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Indigenous leafy vegetables: A super-food and a potent drug for future generation

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Abstract
Indigenous leafy vegetables play a crucial role in addressing the food scarcity problem worldwide. Although it is inexpensive, but it is rich in phytonutrients. Apart from its nutritive value, they are gifted with natural antioxidants and pharmacologically active compounds which can overcome the problem of malnutrition, oxidative stress, anemia and other diseases. They play a prominent role in alleviating hunger of expanding population of the world. However, they remain underutilized due to lack of awareness among the people about its overlapping nutritional and medicinal values. Besides their wider applications, they boost the socioeconomic condition of farmers and tribal people by generating income source for earning their livelihood. Due to its high adaptability to agro-climatic conditions, low maintenance and less investment it can be easily exploited for the benefit of humankind. With vanishing ethnomedicinal knowledge day by day, the need of the hour is to explore the hidden potential of indigenous leafy vegetables for future generation by immediate documentation and conservation. Research in greater scale of indigenous leafy vegetables can give surprising varieties which can be used as future medicines as well as superfood.

Keywords: indigenous, underutilized, superfood, documentation, future medicines

1. Introduction
Food scarcity is the main concern due to rapidly growing population. In order to tackle this scarcity, food production is to be accelerated to meet the hunger of the whole nation. Exploitation of Indigenous Leafy Vegetables (ILVs) has a vital role to play in order to address this issue. ILVs being the cheapest of all the vegetables are affordable by all. Due to their distinct flavor and aroma they add variety in our daily diet. However, leafy vegetables are considered as inferior food due to its low cost. So, the potential of leafy vegetables should not be determined by its cost which most of the people think, ignoring its food values.

Indigenous plant species include those species which grow naturally in an area or existed for many years in an area. Apart from forming food bowl of tribal and rural people, they are storehouse of nutrients which can overcome the problem of malnutrition and can boost our immune system. Many ILVs are gifted with pharmacologically active compounds which can cure various diseases. They are often considered as 'poor man's vegetables' as it is cheaper and easily accessible. Although they are inexpensive and easily available still it remains underutilized now a days due to lack of awareness about its nutritive and medicinal values. Moreover, due to urbanization, traditional knowledge relating to their ethnomedicinal uses is vanishing day by day. ILVs have immense potential to meet the demands of hunger of growing population of whole country besides their wide applications in agriculture and industry. In addition to dietary uses (Fig.1), many leafy vegetables are also used for phytoremediation (*Spinacea oleracea* for controlling Cadmium pollution in soil) [1], as biopesticide (*Azadirachta indica*) [2], as green manures (*Trigonella foenum-graecum*) [3], potent drug (*Bacopa monnieri*) [4], spices (*Coriandrum sativum*), as ornamental plants (*Nyctanthes arbor-tristis*) and in cosmetic industry (*Eclipta prostrata*).

In many parts of the world, majority of tribal communities still depend upon wild edible plants to accomplish their dietary requirements. Underutilized leafy vegetables are enriched with nutraceutical and pharmacologically active components which are needed for human well-being and mostly consumed based on the traditional knowledge, social rituals and as folklores [5]. Traditional leafy vegetables due to their high nutritive value are highly recommended and play crucial role in food security during times of famine and poor harvest [6].

The cultivation of ILVs ensures their sustainability and can enhance socioeconomic condition of tribal people and farmers by generating income source in the developing countries. Due to their high adaptability to agro-ecological condition, less inputs and low maintenance it can be easily propagated. In remote rural communities, where cultivation of vegetables is not practiced and market supplies are unorganized, local inhabitants for enriching the diversity of food rely on indigenous vegetables which are wild or cultivated in kitchen gardens [7]. Consumption of ILVs is higher in rural areas where supply of exotic leafy vegetables is limited in comparison to urban areas. Therefore, efforts should be taken to upgrade ILVs with nutritional cum medicinal value in urban settlements.

2. Rapid decline in consumption of indigenous leafy vegetables
The main drawback for low consumption of ILVs is due to inadequate information among the people about their overlapping nutritional and medicinal benefits. In addition urbanization, habitat destruction, dependency on cultivated food crops, change in culture, and access to modern healthcare facilities contributes significantly to the erosion of traditional knowledge. Present generation is mostly dependent on cultivated, processed and readymade food for their food intake. So, the need of the hour is to spread

awareness among the people about the nutritional and medicinal values of ILVs.

ILVs grow naturally as well as low maintenance is required to grow them, therefore it can be easily propagated both in rural and urban areas for sustainable utilization of natural resources. Although extensive studies have been done regarding nutritive value of leafy vegetables, revealing high content of macro- and micro-nutrients, priority has been given to the exotic vegetables. So, research in greater scale of indigenous leafy vegetables can give surprising varieties which can be used to meet the fast-growing demand of the population in the whole country.

3. Indigenous Leafy Vegetables: As power house of nutrients

Next to China, India ranks second in the production of Green Leafy Vegetables (GLV) and vegetables still there is a lack of awareness among people about their beneficial effects on health upon consumption of GLV [8]. Moreover, present generation give preference to the food based on taste rather than its nutritive value. Leafy vegetables are the most readily available sources of carbohydrates, fats, proteins, vitamins, minerals, essential amino acids, and fibers [9]. As compare to commonly available domesticated vegetables, the nutritional value of wild leafy vegetables is high. GLV are also rich source of carotene, ascorbic acid, riboflavin, folic acids and minerals like calcium, iron and phosphorus [10]. They are low in calories and fat whereas rich in dietary fibre, iron, calcium, vitamin C, vitamin K, carotenoids, lutein, folate, magnesium [11]. In developing countries, where pharmaceutical supplements and vitamin A fortified foods are limited, escalating the consumption of leafy vegetables which are extensively distributed can help in preventing vitamin A deficiency [12].

