millet. It is generally consumed during winters and popularly used to cure kidney stone by rural communities.

Photo credit: A. Bhartiya

Edible uses- Tender green leaves as vegetable in southern part of India, as pulse (both whole and dehulled) for making various types of gravies, soups and *papad* .

- High lysine protein complements the cereal based diet nicely.
- Fibre, calcium, iron and molybdenum content is higher than any other legume.
- Prevent urinary stones, also has healing effect on acute gastric ulceration, curing acidity, lowering cholesterol, asthma, bronchitis and constipation.
- Heat generating property also helps in reducing the body fat.

Nutritional composition (per 100 g)*: Moisture 9.28 g, Protein 21.73 g, Minerals 3.24 g, Fat 0.62 g, Total Dietary Fibre 7.88 g , Carbohydrate 57.24 g and Energy 330 Kcal

Black soybean (*Glycine max*)/Bhat

Photo credit: A. Bhartiya

Nutritionally rich remedial food legume grown in mid hills in Himalayan region during rainy season for its nutritious grains and fodder. It is mainly grown as mixed crop with finger millet. It is generally consumed as remedial food to cure jaundice by rural communities.

Edible uses- As pulse (whole) for making various types of gravies/dal, *chutnies*, roasted snacks, *Tofu*, milk and nuggets.

- Bioactive phytochemicals *viz*., anthocyanins, phenols, isoflavones, phytosterols, saponins and tannins impart strong antioxidative activity.
- Regular consumption reduces cholesterol, diabetes and growth of cancerous cells.
- Improves reproductive function, bone marrow health, muscle strength and immune system.
- Unique combination of high sodium and potassium is beneficial for people suffering from low blood pressure.

Nutritional composition (per 100 g)*:** Moisture 8.51 g, Protein 37.8 g, Minerals 4.74 g, Fat 15.8 g, Total Dietary Fiber 21.5 g, Carbohydrate 12.8 g and Energy 350 Kcal

Kidney bean (*Phaseolus vulgaris*)/Rajmash

Photo credit: H. Joshi

High value cash crop grown during rainy season for its nutritious grains and green pods in higher hills. Several types of landraces of this legume grown by farmers possess a great diversity in shape, size and colours in hills. Rajmash produced in hills is highly valued for its unique taste.

Edible uses- Dried grains as pulse (whole) for making various types gravies and green pods as vegetable.

- Phenols, resistant starch, vitamins, fructo-oligosaccharides protect from oxidative stress, cardiovascular diseases, diabetes and cancers.
- Antioxidants, carotenoid and flavonoids like lutein, zea-xanthin and ß-carotene possess anti-inflammatory actions.
- Rich soluble fibre content regulates the absorption of blood glucose from the body thus, regular consumption helps in preventing diabetes.

Nutritional composition (per 100 g)*: Moisture 9.87 g, Protein 19.91 g, Minerals 3.28 g, Fat 1.77 g, Total Dietary Fibre 16.57 g, Carbohydrate 48.61 g and Energy 299 Kcal

Barley (*Hordeum vulgare*)/Jau

Photo credit: P. Chauhan

Nutritionally rich cereal grown in Himalayan region during *Rabi* season for its grains and fodder. It has a great cultural significance as it is used in every auspicious occasion of the region. Hull less barley (*Wua*) is also commonly grown at higher altitudes of the region.

Edible uses- Confectionary products, breads, soups, stews, health products and malt for alcoholic beverages, especially beer.

- Rich in beta-gluten an anti-cholesterol substance and acetylcholine which nourishes the nervous system and enhance memory.
- Excellent source of complex carbohydrates that help to lower cholesterol and the risk of type-2 diabetes.
- Regular consumption prolongs the feeling of stomach fullness, thus stabilizes blood sugar levels.

Nutritional composition (per 100 g)*: Moisture 11.4 g, Protein 12.4 g, Minerals 1.72 g, Fat 2.04 g, Total Dietary Fibre 14.9 g, Carbohydrate 57.5 g and Energy 298 Kcal

Neglected and underutilised species represent a rich heritage of food crops of nutritional and nutraceutical significance. If nurtured, these crops can play a vital role in building a robust, resilient and economically viable farming system to sustain our food and nutritional security under climate change. Ethnic significance and the concern for healthy foods have kept the treasure of these ancient crops alive in traditional farming systems. To make the world food secure and food system sustainable under the prevailing threat of changing climate require bringing traditional food crops back in the food systems.

