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Screening of best little millet variety based on physical and nutritional characteristics

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Abstract

Little millet varieties (T₂V₁ - CO2 (TNAU), T₂V₂ - CO4 (TNAU), T₂V₃ - CO3 (TNAU), T₂V₄ - Chittansamai (landrace), T₂V₅ - Kozhuthanasamai (landrace), T₂V₆ - Market variety), were procured from different places and study their physical and nutritional characteristics to found that best little millet variety for the standardization of different value added products. The physical characteristics of little millet varieties viz., thousand grain weight, thousand grain volume and bulk density were studied. Among the six varieties T₂V₂ was higher than other varieties. The values of thousand grain weight, thousand grain volume and bulk density of whole grain and dehulled grain was 2.87 and 2.47, 4.00 and 3.20 and 0.75 and 0.92 for T₂V₂. The Carbohydrate, protein, crude fibre, calcium and iron content was 66.75g, 7.50g, 7.40g, 16.50mg and 9.15mg in CO4 (TNAU) respectively. The overall results revealed that T₂V₂ sample were comparatively higher in physical and nutrient content than the other varieties; it was found that the variety T₂V₂ were best suited for the product development.

Keywords: Little millet varieties, physical and nutritional characteristics, best variety screening

Introduction

Millets are one of the oldest and first cereal grains to be used for domestic purposes. There are around 6,000 varieties of millet grown throughout the world. The World's millet production is shared by South and East Asia (about 60%), Eurasia and Central Asia (14%), Africa (16%) and rest of the World (10%). Millets are underutilized in many developed countries. There is an immense potential to process millet grains into value added foods. Millet grain is highly nutritious with good quality protein, vitamins, dietary fibre, phyto-chemicals and rich in minerals. The tiny "grain" is gluten-free and packed with vitamins and minerals. The nutritional composition of the millets is compared with that of rice and wheat. Millet grains account for about one sixth of the total food grain production hold an important place in the food grain economy of India. (Pradhan *et al.*, 2010) [8].

Little millet (*Panicum miliare* and *Panicum sumatrense*) known as *Samai* in Tamil and *Kutki* in Hindi is a native of South Eastern Asia, grown throughout India to a limited extent but is of little importance elsewhere (De Wet, 1986) [3]. Little millets are staple foods of the poor and are crops of tribal areas and marginal lands. They are used as food in situations, where other food grains cannot be raised or purchased at economic prices (Dendy, 1992) [4]. Five varieties of little millet (K-1, CO-2, CO-3, Paiyur-1 and Paiyur-2) were released by the Tamil Nadu Agricultural University, Coimbatore, which are short duration varieties, drought tolerant and disease resistant (Anon, 1999) [1]. Little millet is grown throughout India to limited extent up to altitudes of 2100m. It has received comparatively little attention from plant breeders. The plant varies in high between 30 and 90 cm. The seeds of little millet are smaller than that common millet (Santosh, 2004) [11]. Little millet was nutritionally superior to rice and wheat and provide cheap protein, minerals, vitamins and fibre and are rightly designated as nutritious cereals (Seetharama and Rao, 2004) [12].

Materials and Methods

Three varieties of little millet from the Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, Coimbatore, two varieties of land traces of little millet from Jawwadhu hills, Thiruvannamalai District and one variety from the local market (Market variety) were procured and utilized for the study.

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A. Physical characteristics of little millet varieties

The characteristics like thousand grain weight, thousand grain volume and bulk density of kodo millet were studied by following the procedures as described below. All the estimations were done in triplicates. The size of the seed was measured using calipers to the nearest of 0.01 mm.

Thousand grain weight

Weight of randomly selected thousand grains was recorded in grams using electronic balance with a sensitivity of 0.01 mg.

Thousand grain volume

Thousand randomly selected grains were dropped in a measuring cylinder containing known volume of distilled water. The difference in volume was recorded in ml.

Bulk density

A 30g (14 per cent weight moisture content) of the sample was put into a 100ml measuring cylinder. The cylinder was tapped continuously until a constant volume was obtained. The bulk density was calculated as weight of grain (g) divided by grain volume (ml) and the bulk density was expressed as g per ml.

B. Nutritional characteristics of the little millet varieties

The chemical composition of the little millet varieties was analyzed. The nutrients like moisture, carbohydrate, crude protein, crude fibre, calcium, iron were analyzed and presented in Table 1.

Results and Discussion

A. Physical characteristics of the little millet varieties

The whole millet grains and the dehulled grains were assessed for their physical properties. The physical characteristics of millet varieties viz., thousand grain weight, Thousand grain volume and bulk density were studied and presented in Table 2.

The thousand grain weight of the whole and dehulled grain was assessed. Among the T₂ samples, the higher thousand grain weight was found in T₂V₂ with the values being 2.87g and 2.47g for whole and dehulled grains respectively, when compared to other samples. Similarly the thousand grain volume of the whole and dehulled grain was assessed. The sample T₂V₂ was found to have a higher grain volume with value 4.00 ml for whole grains and 3.20 ml for dehulled grains respectively. The values for bulk density of T₂ samples ranged from 0.70 to 0.75g per ml for whole grains and from 0.88 to 0.92g per ml for dehulled grains respectively. The bulk density of T₂V₂ was found to be maximum with the values being 0.75 and 0.92g per ml for whole and dehulled grains respectively. The overall results revealed that T₂V₂ sample procured from Tamil Nadu Agricultural University were comparatively higher in nutrient content than the land race and market varieties.