Anti-nutrients which are undesirable chemical substances are abundant in both cultivated and wild plant species [13]. Anti-nutritional factors present in green leafy vegetables such as nitrates, phytates, tannins, cyanogenic glycosides and oxalates can affect absorption of micronutrients thereby making it unavailable. Therefore, before intake of leafy vegetables, thermal processing of it by boiling, cooking and blanching may help in decreasing the level of anti-nutrients [14].

4. Indigenous Leafy Vegetables: Nature's doctor

Nature has bestowed leafy vegetables with potentially important bioactive components which can protect us from different diseases. Besides fulfilling the nutritional requirements, leafy vegetables are also used by tribal and rural inhabitants for the treatment of various ailments. As per the culture of traditional healers, they are used as natural remedies for the prevention and cure of various diseases. So, inclusion of greens in our diet serves dual purposes. The consumption of greens has been reported to have beneficial effects such as prevention of age-related degenerative diseases like arteriosclerosis and stroke [15]. ILVs being rich in provitamin A, carotenoids and iron could essentially overcome vitamin A and iron deficiencies in rural areas where the diet is low in animal source foods [16]. Green leafy vegetables also overcome the problem of anemia which causes symptoms like spinning head, blurred vision or floaters, fatigue and lethargy, insomnia, hypotonia, muscle cramps, limb numbness, pallor, dry skin and hair, pale tongue, forgetfulness, premenstrual syndrome, amenorrhoea, a persistent feeling of cold, heart palpitations and anxiety [17]. Epidemiological studies indicate that increased consumption of leafy vegetables is responsible for decreased risk of nutrient deficiency disorders as well as some serious diseases like cancers, cardiovascular disease, cataract and other age-related diseases [18].

5. Indigenous Leafy Vegetables: Natural antioxidants

Edible leafy vegetables contain antioxidants necessary in neutralizing free radicals which are human chemical hazards [19]. The antioxidants present in green leafy vegetables can be helpful in management of oxidative stress and age-related human ailments [20]. Indigenous leafy vegetables contribute to the antioxidant activity in the diet may be due to rich source of phenolic compounds and other phytochemicals [21]. The antioxidant activity of phenolic compounds provides protection against reactive oxygen species by their strong chain-breaking and free radical scavenging capacity [22]. High production of reactive oxygen species (ROS) can cause injury to the tissue and oxidative damage to nucleic acids and proteins [23].

Gupta *et al.* (2009) study the antioxidant activity of Indian green leafy vegetables such as *Amaranthus* sp., *Centella asiatica*, *Murraya koenigii* and *Trigonella foenum graecum*. They reported the total antioxidant activity was highest in *Murraya koenigii* (2,691.78 µmol of ascorbic acid/g sample) and least in *Centella asiatica* (623.78 µmol of ascorbic acid/g sample) [24]. Dasgupta and De, 2007 did comparative study of eleven edible leafy vegetables of India for their free radical-scavenging activity in different systems of assay, e.g. DPPH radical-scavenging activity, superoxide radical-scavenging activity in riboflavin/light/NBT system, hydroxyl radical-scavenging activity, and inhibition of lipid peroxidation induced by $FeSO_4$ in egg yolk. They found *Ipomoea reptans* has good antioxidant activity amongst the eleven plant materials whereas lowest activity was found in *Nyctanthes arbor-tristis* [25].

Table 1: List of some indigenous leafy vegetables with nutritive and medicinal values

Sl.No.	Indigenous Leafy Vegetables	Chemical Constituents	Therapeutic values
1,	*Abelmoschus moschatus* Medik. [Malvaceae]	Carbohydrates, proteins, flavonoids, sterols, tannins, phenolic compounds, fixed oil and fats [26].	Leaves and root extract cures gonorrhea and venereal diseases [27].
2.	*Achyranthes aspera* L. [Amaranthaceae]	Tannins, alkaloids, saponins, flavonoids, steroids, carbohydrates and proteins [28].	Juice of the plant- boils, diarrhoea,dysentery, haemorrhoids, rheumatic pains, itches,rabies, skin eruptions, pyorrhea, toothache, nervous disorders, hysteria, insect and snake bites [29].
3.	*Aerva lanata* (L.) Juss. ex Schult. [Amaranthaceae]	Alkaloids, steroids, flavonoids, tannins, amino acids and proteins, carbohydrates, cardiac glycosides, saponins and terpenoids [30].	Anthelmintic, demulcent, anti-inflammatory, diuretic, expectorant, hepato-protective and nephron- protective [31].
4.	*Alternanthera sessilis* L.	Proteins, fat, vitamin A, vitamin C, vitamin E,	Nootropic, appetizer, anti-oxidant, hepato-

