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Screening of little millet landraces for chemical composition

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ABSTRACT

The proximate composition of little millet landraces collected from 12 localities has been studied on the basis of locality, colour and size and shape. Landraces did not differ with respect to their fat, protein, fiber or ash contents but some differences were observed amongst them in their moisture content. The moisture content in all the landraces was non-significant with one another except collected from Karadikoppa (4.37%) having lowest moisture content. The landraces differed only with respect to moisture content on the basis of colour whereas the differences in relation to fat, protein, fiber and ash content were non-significant. While studying the effect of size and shape on the moisture, fat, protein, fiber and ash contents it was found that small round races exhibited lowest moisture content (4.87%) which was significantly comparable to small lengthy (5.40%), big round (5.59%), small oval (5.62%) and small flattened (5.71%) landraces the latter four categories being at par with one another. The landraces differed non-significantly for fat, protein, fiber and ash contents.

Keywords: Millet; landraces; proximate composition

INTRODUCTION

Cereals play an important role in the human diet. Cereals belong to the family Poaceae which include wheat, rice, barley, oats, rye, maize, sorghum and millets as major grain crops in the world market. Millets are small seeded cereals that are cultivated mainly in semiarid and tropical regions of Asia and Africa.

Millet is one of the oldest cultivated foods known to humans and possibly the first cereal grain used for the domestic purpose. It has been used in Africa and India as a staple food for thousands of years. Of the 30 million tons of millet produced in the world about 90 per cent is utilized in developing countries and only a tiny volume is used in developed countries. The decline in production may be due to reduced cultivated area which is shifted to other crops like rice, wheat, maize etc (Anon 2009). These crops are virtually free from insect-pests in the field while they are affected by a few major diseases. Plant protection measures which are seldom used

by farmers can contribute to productivity increase by minimizing the disease-induced yield crops (Padulosi et al 2009).

Little millet (*Panicum sumatrense*) is one of the important minor millets grown extensively in the tropics and a staple food for the low income groups in some countries of the world. By any nutritional parameter millets are miles ahead of rice and wheat in terms of their mineral content compared to rice and wheat (Gopalan et al 2007). Little millet is comparable with other cereals such as rice and wheat as a source of protein, fat, carbohydrates and crude fibre apart from minerals and vitamins. Millets are also rich source of antioxidants. Now a days the role of antioxidants in human health is gaining more importance. Free radicals are produced in human body constantly and are capable of attacking the healthy cells of the body causing them to lose their structure and functions.

Antioxidants in food may be defined as any substance which is capable of delaying, retarding or preventing the development in food of rancidity or other flavour deterioration due to oxidation. Antioxidants delay the development of off flavours by extending the induction period. Addition of antioxidants after the end of this period tends to be ineffective in retarding rancidity development. Recent epidemiological studies have suggested that increased consumption of whole grains, fruits and vegetables is associated with reduced risks of chronic diseases (Hu 2002).

MATERIAL and METHODS

Totally 92 little millet landraces were procured from the farmers of different districts of Karnataka viz Dharwad, Haveri and Chitradurga grown in the year 2007-09. All the samples were collected in one lot, cleaned and stored in polythene covers and used for entire study. Based on chemical composition top 12 landraces were selected for further study.

Analysis of proximate composition

Proximate principles such as moisture, crude protein, crude fat and total mineral matter were analyzed according to standard AOAC procedures.

Moisture

About 10 g of sample was weighed into previously weighed moisture cup and dried in an oven at 100-105°C till a constant weight was attained. Per cent moisture content was calculated as under:

$$\text{Moisture per cent} = \frac{\text{Initial wt (g)} - \text{Final wt (g)}}{\text{Sample wt (g)}} \times 100$$

Crude protein

The nitrogen content of the grain was assessed by Kjeldahl method using Pelican Kelplus equipment. Crude protein was calculated by multiplying with a factor 6.25.

$$\text{Protein (\%)} = \frac{\text{Titre value-Blank x N of HCl x 14.007 x 6.25}}{\text{Sample wt (g)}} \times 100$$

Crude fat

Moisture free sample was weighed in moisture free thimble and crude fat was extracted by refluxing in soxplus apparatus using petroleum ether as solvent. Per cent crude fat was calculated by difference (Anon 1990).

$$\text{Crude fat per cent} = \frac{\text{Initial weight (g)} - \text{Weight after extraction (g)}}{\text{Sample wt (g)}} \times 100$$

Crude fibre

Crude fibre was estimated from the moisture and fat free sample. The residue obtained after digestion with acid and alkali was dried in crucible and weighed. The difference in weight of the crucible before and after ashing of the digested residues was taken as weight of the crude fibre (Anon 1990).

$$\text{Fibre (\%)} = \frac{\text{Weight of residue before ashing (g)} - \text{Weight of residue after ashing (g)}}{\text{Weight of fat free sample (g)}} \times 100$$

