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INDIGENOUS VEGETABLES RESOURCES AND THEIR UTILIZATION UNDER NORTH WESTERN HIMALAYAN REGION

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Abstract: Indigenous vegetables are defined as crops that are native and unique to a specific area, home grown and produced through traditional production practices. These are not produced commercially but are consumed by a certain groups in a specific area. These crops are important source of valuable nutritional and medicinal components, which are often lacking in staple crops. These nutritional and medicinal components are isolated and used in pharmaceutical industries for synthesis of cancer drugs. Exploitation of these underutilized wild resources is an important way of income and food, especially for the poor farmers who are under employed. Many traditional or indigenous vegetables are characterized by a high nutritional value compared with global vegetables like tomato and cabbage. As source of essential vitamins, micronutrients, protein and other phyto-nutrients, traditional vegetables and underutilized legume crops have the potential to play a major role in obtaining nutritional security. North western Himalayan region is a rich source of diversity of vegetables, herb, shrub and tree having great nutritional, medicinal and cultural value. Among them, major underutilized vegetables are Amaranth (*Amaranthus Spp.*), Bathua (*Chenopodium album*), Lotus (*Nelumbonucifera*), Tarar (*Dioscorea belophylla*), Gokpa (*Allium humile*), Buckwheat (*Fagopyrum tataricum*), (*Malva spp* (*Malva sylvestris*), etc. are considered important for sustainable food production as they reduce the impact of production systems on the environment.

Keywords: Traditional crops, Sustainable, Medicinals, Nutritional, Underutilized.

I. INTRODUCTION

The Himalayas are a mountain range in Asia, separating the Indian subcontinent from the Tibetan plateau. The word Himalaya is derived from two Sanskrit words 'hima' meaning snow, and 'alaya' meaning home. Thus, Himalaya means

'abode of snow'. The term was coined by the ancient pilgrims of India who were the first to explore this region. The North-Western Himalayas refer to the mountain ranges stretching across Western Tibet, North West Nepal, Himachal Pradesh and Jammu & Kashmir in North West India, Pakistan and Afghanistan. The Area and Production of vegetables in North Western Himalayan such as in Jammu and Kashmir total area 59000 ha, production 1424000 mt and productivity 24 q/ha and Himachal Pradesh area 72000ha, production 12,50,000mt and 18q/ha productivity respectively. Indigenous (traditional) vegetables are best defined as species that are locally important for the sustainability of economics, human nutrition and health, and social systems but which have yet to attain global recognition to the same extent as major vegetable commodities such as tomato or cabbage. (Keatinge et al., 2015) Indigenous vegetables are primary candidates for greater use of crop biodiversity in horticulture as they are already consumed and enjoyed locally and can be produced profitably in both rural and urban environments. Yet many such species have received little scientific attention to date. More effort in research and development would likely produce rewarding results, as productivity increases in these neglected crops are much easier to realize than for intensively researched staple cereals. Traditional vegetables/crops are lesser-known plant species in terms of marketing and research, but well adapted to marginal and stress conditions.

1. Important indigenous vegetables of Jammu region

Jammu is a sub-tropical region. The climate varies in different parts of the division. The plains experience a climate similar to Punjab. The summers are hot with rainy seasons. Winters are cool. The mountain regions experience weather similar to that of Kashmir. Jammu is the hottest of the three division. In Jammu region, some of the vegetables which are grown as a traditional/ underutilized are characterized by the high nutritional and medicinal value and others multipurpose are given in Table.1 and 2.



Table 1.

Common name	Botanical name	Local name	Family	Part used
Spear-leaved yam	Dioscorea belophylla	Tarar	Dioscoreaceae	Bulbs
Pigweed	Amaranthus spp	Chaulai	Amaranthaceae	Leaves, seed
Horse purslane	Trianthema portulacastrum	it-sit	Aizoaceae	leaves and shoots are eaten
Vegetable fern	Diplazium esculentum	Kasrod	Polypodiaceae	young fern are used
Fern asparagus	Asparagus filicinus	Satmul	Liliaceae	Rhizome root are use as a vegetable
Kachnar	Bauhinia variegata Linn.	Cow's paw	Fabaceae	Flower
Goosefoot	Chenopodium album Linn	Bathua	Chenopodiaceae	Tender leaves and stems
Malabar spinach	Basella spp	Poi saag	Basellaceae	Leaves

Table 2. Nutritional value (per 100 g edible portion)