	[Amaranthaceae]	vitamin K, vitamin B9, riboflavin, niacin, thiamine and minerals such as calcium, magnesium, iron, Kaempferol , saponins, amino acid such as arginine, leucine, isoleucine, lysine, threonine and tryptophan, peptide, phenols [32].	protective, promotes eye health, blood tonic [33].
5.	*Amaranthus spinosus* L. [Amaranthaceae]	Fiber, proteins, essential amino acids and lysine [34].	Leaves-good emollient, lactagogue and for treatment of colic and menstrual disorders [35].
6.	*Andrographis paniculata* (Burm.f.) Wall. ex Nees [Acanthaceae]	Alkaloids, flavonoids, tannin/phenols, lactones and phytosterols [36].	Anti-dote (snake-bite and poisonous stings of some insects), dyspepsia, influenza, malaria dysentery & respiratory infections [37,38].
7.	*Bacopa monnieri* L. [Scrophulariaceae]	Tannin, phlobatannin, saponin, steroid, flavonoid, cardiac glycoside, phenol, carbohydrate and alkaloid [39].	Anti-depressant activity, anti-anxiety, anti-convulsant, anti-cancer, anti-inflammatory, antioxidant, anti-bacterial, anti-fungal, anti-ulcer, anti-diarrheal, anti-hypertensive, analgesic and anti-toxicity activity [40].
8.	*Bauhinia variegata* L. [Caesalpiniaceae]	Terpenoids, flavonoids, tannins, saponins, reducing sugars, steroids & cardiac glycosides [41].	Antibacterial, antifungal, antiulcer, and hepatoprotective [42].
9.	*Boerhaavia diffusa* L. [Nyctaginaceae]	Roots- alkaloids (punarnavine), rotenoids (boeravinones), flavonoids, amino acids, ligans (liriodendrons), ß sitosterols, and tetracosanoic, esacosanoic, stearic and ursolic acids [43].	Roots - treatment of dyspepsia, jaundice, enlargement of spleen, abdominal pain, abdominal tumors, and cancers [44].
10.	*Cassia occidentalis* L. [Caesalpiniaceae]	Alkaloids, glycosides, flavonoids, phenolic compounds, tannins, and anthraquinones [45].	Unani medicine -antidote of poisons, blood purifier, expectorant, anti-inflammatory agent and for treatment of liver diseases [46].
11.	*Cassia tora* L. [Caesalpiniaceae]	Antrhroquinones, chrysophanol, Emodin, obtusifolin, obtusin, chryso-obtusin, auranto obtusin,and their glycosides, nathopyrones, rubrofusarin, norubrofusarin, rubrofusaring, etiobioside, toralactone, torachrysone [47].	Leaves and seeds are acrid, laxative, antiperiodic, anthelmintic, ophthalmic, liver tonic, cardiotonic and expectorant [48].
12.	*Cayratia auriculata* (Roxb.) Gamble [Vitaceae]	Alkaloids, flavonoids phenolic compounds, tannins, glycosides, saponins, and steroids [49].	Earache, wound abscess, dog bite, tumors, rheumatism, purulent wounds, cough, colds, hydrocele, tonic [50].
13.	*Celosia argentea* L. [Amaranthaceae]	Alkaloids, flavonoids, tannins, saponins, carbohydrates, proteins, steroids and aminoacids [51].	Whole plant-diarrhoea, piles, bleeding nose, disinfectant, inflammation, haematological and gynaecologic disorders [52].
14.	*Centella asiatica* (L.) Urban. [Apiaceae]	Isoprenoids (sesquiterpenes, plant sterols, pentacyclic triterpenoids and saponins) and phenylpropanoid derivatives (eugenol derivatives, caffeoylquinic acids and flavonoids) [53].	Leaf extract (oral administration) - to cure dysentery and boost memory power [54].
15.	*Chenopodium album* L. [Amaranthaceae]	Alkaloids, apo carotenoids, xyloside, limonene, α-terpinyl acetate, α-terpinene and cisascaridole [55].	Anti-ulcer, anti-nociceptive and hepato-protective [56].
16.	*Cleome viscosa* L. [Capparidaceae]	Chemical compounds i.e. coumarino-lignan, glucosinolates, cleomeolide, stigmasta-5, kaempeferide-3-glucuronide [57].	Treatment of malarial fevers, fever due to indigestion, skin diseases, leprosy, blood diseases, and uterine complaints [58].
17.	*Commelina benghalensis* L. [Commelinaceae]	Alkaloids, carbohydrates, sterols, saponins, tannins, phenolic compound, flavonoids, protein, free aminoacid, terpenoids, mucilage, betacyanin, quinone, phlobatannins, carotenoids [59].	In Tropical Asia, it is used to treat infertility in women and in India, it is used as bitter, demulcent, emollient, laxative, as an anti-inflammatory and depressant. [60].
18.	*Eclipta prostrata* (L.) L. [Asteraceae]	Steroids, tannins, saponins, flavonoids, diterpenes and triterpenes [61].	Hair tonic for nourishment, blackening and strengthening, antidandruff of hair [62, 63].
19.	*Emilia sonchifolia* (L.) DC. [Asteraceae]	Alkaloids, terpenoids, carotenoids, flavonoids and tannins [64] .	Ayurveda-Gastropathy, diarrhoea,nyctalopia, ophthalmia, cuts & wounds, intermittent fevers, pharyngodyma & asthma [65].
20.	*Enydra fluctuans* Lour. [Asteraceae]	Flavonoids, triterpenes, carbohydrate, reducing sugars, saponins, phenols, diterpenes, protein and tannin [66].	Anti-microbial, antioxidant, anti-cancer, anti-inflammatory and analgesic, thrombolytic, cytotoxic, CNS depressant properties [67].
21.	*Erythrina variegata* L. [Fabaceae]	Phenols, alkaloids, flavonoids, tannins and saponins [68].	Antibacterial, dental care prevention, smooth muscle relaxant, analgesic, antioxidant, anti-inflammatory, anti-osteoporotic effect, Calcium homeostasis [69].
22.	*Hibiscus sabdariffa* L. [Malvaceae]	Leaves -protein, fat, carbohydrate, minerals (phosphorus), iron, thiamine, β-carotene, riboflavin and ascorbic acid [70].	Antihypertensive, antiseptic, sedative, diuretic, digestive, purgative, emollient, demulcent and astringent [71].
23.	*Hygrophila auriculata* (Schum.) Heine [Acanthaceae]	Tannins, glycosides, saponins, phenols, flavonoids, cardiac terpenoids, alkaloids and steroids [72].	Antitumour, free radical scavenging, anthelmintic, antipyretic and antimotility activities [73].
24.	*Justicia adhatoda* L. [Acanthaceae]	Leaves-alkaloids, vasicinone, vasicinol, adhatodine, adhatonine, adhavasinone, anisotine and peganine as major constituents [74]. Essential oils, fats, resins,	Antispasmodic, antipyretic, antihemorrhagic, anti-inflammatory, bronchodilator, anti-diabetic, disinfectant, anti-jaundice and oxytocic [76].

