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Uttarakhand Himalayas harbour rich diversity of indigenous and minor vegetables

The Himalaya of Uttarakhand is adorned with a vast plant biodiversity including shrubs and herbs of immense nutraceuticals, medicinal and aesthetic importance. Most of the species are of ancient and indigenous origin but many of them have been introduced by foreign invaders, rulers and visitors with the span of time.

THERE are many cultivated and forest species which are supposed to be originated in some other geographical regions with similar agro-climatic conditions but they have been most acclimatized species of this region. Similarly, in vegetable crops also there are many crops which in spite of their exotic origin have been fairly acclimatization in this hilly areas. However, there are many crops of indigenous origin or long back introduced traditional crops of exotic origin seeking place for research attention even after having a great nutraceuticals potential. An account of some of these indiginous and minor vegetables crops has been given hereunder.

Mustard greens *(Brassica juncea* var. *rugosa)*

Mustard greens or vegetable raie cultivation in Uttarakhand Himalaya has been under cultivation since long back in high hill tracts of Kumaon and Garhwal by the name 'Chinese Sarson', characterized by flat, broadened, dark green leaves with white and thick midribs with or without waxy coating on leaves. Another landrace 'Hathikan' with flat, broadened leaves with thin midribs was extensively grown in Jaunsar region of Uttarakhand (Uttarkashi and Tehri districts) and adjoining districts of Himanchal Pradesh. Different phenotypic forms are available in the multiple leaf nipping type of *B. Juncea* var. rugosa. A wide range of variability occurs in this crop with respect to leaf shape, size and colour. Colour of leaves ranges from light green in *Hathikan* to purple in *Badshahi*. Many local races of mustard greens are under cultivation extending from J&K to North Eastern Himalayan regions. Owing to its palatability and nutritional values, this crop is extensively grown for domestic consumption in Punjab, West Bengal, Assam and almost all the Himalayan states of India. The mustard greens are grown after the rainy season, harvesting of leaves starts from November and continues to late January - February when there is scarcity of vegetables in local markets due to heavy frost. During this extremely low temperature and severe frost, mustard greens because of its frost tolerance nature is only vegetable crop which can be grown. It is rich in iron, sulphur, potassium, phosphorus and many other minerals. The leaves contain 71.7-110.9 mg/100 g ascorbic acid, and profuse quantity of carotenoids and anthocyanins (purple leaved types).

Crop improvement

Pusa Sag-1 has been developed by IARI regional Station, Katrain to promote this crop. In recent years, Department of Vegetable Science, Ranichauri, Uttarakhand

UHFVR12-1 (IC-0598459)

UHF VR12-2 (IC-0612094)

University of Horticulture and Forestry has undertaken intensive work on crop improvement and production technologies. Consequently, two lines have been isolated and purified with following peculiarities:

UHFVR12-1 (IC-0598459): This is selection from local race *Badshahi*. The leaves are purple, broad, flattened, succulent, crispy, non-bitter, non-pungent and rich in anthocyanin. First leaf picking starts 35-40 days after sowing or 20 days after transplanting. The purple colour due to anthocyanin development gives more attraction to consumers. It can withstand frost and gives green leaf yield is about 334.3 q/ha at national level and 500-600 q/ha in hilly areas. This line has been identified to release for Zone-III (Humid Eastern Himalaya and Bay Island: Sikkim, Meghalaya, Manipur, Nagaland, Mizorum, Tripura, Arunachal Pradesh and Andman & Nicobar Island) during **XXXVI** Annual Group Meeting of All India Coordinated Research Project (Vegetable Crops).

UHFVR12-2 (IC-0612094): This is selection from local race *Hathikan*. The leaves are green, broad, flattened, succulent, crispy, non-bitter and non-pungent. It can also withstand frost. Leaf yield varies from 519.2-629.5 q/ha.

Round-rooted radish *(Raphanus sativus* L.*)*

Round rooted radish is an extensively grown crop used as cooked vegetable as well as *salad* purpose in Kumaon region of Uttarakhand. *Doonagiri* is a popular landrace of this crop named after a Himalayan peak in Kumaon hills. This landrace can be characterized by white to pinkish white, crispy, oval to oblong roots with sweet and light pungent taste and aroma. The leaves of *Doonagiri* are also variable type ranging from deeply serrated lamina and light green midribs to deeply serrated lamina and pinkish midribs. Uttarakhand University of Horticulture and Forestry, Bharsar have selected populations of round-rooted radish with variation in colour and shape were purified and one advanced line with the name of UHF R12-1 (IC-0598463) has been identified for released for **Zone-I** i.e. Humid Western Himalaya J&K, HP & Uttarakhand) during **XXXVII** Annual Group Meeting of All India Coordinated Research Project (Vegetable Crops). The UHF R12-1 is characterized by leaves with deeply dentate with serrated margin, 20-30 cm in length and dark-green in colour produced in rosette of 7-8 leaves, round to slightly tapering roots of 10-12 cm in length and width, white in colour, weighing 110-130 g at edible maturity, root core colour white resembling to peel, sweet-pungent taste of roots with peculiar aroma, suitable for *Salad* as well as cooked vegetable. Roots attain harvestable maturity in 55-60 days after sowing, 380-400 q/ha root yield has been realized in hilly areas.