	Protein	Fat	Carbohydrates	Calcium	Phosphorus	B-carotene	Iron
Spear-leaved yam	1.53g	0.1g	12.8g	19 mg	38 mg	83µg	0.54mg
Vegetable fern	2.6g	0.5g	5.46 g	52.66mg		4.56mg	10.3mg
Horse purslane	2.0g	0.4g	3.2g	100mg	30mg	2.3 mg	6.4mg
Fern asparagus	2.5g	0.20g	5g	22 mg	62mg	449 µg	10.2mg
Pigweed	3.0g	0.7g	2.0g	200mg	50mg	8.17mg	10mg
Goosefoot	3.0g	0.7g	2.0g	200mg	50mg	1740 µg	1.2mg
Malabar spinach	1.8g	0.3g	3.4g	106mg	52mg	0 mg	1.48mg

* Vitamin C:- vegetable fern 24.4mg/100mg,

- **Spear-leaved yam** (*Dioscorea belophylla* Family Dioscoreaceae):- It is locally known as ‘tarar’ in Jammu region. It is a climber found in the humid region tropical, sub-tropical tracts. The earth skinned tubers with flesh usually buried deep in the ground are eaten. Powdered tubers are used as a remedy for piles, gonorrhoea and are applied externally to sores.
- **Vegetable fern** (*Diplazium esculentum*, Family Polypodiaceae).It is found in the Himalayan states of North Western India and it is suitable for the warmer regions, where young fronds are eaten as salad, pickled, and cooked as a vegetables. A decoction of the leaves is used as a tonic for women after they given birth. It is high in anti oxidant Vitamin A and carotene. Aerial parts used to treat hemoptysis and coughs; rhizomes used for diarrhea, dysentery and coughs; leaves used to treat fever, dermatitis, Fiddleheads are commonly found in moist soils along the banks of rivers and streams.
- **Pigweed** (*Amaranthus* spp). It is widely cultivated throughout the India as a grain crops, pot herb, ornamental and dye plants.The fresh tender leaves and stem of amaranthus are delicious when cooked. It is also grown as a high protein grain crop. The grain amaranthus are popped or parched and milled for flour. Its minute seeds are very nutritious and afford wholesome food for a large number of local people. The ashes of the leaves are used in dyeing and the roots are much used in native medicine.
- **Goosefoot** (*Chenopodium album* Linn. family Chenopodiaceae)⁵. It is very common winter season weed of Northern India. Its use in form of leafy vegetable is in vogue since time immemorial. The leaves and young shoots may be eaten as a vegetables, either steamed or cooked but should be eaten in moderation due to high levels of oxalic acid . Each plant produces thousands of black seeds.in vegetables, Besides its use it is used in several other Indian dishes like Bathua roti, Bathua Paratha etc.



- **Horse purslane**⁴. It is locally known as ‘it-sit’ in Jammu region. It is a fleshy herb of family Aizoaceae, grows commonly as rainy season weed. Its leaves and shoots are eaten as vegetables. It leaves are diuretic and used in oedema and dropsy in case of ascites, especially due to early liver portion and kidney stones. It is considered an antidote to alcoholic poison.
- **Malabar spinach**⁶ (Basella spp), it is an important leafy vegetable, grown in almost all parts of the country. It cultivation is quite popular in Himalayan region. Its tender shoots and leaves, which makes an excellent vegetable after cooking. The properties of Malabar spinach have also been reported like young leaves are used as laxatives, pulped leaves to poultice sores. Malabar spinach slow down the ageing process. The paste of root is applied to swelling. The flower are used as an antidote to poison.
- **Kachnar** (Bauhinia variegata Linn.¹). Kachnar is popular ornamental plants, commonly known as Cow’s paw. It was planted in garden, park and roadsides as ornamental plant in many warm temperate and subtropical regions. Bauhinia variegata is distributed in Sub-Himalayan and outer Himalaya of the Punjab and Sikkim state, India. It is used traditionally in dysentery, diarrhea, hemorrhoids, piles, laxative, antihelmintic, astringent, antileprotic, wound antidote for snake poisoning, dyspepsia and carminative disease.

2. Important indigenous vegetables of Kashmir region

Kashmir is a sub-tropical region, where temperatures are ranges from 30°C to -10°C. Some of vegetables crop which are grown in Kashmir region because of climatic condition which are given in table 3 and 4.

