

# Indian Farmers' Digest

Volume: 53, No. 010

October 2020

**PATRON**  
**Dr. Tej Partap**  
Vice-Chancellor

**Director Communication**  
**Dr. S.K. Bansal**

**Joint Director Communication**  
**Dr. Neelam Bhardwaj**

**EDITORS**  
**Dr. M. A. Ansari**  
**Dr. V. L. V. Kameswari**

Email id: indianfarmersdigest@gmail.com

**EDITORIAL BOARD**  
**Dr. S.K. Guru**  
**Dr. A.K. Upadhyay**  
**Dr. P.K. Omre**  
**Dr. Ashutosh Singh**  
**Dr. Anita Rani**  
**Dr. Vipul Gupta**

Publisher and the Editor are not responsible for views expressed in the articles published in this issue. Authors are required to base their articles on authenticated material/source.

For subscription & advertisement contact:

**BUSINESS MANAGER**  
**V.K. Singh**

Directorate of Communication  
G.B.P.U.A.&T., Pantnagar  
bmpantuniversity@gmail.com

Cost of one copy	Rs. 15
Annual Subscription	Rs. 150
Five years' Subscription	Rs. 675
Ten years' Subscription	Rs. 1,200
Fifteen years' Subscription	Rs. 1,800

## Contents

Editorial	02
Agro-World News Round up	03
1. System of wheat intensification (SWI) Practices : Boon for Farmers <i>Satya Prakash, A.K.Singh and Bhanita Barua</i>	04
2. Beneficial effects of rice straw mulch on wheat fields <i>Ankita Jha, Rajeev Ranjan and Shivani Kothiyal</i>	08
3. Bacterial stalk rot of Maize and their Management <i>Rajesh Pratap Singh, Manoj Kumar Chitara and Sadhna Chauhan</i>	10
4. Minimal Processing of Vegetables to Improve their Shelf Life <i>Chandan Kumar and Dheeraj Singh</i>	12
5. Trichogramma spp. as potential biocontrol agents <i>Arvind Kumar, Rajender Singh and Rishi Pal</i>	14
6. Future Policy for Agricultural Growth: Sustainable Development <i>Vijay Kumar Pal and Ashish Prakash</i>	18
7. Biopesticides: An Alternative to Chemicals in Agriculture <i>Manju Sharma and Stanzin Idong</i>	21
8. Brassica juncea var. rugosa (Pahari rai): Broad leaf mustard with tremendous health promoting and medicinal potential <i>H. Punetha and Ankur Adhikari</i>	23
9. Smart irrigation technology for conserving water: use ET to save water <i>Rajeev Kumar Srivastava, Maitreyie Narayan and Raj Kumar Pandey</i>	26
10. Potential Nutri-Crops from Uttarakhand Hills for Diversifying Food Basket in a Changing Climate <i>Anuradha Bhartiya, J.P. Aditya, Dinesh Joshi, L. Kant and Jitendra Kumar</i>	30
11. Beautify your Home with Florist's Cyclamen <i>Dinesh Kumar Chaurasia and Bal Krishna</i>	36
12. Cost of Economices for Starting with 1000 Layaer Bird (1:2) In Cage System <i>Anil Kumar and Rajan Mishra</i>	39
13. Prevention of Lameness in Dairy Cattle <i>Narendra Singh Jadon and Bharti Negi</i>	43



**Published by : Communication Centre**  
**G.B. PANT UNIVERSITY OF AGRICULTURE & TECHNOLOGY**  
**PANTNAGAR - 263 145, U.S. NAGAR (UTTARAKHAND)**

# Potential Nutri-Crops from Uttarakhand Hills for Diversifying Food Basket in a Changing Climate

Anuradha Bhartiya<sup>1</sup>, J.P. Aditya<sup>2</sup>, Dinesh Joshi<sup>3</sup>, L. Kan<sup>4</sup> and Jitendra Kumar<sup>5</sup>

*Combating malnutrition under changing climate is the biggest hurdle in ensuring nutritional security for the burgeoning population. Rigorous efforts are being made globally in recent past to design major food crops for superior nutritional quality but the potential of existing traditional food crops has been seriously overlooked despite of their ability to produce nutritious grains even under harsh climatic conditions besides their nutraceutical properties against modern lifestyle generated ailments. These ignored locally grown nutri-crops can serve as an alternative way to address the food, nutrition uncertainty with additional health benefits but social disdain, changing lifestyle and lack of synergistic research and development policies rendered the existence of these crops localised mainly in traditional subsistence farming systems. Potential of these underutilised nutri-crops is now being recognised and need for their revival and/or infusion in existing cropping systems is also being felt globally for food and nutritional security of the future. Keeping the need of nutritious, climate resilient and low input demanding crops for future in view, multifaceted efforts have been made by ICAR-VPKAS, Almora for mainstreaming nutri-crops of Uttarakhand hills to benefit both farmers and consumers of the region and country.*