		sugar, gum, amino acids, proteins and vitamins 'C' etc. [75]	
25.	*Mollugo pentaphylla* L. [Molluginaceae]	Flavones such as Apigenin and Mollupentin, Mollugogenol A, an antifungal triterpenoid, Mollugogenol B, Mollugogenol D, Oleanolic acid and a steroid β-Sitosterol [77].	Stomachic, aperient and antiseptic properties [78].
26..	*Oxalis corniculata* L. [Oxalidaceae]	Carbohydrate, glycosides, phytosterols, phenolic compounds, flavonoids, proteins, amino acids and volatile oil [79].	Antioxidant, anticancer, analgesic, diuretic, depurative, antifungal, antimicrobial, antiamoebic, astringent, cardio relaxan, anti-inflammatory, febrifuge, stero-idogenic, stomachic and styptic [80].
27.	*Paederia foetida* L. [Rubiaceae]	Leaves and stems gave the iridoid glycosides asperuloside, paederoside and scandoside; sitosterol, stigmasterol, campesterol; ursolic acid, hentriacontane, hentriacontanol, ceryl alcohol, palmitic acid and methyl mercaptan [81].	Used for asthma, bowel problems, diarrhoea, diabetes, rheumatism and seminal weakness [82].
28..	*Portulaca oleracea* L. [Portulacaceae]	Omega-3 fatty acids, gallotannins, kaempferol, quercetin, apigenin, α-tocopherol, ascorbic acid, glutathione, free oxalic acids, β-Carotene, omega-3 fatty acids, coumarins, flavonoids, mono terpenes glycoside & anthraquinone glycosides [83].	Neuroprotective activity, anticancer, antidiabetic, antimicrobial, anti-inflammatory, antioxidant, antiulcerogenic activity, hepatoprotective activity[84].
29.	*Tamarindus indica* L. [Caesalpiniaceae]	Leaves - protein, fat, fiber, and some vitamins such as thiamine, riboflavin, niacin, ascorbic acid and β-carotene [85].	Leaves are used as astringent, as gargle, and also made into a poultice to treat inflammatory swellings [86].
30.	*Trianthema portulacastrum* L. [Aizoaceae]	Steroids, alkaloids, terpenoids, glycosides, flavonoids, phenolic compounds, and carbohydrates [87].	Alexiteric, analgesic, stomachic, laxative, alterative; cures cough, bronchitis, heart diseases, anemia, inflammations, "Vata," piles and ascites [88].