Table 3

Common name	Botanical name	Local name	Family	Part used
Indian lotus	Nelumbo nucifera	Nadru	Nelumbonaceae	lotus stems are eaten
Kale	Brassica oleraceae var. acephala	Hak Saag	Brassicaceae	green leaves are cooked
Sonchal Sak	Malva sylvestris Linn	Sonchal Saag	Malvaceae	Leaves and stem
Shallot	Allium ascalonicum	Pran	Alliaceae	Bulbs and green leaves
Sorrel	Rumex acetosa	Abej	Polygonacea	Leaves
Puslane	Portulaca olreaceae	Nuner	Portulacaceae	Leaves

Table 4. Nutritional value (per 100 g edible portion)

	Protein	Fat	Carbohy drates	Calcium	Phosphorus	B-carotene	Iron	Vit. C
Indian lotus	1.58g	0.07g	17g	16.02mg	100mg	0 µg	1.16mg	27.4 mg
Kale	3.9g	0.6g	6g	177 mg	49.6mg	2040 mcg	2.5 mg	21 mg
Sonchal Saag	4.3g	0.6	5.6g	300mg	60mg	2490 µg	19.5mg	79mg
Shallot	1.8g	0.1g	17.6g	50 mg	70mg		2.3mg	8mg
Sorrel	2.6g	0.7g	2.6g	43mg	63mg	266 mcg	3.2mg	48mg
Purslane	2.4g	0.1g	2.9g	65mg	44mg	1320 IU	1.99mg	26.6mg

*mcg or µg:- micro gram, IU:- international unit, mg:- milligram

- **Indian lotus** (Nelumbo nucifera Family nelumbonaceae)⁷. It is native to India and is distributed throughout the country. Tender rhizomes, stems, leaves of lotus are edible. The lotus stems are eaten as a favorite vegetable in Kashmir locally known as **Nadru**. It can be cooked along with other vegetables, soaked in syrup or pickled. The stem is used in indigenous medicines as anthelmintic and to treat vomiting. It is also considered to be an antidote to poisons. It is mainly propagated through rhizomes. The climatic condition for Nadru require warm temperature, wetland habitat including flood plain, ponds, Lakes, river etc. Nearly 45kg of rhizomes pieces are used to plant for 1 hectare.
- **Kale** (Brassica oleraceae var. acephala). It is mainly distributed in northern Himalayan region. In Kashmir, kales are grown popularly known as ‘**HAK SAAG**’. Hak saag are among the oldest cultivated vegetables and among most nutritious. It is low calorie foods, loaded with Vitamins and minerals. The green leaves are cooked or boiled and used as salad green. They serve as a powerful heart-protective, blood pressure lowering, anti-inflammatory anti-viral, anti-depressant and anti cancer effects. It is hardy, cool season and withstands cold as low-10°C to -15°C. This type of leafy vegetable prefer temperate climate. Various type of hag saag are grown in Kashmir such as Khanyari hak, Kawardari hak and Jumader hag.
- **Sonchal Saag** (Malva sylvestris Linn⁴) It is distributed in the North-Western Himalayan, Kashmir and Punjab plain. In Kashmir, it is cultivated as a green herb. The plant yield



green round leaves throughout the year if tended properly. It is a rich source of Ca, Fe and carotene. Leaves and aerial shoots are used as vegetables and roots are used for cleansing hair and washing woollen clothes. The seeds are demulcent used in cough and ulceration. And its consumption gives soothing effects to body.

- **Shallot** (*Allium ascalonicum*, Family Alliaceae):- Onion set 'PRAN'. It is an important crop in Kashmir kitchen/home garden where it is grown as green and bunching onion for use in domestic cooking and 'Wazwan'. It is grown for dry bulb but sometimes for the young plants which are used as green onion. The sets are milder tasting than onion. The mature bulbs differ from most of the common onion in that it is made up of a large number of section or cloves. Shallots are high in anti oxidants and may improve blood sugar levels, circulation, seasonal allergies and heart and bone health. They may also help in fight germs and promote weight maintenance.
- **Sorrel** (*Rumex acetosa* Family Polygonacea):- It is locally known as 'Abej' in Kashmir region. It is distributed in the Northern Temperate regions, mainly found in the Himalayas, from Kashmir to Nepal. Leaves are eaten as a vegetable. Leave have a tangy, acidic, sour-lemony flavor and are commonly used in salads, soups and sauces. Leave can also be dried for later use. Sorrel is a very nutritious green leafy vegetable. Sorrels are used to make a cooling drink in the treatments of fevers and are especially useful in the treatments of scurvy. It is also help to prevent the cancer. And also excessive intake may contribute to

growth of kidney stone. It is cool season crop. It is highly acidic in nature.