Traditional nutri-crops, generally grown in traditional subsistence farming system play vital role in meeting the nutritional and health requirements of rural households residing under difficult agro-geographical conditions in Himalayan hills of India. Farmers of the region still continue to grow a number of crops but the conserved huge diversity of crops have not reached in the far flung and inaccessible areas of hills. The importance and knowledge of these traditional crops were known for ages by farming communities and in the present era also indigenous food crops have started gaining an enhanced emphasis in order to have adequate access to nutritionally rich healthy diet for health conscious masses. Crops produced in this region especially in higher hills are of premium quality and known for its unique organoleptic properties and quality probably due to their being organic, pollution free conducive growing conditions. Cultivation of various potential nutri-crops like finger millet, barnyard millet, grain amaranth, buckwheat, barley, horsegram, black soybean (*Bhat*), kidney bean and rice bean (Fig.1) is popular in the hill region besides commercial crops like rice, wheat, maize and legumes. Most of these crops are grown as a mixed/intercrop under the organic condition on hilly terrains. These traditional lesser known crops of Himalayan region are not only nutrient dense but these locally available plant resources possess appreciable adaptation for soil and

weather adversities often encountered in traditional hill farming system. However, because of relatively low returns on investments their abandonment in favour of other commercial crops has generated a threat to these nutri-crops. Replacement of these crops is a serious concern which may result in declining dietary diversity in hills necessitating a focus on the promotion of these potential crops as urgent. Therefore, infusion and/or revival of underutilized minor crops in existing cropping systems has the potential to enhance the resilience of agriculture to weather fluctuations besides serving as a nutritional shield by improving dietary diversity and food security.

## The scenario of potential nutri-crops in Uttarakhand hills

In general agriculture in Uttarakhand hills is rainfed (80% of cultivated acreage) where 54% of agricultural land is located in hills and mainly small scale crop-livestock based mixed farming is practiced under rainfed organic conditions. Hills of this region are generally characterized by steep slopes, soils with poor fertility, prone to severe water erosion and low water holding capacity. Lack of irrigation facilities and resource base for cultivation rendered poor production levels of food crops. Under the difficult agro-geographical condition, water scarcity and fragile ecosystem of the region, local

<sup>1-3,5</sup>Scientist; <sup>4</sup>Head and Principal Scientist, Crop Improvement Division, ICAR-Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora-263601, Uttarakhand, India



**Fig.1. Potential Nutri-Crops of Uttarakhand Hills**

communities have maintained rich crop diversity and native food culture. In hills, a wide range of crops *viz.*, cereals, pseudo-cereals, millets and minor millets, pulses, oilseeds, vegetables and spices are grown mainly upto 2500 masl altitude. Among them, finger millet, barnyard millet, grain amaranth, buckwheat, barley, horsegram, black soybean (*Bhat*), kidney bean and rice bean have special significance in the food culture of the region which are entirely grown in hilly terrains. Finger millet and barnyard millet are important crops after wheat and rice with approximately 9% and 5% contribution in total food grain production of the region whereas, among pulses, horsegram ranks second after black gram in area and production in the state and other nutri-crops *viz.*, barley (2%), grain amaranth (0.27%), black soybean (0.44%) and kidney bean (0.38%) also have special significance in food grain production and in ensuring nutritional security. From 2006-07 to 2014-15, a declining trend in finger millet (171 to 149 thousand tonne), barnyard millet (826 to 743 thousand tonne) and barley (2.77 to 2.48 thousand tonne) whereas rising trend in grain amaranth (1.65 to 4.27 thousand tonne), horsegram (6.74 to 9.78 thousand tonne) and black soybean (3.29 to 5.05 thousand tonne) production is observed in the state (Department of Agriculture, Uttarakhand). Presently the vitality of integrating

traditional crop diversity in mainstream agriculture for sealing the production and nutrition gaps has been realised globally but serious social disdain due to their inherent label as “food of the poors” and economic considerations have led to the negligence of these crops not only from high cropping intensive areas but from traditional growing areas also.