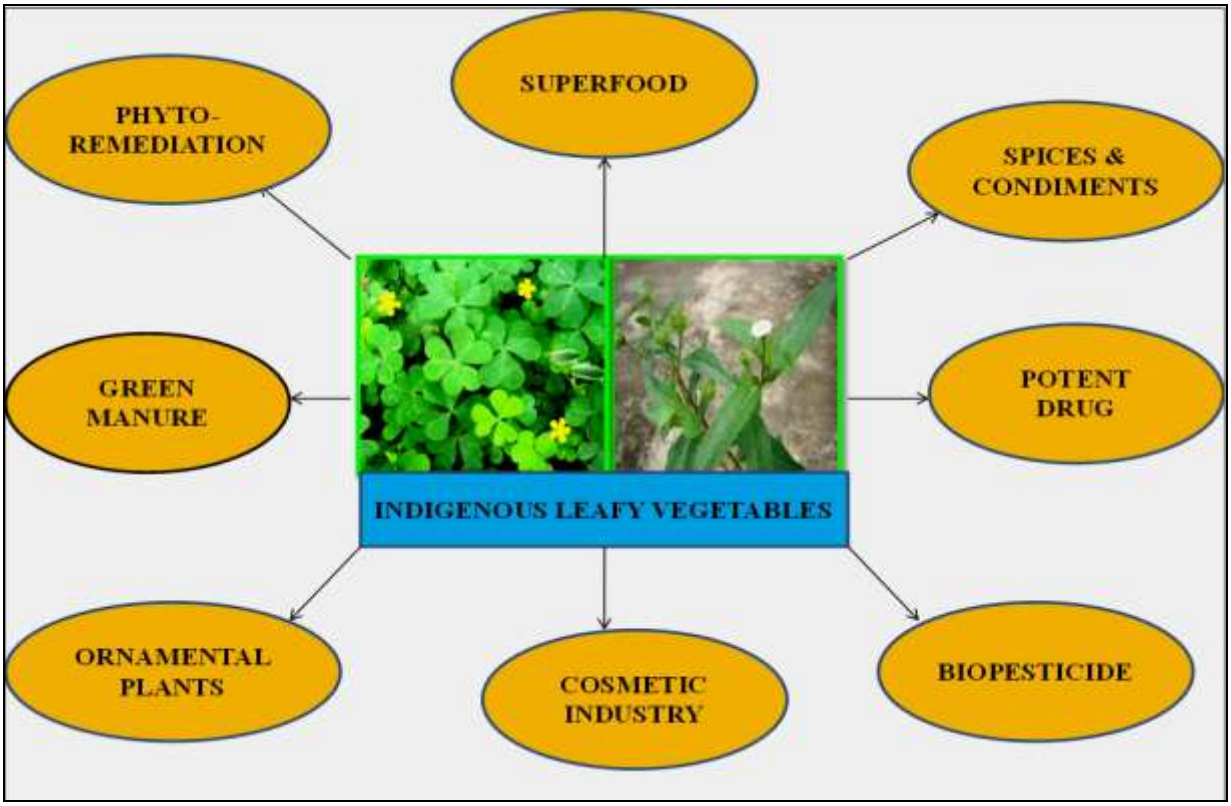

Fig 1: Application of Indigenous Leafy Vegetables

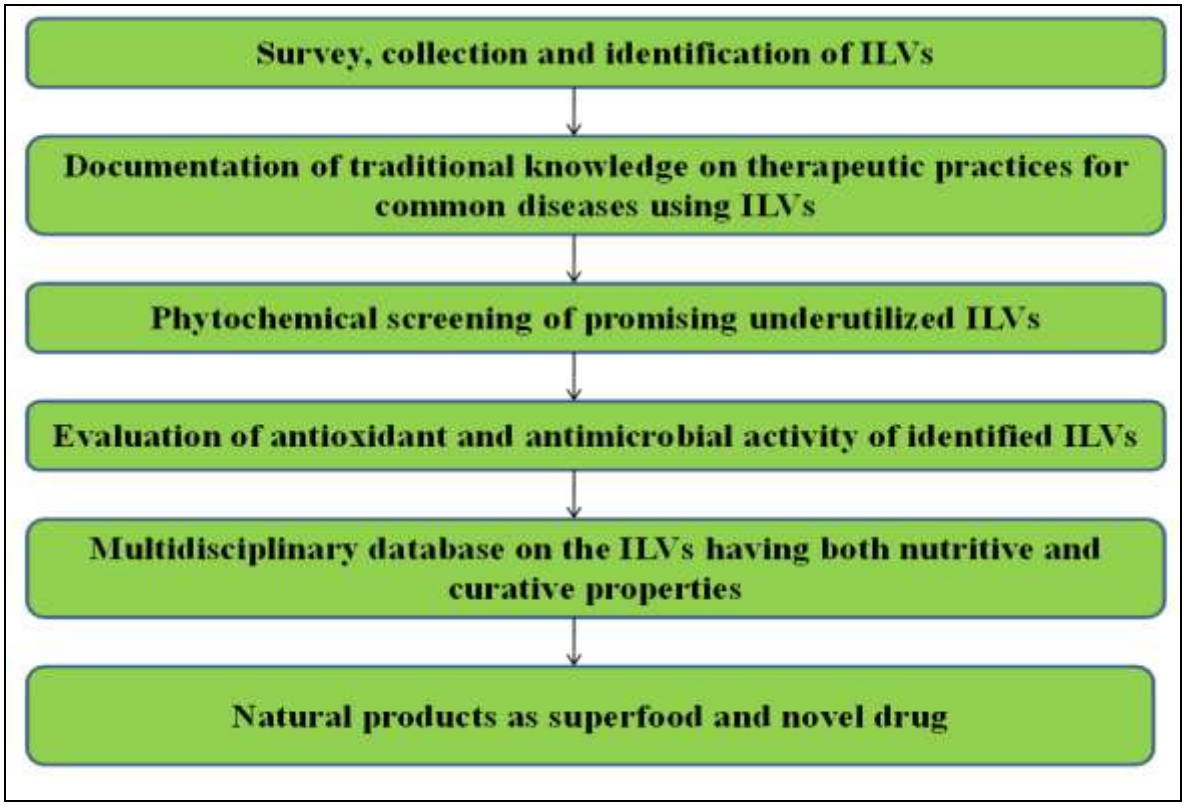

Fig 2: A potent approach towards production of super food cum novel drug

6. Conclusion and Perspectives

Due to wider benefits of ILVs, there is an urgent need for awareness among public about their immense potential for improving food security in the whole world. However due to rapid erosion of traditional knowledge related to their benefits and dependency of present generation on synthetic drugs, the potential of ILVs is currently undervalued. Therefore, in order to preserve indigenous knowledge of ILVs, measures should be taken to educate present generations about their importance. For sustainable utilization of natural resources, further studies should be undertaken in order to assess their potential and to bring more potent ILVs under domestication and propagation in order to maintain their continuous supply. Both in-situ an ex-situ conservation strategy can be adopted to conserve and sustainably utilize the ILVs and associated knowledge. So, scientific investigation and evaluation of ethnomedicinal knowledge related to diversity, usage and status of ILVs are essential for establishing its efficacy for safer use and for preserving it for future generation (Fig.2). Moreover, due to the presence of active ingredients with no side effects they can be explored as future medicinal plants.

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8. References

1. Salaskar D, Shrivastava M, Kale S. Bioremediation potential of Spinach (*Spinacia oleracea* L.) for decontamination of cadmium in soil. Current Science. 2011; 101(10):1359-1363.
2. Bhattacharrya N, Chutia M, Sarma S. Neem (*Azadirachta indica* A. Juss), a Potent Biopesticide and Medicinal Plant: A Review. Journal of Plant Sciences. 2007; 2(3):251-259.
3. Abdelgani ME, Elsheikh EAE, Mukhtar NO. The effect of *Rhizobium* inoculation and chemical fertilization on seed quality of fenugreek. Food Chemistry. 1999; 64(3):289-293.
4. Rai K, Gupta N, Dharamdasani L, Nair P, Bodhankar P. *Bacopa monnieri*: A Wonder Drug Changing Fortune of People. International Journal of Applied Sciences and Biotechnology. 2017; 5(2):127-132
5. Deb P, Prasad BVG, Munsi P, Chakravorty S. Underutilized Leafy Vegetables: Diversity, nutritional security and medicinal benefit in context of Eastern India, Advances in biodiversity conservation for sustainable development, Parmar Publishers and Distributors, 2018, 95-104.
6. Jana JC. Use of traditional and underutilized leafy vegetables of Sub-Himalayan terai region of West Bengal. Acta Horticulturae. 2007; 752:571-575.
7. Misra S, Maikhuri RK, Kala CP, Rao KS, Saxena KG. Wild leafy vegetables: A study of their subsistence dietetic support to the inhabitants of Nanda Devi Biosphere Reserve, India. Journal of Ethnobiology and Ethnomedicine, 2008, 4:15.
8. Jarapala SR. Nutrition Science in India: Green leafy vegetables: A potent food source to alleviate micronutrient deficiencies. International Research Journal of Basic and Applied Sciences. 2017; 2(1):7-13.
9. Sharma HP, Kumar RA. Health security in ethnic communities through nutraceutical leafy vegetables. Journal of Environmental Research and Development. 2013; 7(4):1423-1429.
10. Fasuyi AO. Nutritional potentials of some tropical vegetable meals, chemical characterization and functional properties. African Journal of Biotechnology. 2006; 5(1):49-53.

