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Dr. TV Hymavathi

Professor & Head, Department of Foods and Nutrition, Post Graduate & Research centre, PJTS Agricultural University, Rajendranagar, Hyderabad, Telangana, India

TP Pradeepa Roberts

Research Associate, Millet Processing & Incubation Centre, PJTS Agricultural University, Rajendranagar, Hyderabad, Telangana, India

E Jyothsna

Assistant Professor, Department of Foods and Nutrition, Post Graduate & Research centre, PJTS Agricultural University, Rajendranagar, Hyderabad, Telangana, India

V Theja SRI

Research Associate, Millet Processing & Incubation Centre, PJTS Agricultural University, Rajendranagar, Hyderabad, Telangana, India

Corresponding Author:**Dr. TV Hymavathi**

Professor & Head, Department of Foods and Nutrition, Post Graduate & Research centre, PJTS Agricultural University, Rajendranagar, Hyderabad, Telangana, India

Proximate and mineral content of ready to use minor millets

Dr. TV Hymavathi, TP Pradeepa Roberts, E Jyothsna and V Theja Sri

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Abstract

Millets are underutilized and neglected crop because of less knowledge about its utilization and problems encountered while handling such as lower cooking quality, taste and low bioavailability. These issues can be resolved and make them valuable as food by relocating them into ready to use form. The present study aimed at proximate composition and mineral content of ready to use minor millets. The protein content of processed /dehulled minor millets ranged from 9.21g to 15.72g per 100g. Protein content of four dehulled minor millets were comparatively higher than rice. Barnyard millet recorded highest carbohydrate content whereas highest fat, protein, ash and crude fibre content was in proso millet (15.72g).

Keywords: Proximate, mineral, minor millets

Introduction

Millets are considered food safety crops because of their resilience in adverse agro-climatic settings ^[1]. Such crops have significant potential to expand the food basket's genetic diversity and boost food and nutrition safety ^[2]. In addition to food, millets offer health benefits in daily diets and aid in the management of disorders like diabetes mellitus, obesity, hyperlipidaemia, cancer, etc. ^[3] Millets are also superior to major cereals concerning nutrient composition and nutritional benefits for the modern lifestyle. They are rich sources of dietary fibre, phytochemicals and micro-nutrients ^[4, 5].

Though minor millets are nutritionally superior to cereals, their utilization is limited owing to drudgery associated with its processing ^[6]. There is a need to restore the lost interest in millets that deserves recognition for its nutritional qualities and potential health benefits in the management of diabetes mellitus, obesity and hyperlipidaemia ^[7-11]. Provision of such nutritionally superior grains in consumer-friendly RTC or RTE convenient form would, promote enhanced utilization for better nutrition of the modern consumers and encourage the farming and processing sectors. The food sector has been witnessing a marked change in consumption patterns. RTC or convenience food, is now dotting the shelves of urban stores and supermarkets.

In recent years, there is a great public demand for ready to cook millets, however, there was no information on the processed minor millets, many studies were focussed on whole grains. Millet and some other coarse grains are usually dehulled and subjected to different treatments before consumption to improve their sensory and edible quality ^[12]. Dehulling of grains is necessary because hulls contain a very high percentage of silica ^[13]. The dehulled millet might be cooked as discrete grains similar to rice to obtain soft edible texture in a shorter time than the whole grains ^[14]. There was no information available in the literature on the nutritional composition of the ready to use millet rice. Hence in the present study, proximate composition and mineral content was estimated in the ready to use millet rice available in the market.

Methods

Dehulled minor millets (Figure 1) were purchased from Sai Techno youth Association, Rythu bazaar, Mehdipatnam, Hyderabad and samples were stored in an airtight container for further analysis. Dehulled millet samples were ground to powder and analyzed for the following.

Fig 1: Dehulled minor millets

Moisture and ash were estimated as per procedures of Indian Standards (1968) [15]. Protein [16], fat [17], crude fibre [18], Iron [19], Calcium [19] and Zinc [20] was estimated by the standard methods of Association of official analytical chemists. Total carbohydrate was calculated by the difference method (summing the values of moisture, crude protein, ash and crude fat (ether extract) and subtracting the sum from 100) [21].