### **The significance of nutri-crops for food and nutritional security**

Indigenous masses residing in Uttarakhand hills have wisely integrated native crops having medicinal values in their food culture thus various minor crops like millets, pseudo-cereals and minor legumes still existed as the inseparable component in hill agriculture. Many traditional or indigenous crops are characterized by a high nutritional value (Fig. 2) with various health benefits (Table 1) compared with commercial crops and because of these benefits, these crops are conserved as treasure by local communities. As the source of essential nutrients like higher protein with a more balanced amino acid profile, crude fibre vitamins, minerals and other phytochemicals, traditional crops *viz.*, finger millet, barnyard millet, amaranth, buck wheat, barley, horsegram, black soybean, kidney bean and rice bean can play potential role in attaining nutritional security. Some of these crop species may be widely

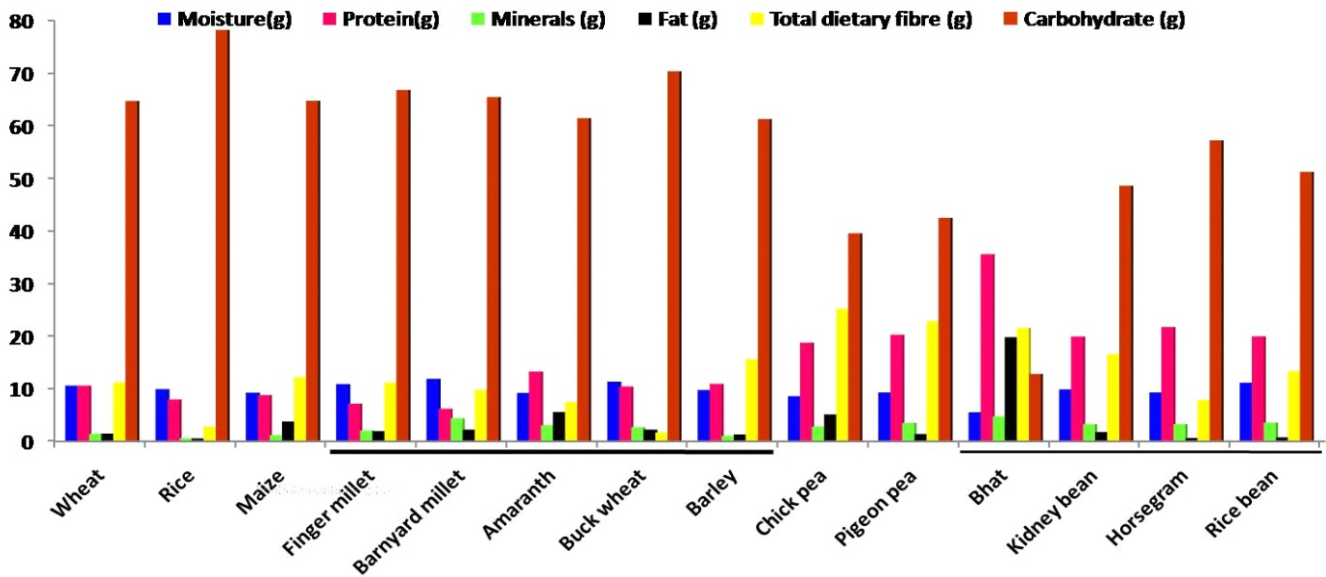


Fig. 2. Nutritional Composition of Potential Nutri-Crops of Uttarakhand Hills (Per 100 g Edible Portion)

distributed globally, but presently confined to traditional production and consumption system as food, fodder and as sources of traditional medicine for subsistence of local communities. These crops often constitute an integral part in local cuisine of communities growing them and provide valuable nutritional and health promoting benefits which are often lacking in staple crops. In recent years there has been a revived interest in cultivation and consumption of these orphan crops particularly small millets and underutilised legumes. In India, the government has setup an Initiative for Nutritional Security through Intensive Millet Promotion (INSIMP), while in the developed world amaranth and other ancient grains have appeared on the shelves of specialized shops. Calling them as 'climate resilient crops' and 'powerhouse of nutrients' government of India has declared eight millet crops (sorghum, pearl millet, finger millet, barnyard millet, foxtail millet, proso millet, kodo millet and little millet) and two pseudo-cereals (amaranth and buckwheat) as “nutri-cereals”. In addition to this, national submission on these identified nutri-cereals crops will be launched shortly for enhancing seed production for increasing indigenous production of millets in India. The Government of India has approved 2018 as “National Year of Millets” to boost production of the nutrient rich millets”. However, such initiatives are also needed in other underutilised

legumes to realise their nutritional and commercial potential.

