

## Nutricereals of Tribal Dominated Areas of Melghat Region of Maharashtra, India

Nilamani Dikshit<sup>1\*</sup> and AR Dorkar<sup>2</sup>

<sup>1</sup>ICAR-National Bureau of Plant Genetic Resources, Regional Station, Dr. PDKV Campus, Akola, Maharashtra, India

<sup>2</sup>Agricultural Technical School, Dharni, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

\*Corresponding Author: Nilamani Dikshit, ICAR-National Bureau of Plant Genetic Resources, Regional Station, Dr. PDKV Campus, Akola, Maharashtra, India.

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### Abstract

This paper presents nutricereals scenario of a tribal dominated areas of Melghat region of Amravati district of Maharashtra, India. The area is inhabited mainly by the primitive aboriginal tribes Korku and Gond tribes and small percentage of other communities viz. Gaoli, Nihal, Balai, Gaolan and Rathya. Nutricereals constitutes the staple food of the tribal and other communities of Melghat since ages. During a survey and exploration programme of the region, nutricereal species viz., Sorghum (5), Pearl millet (5), barnyard millet (15), little millet (13), kodo millet (9), finger millet (7), and foxtail millet (4) were collected. In the present paper, nutrient compositions of these species in general and agro- morphological characteristics, distribution, diversity and uses of these in particular are discussed.

**Keywords:** Nutricereals; Tribal Dominated Areas; Melghat Region

### Introduction

Nutricereals possess unique nutritional characteristics and encompasses coarse cereals (sorghum and pearl millet) and small millets (finger millet, barnyard millet, foxtail millet, little millet, kodo millet and proso millet). These species are not only a power house of nutrients but also hold great potential in contributing to food and nutritional security as they are climate resilient crops. They constitute the staple foods and supply a major portion of calories and protein to large segments of populations in the semi-arid tropical regions of Africa and Asia [1]. In addition to meeting the dietary requirements of the poor people, it also serve as nutritional security as these species contain high micro nutrient, high amount of essential amino acids with low glycaemic index compared to rice and wheat.

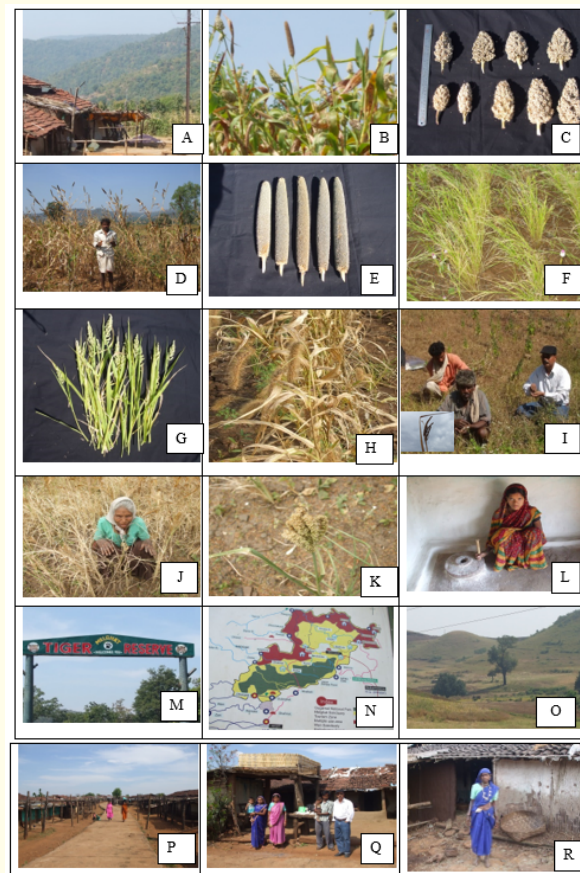
Melghat constitute the south western Satpura mountain ranges and is located on the northern portion of the Amravati district of Maharashtra. This region represent a typical central Indian Highland of the Bio-geographic zone 6E Deccan peninsula of central highlands of India. The geological formation in the area is the Deccan trap and underlying track is basalt in one form or another. The area is also determined as a unique blending of multiple high hills and deep valleys with terrains and vegetations changing at close intervals. The forests are deciduous in nature and grouped under the sub group 5-A southern tropical dry deciduous forests.

