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Nutritional Content of Underutilized Vegetable Crops: A Potential Source of Human Health and the National Economy

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ABSTRACT

Vegetables constitute the basis of a balanced diet and the main source of global nutritional security, because of their high nutrient, vitamin, and mineral content, Underused vegetable crops are those that are not grown for commercial purposes or traded extensively. Due to a decrease in emphasis on their production, consumption, and utilization, underutilized crop species haven't received the attention they deserve and have the ability to strengthen the nation's economy. The majority of underutilized crop species are rich in nutrients, and some even have therapeutic qualities, according to a review of the literature. Underutilized vegetables could be important on a local or regional level, but they are usually not recognized or valued on a national level. The underused vegetable crops are those plant species that are traditionally used for food, fiber, fodder, oil, or medicinal uses. However, there is unrealized potential for these species to contribute to food security, economic productivity, nutrition, health, and the environment. Using underutilized crops helps combat issues related to malnutrition and enhances the health of rural populations. Vegetables that are discarded can provide a wealth of nutrients, including lipids, proteins, carbs, and vitamins and minerals. Hypertension, cancer, kwashiorkor, marasmus, night blindness, anemia, diabetes, and hidden hunger are just a few of the ailments

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that these nutrients can help prevent or treat. Globe artichokes, kale, broad beans, asparagus, amaranthus, basella, moringa, ivy gourds, and others are significant underutilized vegetable crops. India's climate and soil are perfect for growing a wide range of underappreciated vegetables. Therefore, the Indian government has begun to promote the veggies that are underutilized. In conclusion, underused vegetable production has the potential to strengthen the national economy by addressing nutritional concerns, the lack of vegetables available for per capita consumption, and job creation and income growth for rural residents.

Keywords: Underutilized vegetables; nutritional content; human diet and national income.

1. INTRODUCTION

Vegetables are an essential component of the human diet since they are a vital source of vitamins, minerals, and other essential nutrients [1]. Recognizing their significance contributes to international efforts to alleviate nutritional deficiencies and provide nutritional security. It becomes clear that India must navigate the intricate system of food production, distribution, and consumption when highlighting the significance of vegetables. This is an essential first step toward developing a healthier and better-fed populace. In India, a significant portion of the entire output of agriculture is composed of vegetables, making them a vital component of the sector. Vegetables make up 58.73% of all agricultural production, according to the latest figures. The country has achieved impressive accomplishments, producing 162.89 million tons of veggies on 9.39 million hectares of land [2].

Technological developments including enhanced variety development, high-bridge production techniques, and protection technologies are responsible for the impressive increase in vegetable production. In order to reach these milestones, systematic research initiatives and broad acceptance by farmers have been crucial. Nonetheless, it's notable that a smaller quantity of important vegetable crops accounts for the majority of this notable production. It seems that underutilized vegetables are not given enough attention, even though India has a varied range of agroclimatic conditions that allow for the growth of over 60 well-known and over 30 lesser-known vegetable crops [3,3a]. Focusing on the production and marketing of these underappreciated vegetables presents a chance to fully use India's agricultural diversity while guaranteeing a more all-encompassing and sustainable strategy for meeting dietary needs. This change might help create a more robust and diverse agricultural environment in the nation.

Underutilized crops are plant species that have unrealized potential and might make a big difference in areas including environmental services, revenue production, health, and food security. Compared to other refined vegetables with medicinal potential, these vegetables have a higher nutritional profile. There are many underutilized vegetables because of the great variety of crops that thrive in

the Himalayan and sub-Himalayan regions of India, including species of Brassicaceae, Cucurbitaceae, and Solanaceae, as well as many types of roots, beans, spices, tubers, and leafy crops [4]. Underutilized vegetables are those that are farmed primarily for personal use rather than on a huge commercial scale and are not frequently traded. These crops might feature special nutritional profiles, climate-adaptive traits, or other advantageous traits that haven't been thoroughly investigated or identified [3a]. The promotion of agricultural sustainability and nutritional variety can result in a more robust and diverse food system through the cultivation and consumption of underutilized vegetables. Underutilized vegetables contribute to the well-being of many tribal people and are a valuable natural resource in agriculturally deficient areas [3]. One effective way to help achieve micronutrient deficiency with a varied and nutritious diet is to focus on underappreciated vegetables. Native leafy greens are low-cost, high-quality food options for the underprivileged population, particularly in areas where hunger is a widespread problem, such as in several developing nations. Ascorbic acid, riboflavin, folic acid, carotene, and minerals including calcium, iron, and phosphorus are all abundant in leafy plants [5].