11. Schippers RR. African Indigenous Vegetables. An overview of the cultivated species. University of Greenwich, Natural Resources Institute, London, UK, 2000, 222.
12. Baudoin WO, Louise F O. Food and nutrition security towards human security. ICV Souvenir paper, Italy, 2002, 1-19.
13. Dagostin JLA. Use of blanching to reduce anti nutrients, pesticides, and microorganisms. New perspectives on food blanching. F. Richter Reis (ed.), Springer International Publishing AG, USA, 2017, 61-94.
14. Natesh HN, Abbey L, Asiedu SK. An overview of nutritional and anti-nutritional factors in green leafy vegetables. Horticulture International Journal. 2017; 1(2):58-65.
15. Lindeberg S, Cordain L, Eaton SB. Biological and clinical potential of a paleolithic diet. Journal of Nutritional and Environmental Medicine. 2003; 13(3):149-160.
16. Shekhar C. Hidden hunger: Addressing micronutrient deficiencies using improved crop varieties. Chemistry & Biology. 2013; 20(11):1305-1306.
17. Sharma N, Vijayvergia R. A Review on *Digera muricata* (L.) Mart. - A Great Versatile Medicinal Plant, International Journal of Pharmaceutical Sciences Review and Research. 2013; 19:114-119.
18. Acho CF, Zoue LT, Akpa EE, Yapo VG, Niame SL. Leafy vegetables consumed in Southern Cote d'Ivoire: a source of high value nutrients. Journal of Animal and Plant Sciences. 2014; 20(3):3159-70.
19. Mosha TC, Gaga HE. Nutritive value and effect of blanching on the trypsin and chymotrypsin inhibitor activities of selected leafy vegetables. Plant Foods for Human Nutrition. 1999; 54(3):271-283.
20. Gacch RN, Kabaliye VN, Dhole NA, Jadhav AD. Antioxidant potential of selected vegetables commonly used in diet in Asian subcontinent. Indian Journal of Natural Products and Resources. 2010; 1(3):306-313.
21. Uusiku NP, Oelofse A, Duodu KG, Bester MJ, Faber M. Nutritional value of leafy vegetables of sub-Saharan Africa and their potential contribution to human health: A review; Journal of Food Composition and Analysis. 2010; 23(6):499-509.
22. Podsędek A. Natural antioxidants and antioxidant activity of *Brassica* vegetables: A review. LWT- Food Science and Technology. 2007; 40(1):1-11.
23. Middleton E Jr, Kandaswami C, Theoharides TC. The effects of plant flavonoids on mammalian cells: Implication for inflammations, heart disease and cancer; Pharmacological Reviews. 2008; 52(4):673-751.
24. Gupta S, Prakash J. Studies on Indian Green Leafy Vegetables for Their Antioxidant Activity. Plant Foods for Human Nutrition. 2009; 64(1):39-45.
25. Dasgupta N, De B. Antioxidant activity of some leafy vegetables of India: A comparative Study. Food Chemistry. 2007; 101(2):471-474.
26. Christina AJ, Muthumani P. Phytochemical investigation and antilithiatic activity of *Abelmoschus moschatus* Medik. International Journal of Pharmacy and Pharmaceutical Sciences. 2013; 5(1):108-13.
27. Prajapati ND, Purohit SS, Sharma AK, Kumar T. Medicinal plants.3rd ed. Agrobios published Company, India, 2003, 353.
28. Parveen S. Phytochemical Screening and Antimicrobial Activity of Herbal Plant Extracts- *Achyranthes aspera*. International Journal of Pharmaceutical and Clinical Research. 2018; 10(7):201-209.
29. Londonkar R, V Chinnappa Reddy, K Abhay Kumar. Potential antibacterial and antifungal activity of *Achyranthes aspera* L. Recent Research in Science and Technology. 2011; 3(4):53-57.
30. Ragavendran P, Sophia D, Arul Raj C, Starlin T, Gopalakrishnan VK. Phytochemical screening, antioxidant activity of *Aerva lanata* L.-An in vitro study. Asian Journal of Pharmaceutical and clinical research. 2012; 5(2):77-81.
31. Yamunadevi M, Wesely EG, Johnson M. Phytochemical studies on the terpenoids of medicinally important plant: *Aerva lanata* L. using HPTLC. Asian Pacific Journal of Tropical Biomedicine. 2010; 1(2):220-225.
32. Gupta R, Singh HK. Nootropic potential of *Alternanthera sessilis* and *Clerodendrum infortunatum* leaves on mice. Asian Pacific Journal of Tropical Disease. 2012; 2(1):465-470.
33. Balakrishnan B, Ayyavoo J, Sadayan P, Abimannan AK. Evaluation of Antioxidant Activity of *Clitoria ternatea* and *Alternanthera sessilis* Plant Extracts Using Model System for Yeast Cells, African Journal of Basic & Applied Sciences. 2013; 5(3):134-138.
34. Vinson JA, Hao Y, Su X, Zubik L. Phenolic antioxidant quantity and quality in foods: vegetables. Journal of Agricultural and Food Chemistry. 1998; 46(9):3630-3634.
35. Ayethan WM, Sein MM, Maybwin M. The effects of some medicinal plants on smooth muscle. 1996; AB Abstract, 1970-1979.
36. Bhansali S, Bhishma V, Patil S. Phytochemical Screening and Measurement of Antioxidant activity from *Andrographis paniculata*. International Journal of Innovative Research in Science, Engineering and Technology. 2018; 7(8):9022-9026.
37. Chopra RN. Glossary of Indian medicinal plants. Council for Scientific and Industrial Research, New Delhi, 1980, 18.
38. Jarukamjorn K, Kondo S, Chatuphonprasert W, Sakuma T, Kawasaki Y, Emito N. Gender-associated modulation of inducible CYP1A1 expression by andrographolide in mouse liver. European Journal of Pharmaceutical Sciences. 2010; 39(5):394-401.
39. Jain P, Sharma HP, Basri F, Priya K, Singh P. Phytochemical analysis of *Bacopa monnieri* (L.) Wettst. and their antifungal activities. Indian Journal of Traditional Knowledge. 2017; 16(2):310-318.
40. Lal S, Baraik B. Phytochemical and pharmacological profile of *Bacopa monnieri* - an ethnomedicinal plant. International Journal of Pharmaceutical Sciences and Research. 2019; 10(3):1001-1013.
41. Uddin G, Sattar S, Rauf A. Preliminary phytochemical, *in-vitro* pharmacological study of *Bauhinia alba* and *Bauhinia variegata*. Middle-East Journal of Medicinal Plants Research. 2012; 1(4):75-79.
42. Bodakhe B, Jayakar B, Ram A. Hepatoprotective properties of bark extract. *Bauhinia variegata*.