In the Melghat region of Amravati district of India, nutricereals viz. *Sorghum*, *Pennisetum*, *Panicum*, *Echinochloa*, *Paspalum*, *Setaria* and *Eleusine* constitutes the staple food and are grown by the tribal farmers since ages. These crops are an important source of food and fodder and quite resilient to varied agro-climatic conditions and play an important role in marginal agriculture prevalent in hilly and semi- arid conditions of the region. Currently, the area under millet and small millets is declining due to growing of remunerative crops like soybean, sunflower, orange, cotton, sugar cane, banana etc. Due to the introduction of major food crops like rice and wheat, there has been a change in food habit among tribal people which has resulted in undernourishment and malnutrition. Now the Government of India has taken renewed interest to bring back the nutricereals to its old position so that the tribal people grow nutricereals in large areas and

become free from hunger, poverty and malnutrition. Conservation of agrobiodiversity is the Millennium Development Goals (MDGs) for the people of Asian and African people for making them free from hunger and malnutrition. Therefore, effort has been made to systematically collect, characterize and conserve these valuable crops before they are lost forever and making them available for crop improvement programmes.

### Materials and Methods

Survey of literature and flora books was reviewed before planning an exploration programme from this region. Exploration was conducted during the crop maturity period during 29<sup>th</sup> October - 5<sup>th</sup> November 2012. Passport data was recorded right at the collection time for each accession with date of collection, botanical name, village, block, district, longitude, latitude and altitude (Table 1 and Figure 1). Information on collection site, sampling of material (random/bulk), frequency, and description of the soil characteristics, farmer's name, and ethnicity were recorded during the collection period. Each accession was assigned collector number and the samples collected in the form of panicles/inflorescence or seeds were kept in craft paper with an assigned collector number. Qualitative and agronomical characteristics of the crops were recorded in the collection site where ever available. Detail seed characteristics were recorded after the exploration.



**Figure 1:** Nutricereal collection from Melghat region, Maharashtra, India.

A: Tribal hamlet in Melghat region, B: Growing of Sorghum and pearl millet, C: Variability in Sorghum landraces D-E: Pearl millet crop, F: Little millet, G: Inflorescence of barnyard millet, H: Foxtail millet, I: Collecting Kodo millet, J: Finger millet crop grown by a tribal lady, K: Inflorescence of finger millet, L: Stone grinding of finger millet, M: Entrance to Melghat tiger Reserve forest, N: Map of Melghat Tiger Reserve, O: Topography showing tribal lands, P: View of a Tribal village in Melghat, Q: Discussing with tribal farmers, R: Typical Korku lady with traditional attires.