2. MALNUTRITION ISSUES

Malnutrition has a negative impact on children's capacity to learn and develop into adults since it not only affects their physical look and energy levels but also has a direct impact on many elements of their mental development and functioning [6]. According to Oguntibeju et al. [7], malnutrition also lowers immunity against illness and makes people more vulnerable to infections and illnesses. A balanced diet that lowers the risk factor for chronic diseases including cancer, heart disorders, and strokes requires a sufficient intake of vegetables [3a].

According to the World Health Organization (WHO), deficiencies, excesses, or imbalances in an individual's energy and nutritional consumption are considered malnutrition. It is a disorder brought on by a diet lacking important nutrients that are necessary for a person's optimum growth, development, and health. India faces a significant challenge with the prevalent burden of malnutrition. This issue is connected to the complicated mix of social, economic, and cultural differences in the country. The multifaceted nature of this pervasive problem demands urgent focus and dedicated resources to prevent a further decline in nutritional indicators.

According to the National Family Health Survey: The prevalence of malnutrition is as follows: 19.3% of children under five are wasted, 35.5% of stunted, 32.1% are underweight, and 3% are overweight. The following rates of anemia prevalence exist: 25.0% in men (15–49 years old), 57.0% in women (15–49 years old), 31.1% in young men (15–19 years old), 59.1% in teenage girls, 52.2% in pregnant women (15–49 years old), and 67.1% in children (6–59 months). The Global Situation of Nutrition and Food Security, 2023: A nutritious diet was unaffordable for almost 74% of Indians, and only 39% of them consumed enough nutrients. India has a 2023 Global Hunger Index (GHI) score of 28.7, which is serious per the GHI Severity of Hunger Scale.

3. USES OF UNDERUTILIZED VEGETABLES

Underutilized vegetables are vital biological resources for the impoverished in rural areas and have the potential to improve the health of millions of people living in tribal communities. When compared to other commercially accessible species and variations, underutilized vegetables have more antioxidant activity and are richer in vitamins, minerals, and other health-promoting elements. They are mostly responsible for the diet's diversity, which produces a better-balanced supply of micronutrients [3a]. Moreover, underused vegetables can be effectively employed in a plant breeding program due to their strong tolerance to a variety of biotic and abiotic stresses [8]. Underutilized vegetables have a significant impact on rural residents' lives. They have the ability to end poverty by creating jobs and revenue, as well as by increasing the productivity and profitability of farm household labor use in both rural and urban areas. Reducing the risk of over-reliance on a very small number of important crops can be achieved by using underutilized vegetable crops. Furthermore, by increasing the variety of foods that are edible, they can support sustainable livelihoods through household food security. Additionally, they can offer a wide variety of crops to satisfy changing market demands and boost productivity as well as global food security.

4. THE VALUE OF UNDERUTILIZED VEGETABLES

Vegetable crops that are underutilized are very important for several reasons. To begin with, they play a major role in combating malnutrition by providing an abundant supply of vital vitamins, minerals, and antioxidants. Their high nutritional density encourages greater health by supporting a diet that is more varied and balanced [3a]. These crops are essential to rural communities' economic well-being. Many families receive financial support from the production and sale of vegetables that are underutilized, which helps to reduce poverty and improves livelihoods. For example, The Mission for Integrated Development of Horticulture (MIDH) program in India provides farmers with significant financial assistance for their vegetable crops, with amounts ranging from 40% to 60%. This program fosters sustainable farming methods while easing financial burdens. The qualifying requirements, application procedure, important features, and scientific approaches to optimize the subsidy and guarantee both economic growth and environmental well-being will all be covered. NHM offers financial assistance for growing vegetables in both open fields and protected areas, which is one of its benefits. The kind of vegetable, the region in which it is grown, and the farmer's classification all influence the subsidy rates. Generally speaking, the subsidy is equal to 60% of the price for small and marginal farmers, women, SC/ST and 50% of the cost for general farmers. Furthermore, these crops are robust and sustainable choices for the development of varieties and hybrids due to their tolerance to biotic and abiotic stresses. This resilience can support food security by lessening the effects of environmental problems. Furthermore, underutilized vegetable crops have traditional and cultural value and are used for food, medicine, and other uses. Thus, encouraging and preserving the growth of these crops can support the preservation of traditional knowledge and biodiversity in the area [3a].

