

SHORT COMMUNICATION

Proximate and Mineral Composition Analysis of Little Millet Collected from Some Millet Growing Areas in Tamil Nadu

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Eighteen accessions of little millet (*Panicum sumatrense* Roth ex Roem. & Schult.) collected from different locations across millet growing regions of Tamil Nadu were analysed for their variation in nutrient and mineral composition using AOAC method and quantification of metals using ICP spectroscopic method. Among the 18 accessions analyzed, maximum proximate content of moisture (MSSRF-BD2), protein (MSSRF-BD11), carbohydrate (MSSRF-BD5), total ash (MSSRF-BD9), fibre (MSSRF-BD18), fat (MSSRF-BD12) and energy (MSSRF-BD12) were listed. High mineral content of calcium (MSSRF-BD8), iron (MSSRF-BD1), magnesium (MSSRF-BD14), phosphorus (MSSRF-BD14), potassium (MSSRF-BD15) and zinc (MSSRF-BD6) were observed in the collections.

Key Words: Intra-species variation, Little millet, Mineral composition, *Panicum sumatrense*, Proximate composition

Millet cultivation in India extends from sea level and the Deccan plateau (Mazhar *et al.*, 2007) in southern peninsula to almost 2438 m altitude in western and eastern Himalaya and north-eastern hill regions (ICAR, 1999). Seeds of eighteen accessions were collected from farmers field across five millet cultivating locations in Tamil Nadu i.e. Dharmapuri, Salem, Thiruvannamalai, Vellore and Theni districts. Different accessions, identified by specific local names in the pockets of cultivation displayed variability in seed colour. The present investigation was under taken to analyse the samples for their nutritional and mineral composition.

The study was conducted in the year 2009-2010 crop season when 18 seed samples of little millet (locally called *Samai*) were collected from the farmers in millet growing areas of Pachamalai Hills (726-826 m), Javadu Hills (706-809 m), Yelagiri Hill (563-588 m), Megamalai (323 m), and Dharmapuri district (458-525 m) in the state of Tamil Nadu (Table 1). Seeds were ground into fine powder separately and moisture analysis was carried out before storing at 4°C.

Proximate composition (AOAC, 2006) of moisture was determined at 95°-100°C under pressure ≤ 100 mm Hg (ca 5 h) Ref. 934.01, crude protein Ref. 984.13, fat (ether extract) Ref. 920.39, total ash was determined at 600°C for 2 h Ref. 942.05, crude fibre Ref. 962.09, total

carbohydrate [100 – (crude protein+crude fat+ash+crude fibre)]. The energy value was calculated by Pearson's method (Kirk and Sawyer, 1991).

The calcium, magnesium, potassium, phosphorus and zinc metal analysis of millets were performed using AOAC method, Ref. 985.01 (AOAC, 2006). Quantification of metals was done by Inductively Coupled Plasma (ICP) spectroscopic method as indicated at the following wavelengths, calcium (317.9 nm), magnesium (279.5 nm), potassium (766.5), phosphorus (214.9), Iron (372.0 nm) and zinc (213.8 nm). Results calculated from triplicate data were expressed as mean $\pm$ standard deviation.

The proximate composition of the samples, their mean and standard deviation are presented in Table 2. The moisture content ranged from 9.33 to 12.70 g/100 g. Higher moisture content was observed in MSSRF-BD2. The protein content among the accessions ranged from 6.36 to as high as 9.15 g/100 g found in MSSRF-BD11. The carbohydrate value ranged between 61.48 to 68.57 g/100 g. The sample MSSRF-BD5 showed the highest percentage of carbohydrate content among the accessions. The total ash value ranged from 3.15 to 9.07 g/100 g and the accession MSSRF-BD9 showed higher percentage. Fibre content ranged from 5.54 to 7.84 g/100 g and content was rich in MSSRF-BD18. The percentage of fat content ranged between 3.61 to 5.56 g/100 g and MSSRF-BD12 showed

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Table 1. Locations of collection, local name and seed colour