#### Endeavours for mainstreaming nutri-crops from Himalayan hills at ICAR-VPKAS, Almora

Traditional nutri-crops are inseparable component of food and agriculture of Himalayan hill region. Presently, these underutilized nutri-crops are being considered as an excellent alternative food for people suffering from lifestyle ailments and health conscious masses but these crops are alienated from mainstream agriculture due to lack of attention by researchers, policymakers and consumers. Keeping the importance of these crops in view ICAR-VPKAS, Almora has made multifaceted efforts for mainstreaming these Himalayan nutri-crops by attempting conservation of genetic resources, development and popularization of new varieties, their post-harvest processing and value addition to benefit both farmers and consumers.

#### Germplasm conservation, development of new varieties of nutri-crops and their popularization:

Crop genetic resources are invaluable assets for humankind and increasingly required for mitigating food and nutritional security issues for the burgeoning population. Therefore ICAR-VPKAS, Almora is actively engaged in preserving the native diversity of these traditional crops and collected



**Fig.3 Post Harvest Interventions in Potential Nutri-Crops: Threshing with (a) Vivek Millet Thresher-cum-Pearler (b) Traditional Method (c) Finger Millet Biscuits & Namkeen (d) Black soybean Tofu & Milk**

local germplasm from different districts of Uttarakhand to safeguard the gene pool of traditional crops in the face of climate change. Efforts were made to collect and conserve the germplasm accessions of finger millet (2681), barnyard millet (524), grain amaranth (124), buckwheat (69), barley (770), horsegram (233), black soybean (337), kidney bean (134) and rice bean (43) mainly from hills for their utilization in developing improved varieties of these underutilized nutri-crops.

ICAR-VPKAS, Almora has developed high yielding varieties of traditional potential crops which have been recommended and cultivated for different agro-ecological zones of the country (Table 2). The developed cultivars have also been promoted to small scale farmers through front line demonstrations (FLDs) in the state. Data from different FLDs revealed that the high yielding

cultivars have a significant yield advantage in finger millet (30-45%), barnyard millet (20-30%), grain amaranth (18-28%), barley (15-20%), horsegram (35-40%) and black soybean (65-70%) over the farmer's varieties. Significant yield advantage over local cultivars was achieved through improved varieties in Uttarakhand hills. Popularization of improved varieties with recommended production techniques has given boost and awareness to farmers to cultivate these tradition crops profitably in the region. In addition to this, the institute has undertaken initiatives to develop Tunakot and Tipola cluster of district Almora as millet's bio-cluster and seed villages for providing quality seeds. The institute is actively engaged in centrally sponsored scheme of National Food Security Mission (NFSM) for enhanced breeder seed production for increasing indigenous production of millets in India. The

**Table 1. Health Benefits of Nutri-Crops of Himalayn Hills**

Crop	Local names	Important constituents & health benefits
<i>Finger millet</i> ( <i>Eleusine coracana</i> )	Ragi, Mandua & Koda	Rich in calcium, soluble fibres and low glycemic index therefore suitable for diabetics, reduce cholesterol levels and digestive problems
<i>Barnyard millet</i> ( <i>Echinochloa sp.</i> )	Madira, Sanwa & Jhangora	High dietary fibres cause slow digestibility and helpful in reduction of blood glucose level
<i>Grain amaranth</i> ( <i>Amaranthus sp.</i> )	Marsa, Rajgira & Ramdana	Rich in protein with essential amino acids especially lysine, beta-carotene and folic acid, reduce plasma cholesterol, blood glucose level and beneficial in coeliac disease
<i>Buck wheat</i> ( <i>Fagopyrum esculentum</i> )	Kuttu	Proteins of high biological value, gluten-free (so safe in coeliac disease), high in dietary fibres & resistant starch (therefore impart anti-obesity and type II diabetes) and anti-oxidative substance Rutin, Catechins and polyphenols impart strong anti-oxidative activity
<i>Barley</i> ( <i>Hordeum vulgare</i> )	Jau	Beta-glucan (anti-cholesterol substance), acetylcholine which nourishes our nervous system and recovers memory loss, easy digestibility due to low gluten
<i>Horsegram</i> ( <i>Macrotyloma uniflorum</i> )	Gahot & Kulthi	Excellent therapeutic properties to cure kidney stones, asthma, bronchitis, leucoderma, urinary discharges, heart diseases, piles besides anti-diabetic, anti-ulcer activity and also helps in dietary management of obesity
<i>Black soybean</i> ( <i>Glycine max</i> )	Bhat, Bhatmas & Bhatman	Prevention of coronary heart diseases, anti-diabetes, anti-obesity, anti-carcinogenic effects and excellent antioxidant activity due to anthocyanins, isoflavones and tannins and also helps in dietary management of Jaundice
<i>Kidney bean</i> ( <i>Phaseolus vulgaris</i> )	Rajmash & Rajma	Preventing diabetes due to richness of soluble fibre content and low glycemic index. Also beneficial in evading Alzheimer's disease
<i>Rice bean</i> ( <i>Vigna umbellata</i> )	Naurangi	Helps in curing menstrual issues, epilepsy and also possess anti-inflammatory properties