- **Purslane** (*Portulaca oleraceae* Family Portulaceae) :- It is locally known as 'Nuner' in Kashmir region. It is distributed all over India, up to 170 m in the Himalaya and in all warm countries. It occurs in several forms during the hot weather in cultivated as well as in the wild state. Leaves and shoots are used as a vegetables and salads. It has an acidic taste and used as a pot herb .It is cooked like a rape leaves. It is quite nutritious because it is high in omega-3 fatty acids (found mostly in fish and flax seeds) and it is also contains significant amounts of Vitamins A and C, as well as calcium , iron, magnesium and potassium and antioxidants.

3. Important indigenous vegetables of Ladakh region

Ladakh is the coldest place among the Jammu and Kashmir. Now Ladakh is bifurcated from Jammu and Kashmir and are newly form union territory in 2019 of Indian proviance. The climate is very arid. The place has a long and severe winter with the temperature reaching down to more than -20°C. It constitutes the eastern most trans-Himalayan part of India and truly described as high altitude cold-arid desert (Angchuk et al , 2009). High altitude plants had higher photosynthetic rates, especially when measured at low temperatures (Machler, and Nösberger, 1977). It covers an area of 59,146 sq km situated along the valleys of the Indus river (Anonymous, 1993). In Ladakh, some of the vegetables which are lesser known and underutilized are characterized as a high nutritional and medicinal value. Some of the underutilized vegetables crops are given in table 5 and 6.

Common name	Botanical name	Local name	Family	Part used
Wild onion	<i>Allium przewalskianum</i>	Skotche	Alliaceae	Leaves of the plant are used instead of onion in the preparation of thangthour (vegetable curry).
Wild garlic	<i>Allium humile</i> Kunth	Gokpa	Alliaceae	Leaves of the plant are used instead of garlic in the preparation of thangthour (vegetable curry).
Buckwheat	<i>Fagopyrum tataricum</i>	Tayat	Polygonaceae	the tender leaves or germinated juvenile seedling are used as green vegetables in Ladakh region
Northern nettle	<i>Urtica hyperborean</i>	zatchod	Urticaceae	young leaves are used as a vegetable after boiled or dry in sun.
Rhubarb	<i>Rheum emodi</i>	lachu	Polygonaceae	Leaf stalks
Mountain spinach	<i>Atriplex hortensis</i>	Phaltora	Chenopodiceae	Branches and leaves
Capers	<i>Capparis Spiniosa</i>	Kapra	Capparaceae	Young leaves
Horse Mint	<i>Mentha longifolia</i>	Pholoing	Lamiaceae	leaves and tender shoots



Table 4. Nutritional value (per 100 g edible portion)

	Protein	Fat	Carbohy drates	Calcium	Phosphorus	B-carotene	Iron	Vit. C
Rhubarb	0.9g	0.2g	4.5g	44mg	14mg	61µg	10mg	4mg
Mountain spinach	2.9g	0.4g	3.6g	99mg	49mg		2.71mg	28mg
Capers	0.7g	0.2g	1.4g				0.5mg	1.2mg

Common name	Botanical name	Local name	Family	Part used
Wild onion	<i>Allium prezwalskianum</i>	Skotche	Alliaceae	Leaves of the plant are used instead of onion in the preparation of thangthour (vegetable curry).
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Buckwheat	<i>Fagopyrum tataricum</i>	Tayat	Polygonaceae	the tender leaves or germinated juvenile seedling are used as green vegetables in Ladakh region
Northern nettle	<i>Urtica hyperborean</i>	zatchod	Urticaceae	young leaves are used as a vegetable after boiled or dry in sun.
Rhubarb	<i>Rheum emodi</i>	lachu (Ladakh)	Polygonaceae	The leaf stalks are either eaten raw or boiled, then they are sprinkled with salt and pepper by the locals of kashmir.ithas also been used in jams, jelly and sauce by its tart flavour

- RHUBARB** (*Rheum emodi* Family Polygonaceae):- In Ladakh, it is locally known as Lachu. It grows in the cooler regions of India. In India, it grows as a wild crop in higher reaches of Kashmir valley and can be found growing in higher altitude of J & K and Ladakh. It is found in alpine zone on rocky soil, moraines, and crevices, between boulders and near streams in specific pockets. The leaf stalks are either eaten raw or boiled, and then they are sprinkled with salt and pepper by the locals of kashmir. It has also been used in jams, jelly and sauce by its tart flavour. It is also useful as hair colorant owing to being a fairly strong dye that can produce a more golden colour. It is used treat kidney stones and other liver associated disorders like gout and jaundice, fevers, ulcers, bacterial and fungal infections. The stem dried rhizomes that is the underground stem producing roots and leaf shoots of the plant constitute the drug. It is rarely grown where the summer mean stimulate temperature is above 20 °C or where the winter mean is above 5°. It is propagated

by dividing the fleshy roots which have strong buds and crowns. Each crown pieces should contain at least one bud.