S. No.	Coll. No.	Botanical Name	Vernacular name	Village	Block	Latitude	Longitude	Alt.(ft)
1	D 2012-1	<i>Pennisetum glaucum</i>	Bajri	Dhomni phata	CK	21° 23' 580"	77° 27' 527"	2107
2	D 2012-2	<i>Panicum sumatrense</i>	Kutki	Dhomni phata	CK	21° 23' 580"	77° 27' 527"	2107
3	D 2012-3	<i>Setaria italica</i>	Ladanga	Dhomni phata	CK	21° 23' 580"	77° 27' 527"	2107
4	D 2012-4	<i>Sorghum bicolor</i>	Jowar	Dhomni phata	CK	21° 23' 580"	77° 27' 527"	2107
5	D 2012-5	<i>Sorghum bicolor</i>	Jowar	Dhomni phata	CK	21° 23' 580"	77° 27' 527"	2107
6	D 2012-6	<i>Pennisetum glaucum</i>	Bajri	Bhilkhed	CK	21° 22' 290"	77° 26' 191"	2082
7	D 2012-7	<i>Panicum sumatrense</i>	Kutki	Doma	CK	21° 32' 80"	77° 33' 79"	2100
8	D 2012-9	<i>Echinochloa frumentacea</i>	Bhagar	Doma	CK	21° 33' 187"	77° 33' 369"	2010
9	D 2012-13	<i>Paspalum scrobiculatum</i>	Kodo	Bhawai	CK	21° 25' 411"	77° 20' 642"	2005
10	D 2012-15	<i>Eleusine coracana</i>	Safed mandgi	Makhla	CK	21° 31' 973"	77° 22' 866"	2210
11	D 2012-16	<i>Panicum sumatrense</i>	Kutki	Makhla	CK	21° 31' 973"	77° 22' 866"	2210
12	D 2012-17	<i>Pennisetum glaucum</i>	Bajri	Makhla	CK	21° 31' 973"	77° 22' 866"	2210
13	D 2012-18	<i>Sorghum bicolor</i>	Jowar	Makhla	CK	21° 31' 973"	77° 22' 866"	2210
14	D 2012-19	<i>Panicum sumatrense</i>	Kutki	Raipur	CK	21° 34' 924"	77° 15' 935"	1010
15	D 2012-20	<i>Panicum sumatrense</i>	Kutki	Rehetiakheda	CK	21° 39' 516"	77° 15' 776"	1045
16	D 2012-21	<i>Echinochloa frumentacea</i>	Sawa	Rehetiakheda	CK	21° 39' 516"	77° 15' 776"	1045
17	D 2012-22	<i>Eleusine coracana</i>	Koda / Mandgi	Rehetiakheda	CK	21° 39' 516"	77° 15' 776"	1045
18	D 2012-23	<i>Paspalum scrobiculatum</i>	Kodo	Rehetiakheda	CK	21° 39' 516"	77° 15' 776"	1045
19	D 2012-24	<i>Panicum sumatrense</i>	Kutki	Kekdabad	DN	21° 37' 201"	76° 56.44"	1001
20	D 2012-25	<i>Echinochloa frumentacea</i>	Sawa	Kekdabad	DN	21° 37' 201"	76° 56.44"	1001
21	D 2012-26	<i>Paspalum scrobiculatum</i>	Kodo	Kekdabad	DN	21° 37' 201"	76° 56.44"	1001
22	D 2012-27	<i>Echinochloa frumentacea</i>	Sawa	Kutanga	DN	21° 42' 162"	77° 05' 520"	1005
23	D 2012-28	<i>Eleusine coracana</i>	Mandgi	Kutanga	DN	21° 42' 162"	77° 05' 520"	1050
24	D 2012-29	<i>Paspalum scrobiculatum</i>	Kodo	Kutanga	DN	21° 42' 147"	77° 05' 300"	1100
25	D 2012-30	<i>Echinochloa frumentacea</i>	Safed Sawriya	Chatwavod	DN	21° 37' 644"	76° 58' 297"	1107
26	D 2012-31	<i>Echinochloa frumentacea</i>	Lal Sawriya	Kekdabod	DN	21° 37' 490"	76° 56' 954"	1117
27	D 2012-32	<i>Paspalum scrobiculatum</i>	Kodo	Tembli	DN	21° 30' 728"	76° 54' 535"	1100
28	D 2012-33	<i>Echinochloa frumentacea</i>	Sawa	Tembli	DN	21° 30' 738"	76° 54' 557"	1100
29	D 2012-34	<i>Panicum sumatrense</i>	Kutki	Tembli	DN	21° 30' 738"	76° 54' 557"	1100
30	D 2012-35	<i>Eleusine coracana</i>	Kodo	Tembli	DN	21° 30' 738"	76° 54' 557"	1100
31	D 2012-36	<i>Setaria italica</i>	Landanga	Tembli	DN	21° 30' 738"	76° 54' 557"	1100
32	D 2012-39	<i>Panicum sumatrense</i>	Kutki	Jutpani	DN	21° 30' 762"	76° 56' 071"	1000
33	D 2012-44	<i>Panicum sumatrense</i>	Kutki	Lawada	DN	21° 31' 961"	77° 01' 496"	1295
34	D 2012-45	<i>Echinochloa frumentacea</i>	Sawriya	Lawada	DN	21° 31' 961"	77° 01' 496"	1295
35	D 2012-46	<i>Echinochloa frumentacea</i>	Safed Sawriya	Bod	DN	21° 31' 961"	77° 01' 496"	1295
36	D 2012-47	<i>Echinochloa frumentacea</i>	Chota sawriya	Bod	DN	21° 31' 792"	76° 59' 445"	1209
37	D 2012-48	<i>Panicum sumatrense</i>	Kutki	Bod	DN	21° 31' 461"	76° 59' 196"	1202
38	D 2012-50	<i>Paspalum scrobiculatum</i>	Kodo	Bod	DN	21° 31' 461"	76° 59' 196"	1202
39	D 2012-51	<i>Panicum sumatrense</i>	Kutki	Tingriya	DN	21° 33' 310"	76° 52' 071"	1112
40	D 2012-52	<i>Echinochloa frumentacea</i>	Sawan	Tingriya	DN	21° 33' 280"	76° 52' 025"	1093