RESULTS and DISCUSSION

Table 1 shows the proximate composition of whole grain millets based on locality. The moisture content in the landraces ranged from 4.37 (Karadikoppa) to 5.73 (SS Koppa) per cent. However the moisture content in all the landraces was non-significant with one another except collected from Karadikoppa (4.37%) having lowest moisture content which on the other hand was at par with landraces collected from Tirumallakoppa (4.90%). Fat content varied from 2.93 (Shishunal) to 4.79 (Jekinkatti) per cent; protein content from 7.39 (Chadaval) to 7.68

Table 1. Proximate composition (%) of little millet landraces based on locality

Locality	Moisture	Fat	Protein	Fiber	Ash
Chikkayagatti	5.59*	4.52	7.63	2.80	4.53
Jekinkatti	4.87	4.79	7.55	2.80	1.52
Chadaval	5.30	4.62	7.39	2.73	3.19
Ganjigatti	5.50	3.15	7.52	2.68	3.53
Palikoppa	5.59	4.53	7.65	2.66	3.00
Tirumallakoppa	4.90	3.04	7.68	2.71	4.67
Shishunal	5.57	2.93	7.64	2.73	4.88
BN Koppa	5.36	4.49	7.52	2.69	3.15
Karadikoppa	4.37	4.26	7.57	2.77	4.63
Kamplikoppa	5.55	4.52	7.52	2.70	3.65
SS Koppa	5.73	4.37	7.61	2.76	3.30
Mantrodi	5.52	4.59	7.64	2.69	4.00
SEm±	0.302	0.768	0.119	0.068	1.343
$CD_{0.05}$	0.882	NS	NS	NS	NS

*Mean of three replications

(Tirumallakoppa) per cent; fiber content from 2.66 (Palikoppa) to 2.80 (Chikkayagatti, Jekinkatti) per cent and ash content from 1.52 (Jekinkatti) to 4.88 (Shishunal) per cent but all the landraces differed non-significantly with respect to one another for these traits. While comparing the landraces on the basis of their colour (Table 2) the trends remained the same. The landraces differed only with respect to moisture content on the basis of colour whereas the differences in relation to fat, protein, fiber and ash content were non-significant. The moisture content in blackish landraces was lowest (3.66%) with highest (5.71%) in creamish coloured ones the latter being at par with creamish brown and blackish brown landraces.

Size and shape of the landraces did not have significant affect on their fat, protein, fiber or ash contents (Table 3). Only some differences were found in the moisture content. Small round races exhibited lowest moisture content (4.87%) which was significantly comparable to small

Table 2. Proximate composition (%) of little millet landraces based on colour

Colour	Moisture	Fat	Protein	Fiber	Ash
Creamish brown	5.59*	4.55	7.51	2.79	4.67
Blackish	3.66	4.38	7.40	2.70	5.26
Blackish brown	5.59	4.46	7.56	2.72	5.45
Creamish	5.71	3.04	7.64	2.79	3.01
SEm±	0.076	0.769	0.112	0.044	0.786
$CD_{0.05}$	0.248	NS	NS	NS	NS

*Mean of three replications

Table 3. Proximate composition (%) of little millet landraces based on size and shape

Size and shape	Moisture	Fat	Protein	Fiber	Ash
Small round	4.87*	4.61	7.68	2.71	4.67
Big round	5.59	4.60	7.66	2.61	4.63
Small flattened	5.71	4.12	7.57	2.78	4.79
Small lengthy	5.40	3.64	7.56	2.70	5.29
Small oval	5.62	4.55	7.48	2.56	4.48
SEm±	0.25	0.512	0.136	0.123	0.159
$CD_{0.05}$	0.79	NS	NS	NS	NS

*Mean of three replications

lengthy (5.40%), big round (5.59%), small oval (5.62%) and small flattened (5.71%) landraces the latter four categories being at par with one another.

Ragaee Sanaa et al (2006) analyzed 4 cereals including barley, pearl millet, rye and sorghum and found that barley whole grain had highest protein content (19.4%) and pearl millet exhibited the lowest levels (8.8%). Barley whole grain had the highest total ash content (2.9%) among cereals followed by rye, millet and sorghum (1.96, 1.82 and 1.87%). Madibela and Modiakgotla (2004) analysed samples of three finger millet landraces NPGRC 3001, NPGRC 3002 and NPGRC 3003 for ash, CP, NDF, ADF, ADL, NDF-N, Ca, P, Zn, Mn, Cu and IVDMD. They reported that NPGRC 3001 had the highest

IVDMD (62.6% DM) while NPGRC 3002 had the highest ash (15.1% DM), NDF (72.6% DM) and ADF (41.3% DM) content. CP was positively correlated to NDF-N ($r = 0.57$; $P<0.001$) and to IVDMD ($r = 0.40$; $P<0.01$). The amount of protein in straw was lower than that of the vegetative form but was well above what would be expected in natural grass harvested at full maturity.

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