- Mountain spinach** *Artiplex hortensis* L. a member of chenopodaceae, popularly known as Phaltora in Ladakh region is an annual herb (Rinchen and Narendra, 2015) and internationally known as garden orach, sea purslane and salt bush. Mainly branches and leaves are used as vegetable. It has stronger flavor than spinach. It was an important food plant for mankind long before the introduction of spinach. *Atriplex hortensis* used as an indigenous vegetable in Ladakh region and is the first green to appear as vegetable after the prolonged winter. The red and green type are mostly used. In traditional medicine, it is used as a health tonic, helps in nutrition absorption, digestion and enhance the metabolism (Sarwa, 2001). Oarch content low carbohydrates, so it is included in the list of vegetables that may be safely eaten by diabetics. The leaves have been used externally to treat



gout. Mountain spinach has been used to address several lung ailments. It is a good source of vitamin C, protein.

- Wild onion (*Allium prezewalskianum*³) local name Skotche, Leaves of the plant are used instead of onion in the preparation of thanghour (vegetable curry). It is considered good for indigestion, also used as flavouring agent. Nasir & Ali (1975) state that it is used as vegetable in Ladakh and also recorded from Ladakh.

Wild garlic (*Allium humile* Kunth³) Local name 'Gokpa':- *Allium humile*. It is use in kitchen garden for seasoning and also as vegetables. Leaves of the plant are used instead of garlic in the preparation of thanghour (vegetable curry). And also it is given with milk to ladies after delivery.

Buckwheat (*Fagopyrum tataricum*³ family Polygonaceae)-local name 'Tayat'. The leaves and blossom of the plant contain most of Rutin 80-90%. It is cultivated pseudo cereal and the tender leaves or germinated juvenile seedling are used as green vegetables in Ladakh region of Himalayas. The previous years shed crop seeds are the first green available in spring and are used/cooked as vegetable. Nutritional value (per 100g edible portion). Protein 1.8g, Fat 0.6g, Carbohydrates 4.04g, Calcium 950 mg. Iron 10mg.

Potentilla bifurca—Local name "Toma" Potentilla is an herb. The flower and leaf are used to make medicine. Root are used as fresh or cooked. Potentilla contains chemicals called tannins that might help reduce skin inflammation and have a drying (astringent) effect on the tissues.

Northern nettle (*Urtica hyperborean* family Urticaceae)-Local name 'zatchod'. Nettle was widely distributed throughout all the temperate regions of the world. young leaves are used as a vegetable after boiled or dry in sun. The nettle have many

hollow stinging hairs called trichomes on the leaves and stems, which act like hypodermic needles, injecting histamine and other chemicals that produce a stinging sensation upon contact ("contact urticaria"). Soaking stinging nettles in water or cooking removes the stinging chemicals from the plant, which allows them to be handled and eaten without injury.

II. CONCLUSION

North western Himalayan region is a rich source of diversity of vegetables, herb, shrub and tree having great nutritional, medicinal and cultural value. Among them, major indigenous vegetables are Amaranth (*Amaranthus* Spp.), Bathua (*Chenopodium album*), Lotus (*Nelumbo nucifera*), Tarar (*Dioscorea elaphoglossa*), Gokpa (*Allium humile*), Buckwheat (*Fagopyrum tataricum*), Malva spp (*Malva sylvestris*), Malabar spinach (*Basella alba*), Purslane (*Portulaca oleraceae*) etc. are considered important for sustainable food production as they reduce the impact of production systems on the environment. These need to be promoted for wider cultivation on scientific line. Germplasm need to be conserve and exploited for further crop improvement. Exploitation of these indigenous wild resources is an important way of income and food, especially for the poor farmers who are under employed. Currently traditional food sources ranging from minor grains and pulses, root and tuber crops and fruits and vegetables to non-timber forest products have the potential to make a substantial contribution to food and nutritional security, to protect against internal and external market disruptions and climate uncertainties, and lead to better ecosystem functions and services, thus enhancing sustainability.

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