41	D 2012-53	<i>Paspalum scrobiculatum</i>	Kodo	Tingriya	DN	21° 33' 280"	76° 52' 025"	1093
42	D 2012-54	<i>Eleusine coracana</i>	Koda	Tingriya	DN	21° 33' 280"	76° 52' 025"	1093
43	D 2012-55	<i>Setaria italica</i>	Ladanga	Dahinda	DN	21° 33' 998"	76° 57' 235"	1098
44	D 2012-58	<i>Paspalum scrobiculatum</i>	Kodo	Dahinda	DN	21° 33' 835"	76° 51' 577"	1081
45	D 2012-59	<i>Echinochloa frumentacea</i>	Sawriya	Jilpi	DN	21° 27' 974"	76° 48' 578"	1183
46	D 2012-60	<i>Setaria italica</i>	Ladanga	Jilpi	DN	21° 27' 974"	76° 48' 578"	1183
47	D 2012-61	<i>Eleusine coracana</i>	Koda	Jilpi	DN	21° 27' 974"	76° 48' 578"	1183
48	D 2012-62	<i>Echinochloa frumentacea</i>	Bhagar	Patharpur	DN	21° 26' 595"	76° 50' 304"	1262
49	D 2012-63	<i>Paspalum scrobiculatum</i>	Kodo	Patharpur	DN	21° 26' 595"	76° 50' 304"	1262
50	D 2012-64	<i>Panicum sumatrense</i>	Kutki	Patharpur	DN	21° 26' 595"	76° 50' 304"	1262
51	D 2012-65	<i>Eleusine coracana</i>	Safed Madgi	Kamapur	CK	21° 23' 259"	77° 23' 869"	2875
52	D 2012-66	<i>Panicum sumatrense</i>	Kutki	Kamapur	CK	21° 23' 259"	77° 23' 869"	2875
53	D 2012-67	<i>Pennisetum glaucum</i>	Bajri	Kamapur	CK	21° 24' 826"	77° 23' 261"	2910
54	D 2012-69	<i>Sorghum bicolor</i>	Jowar	Kamapur	CK	21° 24' 675"	77° 23' 414"	2935
55	D 2012-70	<i>Echinochloa frumentacea</i>	Sawa	Kamapur	CK	21° 24' 675"	77° 23' 414"	2935
56	D 2012-72	<i>Sorghum bicolor</i>	Gawrani jowar	Badnapur	CK	21° 21' 290"	77° 22' 410"	1785
57	D2012-73	<i>Pennisetum glaucum</i>	Bajri	Badnapur	CK	21° 21' 230"	77° 22' 661"	1815

**Table 1:** Passport data of nutricereal collection from Melghat, Amravati, Maharashtra.

## Results and Discussion

Diversity in nutricereal species of Melghat region represents an interesting variability with respect to plant type and seed characteristics (Table 2). The area is situated between 21° 16' 330" - 21° 42' 163" and 76° 48' 578" - 77° 33' 791" longitude. The altitude of the area varied from 1000 ft (Jutpani) to 2935 ft. (Kamapur) area. In total, 57 accessions of nutri-cereals comprising 25 accessions from Chikhaldara and 32 accessions from Dharni block were collected from nine and eleven sites respectively. Botanical characteristics of each species collected are mentioned.

Crop/grass name	Botanical name	Biological status	Chromosome number	CK*	DN**	Total
Sorghum	<i>Sorghum bicolor</i> (L.) Moench	C***	2n = 2x = 20	5	-	5
Pearl millet	<i>Pennisetum glaucum</i> (L.) R. Br.)	C	2n = 2x = 14	5	-	5
Barnyard millet	<i>Echinochloa frumentacea</i> Link.	C	2n = 36,54	3	11	14
Little millet	<i>Panicum sumatrense</i> Roth ex. Roemer and Schultes	C	2n = 36	6	7	13
Kodo millet	<i>Paspalum scrobiculatum</i> L.	C	2n = 40	2	7	9
Finger millet	<i>Eleusine coracana</i> (L.) Gaertner	C	4x,2n = 36	3	4	7
Foxtail millet	<i>Setaria italica</i> (L.) P. Beauv.	C	2n = 18	1	3	4
			Total	25	32	57

**Table 2:** Diversity collected in nutricereal species from Melghat region, Amravati.

\*CK: Chikhaldara; \*\*DN: Dharni; C\*\*\*: Cultivated.

### Sorghum

Botanical name- *Sorghum bicolor* (L.) Moench

Vernacular name- Korku-Jondhra

Plant height about 2.22 metre, number of leaves 12, number of nodes on main stem 12, leaf length 60.0 cm, leaf width 5.0 cm, days to maturity 145 - 155 days, number of tiller 1.0, ear head length (9.82 - 12.05 cm), ear head width (5.0 - 5.2 cm), ear head weight (51.37 - 59.15g), 100 seed weight (1.99 - 2.46g) inflorescence round shaped , conical, leaf sheath purple spotted during maturity. Diabetic patient prefer jowari roti than that of wheat roti.