Yakugaku Zasshi Journal of the Pharmaceutical Society of Japan. 2007; 127(9):1503-1507.
43. Ujowundu CO, Igwe CU, Enemor VHA, Nwaogu LA, Okafor OE. Nutritive and Anti-Nutritive Properties of *Boerhaavia diffusa* and *Commelina nudiflora* Leaves. Pakistan Journal of Nutrition. 2008; 7(1):90-92.
44. Kirtikar KR, Basu BD. Indian Medicinal Plants. Vol. III; 2nd ed. Lalit Mohan Basu, Allahabad, Uttar Pradesh, India, 1956, 2045-2048.
45. Ali M, Ansari SH, Ahmad S, Sanobar S, Hussain A, Khan SA *et al*. Phytochemical and Pharmacological Approaches of Traditional Alternate *Cassia occidentalis* L. Plant and Human Health. 2019; 3:321-341.
46. Nadkarni AK. Indian Materia Medica, 3rd edition, Popular Press Prakashnan Pvt. Ltd, Mumbai, India, 1976.
47. Supare S, Patil M. Estimation of Phytochemical Components from *Cassia tora* and to Study Its Larvicidal Activity. International Journal of Pharmaceutical Science Invention. 2015; 4(6):11-16.
48. Ahmad I, Mehmood Z, Mohammad F. Screening of some Indian medicinal plants for their antimicrobial properties. Journal of Ethnopharmacology. 1998; 62(2):183-193.
49. Kancherla N, Dhakshinamoothi A, Chitra K, Komaram RB. Preliminary Analysis of Phytoconstituents and Evaluation of Anthelminthic Property of *Cayratia auriculata* (In Vitro). Maedica (Buchar). 2019; 14(4):350-356.
50. Wath M, Jambu S. Ethnoveterinary survey of herbal therapy treating live stocks of Melghat region (Maharashtra). International Journal of Plant, Animal and Environmental Sciences. 2014; 4(3):42-48.
51. Fayaz M, Bhat MH, Kumar A, Jain AK. Phytochemical Screening and Nutritional Analysis of Some Parts of *Celosia argentea* L. Chemical Science Transactions. 2019; 8(1):12-19.
52. Wiart C. Medicinal plants of Southeast Asia. Pelanduk Publications, 2000.
53. Gray NE, Alcazar Magana A, Lak P, *et al*. *Centella asiatica* - Phytochemistry and mechanisms of neuroprotection and cognitive enhancement. Phytochemistry Reviews, 2018; 17(1):161-194.
54. Rajendran K, Balaji P, Basu MJ. Medicinal plants and their utilization by villagers in southern districts of Tamil Nadu. Indian Journal of Traditional Knowledge. 2008; 7(3):417-420.
55. Nigam V, Paarakh PM. Anti-ulcer Effect of *Chenopodium album* Linn. Against Gastric Ulcers in Rats. International Journal of Pharmaceutical Sciences and Drug Research. 2011; 3(4):319-322.
56. Jain NK, Singhai AK. Hepatoprotective activity of *Chenopodium album* Linn: *in vitro* and *in vivo* studies. Journal of Experimental and Integrative Medicine. 2012; 2(4):331-336.
57. Sudhakar M, Rao ChV, Rao PM, Raju DB. Evaluation of antimicrobial activity of *Cleome viscosa* and *Gmelina asiatica*. Fitoterapia. 2006; 77(1):47-49.
58. Kirtikar KR, Basu BD. Indian Medicinal Plants. Vol. I. Allahabad, Lalit Mohan Basu, 1984, 181-185.
59. Krishnaveni A, Iyappan A, Ezhilarasan B, Sathali AAH. Preliminary phytochemical screening and in vitro antioxidant activity of *Commelina benghalensis* L. International Journal of Research in Pharmacology & Pharmacotherapeutics. 2018; 7(2):178-185.
60. Jayvir A, Minoo P, Gauri B, Ripal K. Nature Heals: A glossary of selected indigenous medicinal plant of India. 2nd ed., SRIST Innovations, Ahmedabad, India, 2002, 22.
61. Priya K, John P, Usha PTA, Kariyil BJ, Uma R, Hogale MS. Phytochemical Analysis of *Eclipta prostrata* L. (L.) Leaves. International Journal of Current Microbiology and Applied Sciences. 2018; 7(8):1069-1075.
62. Sorna Kumar RSA, Sivalakshmi G, Eshwari KAS, Mahalakshmi R, Nivedha DM, Nivethitha S. Formulation of shampoo from *Eclipta alba* based on their antioxidant and antimicrobial activity. Der Pharmacia Lettre. 2016; 8(19):44-47.
63. Lee HY. Enhancement of skin anti-inflammatory activities of *Eclipta prostrata* L. from the ultrasonic extraction process. Applied Sciences. 2017; 7(12):1227.
64. Vijayakumar N, Gangaprasad A. Preliminary phytochemical screening and antioxidant activity of *Emilia sonchifolia* (L.) DC., a member of 'Dashapushpa'. International Journal of Research and Analytical Reviews. 2018; 5(4):124-129.
65. Nair SL, Chopra RN. In: Glossary of Indian Medicinal Plants. National Institute of Science and Communication, New Delhi, 1996, 107.
66. Kuri S, Billah MM, Rana SMM, Naim Z, Islam MM, Hasanuzzaman M, et. al. Phytochemical and *in vitro* biological investigations of methanolic extracts of *Enhydra fluctuans* Lour. Asian Pacific Journal of Tropical Biomedicine. 2014; 4(4):299-305.
67. Saha S, Paul S. A review on phytochemical constituents and pharmacological properties of *Enhydra fluctuans* Lour. Journal of Pharmacognosy and Phytochemistry. 2019; 8(2):887-893.
68. Muthukrishnan S, Palanisamy S, Santhanam I, Kaveriyappan G. Phytochemical Screening and Antimicrobial Activity of *Erythrina variegata*. World Journal of Pharmacy and Pharmaceutical Sciences. 2014; 3(6):680-690
69. Kumari P, Singh SK, Kumari C. Phytochemical Screening and Antibacterial Activity of *Erythrina variegata* L. (Leaf extract). International Journal of Current Microbiology and Applied Sciences. 2017; 6(6):2500-2505.
70. Ismail A, Ikram EHK, Nazri HSM. Roselle (*Hibiscus sabdariffa* L.) seeds nutritional composition protein quality and health benefits. Food. 2008; 2(1):1-16.
71. Odigie IP, Ettarh RR, Adigun SA. Chronic administration of aqueous extract of *Hibiscus sabdariffa* attenuates hypertension and reverses cardiac hypertrophy in 2K-1 C hypertensive rats. Journal of Ethnopharmacology. 2003; 86(2-3):181- 185.
72. Prasanna M, Sridhar S. Studies on phytochemical screening, tannin content and their antibacterial activity of *Hygrophila auriculata* leaf extracts. International Journal of Current Sciences. 2016; 19(4):140-148.
73. Esther CJ, Saraswathi R, Dhanasekar S. *In vitro* antibacterial and antifungal activities along with x-ray irradiation studies of medicinal plant *Hygrophila*