Nutritional Security: Vegetables that are neglected and underutilized but rich in nutrients are essential for low-input agriculture and food security. The well-being of underprivileged groups may suffer direct and detrimental consequences from the degradation of these species, making their preservation essential. Certain underappreciated veggies are higher in vital nutrients like pro-vitamin A and vitamin C than commercial varieties that are commonly available. Making these veggies a priority is a useful strategy for improving nutrition and preventing micronutrient deficiencies [3a]. It also addresses "Hidden Hunger," which is a problem that is particularly common among the impoverished and vulnerable social groups in rural areas of developing nations. Put simply, emphasizing neglected and underutilized vegetables not only supports dietary diversity but also makes a substantial positive impact on the general health and food security of populations confronting economic hardships.

Ecosystem Stability: As a result of climate change and the depletion of land and water resources, there is an increasing demand for plants and animals that can survive in harsh conditions, such as those found on desert edges, areas with low soil, withered vegetation, or experience drought.

Cultural Biodiversity: The use of plants is deeply ingrained in local customs and behaviors, and is rooted in culture. Vegetables that are overlooked and underutilized contribute significantly to the preservation and enhancement of cultural diversity in relation to dietary customs, medical procedures, religious ceremonies, and interpersonal interactions. When these vegetables are used in customary meals or rituals, they frequently have special significance or value for a group. They add to the distinctive character of regional cuisines and are occasionally linked to symbolic or therapeutic meanings, which heightens their cultural relevance [3a]. Acknowledging and encouraging the use of these plants presents a chance to maintain and celebrate the cultural heritage ingrained in the links between communities and the plants they grow and eat, in addition to improving nutritional diversity.

Improvement in Employment Opportunities: Compared to staple crops like cereals or some fruits, horticultural crops, such as vegetables, usually require more care and labor during the course of their cultivation. Their rigorous care needs, ranging from clearing the ground to harvesting, frequently call for a larger labour input, making cultivation more labour-intensive. The unemployed population can greatly benefit from this employment potential by having more opportunities to make money, which will help to reduce poverty in the nation.

Agroecological Vegetable Farming: Underutilized vegetables do have a competitive advantage, particularly when there is a shortage of arable land, a labour pool that is large, and markets are close by. The average revenue of farmers who grow these veggies is typically higher than that of farmers who grow many crops [3a]. Research has indicated notable discrepancies in earnings between smallholder farmers who cultivate vegetables for sale and those who do not. In fact, farmers who cultivate vegetables for export can make up to five times more money. Increased trade and marketing activities are fostered by the

integration of vegetable growers into marketplaces, which plays a vital role in the commercialization of the rural pro. In addition to giving the participating farmers more options for increased revenue, this integration can improve the economic viability of these regions. Commercialization is essential to the recovery of rural economies since it increases production per unit area and creates jobs. The need to feed expanding cities is more urgent as urbanization keeps increasing. To address the food needs of these growing urban populations, this situation requires a shift in concentration toward urban and peri-urban agriculture production. In addition to meeting the need for food, urban and peri-urban agriculture generates jobs and stimulates the local economy in and around cities.

Production of Derived Products and By-Products: The agriculture industry has enormous potential for generating revenue, especially through value addition. Processing vegetables to make pulps, pickles, jams, and jellies increases their value and opens doors to reducing poverty. Furthermore, producers can reduce losses by processing vegetables for foreign exchange profits and diversifying by-products like starch, chips, or crisps from extra supply [3a]. Furthermore, the climate is conducive to producing neglected vegetables used in perfumery, including medicinal crops or flowering plants, which opens up opportunities for the perfumery business globally. Governments can have a significant impact by encouraging youth unemployment and growers to work in the processing sector, which will provide value to the agricultural sector and create jobs. Such actions not only help farmers but also greatly boost employment and economic growth.