Distribution- Dhomniphata, Makhala, Kamapur and Badnapur.

### Pearl millet

Botanical name- Pennisetum glaucum (L.). R.Br.

Vernacular name- Korku- Salaya

The plants are very tall and about 3.2 metre in height, leaf length 55.0 cm, leaf width 4.0 cm, number of tiller (1 - 2), number of spikes six, no. of nodes 15, spike length 19.5 cm, spike width 2.16 - 2.18 cm, days to maturity 150 days, spike weight (23.13 - 48.55g), 100 seed weight (0.71 - 0.96g).

Distribution: Dhomniphata, Bhilkhed, Makhala, Kamapur and Badnapur.

### Barnyard millet

Botanical name- Echinochloa frumentacea Link.

Vernacular name- Sawa in Korku and Bhagar in Marathi.

Plants are medium tall about 68 cm in height, leaf length 18.07 cm, leaf width 0.65 cm, flag leaf length 15.6 cm, flag leaf width 1.0 cm, inflorescence length 10.39 cm, inflorescence width 1.8 cm, number of racemes/inflorescence -16, raceme length -1.7 cm, compact round the rachis, minute hairs on tip of the spikelet, colour of inflorescence mostly green but some time dark purple, days to maturity about 100 days, inflorescence shape elliptical, inflorescence compactness intermediate, shape of lower raceme straight, length of peduncle 10.3 cm, plants are uniform at maturity and 95 - 100% spikelets remain at the time of maturity, spikelet arranged round the axis. Degree of branching low/medium or high, degree of lodging at maturity low. 100 seed weight (0.25 - 0.0.37g). white seed colour are preferred by the farmers for good palatability and taste.

Distribution- Dhomniphata, Doma, Rehetia kheda, Kekkabad, Kutanga, Chatarabad, Tembli, Lawada, Bod, Tingriya, Jilpi, Patharpur, Kamapur.

### Little millet

(Panicum sumatrense Roth ex. Roemer and Schultes) Korku-Kutki

Plants are erect to erect geniculate, plant pigmentation green, leaf blade essentially glabrous to medium pubescent, inflorescence open type, Plant height 80.5 - 101.5 cm, inflorescence length 30.0 cm, number of nodes per primary axis (4.0 - 7.1), effective tillers per plant (3.0 - 9.0). Degree of compactness of inflorescence open, 100 seed weight (0.11 - 0.18g).

Distribution: Dhomniphata, Doma, Makhala, Raipur, Rehetiakheda, Kekkabad, Tembli, Jutpani, Lawada, Bod, Tingriya, Patharpur, Kamapur.

### Kodo millet

(Paspalum scrobiculatum L.) kodo in korku language

Plants are erect, 50 - 60 cm height , inflorescence length 3.0 - 8.0 cm, maturity about 120 days, degree of lodging at maturity low, plants are almost dead at the time primary inflorescence on each culm (tiller) reaches maturity, flag leaf at the second primary axis node absent,

number of racemes above first (lowest) primary axis node, sheath pigmentation present, internode pigmentation present, ear exertion complete, spikelet density sparse/intermediate, 90-100% uniformity of population at maturity, seed shape orbicular/ellipsoidal/oval, grain colour- golden brown/brown/dark brown, 100 seed weight (0.42 - 0.55g), yield low to intermediate type.

### Finger millet

*Eleusine coracana* (L.) Gaertner

Mandwa/Konda - Korku

Plants are erect, 75-80 cm height, green, low tillering, ear shape fist like, ear size intermediate, spikelet shattering at maturity absent, number of grains per spikelet (low 4 grains/ intermediate (6 grains) /high (8 grains), grain covering (exposed/intermediate/enclosed), seed/grain colour (white/light brown/copper brown/purple brown), 100 seed weight (0.18 - 0.26g). Preferred by the farmers for good taste. Eaten as rice, kheer/pudding etc. Usually served to the lactating and pregnant woman in Melghat region for providing calcium and nutritional security.

Distribution- Domniphata, Tembli, Dahinda and Jilpi.

### Foxtail millet

(*Setaria italica* L. (P.) Beauv.), (Ladanga- Korku language, Bhadli in Marathi language).