institute also provides trainings to farmers for improved cultivation of traditional nutri-crops to the farmers.

#### Post-harvest technologies, processing and value addition in nutri-crops

Proper utilization of post-harvest technologies, processing and value addition has enormous potential of value addition in underutilized nutri-crops which has so far remained neglected and isolated from the market access. In hills, processing of finger millet and barnyard millet is being done manually through traditional methods which are time consuming and very drudgery prone due to small seed size of both of these millets. To reduce the drudgery, labour and cost and time involvement of traditional method of threshing,

pearling and dehusking of finger millet and barnyard millet the institute has designed a specific millet thresher cum pearler. The *Vivek* millet thresher cum pearler has threshing capacity of 30-35 kg/hour and pearling capacity of 60-65 kg grain/hour and very popular among the farmers (Fig 3). Attempts were also initiated for the value addition of underutilized nutri-crops and ready to use products like finger millet biscuits, *namkeen*, black soybean tofu, milk and nuggets were developed to fulfil consumer and market needs with maximum profitability to hill farmers. The technology for finger millet biscuit making has been transferred to one of the local bakery for large scale production.

#### Conclusion

Himalayan hills harbour a great diversity of

**Table 2. Improved Varieties of Potential Nutri-Crops**

Crop	Improved Varieties	Area of Adaptation	Maturity (Days)
Finger millet	VL Mandua 315	Uttarakhand	105-115
	VL Mandua 324	All India	98-102
	VL Mandua 347	Uttarakhand	100-106
	VL Mandua 352	All India	95-100
	VL Mandua 348	Uttarakhand	104-112
	VL Mandua 376	All India	103-109
	VL Mandua 379	Uttarakhand, Jharkhand, Bihar , NE States and Madhya Pradesh	104-107
Barnyard millet	VL Madira 181	Bihar, Karnataka, MP & Tamil Nadu	70-80
	VL Madira 172	Uttar Pradesh, Gujarat & Karnataka	75-80
	VL Madira 207	Uttarakhand	80-90
Grain amaranth	VL Chua 44	Uttarakhand	85-95
	VL Chua 101	Uttarakhand	100-110
Buck wheat	VL Ugal 7	Uttarakhand Hills	90
Barley	VL Barley 56	Uttarakhand hills	150-155
	VL Barley 85	Uttarakhand hills	155-160
	VL Jau 118	J& K, HP, UK, Sikkim, WB, Arunachal Pradesh, Manipur, Assam, Meghalaya, Mizoram, Nagaland & Tripura	160-165
	VL Barley 94	Uttarakhand hills	160-170
Horsegram	VL Gahat 8	Uttarakhand hills	130-135
	VL Gahat 10	Uttarakhand hills	115-120
	VL Gahat 15	Northern & Central India	105-110
	VL Gahat 19	Northern India	90-95
Black soybean	VL Soya 65	Uttarakhand hills	115-120
	VL Bhat 201	Uttarakhand hills	115-120
Kidney bean	VL Rajma 63	Uttarakhand hills	70-75
	VL Rajma 125	Uttarakhand hills	95-100
Rice bean	Him Shakti (VRB 3)	HP, UK, Arunachal Pradesh, Assam, Tripura, Manipur, Meghalaya, Mizoram & Nagaland	130-135

traditional crops and the attractiveness of these crops lies in their excellent nutritional and nutraceutical values along with their innate climate resilience and ability to grow under low input conditions. These crops are the ideal choice for wholesome diet and for combating lifestyle diseases but their limited competitiveness as compared to other commercial crops has resulted in the restricted diffusion of these crops outside their

niche area. Presently, meagre efforts have been done to mainstream these crops at the national and global level but multifaceted efforts for generating public awareness along with suitable government policies supporting research, cultivation, value addition and marketing of these crops could save these precious crops for future.

**For more information contact: email id: [anuradhagpb@gmail.com](mailto:anuradhagpb@gmail.com) and Mob. no: 9410560611.**