5. BENEFITS OF UNDERUTILIZED VEGETABLES FOR NUTRITION

Underutilized Vegetables have good levels of fat, protein, and carbohydrates. The amount of carbohydrates varies from 3.13 g/100 g (*Ipomoea aquatica)* to 57.24 g/100 g in *Macrotyloma uniflorum*. The protein content of *Parkia speciosa* is 27.5 g/100 g, while that of *Momordica charantia* is 0.84 g/100 g. *Vigna angularis* has fat contents ranging from 0.1 g/100 g to 13.3% in smelly beans. Underutilized vegetables and legumes have varying energy values: 346 kcal/100 g for *Vigna umbellate* and 19 kcal/100 g for (*Convolvulus aquatica*) [3a]. Also, Minerals like iron, magnesium, phosphorus, potassium, salt, zinc, copper, manganese, and selenium are also abundant in underused vegetables [9]. The amount of calcium in a 100 g sample of rice beans ranges from 290 mg/100 g in bitter gourds. In bitter gourds, the magnesium content varies from 16 mg/100 g to 230 mg/100 g in rice beans. Potassium values in rice beans range from 1400 mg/100 g in rice beans to 208 mg/100 g in roselles (*Hibiscus sabdariffa*). As a result, Underutilized Vegetables can also be helpful in supplying mineral nutrients. The human body depends heavily on mineral elements for growth and development. For example, calcium ions are essential for bone formation and are involved in the regulation of blood clotting, enzyme activity, muscle contraction, and nerve function. Osteoporosis and rachitis result from a calcium deficiency. An essential component of blood, iron is involved in both oxidation and reduction processes. A low iron level causes anemia [3a]. An element called phosphorus is required for the development of teeth and bones. Eating underutilized legumes and veggies will provide humans with adequate mineral nutrition [10].

Table 1. Major nutritional content of important underutilized vegetable crops

S. No.	Common name	Nutritional content	References
1.	Agathi (*Sesbania grandiflora*)	Due to their great nutritional value -which includes substantial levels of vitamin A and minerals. Protein (8.25%), carbohydrates (6.30%), ash (3.15%), fiber (2.90%) and vitamin A (89 µg RE).	Chandralekha et al., [12]
2.	Ponnanganni Greens/Gudrisag (*Alternanthera sessilis*)	Ritch in fiber, vitamin C, riboflavin, niacin, protein, carbs, fat, and carotene. Energy (65.4 Cal), Protein (4.0 g), Fat (0.012 g), Carbohydrate (0.290 g), Dietary fiber (0.356 g), Ash (0.51 g), Moisture (6.16 %), Iron (5.0 mg), Calcium (379 mg) and Vitamin A (50 mg).	Karolin, [13] and Vijaya Vahini and Sharmila, [14]
3.	Common Purslane (*Portulaca oleracea*)	It is abundant in vital fatty acids, vitamin C, folic acid, and β carotene. Energy (16 Kcal), Carbohydrates (3.4 g), Protein (1.30 g), Total Fat (0.1 g), Potassium (494 mg), Calcium (65 mg), Iron (1.99 mg), Magnesium (68 mg), Phosphorus (44 mg) and Zinc (0.17 mg). Vitamins: Vitamin A (1320 IU) and Vitamin C (21 mg)	Kamal et al., [15]
4.	Water leaf (*Talinum triangulare*)	It contains carotenoids such as Lutein and Zeaxanthin also contain vitamins K, C, and A, as well as minerals. Fiber (16.43%), Fat (2.23 %), Protein (11.88%), Ash (13.29 %) and Carbohydrate (45.80 %)	Tiamiyu and Oluwafemi, [16]
5.	Water spinach (*Ipomoea aquatica*)	The plants contain fibre, carbohydrate and minerals (particularly K, Fe, Mg and Mn). Protein (2.90%), ash (1.13%), fiber (1.48%), fat (0.16%), carbohydrates (3.70%) and energy value of 30 kcal/100g. Elements including K (1.364%), Ca (0.233%), Fe (0.012%), Mn (0.004%), Zn (0.001%) and Mg (0.123%).	Umar et al., [17] and War War Nyein, [18]
6.	Chekurmanis (*Sauropus androgynus*)	Multivitamin green, it is high in rich source of β-carotene, vitamin E, vitamin C, thiamine, riboflavin, calcium, iron, zinc and protein. Protein (22.0 g), fibre content (34 g), iron (4.50 mg), zinc (1.48 mg), niacin (69 mg), β-carotene (9250 µg/100 g) and vitamin E (15.6 mg)	Sheela et al., [19] and Kalpana and Krishnapura, [20]