Results

The proximate composition of the millets was given in Table 1. The protein content of processed/dehulled minor millets ranged from 9.21g to 15.72g per 100g which were relatively higher than rice and maize [22]. Among the four dehulled grains proso millet had the highest protein content (15.72g)

followed by little millet, while kodo millet has lowest protein content (9.21g). Though kodo millet had lower protein content among four grains it is at par with unprocessed sorghum (9.97g) and higher than Ragi (7.16g) [22]. The protein content of dehulled minor millet grains found to have higher content than their whole grain counterparts [22] except for dehulled barnyard and this might be due to varietal differences. Many studies revealed that pre-treatment such as dehulling or milling has a significant positive effect on the nutrient content of the millet flour [23, 24]. Dehulled proso and little millet met around 25% and 20% of daily protein intake /RDA respectively [25]. In the protein deficient population if these grains are consumed regularly in the form of rice some of the protein requirement can be met.

Table 1: Proximate analysis of dehulled minor millets

Parameters	Barnyard millet	Little millet	Kodo millet	Proso millet
Moisture (%)	11.24	11.98	10.83	10.29
Protein (g)	10.05	11.58	9.21	15.72
Carbohydrates (g)	74.99	71.28	74.71	63.65
Fat (g)	1.55	2.84	2.59	4.90
Ash (g)	0.42	0.39	0.83	1.53
Crude fibre (g)	1.75	1.93	1.83	3.91

Barnyard millet and proso millet exhibited highest carbohydrate, however, highest fat content was found in proso millet (4.90g) followed by little millet (2.84g). Generally fat in cereals ranges from 0.5 g to 5.5g [22]. Lipids are relatively minor constituents in cereal grains but lipid content in

dehulled grains of proso millet ranged from 3.5 to 6.7% [7, 26-28]. Oat has highest content (7.14%) of lipids followed by bajra and amaranth [22]. Barnyard millet exhibited lowest fat content (1.55g) whereas little and kodo millet exhibited almost similar values (2.84g & 2.59g respectively).

Fig 2.

Minor millets are found to possess hypoglycemic and hypolipidemic activity which may be due to high dietary fiber and its resistant starch content [29]. The minor millets improve its digestibility and help in the peristaltic movement of the intestine and this is due to their high crude fibre [30]. In comparison to other dehulled minor millets, proso millet had the highest crude fibre content (3.91g) and least in barnyard millet (1.75g). This clearly indicates that even after dehulling the fibre content of the four millets was higher than the rice (1.0g) and wheat (2.0g), however only barnyard exhibited slightly lower fibre content than that of wheat.

With respect to ash content, Proso millet was found to have highest ash content (1.53g). Mineral compounds in proso millet grains ranged from 1.5 to 4.2g [7, 28, 31] and it is higher than in wheat caryopsis (1.5–2.0%). Higher ash content indicates higher mineral content. The maximum content of mineral compounds is present in the pericarp, aleurone layer and germ. The mineral content is decreased to about 27-53% during common food processing, dehulling [32]. The intensity of losses of mineral compounds content is depended on the economy of dehulling. Iron and zinc content was found to be high in dehulled proso millet (3.84g and 2.93g respectively) followed by little millet whereas, calcium was high in little millet (24.99g). Though calcium content in little millet was lower than the other major millets, zinc content in dehulled minor millets was higher than major cereals. Whole wheat was reported to contain (2.85g) of zinc [27]. Consumption of 100 g of dehulled proso millet can meet approximately 16% of the RDA of zinc.

Conclusion

Nutrient rich minor millets require preliminary processing before consumption either in the form of rice or for further use in several secondary processed product formulations. Sometimes extreme processing changes the grain structure resulting in diminished nutrients. Hence primary/grain processing methods such as dehulling should be prompt and standardized to emanate nutri cereal in better form by improving their digestibility and mineral bioaccessibility as an uncontrolled dehulling result in a highly refined product which was not recommended. Even other primary processing methods such as soaking, germination reduced the antinutrient

activity and improved mineral availability but compared to above pre-processing methods dehulling gained immense response as it brought ancient grains in modern form i.e. in ready to use form. The present study has shown that among processed minor millets proso millet had the highest protein, ash, fat and crude fibre content. The nutrient content in all dehulled minor millets was better than regularly consumed wheat and rice. On the other hand proximate and mineral content of dehulled minor millets data can be used to develop various value-added products to enhance its utilization. The antinutritional factors and low sensory acceptability that hindered the whole grain consumption can be minimized if dehulled minor millets are popularized.

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