Districts	Sample Code	Locations	Altitude (m)	Latitude and longitude	Local name	Seed colour
Salem and Trichy	MSSRF-BD1	Pachamalai Hills	726	11°22'36.49"N 78°34'08.55"E	Samai	White and brown mixed
Salem and Trichy	MSSRF-BD2	Pachamalai Hills	768	11°21'27.69"N 78°37'15.48"E	Ilansamai or Vella samai	Light brown
Salem and Trichy	MSSRF-BD3	Pachamalai Hills	732	11°19'35.77"N 78°36'32.15"E	Vella samai	Light honey dew
Salem and Trichy	MSSRF-BD4	Pachamalai Hills	826	11°16'28.91"N 78°35'08.51"E	Perumsamai	Light brown
Salem and Trichy	MSSRF-BD5	Pachamalai Hills	791	11°18'19.99"N 78°37'54.38"E	Ilansamai	White and brown mixed
Dharmapuri	MSSRF-BD6	Pennagaram	458	12°09'15.12"N 77°54'48.33"E	Samai	Brown
Dharmapuri	MSSRF-BD7	Pennagaram	493	12°06'50.91"N 77°56'14.95"E	Samai	Brown and black mixed
Dharmapuri	MSSRF-BD8	Pennagaram	525	12°06'12.42"N 77°52'22.29"E	Samai	Light brown
Vellore	MSSRF-BD9	Yelagiri Hills	588	12°43'06.79"N 78°44'486.07"E	Ella samai	White and brown mixed
Vellore	MSSRF-BD10	Yelagiri Hills	563	12°42'55.05"N 78°45'10.61"E	Samai	Light black
Vellore	MSSRF-BD12	Yelagiri Hills	740	12°29'36.03"N 78°50'05.62"E	Sittansamai	Dull white
Vellore	MSSRF-BD13	Yelagiri Hills	779	12°38'21.86"N 78°56'07.45"E	Sittansamai	Medium black
Vellore	MSSRF-BD14	Javadhu Hills	740	12°29'36.03"N 78°50'05.62"E	Sittansamai	Medium black
Vellore	MSSRF-BD15	Javadhu Hills	706	12°37'20.85"N 78°54'43.86"E	Perumsamai	Brown
Vellore	MSSRF-BD16	Javadhu Hills	809	12°38'16.60"N 78°56'57.46"E	Sirusamai or Koluthanan Samai	Brown and white mixed
Vellore	MSSRF-BD17	Javadhu Hills	706	12°37'20.85"N 78°54'43.86"E	Sittansamai	Medium black
Vellore	MSSRF-BD18	Javadhu Hills	809	12°38'16.60"N 78°56'57.46"E	Perumsamai or Vella Samai	Dull white
Theni	MSSRF-BD11	Megamalai	323	9°58'53.66"N 77°22'43.64"E	Chinnasamai	White brown mixed

higher value. The energy values obtained across accessions and ranged from 317.17 to 349.40 kcal/100 g and highest value observed in MSSRF-BD12.

The mineral composition of the samples, their mean and standard deviation are presented in Table 3. Potassium ranged from 199.2 to 303.4 mg/100 g and higher content was found in MSSRF-BD15. Phosphorous had a value

ranging from 184.3 to 308.9 mg/100 g and was high in MSSRF-BD14. Magnesium varied from 131.3 to 186.6 mg/100 g and the maximum found in MSSRF-BD14. The iron content ranged from 7.84 to 90.8 mg/100 g and MSSRF-BD1 showed maximum content. Calcium content ranged from 22.6 to 56.4 mg/100 g and accession MSSRF-BD8 showed the highest. Zinc ranged from 1.52 to 2.14

Table 2. Proximate composition of little millet (g/100g)¹

Sample	Moisture (% _{f.w.})	Protein (% _{d.w.})	Fat (ether extract) (% _{d.w.})	Total ash (% _{d.w.})	Fibre (crude) (% _{d.w.})	Carbohydrates (% _{d.w.})	Energy (kcal/100 g)
MSSRF-BD1	10.58±0.32	7.10±0.27	4.81±0.26	4.08±0.23	7.44±0.31	65.99±1.94	335.65±4.33
MSSRF-BD2	12.70±0.44	7.12±0.35	4.73±0.24	7.73±0.36	6.41±0.23	62.0±2.34	317.17±2.12
MSSRF-BD3	11.21±0.43	7.16±0.23	4.76±0.25	3.27±0.22	6.43±0.34	67.17±1.55	340.16±4.34
MSSRF-BD4	10.71±0.39	6.88±0.26	4.53±0.26	3.30±0.25	6.50±0.37	68.08±2.24	340.61±3.28
MSSRF-BD5	10.28±0.41	6.36±0.34	4.42±0.23	3.57±0.24	6.80±0.25	68.57±1.42	339.5±4.25
MSSRF-BD6	10.64±0.47	7.83±0.35	4.48±0.25	5.48±0.23	6.67±0.32	64.9±2.29	331.24±3.32
MSSRF-BD7	11.47±0.44	8.17±0.36	4.35±0.24	6.61±0.32	6.27±0.24	63.13±2.21	324.35±3.45
MSSRF-BD8	10.86±0.38	7.64±0.24	4.35±0.27	7.31±0.21	6.11±0.17	63.73±1.32	324.63±2.72
MSSRF-BD9	9.91±0.26	8.66±0.26	4.34±0.29	9.07±0.23	6.54±0.24	61.48±2.23	319.62±3.42
MSSRF-BD10	10.96±0.42	8.62±0.34	4.66±0.25	4.06±0.24	7.36±0.33	64.34±1.64	333.78±4.34
MSSRF-BD11	9.46±0.28	9.15±0.23	4.74±0.14	3.83±0.15	6.68±0.28	66.59±1.23	345.62±3.32
MSSRF-BD12	9.33±0.36	7.46±0.24	5.56±0.13	4.73±0.14	5.54±0.25	67.38±2.12	349.40±2.17
MSSRF-BD13	11.97±0.37	8.07±0.27	4.45±0.16	4.09±0.12	7.16±0.26	64.26±2.34	329.57±4.18
MSSRF-BD14	10.43±0.27	7.90±0.25	4.69±0.14	5.07±0.13	6.40±0.23	65.51±1.23	335.85±3.12
MSSRF-BD15	11.29±0.22	6.46±0.17	3.61±0.17	4.35±0.24	7.45±0.35	66.91±1.18	326.69±3.37
MSSRF-BD16	10.04±0.41	8.46±0.22	5.04±0.33	3.44±0.15	6.72±0.22	66.3±2.11	344.4±4.52
MSSRF-BD17	9.73±0.37	6.65±0.26	4.72±0.24	6.05±0.27	7.31±0.25	65.54±2.32	331.24±3.23
MSSRF-BD18	10.64±0.26	8.08±0.35	4.32±0.23	3.15±0.17	7.84±0.26	65.97±2.12	335.08±3.32