Variations in round rooted radish

Pahari palak/Spinach *(Spinacea oleracea)*

This vegetable has significant morphological variability extending from light green leaves and green stem to dark green leave and deep red stems. Pahari palak is free from oxalate content in comparison to beet leaf with considerable quantity.

Variable form of Pahari Palak-genotype UHFES-12-2 (IC-0598460)

Stuffing cucumber *(Cyclanthera pedata)*

Locally known as Pahari Karela/Meetha Karela because of its bitterless taste. Young fruits are eaten raw or pickled. Young shoots and leaves are eaten as greens. This crop has a wide variability in fruit morphology, fruit size, yield and vine proliferation. The fruits may be smooth to spiny and small (12-15 g) to big (12022 g). Plants are monoecious and may have male and female flowers on the same leaf axil. Male flowers are borne on long stalk in the small racemes whereas female flowers are borne on small stalk as solitary axillary or in pairs. New crop is grown during rainy season which comes to flowering and fruiting during October-December. The plants are sufficiently tolerant to frost and are usually free from foliar diseases and insect-pests. This vegetable is much liked by local peasantry. Immature fruits are used as cooked vegetable whereas mature and ripe fruits are dried after removal of seeds and kept for off-season consumption. Fruits are also used as anti-inflammatory, hypocholesterolaemic and hypoglycemic. The fruit are rich in calcium (14.0 mg) and phosphorus (14.0 mg). A genotype UHF Meetha Karela-1 (IC-0619212) bearing paired female flowers in leaf axils, spineless and small fruits was identified by the Department

Flowering and fruiting in Meetha Karela

of Vegetable Science, Ranichauri Campus of Uttarakhand University of Horticulture and Forestry, Bharsar.

Marrows *(Cucurbita pepo)*

Himalayan region has profound genetic variability in all three species of genus *Cucurbita* (*C. pepo*, *C. maxima* and *C. moschata*). The vining marrow shows much variability in fruit shape and size. This is an important crop of hilly areas. The green as well as yellow ripe fruits are used as cooked vegetable in the season and off seasons also. The marrow fruits are rich in proteins, fats, beta-carotene, minerals and vitamins. The indigenous genotypes have vining plants and oval to oblong fruits but introduced recent varieties are bushy in nature with slender long fruits. The fruits of Pahari marrow (locally called *Khirboj*) have higher carotene content as compared to bushy marrows. The plants are more tolerant to excessively moist rhizospheric and phyllospheric environments and thus exhibiting more tolerance to disease and insect-pests.

Variability in fruit colour, size and shape in marrows

Pahari Kheera: Locally known as kakri, is a wonderful landrace of cucumber in Uttarakhand hills bearing fruits of 25.30 cm length, 10-12 cm diameter and 500-800 g in weight at edible maturity. Even in bulky fruits, seeds remain tender for a longer time. The plants are profusely vining in growth. They tolerant to excess soil moisture, foliar diseases and insects as it is grown during monsoon. Owing to huge genetic and morphological diversity in cucumber ranging from small and spiny fruited pickling type (*C. hardwickii* or gherkin) to giant and smooth fruited *Kakri*, the Himalayan region is considered as origin place of this crop. A genotype UHF Cu 12-1 (IC-0612095) with fruits weighing 800-900 g at edible maturity, and brownish rind colour at maturity was identified by the Department of Vegetable Science, Ranichauri Campus, Uttarakhand University of Horticulture and Forestry, Bharsar.

Fruit variability in Pahari Kheera

Sem or Dolichos bean *(Dolichos lablab)*

In Dolichos bean, many morphological forms ranging from green and flat poded to purplish green and long poded in Himalayas. Immature tender pods are used for cooked vegetables and pickles whereas dried seeds for pulses. It shows tolerance to light frost however; heavy frost can kill the vines. It is grown as rainfed crop during rainy season. Photo insensitive dwarf varieties have great potential in hilly areas. Nutritionally, it is rich in proteins, vitamins and anti-oxidants.