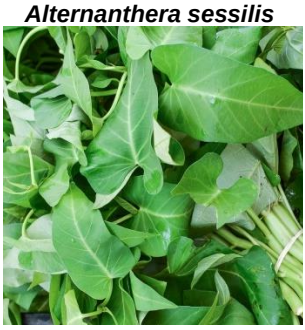
S. No.	Common name	Nutritional content	References
7.	Aerial yam or Air potato (*Dioscorea bulbifera*)	Moisture (26.84%), ash (7.28 g), lipids (0.2032g), crude fiber (2.7942), protein (1.0 mg) and total carbohydrates (0.8721 g).	Ruby, [21]
8.	Globe Artichoke (*Cynara scolymus*)	Moisture (79.60%) Dietary fiber (6.01 g) Ash (0.96g) Proteins (3.08 g) Lipids (0.18 g) Carbohydrates (10.17%) and Vitamin C (13.70 mg)	Roberta et al., [22]
9.	Adzuki bean (*Vigna angularis*)	Moisture (13.3 g), ash (4.2 g), protein (23.9 g), starch (43.9 g) and total soluble sugar (8.2 g)	Deepika et al., [23]
10.	Ivy gourd (*Coccinia grandis*)	Energy (21 K.Cal), Protein (1.4 g), Carbohydrate (3.4 g), Fat (0.2 g), Calcium (25 mg) and Iron (0.9 mg)	Neetu et al., [24]
11.	Bok choy (*Brassica rapa*)	Potassium (2,199 mg), Ca (289 mg), Mg (146 mg), Na (111 mg), and vitamin C (316 mg)	Pokluda, [25]
12.	Kakrol (*Momordica dioica*)	Potassium content (4.63), sodium content (1.62), calcium content (7.37), iron content (5.04), and zinc content (3.83) [18]. Carbohydrate (7.7 g), protein (3.1 g) and fat (3.1 g)	Aberoumand, [26]
13.	Sword bean or Jack Bean (*Canavalia gladiate*)	Protein (28.39%), lipid (7.84%), fiber (8.23%), ash (5.63%) and carbohydrates (49.91%)	Vadivel et al., [27]
14.	Velvet bean (*Mucuna pruriens*)	Crude protein (28.82 mg), Potassium (1,628.36 mg), Phosphorus (456.35mg), Calcium (689.45 mg), Iron (14.74 mg) and Magnesium (341.44 mg).	Chinju et al., [28]
15.	Tree Bean (*Parkia roxburghii*)	Calcium (97.47 mg), Potassium (2400 mg), Copper (2.3 mg) and Zink (2.77 mg)	Chatterjee et al., [29]