References:* IFCT, 2017 & ** Aswal *et al.*, 2017 & ***Bhartiya *et al*., 2020

Authors

Anuradha Bhartiya, J.P. Aditya, R.S. Pal, Jitendra Kumar, Kushagra Joshi, Hemlata Joshi and L. Kant

Please contact for more information:

Director

ICAR-Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora 263 601 (Uttarakhand)

Contact no.: 05962-230208(Phone), 05962-231539(Fax)

Website: www.vpkas@icar.gov.in

Technical Assistance

Mrs. Renu Sanwal

Printing Assistance

P.M.E. Cell

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Toll free krishak helpline: 1800 180 2311

Contact Timing : Every working day (10:00 am - 5:00 pm)

Major food crops are likely to face various challenges like climate variability, stagnating yield levels and shrinking land and water resources in the near future. Thus, away from the over-reliance on staples, diversification of the food basket has not remained just an option, but has become a necessity to safeguard health and nutrition under changing food habits and life styles. The mountain region harbour huge diversity of neglected and underutilised species (NUS) which have potential to contribute immensely for food and nutritional security in this era of climate change. NUS are often indigenous ancient crop species cultivated at smaller scale by the local rural farming communities as cultural legacy. Although NUS are presently under cultivation but the existing diversity of these crops are facing a continuous threat of irretrievable erosion because farmers are not able to reap the benefits from these crops and being gradually replaced by commercial remunerative crops. It is assumed that if this pattern of declining crop diversity continues, it will make the food system highly vulnerable to climatic shocks often experienced in the fragile agro-ecosystem of Himalayan region. Keeping this in view, conservation, utilization as well as reintroduction of lost and/or discontinued NUS at farmers level have been promoted under UN Environment-GEF implemented project "Mainstreaming agricultural biodiversity conservation and utilization in the agricultural sector to ensure ecosystem services and reduce vulnerability" implemented by the Alliance of Bioversity International-CIAT and Indian Council of Agricultural Research. Under the project, farmers are being enabled and supported to have a control over their local crop varieties conserved by them over generations for improving their livelihood through technical backstopping on conservation, improved cultivation practices, marketing and value chains development for making the communities nutritionally secure and more resilient to climatic variations at grass root level.

We assume that NUS occurring in the Himalayan hills possess immense potential as ideal food alternatives to support healthy and nutritious diet in a sustainable way without adversely impacting the environment due to their energy-water-carbon efficiency. However, these are little known outside their niche areas thus, popularization of these nutraceutical crops are urgently needed for their wider diffusion through value chain development and rural-urban linkages for human well-being. In this document we have tried to capture the most desirable nutraceutical properties of these nutrient dense, climate resilient and eco-friendly Himalayan NUS.

Finger millet (*Eleusine coracana*)/Mandua/Ragi


Photo credit: J.C. Rana

Finger millet is a popular minor millet in the Himalayan region grown during rainy season for food and fodder uses. It is mainly grown as mixed crop with horse gram and also as base crop in traditional mixed cropping "*Barhanaaja*" system where twelve food crops are grown as mixed crop.

Edible uses- Chapatti, dumpling, porridge, malt, biscuits, namkeen, flakes, popped grains and noodles.

- Richness of dietary fibre is useful in curing constipation, intestinal cancer and controlling cholesterol levels.
- Well known food source of non-dairy calcium which, improves bone health and also an important food for lactating mothers.
- Low glycemic index and no gluten thus, suitable for diabetics and people suffering from gluten intolerance.

Nutritional composition (per 100 g)*: Moisture 10.89 g, Protein 7.16 g, Minerals 2.04 g, Fat 1.92 g, Total Dietary Fibre 11.18 g, Carbohydrate 66.82 g and Energy 321 Kcal

Barnyard millet (*Echinochloa frumentacea*)/ Jhangora/Madira/Sanwa

Barnyard millet is an important millet in the Himalayan region grown on large acreages for food and fodder uses during rainy season mainly as sole crop.


Photo credit: J.C. Rana

Edible uses- Small dehulled grains are widely used as substitute of rice, porridge, macaroni, dumplings and bakery products.

- Natural designer food due to highly digestible protein and slowly digestible carbohydrate.
- High dietary fibre with fair amounts of soluble & insoluble fractions beneficial for intestinal functions and in moderating blood glucose level.
- No gluten content, thus appropriate for patients suffering from celiac disease.