Grown in poor marginal soil. Plants are erect, pigmented, leaf colour green, medium to strongly pubescent, compact-elliptic inflorescence with medium-long bristles, 150 days duration, very slight or no lodging at maturity with no stay green type variety. Seed colour red or yellowish white in colour, 100 seed weight (0.18 - 0.29g).

Distribution- Domniphata Makhala , Kamapur , Kutanga , Tembli, Tingriya, Jilpi.

### Chemical composition, nutricereals products and recipes

Tribal farmers depend upon nutricereals for sustenance and the hay are used for livestock. Tribal farmers classify different species of millets based on morphological, agronomic, gastronomic and practical utility of the landrace [2]. Tribal farmers recognize ethnotaxa that have considerable value in their communities and represent intra-specific variation in minor millets that occupy specific habitats in the landscape [3]. 47 accessions of little millet germplasm belonging to four Indian states were characterized for nine qualitative and ten quantitative traits and observed significant differences in all the traits studied [4].

Powdered Sorghum and pearl millet grains are used as roti, halwa and khichdi; barnyard millet grains as rice, khir (pudding), grains of little millet and foxtail millet used as rice and pudding; finger millet as Kheer/pudding, Upma and kodo millet as rice and pulao. Crispy texture of foxtail millet rendered it very suitable for making biscuit and fried [5].

Nutrient compositions of nutri-cereals are better in comparison to other cereals. They contain high amounts of dietary fibre, B-complex vitamins, essential amino and fatty acids and vitamin E. They are particularly high in minerals, iron, magnesium, phosphorous, potassium and release lesser percentage of glucose over a longer period of time causing satiety which lowers the risk of diabetes (Table 3). These grains are high in carbohydrates, with protein content varying from 6 to 11 percent and fat varying from 1.5 to 5 percent [6]. Yenagi and Masur [7] reported that 50% blending of any millet flour was ideal for biscuit production and highlighted the potential of millet biscuits in bakery industry. Acceptability and high nutritional quality of nutricereals make them good candidate for food product development [8].



Grain	Carbo-hydrate (g)	Protein (g)	Fat (g)	Energy (kcal)	Dietary Fibre (g)	Ca (mg)	P (mg)	Mg (mg)	Zn (mg)	Fe (mg)	Thiamin (mg)	Ribo-flavin (mg)	Nia-cin (mg)	Folic Acid (mg)
Sorghum	67.7	09.9	1.73	334	10.2	27.6	274	133	1.9	3.9	0.35	0.14	2.1	39.4
Pearl Millet	61.8	10.9	5.43	347	11.5	27.4	289	124	2.7	6.4	0.25	0.20	0.9	36.1
Finger millet	66.8	07.2	1.92	320	11.2	364.0	210	146	2.5	4.6	0.37	0.17	1.3	34.7
Kodo millet	66.2	08.9	2.55	331	06.4	15.3	101	122	1.6	2.3	0.29	0.20	1.5	39.5
Proso millet	70.4	12.5	1.10	341	-	14.0	206	153	1.4	0.8	0.41	0.28	4.5	-
Foxtail Millet	60.1	12.3	4.30	331	-	31.0	188	81	2.4	2.8	0.59	0.11	3.2	15.0
Little millet	65.5	10.1	3.89	346	7.7	16.1	130	91	1.8	1.2	0.26	0.05	1.3	36.2
Barn-yard millet	65.5	06.2	2.20	307	-	20.0	280	82	3.0	5.0	0.33	0.10	4.2	-
Wheat flour	64.7	10.6	1.47	321	11.2	39.4	315	125	2.8	3.9	0.46	0.15	2.7	30.1
Rice	78.2	07.9	0.52	356	02.8	07.5	96	19	1.2	0.6	0.05	0.05	1.7	9.32

**Table 3:** Nutrient composition of nutricereals (Per 100g edible portion: 12% moisture)\*\*.

\*\*Source: Indian Food Composition Tables, NIN-2017, \*Nutritive value of Indian Foods, NIN-2007.

## Conclusion

During the exploration programme and discussion with the tribal farmers awareness generation has been created among the farmers its utility and regeneration and maintenance at the on-farm level. Present effort and comprehensive collection of nutricereal species would help conserve the valuable genetic resources of the region besides its availability for crop improvement programmes. Considering the anti-diabetic properties, low glycaemic index and unique nutritional characteristics, Government of India also has decided to boost its demand and allow farmers to get higher prices and included these nutricereals in the Public Distribution System (PDS) with the objective of improving the food and nutritional security.

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