Variable forms of fruits in Sem

Yardlong bean (*Vigna unguiculata* ssp. *sesquipedalis*)

The yardlong bean or vining type cowpea is a widely grown crop in Himalayan regions during rainy season for its long tender pods as vegetable and seeds as pulse. This crop is an efficient nitrogen fixing crop profoundly rich in proteins, vitamin A, C and minerals as compared to other legumes of the same family such as lima beans, faba bean, green beans etc. There is enormous diversity in yardlong bean Himalayan region for day length responsiveness and pod length and colour.

Fruiting in yard long bean

Yam *(Dioscorea alata)*

Yam belongs to the family Dioscoreaceae. Tubers are rich source of starch, fiber and mineral nutrients (K, Na, P, Ca, Mg, Cu, Fe, Mn, Z and S). It has been used as a laxative and vermifuge, and in treatment for fever, gonorrhea, leprosy and tumors.


Plant and tuber of yam

Taro *(Colocasia esculenta)*

Many forms of taro occur in hills of Uttarakhand. It is a tropical plant grown primarily for its edible corms. It has been utilized for treatment of various ailments such as asthma, arthritis, diarrhea, neurological disorders, and skin disorders. This crop is grown during the monson and both nutritive leaves with petioles and corms are consumed as cooked vegetable. The corms are rich source of starch whereas leaves and petioles are rich in minerals, proteins, fats and vitamins.



Variable forms of Taro

Bitter cress *(Cardamine oligosperma)*

The bitter cress popularly known as Chamsur in Kumaon hills and Nepal and has been under cultivation and consumption since centuries in hilly areas of Nepal and Uttarakhand and now it has gained commercial importance. Botanically it belongs to the family Brassicaceae with almost 26 species widely distributed in cooler parts of the world. The plants have serrated leaves with dentate margin tender shoots. The shoots remain tender up to flowering stalks start to emerge. The flowers are white borne in cluster of racemes. The crop is quite tolerant to frost but quick and faster growth is assumed at 10-15^{0}C. The shoots and leaves are rich in viatamin C and A, and most of the minerals. A wide range of variability in plant morphology has been noticed in Kumaon and Garhwal hills. A mass selected population, UUHF/Chamsoor12-3 (IC-0598461) has been developed by Department of Vegetable Science, Ranichauri, Uttarakhand University of Horticulture and Forestry, Bharsar with certain desirable characters like green, tender and foliaceous shoots with delayed bolting.

Plants of bitter cress

Chow chow *(Sechium edule)*

Chayote is a single seeded cucurbit profusely occurs in Himalayan region extending from West to North-East. Fruits, root, stem, seeds and leaves are edible. The tubers are eaten like potatoes or other root vegetables. It is a good source of amino acids and vitamin C and is also very rich in Ca in stem (58 mg/100g). It is resistant to diseases and pests.

Fruit of Chow chow

Stinging Nettle *(Urtica dioica)*

Stinging Nettle or Kandali Sag/Bichhu Ghas belongs to the family Urticaceae. The plants occur gregariously in abandoned or waste lands. These grow to a height of 150-180 cm during spring-summer season in hills. Leaves and shoots have trichomes containing formic acid as irritant on skin. It is propagates through seeds. However, deep growing perennial rhizomes are the main source of next


Plants of Stinging Nettle

year flushes of shoots. The plants remain free from biotic and abiotic stresses. Leaves and stems are used to treat the arthritis and roots are beneficial in frequent urination disorder. The tender shoots and leaves are used as cooked vegetable by local people of hilly areas.

Fiddlehead ferns *(Matteuccia struthiopteris)*

It is a terrestrial fern species belonging to the family Onocleaceae. These are found in shady and swamp places in forest areas. The tightly coiled tender fern fronds which resemble the head of fiddle are edible and are harvested from clumps almost round the year with plenty in spring to rainy seasons. It is highly nutritious and 100 g fresh weight of it contains 4.6 g protein, 0.32 mg copper, 4.98 mg niacin, 26.6 mg ascorbic acid, 0.51 mg manganese and 1.31 mg iron.

Harvested produce of Fiddlehead ferns

SUMMARY

All indigenous and minor vegetable crops are grown for domestic consumption and even many of them have not been brought under systematic cultivation. The farmers use to save their own seed of the crops which are in cultivation and grow in subsequent years and thus, crops always remain under thrust and underutilized. For exploitation of the potential of these traditional and indigenous vegetable crops of Himalayan regions, an intensive research work is needed for identification of nutraceuticals rich promising types, development of high yielding and stress tolerant varieties, agronomical packages of practices and seed chain system.

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