure (hypertension) (Afolabi *et al*., 2012).

Globe artichoke

Globe artichoke (*Cynara cardunculus*) belongs to the family Cynaraceae and originated in North Africa. Globe artichoke is a perennial herb grown for its globular immature flower heads or buds which are used as vegetable. The nutritional content of Globe artichoke contains high concentration of Fiber (10g), Protein (5g), Fat (0.6g), Copper (21%), and Vitamin C (12%). It helps to regulate the blood pressure, liver health, digestive system, lower blood sugar (Ceccarelli *et al*., 2010).

Culantro

Culantro *(Eryngium foetidum)* is a popular medicinal herb which belongs to the family Apiaceae and originated from Mexico. Culantro contain good source of vitamin A and C to maintain healthy organ functioning and strengthening the immune system. The leaves provide

calcium, and phosphorus to protect bones and teeth, and contains good amounts of iron, riboflavin, and thiamine. Culantro is mainly used as a medicinal herb and tea prepared from culantro is used to treat digestion, constipation, flu, fever, asthma, and gas. Culantro is a notable source of dietary fibre promoting digestive health and regulate bowel movements. Culantro helps to prevent diseases like Alzheimer's and Parkinson's. In addition, regular intake of Culantro can reduce the occurrence of toxins in the human body (Aly, 2010).

Water chest nut

Water chest nut (*Eleocharis dulcis*) belongs to the family Cyperaceae and originated in Eurasia. Raw water chest nuts contain Carbohydrates (24%), Protein (1%), and very little fat. In a 100-gram reference amount, raw water chest nuts supply 410 kilojoules (97 kcal) of food energy, vitamin B_6 (25%), and contain moderate amounts of vitamins B, manganese, and potassium (10–17%). It reduces the risk of stroke and improved blood pressure. Studies suggest that people whose diets contain plenty of potassium have a significantly lower risk for stroke and high blood pressure (Rajkumar and Rajithasri, 2022).

Conclusion

Underutilized vegetable crops are considered as valuable component to attain nutritional security because of their high content of vitamins, micronutrients, and proteins. Most of underutilized vegetable crops are tolerant to adverse climatic conditions and resistance to biotic stresses. Special attention is required for popularization of underutilized vegetable crops in order to exploit their potential to treat many lifestyles related diseases. The increase in area and production of the underutilized vegetable crops will not only provide nutritional security and save money on import but also export of fresh vegetable crops and seed in further expected to boost region economy. Underutilized vegetable crops also provide many fold employment opportunities in agro-based industries, packing, storage, preservation, canning and transportation.

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Competing Interests

Authors have declared that no competing interests exist.

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