¹Values are expressed as means ± SD of three replicates; f.w.: fresh weight; d.w.: dry weight

Table 3. Mineral composition of little millet (mg/100 g)¹

Sample	Calcium	Iron	Magnesium	Phosphorous	Potassium	Zinc
MSSRF-BD1	29.5±0.97	90.8±1.77	149.5±3.32	209.9±2.47	214.1±2.71	1.78±0.03
MSSRF-BD2	29.1±1.12	75.5±2.11	165.9±2.91	251.1±2.82	222.3±2.89	1.98±0.02
MSSRF-BD3	23.5±1.06	29.7±1.35	135.5±2.69	208.3±2.94	222.9±2.31	1.96±0.04
MSSRF-BD4	24.1±1.47	14.6±0.86	132.3±2.23	224.9±2.31	263.2±2.79	1.75±0.02
MSSRF-BD5	22.6±1.68	40.8±1.45	139.8±2.21	226.4±2.33	252.8±1.72	1.52±0.03
MSSRF-BD6	30.8±1.57	14.8±0.94	167.5±3.12	227.8±2.84	267.3±2.43	2.14±0.03
MSSRF-BD7	36.6±1.19	10.5±1.27	165.3±2.63	218.1±2.22	244.5±2.67	2.10±0.03
MSSRF-BD8	56.4±2.13	45.2±1.73	166.3±2.55	254.2±3.27	250.5±2.42	1.89±0.04
MSSRF-BD9	27.8±1.12	42.3±1.21	132.2±2.14	184.3±2.24	257.9±2.63	1.98±0.03
MSSRF-BD10	26.3±1.18	24.5±1.22	167.2±2.83	277.2±3.31	239.6±2.42	1.82±0.04
MSSRF-BD11	30.4±1.32	28.9±1.18	131.3±2.31	201.1±2.13	199.2±1.84	1.95±0.03
MSSRF-BD12	22.9±1.71	24.1±1.29	155.9±2.16	272.7±3.14	278.5±2.38	1.69±0.04
MSSRF-BD13	24.4±1.28	32.0±1.27	162.3±2.71	242.9±2.26	224.9±2.22	2.06±0.02
MSSRF-BD14	26.1±1.32	54.4±1.88	186.6±2.38	308.9±3.23	257.8±2.17	1.74±0.03
MSSRF-BD15	36.0±1.76	50.5±1.74	183.5±2.63	289.5±2.87	303.4±2.71	1.97±0.05
MSSRF-BD16	25.0±1.17	13.6±0.95	172.9±2.85	263.8±2.38	247.4±1.92	2.09±0.03
MSSRF-BD17	25.7±1.36	36.8±1.14	161.6±2.31	211.1±2.46	245.2±2.17	1.85±0.04
MSSRF-BD18	23.1±1.19	7.84±0.63	141.7±2.42	239.0±2.44	259.0±1.16	2.06±0.03

¹Values are expressed as means ± SD of three replicates

mg/100 g, with accession MSSRF-BD6 having the highest. Over all analysis of the mineral composition of little millet showed that they contained minerals in varying amounts in the following order, K>P>Mg>Fe>Ca>Zn.

The samples collected from different locations indicated a high level of variability in terms of their proximate and mineral composition. Accessions having high nutrient content can possibly be used in breeding programmes, promotion of large scale cultivation and consumption. Under-utilized species like little millet are likely to be useful in fighting malnutrition and hidden hunger, both in the areas of cultivation and urban locations.

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