Nutritional composition (per 100 g)*: Moisture 12.0 g, Protein 11.0 g, Minerals 4.50g, Fat 3.90 g, Total Dietary Fibre 13.60 g, Carbohydrate 55.0 g and Energy 300 Kcal

Foxtail millet (*Setaria italica*)/Kauni


Photo credit: H. Joshi

Small millet of Himalayan region grown as mixed crop with finger millet at smaller scale for its nutritious grains. Small dehulled grains are generally used as substitute of rice and also in traditional dessert '*Kheer*' during auspicious occasions. It is recognized more healthful than rice but its cultivation and consumption is a rare occurrence now a days.

Edible uses- All the ways that rice is used, cakes, puddings, porridge (*Sargati*) and flour for making chapatti.

- Possess diuretic, astringent and emollient properties.
- Regular consumption cause significant reduction in blood glucose levels thus, helps in the dietary management of diabetes.
- Insoluble fibre content improves intestinal functions.
- Good source of beta carotene which is generally lacking in cereals.
- Polyphenols, flavonoids imparts strong antioxidant activity.

Nutritional composition (per 100 g)*: Moisture 10.2 g, Protein 12.3 g, Minerals 2.3 g, Fat 4.3 g, Total Dietary Fibre 6.39 g, Carbohydrate 64.5 g and Energy 346 Kcal

Proso millet (*Panicum miliaceum* L.)/Cheena


Photo credit: J.C. Rana

Minor millet grown in Himalayan region for its nutritious grains and cattle feed in mixed cropping pattern with kidney bean. It is also used as a high quality fodder. Its cultivation and consumption is dwindling sharply in the region.

Edible uses- Small dehulled grains are widely used as substitute of rice and in preparation of snacks.

- Lack of gluten, thus suitable for celiac disease patients.
- Rich in anti-oxidants and vitamin E which supports regenerative and anti-inflammatory properties.
- Protein quality is better than wheat and other major cereals.
- Rich in vitamins (niacin, B-complex & folic acid), minerals (P, Ca, Zn & Fe) and essential amino acids (methionine & cysteine).

Nutritional composition (per 100 g):** Moisture 13.5 g, Protein 12.5 g, Minerals 2.1 g, Fat 4.5 g, Total Dietary Fibre 7.8 g, Carbohydrate 59.6 g and Energy 329 Kcal

Amaranth (*Amaranthus* spp.)/Chua/Ramdana


Photo credit: P. Chauhan

High value pseudo-cereal in higher hills grown mainly for grains and as leafy vegetable. It is considered as an excellent food during fasting. Tribal communities of Himalayas also use it for the treatment of measles. It is often intercropped with maize, ragi, madira and also as sole crop during rainy season.

Edible uses- Tender green leaves as vegetable, puddings, sweet balls (*Laddu*), porridge, bread, biscuits, flakes, cake, pastry, crackers, ice-cream and baby foods.

- Lysine rich high digestibility of protein which is usually limiting in cereals.
- High calcium and magnesium helps in better bone health.
- Iron rich green leafy vegetable.
- Gluten-free grains consumed for recovering from illness and during fasting.
- Squalene present in amaranth oil helps in lowering cholesterol levels.

Nutritional composition (per 100 g)*: Moisture 9.20 g, Protein 13.27 g, Minerals 3.05 g, Fat 5.56 g, Total Dietary Fibre 7.47 g, Carbohydrate 61.46 g and Energy 356 Kcal

Buckwheat (*Fagopyrum* spp.)/Ugal/Kutu


Photo credit: J.C. Rana

Popular remunerative short duration pseudo-cereal in higher hills grown mainly as sole crop for its gluten free flour, leafy vegetable and as honey crop. The honey produced from buck wheat flowers is highly valued for its unique taste and commonly used to cure common cold. It is culturally important and consumed in various forms during fasting.

Edible uses- Tender green leaves as vegetable, porridge, pudding, pancakes, chapatti, liquor, biscuits, flakes, cake, pastry, crackers, ice-cream and baby foods.

- High biological value of protein, rich in resistant starch, fibre, vitamins and minerals.
- Gluten-free thus, alternative food for diabetic and cardiovascular patients.
- Leaves cooked in iron vessel cure anaemia and constipation.
- Flavanoids rutin & quercetin impart antioxidant, antidiabetic, antitumor and cholesterol lowering properties.

Nutritional composition (per 100 g):** Moisture 12.0 g, Protein 9.85 g, Minerals 2.24 g, Fat 2.2 g, Total Dietary Fibre 7.88 g, Carbohydrate 73.4 g and Energy 353 Kcal

Horsegram (*Macrotyloma uniflorum*)/Gahat/Kulthi

Popular remedial food legume grown in mid hills in Himalayan region during rainy season for its nutritious grains and fodder. It is mainly grown as mixed crop with finger