auriculata. International Journal of Pharmacy and Pharmaceutical Sciences. 2012; 4(4):352-358.
74. Lahiri PK, Pradhan SN. Pharmacological investigation of Vasicinol - an alkaloid from *Adhatoda vasica* Nees. Indian Journal Experimental Biology, 1964; 2:219-223.
75. Bhat VS, Nasavatl DD, Mardikar BR. *Adhatoda vasica* - an Ayurvedic plant. Indian Drugs, 1978; 15:62-66.
76. Maurya S, Singh D. Quantitative analysis of total phenolic content in *Adhatoda vasica* Nees extracts. International Journal Pharm Tech, Research. 2010; 2(4):2403-2406.
77. Hamburger M, Dudan G, Ramachandran NAG, Jayaprakasam R, Hostettmann K. An antifungal triterpenoid from *Mollugo pentaphylla*. Phytochemistry. 1989; 28(6):1767-1768.
78. Kirtikar KR, Basu BD. Indian Medicinal Plants. International book publishers, 1999; 2:1185.
79. Raghvendra MP, Satish S, Raveesha KA. Phytochemical analysis and antibacterial activity of *Oxalis Corniculata*, a known medicinal plant. My Science. 2006; 1(1):72-78.
80. Kumar A, Niketa RS, Sagwal S. An absolute review on *Oxalis corniculata* Linn. International Journal of Research in Pharmaceutical and Biomedical Sciences. 2012; 3(3):1173-88.
81. Khare CP. Indian Herbal Remedies. Khare C.P. (eds). Springer, Berlin, Heidelberg, 2004, 347-348.
82. Afroz S, Alamgir M, Khan MT, Jabbar S, Nahar N, Choudhuri MS. Antidiarrhoeal activity of the ethanol extract of *Paederia foetida* Linn. (Rubiaceae). Journal of Ethnopharmacology. 2006; 105(1-2):125-130.
83. Karimi G, Khoei A, Omidi A, Kalantari M, Babaei J, Taghiabadi E. *et.al*. Protective effect of aqueous and ethanolic extracts of *Portulaca oleracea* against Cisplatin induced Nephrotoxicity. Iranian Journal of Basic Medical Sciences. 2010; 13(2):31-35.
84. Zhou YX, Xin HL, Rahman K, Wang SJ, Peng C, Zhang H. *Portulaca oleracea* L. A review of phytochemistry and pharmacological effects. Bio Med Research International, 2015, 925631.
85. El-Siddig K, Gunasena HPM, Prasa BA, Pushpakumara DKNG, Ramana KVR, Vijayanand P, *et al.* Tamarind - *Tamarindus indica* L. Fruits for the future. Southampton Centre for Underutilized Crops, Southampton, UK, 2006, 188.
86. Chopra RN, Chopra IC, Handa KL, Kapur LD. Indigenous Drugs of India. UN Dhur & Sons Ltd, Calcutta, India, 1958.
87. Sarkar A, Pradhan S, Mukhopadhyay I, Bose SK, Roy S, Chatterjee M. Inhibition of early DNA-damage and chromosomal aberrations by *Trianthema portulacastrum* L. in carbon tetrachloride-induced mouse liver damage. Cell Biology International. 1999; 23(10):703-800.
88. Kirtikar KR, Basu BD. Indian Medicinal Plants. Allabahad: Lalit Mohen Basu. 1975; 2:1180-1.