B. Nutritional characteristics of the little millet varieties

The mean proximate composition of the little millet grain varieties are presented in Table 3. The little millet varieties were high in iron content ranging from 9.08 to 9.15g per 100g. The proximate composition of T₂V₂ was comparatively higher than the landrace and market varieties. The carbohydrate, protein, fibre and calcium content of the T₂V₂ variety was 66.75g, 7.50g, 7.40g and 16.50mg per 100g respectively and was found to be comparatively higher than the other five varieties.

Kumari *et al.* (2000) [6] studied the nutritive value of malted finger millet varieties and their use in the preparation of burfi. Five finger millet varieties such as PES-400, PES-176, PES-110, PES-4 and PES-5 were malted. Malting of finger millet resulted in significant changes in nutrient composition such as calcium, iron, zinc and vitamin-C which ranged from 516-596, 8.26-15.10, 1.66-2.22 and 5.08-8.74mg per 100g, respectively in all the varieties.

Table 1: Methods of Analysis

Parameters	Methods	References
Moisture	Hot air oven method	Ranganna (1995) [9].
Carbohydrate	Phenol sulphuric acid method	Dubois <i>et al.</i> (1956) [5].
Crude Protein	Micro kjelplus method	Ma and Zuazaga, (1942) [7].
Crude fibre	Acid and alkali digestion	Sadasivam & Manickam (1996) [10].
Calcium	Titration	Clark and Collip, (1925) [2].
Iron	Colorimetric method	Wong, (1928) [13].

Table 2: Mean value of physical characteristics of the little millet varieties

Treatment and Varieties	Thousand Grain weight (g)		Thousand Grain volume (ml)		Bulk density (g/ml)	
	Whole grain	Dehulled grain	Whole Grain	Dehulled grain	Whole Grain	Dehulled grain
T ₂ V ₁	2.60	1.79	3.60	2.20	0.71	0.89
T ₂ V ₂	2.87	2.47	4.00	3.20	0.75	0.92
T ₂ V ₃	2.70	1.90	3.55	2.40	0.72	0.90
T ₂ V ₄	2.74	1.98	3.60	2.50	0.72	0.89
T ₂ V ₅	2.59	1.89	3.50	2.17	0.70	0.88
T ₂ V ₆	2.71	2.06	3.60	2.60	0.73	0.90

T₂V₁ - CO2 (TNAU), T₂V₂ - CO4 (TNAU), T₂V₃ - CO3 (TNAU) T₂V₄ - Chittansamai (landrace), T₂V₅ - Kozhuthanasamai (landrace), T₂V₆ - Market variety

Table 3: Mean value of nutritional characteristics of the little millet varieties (per 100g)

Varieties	Moisture (g)	Carbohydrate (g)	Protein (g)	Crude Fibre (g)	Calcium (mg)	Iron (mg)
T ₂ V ₁	11.40	66.00	7.00	7.20	16.30	9.10
T ₂ V ₂	11.45	66.75	7.50	7.40	16.50	9.15
T ₂ V ₃	11.42	66.20	7.20	7.05	16.10	9.08
T ₂ V ₄	11.41	66.20	7.10	7.10	16.15	9.11
T ₂ V ₅	11.39	66.10	7.00	7.05	16.24	9.10
T ₂ V ₆	11.40	66.00	7.10	7.15	16.28	9.11

T₂V₁ - CO2 (TNAU), T₂V₂ - CO4 (TNAU), T₂V₃ - CO3 (TNAU) T₂V₄ - Chittansamai (landrace), T₂V₅ - Kozhuthanasamai (landrace), T₂V₆ - Market variety

Conclusions

A. Physical characteristics

The mean thousand grain weight for the whole and dehulled grains of T₂V₂ was 2.87g and 2.47g respectively which was higher than the other samples. The thousand grain volume of the whole and dehulled grain for T₂V₂ was 4.00 ml and 3.20 ml respectively. The bulk density of T₂V₂ was 0.75g per ml for whole grains and 0.92g per ml for dehulled grains.

B. Nutritional characteristics

The moisture content of T₂V₁, T₂V₂, T₂V₃, T₂V₄, T₂V₅ and T₂V₆ were 11.40g, 11.45g, 11.42g, 11.41g, 11.39g, and 11.40g respectively. The Carbohydrate, protein, crude fibre, calcium and iron content was 66.75g, 7.50g, 7.40g, 16.50mg and 9.15mg in T₂V₂ respectively. The overall results revealed that T₂V₂ sample were comparatively higher in nutrient content than the other variety.

From the results of physical and nutritional characteristics of the little millet varieties, T₂V₂ - CO4 (TNAU) was best suited for the product development.

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