Sesbania grandiflora

Alternanthera sessilis

Portulaca oleracea

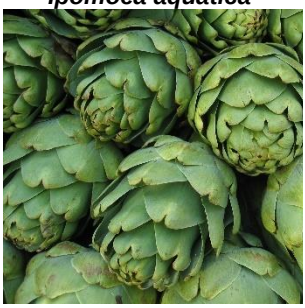
Talinum triangulare



Ipomoea aquatica

Sauropus androgynus

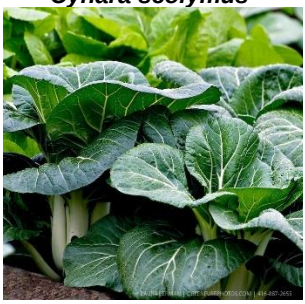
Dioscorea bulbifera



Cynara scolymus

Vigna angularis

Coccinia grandis



Brassica rapa

Momordica dioica



Canavalia gladiate ***Mucuna pruriens*** ***Parkia roxburghii***

Plate 1. Important underutilised vegetable crops

Vitamins are important dietary components that the body needs for a variety of vital processes. Vitamin C, or ascorbic acid, is necessary for the creation of collagen, which is a crucial component of the skin, gums, and bones. Underutilized vegetables are high in vitamin C because ascorbic acid concentrations are 12 mg/100 in roselle and 55 mg/100 g in water convolvulus [11,3a].

6. CONCLUSION

Underutilized vegetables have a lot of unrealized wealth potential. They are resilient to harsh weather and rich in nutrients, so they can benefit growers, consumers, and the environment. It is imperative to address issues including a shortage of planting materials, knowledge of the plant's nutritional and therapeutic value, and information on cultivation methods in order to fully realize these benefits. In order to secure future food and nutritional security, initiatives centered on the investigation, management, and enhancement of underutilized vegetable crops are desperately needed [3a]. Government initiatives and development projects run by non-governmental organizations are crucial in advancing the cultivation of many underutilized vegetables in India, where the land and climate are favorable for their production.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during the writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Buturi CV, Mauro RP, Fogliano V, Leonardi C, Giuffrida F. Mineral biofortification of vegetables as a tool to improve human diet. Foods. 2021;10:223.
2. Santosh Rani. Makhan Lal. Media effectiveness on rural women in Haryana for vegetables cultivation, Indian Journal of Extension Education. 2019; 55(1):21-27.
3. Anil Kumar Jena, Rimi Deuri, Pranamika Sharma, Surya Prakash Singh. Underutilized vegetable crops and their importance, Journal of Pharmacognosy and Phytochemistry. 2018;7(5):402-407.

3a. Marappan K, Arumugam VA, Mariyappillai A, Subramani M. Nutritional Content of Underutilized Vegetable Crops: A Source for Nutritional Security and Human Health. Asian Research Journal of Agriculture. 2024 Apr 27;17(2):233-41.

4. Salvi J, Katewa SS. Nutritional composition of *Momordica dioica* fruits: As a wild vegetable. Journal of Food and Pharmaceutical Sciences. 2015;3(2):18-22.
5. Nnamani CV, Oselebe HO, Okporie EO. Ethnbotany of indigenous leafy vegetables of Izzi Clan, in Ebonyi State, Nigeria. In: Proceeding of 20th Annual National Conference of Biotechnology Society of Nigeria. Abakaliki. 2007;111-114.
6. Mayes S, Massawe FJ, Alderson PG, Roberts JA, Azam-Ali SN, Hermann M. The potential for underutilized crops to improve security of food production. Journal of Experimental Botany. 2012;63(3), 1075-1079.
7. Oguntibeju OO, Truter EJ, Esterhuyse AJ. The role of fruit and vegetable consumption in human health and disease prevention. Diabetes Mellitus-Insights and Perspectives. 2013;3(2):172-180.
8. Andreas W. Ebert. Potential of underutilized traditional vegetables and legume crops to contribute to food and nutritional security, Income and More Sustainable Production Systems, Sustainability. 2014;6(1):319-335.
9. Longvah T, Ananthan R, Bhaskarachary K, Venkaiah K. Indian food composition tables National Institute of Nutrition, Hyderabad; 2017.
10. Kamisah Y, Othman F, Qodriyah HM, Jaarin K, Parkia speciosa Hassk.: A potential phytomedicine. Evid Based Complement Alternat Med; 2013.
11. Gopalan M, Rmashastri BV, Balasubramanian SC, Rao NBS, Deosthale YG, Pant KC. Nutritive value of Indian foods. National Institute of Nutrition, Indian Council of Medical Research, Hyderabad; 2004.
12. Chandralekha Bhokre, Kailash Gadhe, Anuprita Joshi. Assessment of nutritional and phytochemical properties of Sesbania grandiflora flower and leaves. The Pharma Innovation Journal 2022;11(6):90-94.
13. Karolin A. Ideas and innovations in technology, development of ponnanganni green soup powder, International Journal of Advance Research. 2019;5(1)-787-791.

14. Vijaya Vahini R, Sharmila M. Nutritional, functional, and microbial evaluation of dehydrated *Alternanthera sessilis* Powder: An Underutilized Green Leafy Vegetable. Research Journal of Agricultural Sciences 2023;14(04):961–966.
15. Kamal Uddin Md, Abdul Shukor Juraimi, Md Sabir Hossain, Most. Altaf Un Nahar, Md Eaqub Ali, Rahman MM. Purslane weed (*Portulaca oleracea*): A prospective plant source of nutrition, Omega-3 Fatty Acid, and Antioxidant Attributes, Scientific World Journal. 2014;6.
16. Tiamiyu Adebisi Musefiu, Oluwafemi Doris Yinka. *Talinum triangulare* (Water Leaf): What a Wonderful Plant, Journal of Biotechnology Research. 2022;8(2);26-31.
17. Umar KJ, Hassan LG, Dangoggo SM, Ladan MJ. Nutritional composition of water spinach (*Ipomoea aquatica* Forsk.) Leaves. Journal of Applied Sciences. 2007;7:803-809.
18. War War Nyein. Studies on some nutritional values of water Spinach *Ipomoea aquatica* Forssk 3rd Myanmar Korea Conference, Research Journal. 2019;3(5).
19. Sheela K, Nath KG, Vijayalakshmi D, Yankanchi GM, Patil RB. Proximate composition of underutilized green leafy vegetables in Southern Karnataka. The Journal of Human Ecology. 2004;15, 227–229.
20. Kalpana Platel, Krishnapura Srinivasan. Nutritional profile of Chekurmanis (*Sauropus androgynus*), A less explored green leafy vegetable, The Indian Journal of Nutrition and Dietetics. 2017;54(3).
21. Ruby Lyn V Gutierrez. Nutritional, phytochemical and cytotoxicity analyses of air potato *Dioscorea bulbifera* L. bulbils, Plant Science Today. 2021;8(2).
22. Roberta Dosi, Addolorata Daniele, Vincenzo Guida, Luigia Ferrara, Valeria Severino, Antimo Di Maro. Nutritional and metabolic profiling of the globe artichoke (*Cynara scolymus* L. 'Capuanella' heads) in province of Caserta, Italy, Australian Journal of Crop Science. 2013;7(12):1927-1934.
23. Deepika DD, Siddhant Ranjan Padhi, Padmavati G Gore, Kuldeep Tripathi, Ashvinkumar Katral, Rahul Chandora, et al. Nutritional potential of Adzuki Bean Germplasm and Mining Nutri-Dense Accessions through Multivariate Analysis, Food. 2023;12(22):4159.
24. Neetu, Shalini Purwar, Vinita Bisht, Neeraj, Brijesh KR Maurya. Nutritional and therapeutic values of *Coccinea grandis*: A review, International Journal of Chemical Studies. 2020;8(4):1555-1561.
25. Pokluda R. Nutritional quality of Chinese cabbage from integrated culture, Horticulture Science (Prague). 2008;35(4):145–150.
26. Aberoumand A. Screening of less known two food plants for comparison of nutrient contents: Iranian and Indian vegetables. Functional Foods in Health and Disease 2011;10:416–423.
27. Vadivel V, Doss A, Pugalenthi M. Evaluation of nutritional value and protein quality of raw and differentially processed sword bean, African Journal of Food, Agriculture, Nutrition and Development. 2010;10(7).

28. Chinju Baby, Sawinder Kaur, Jyoti Singh, Rasane Prasad. Velvet bean (*Mucuna pruriens*): A sustainable protein source for tomorrow, Legume Science. 2023;5:178.
29. Chatterjee, Debmala Mukherjee, Arghya Mani. Partha Choudhuri. Nutraceutical potential of Tree bean (*Parkia roxburghii*), Agriculture and Food. 2024;1(1).

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