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ANALYSIS OF KUTKI (*Panicum sumatrense*) FROM MELGHAT FOR ITS PHYSICO-CHEMICAL, FUNCTIONAL AND NUTRITIONAL PROPERTIES

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ABSTRACT

Kutki or little millet *Panicum sumatrense* is a kind of minor millet extensively grown in Melghat province. It is a native crop of India. The minor millets can grow in insignificant environmental situations where the other major cereals such as wheat, rice, maize, etc, proved to be unsuccessful to grow. It can be termed the bio-energy crop because of its short duration as well as high yield of biomass production. Despite the remarkable benefits, there is very little research work carried out to explore the properties of Kutki. In the current study,Kutki is analyzed for the determination of its physicochemical and functional properties.The Kutki grains were procured from the local market in the year 2019. Physicochemical parameters such as moisture, ash, total carbohydrates, total fats, protein, energy, dietary fibers, monounsaturated, saturated, and poly-unsaturated fats, sodium, calcium, iron, and some functional properties such as dry and soaked grain weight and volume (1000 grains), dry and soaked bulk densities, hydration capacity and index, swelling capacity and index, etc. were also determined. The data obtained showed that the Kutki from Melghat is of excellent quality. The functional properties showed that it can be utilized for various product making and value addition. It is suggested that there is a great need to study more regarding the properties of Kutki from Melghat and its utilization for different products.

(Key words: Melghat, Kutki, *Panicum sumatrense*, little millet, Chikhaldara, Amravati)

INTRODUCTION

Melghat

Melghat is a gigantic forest tract and tribal region spread over Dharni and Chikhaldara tehsils located in the laps of the *Maikal* ranges of *Satpuda* hills. It is the part of Amravati district of Maharashtra state and has a combined area of two Sanctuaries named *Melghat* and *Wan* as well as Gugamal National Park.

Chikhaldara is a hill station at a height of about 1100 meters above sea level. It is a gigantic forest area with an exclusive and representative ecosystem with rich biodiversity and varied habitats. Schedule tribes including *Nihal, Korku, and Gond* are the predominant inhabitant of the *Melghat,* while *Balai, Gaoli*, and *Gaolan* are the other most important tribes (Bhoyar *et al*., 2018; Anonymous, 2015).

Malnutrition among kids is the most rigorous problem in the region. Poverty and consumption of a diet with low nutrition are some of the very important grounds for malnutrition (Singh and Singh, 2008).

Little millet

Millets are some of the oldest crops cultivated by humanity since 8000 BC. Millets are having excellent nutritional potential but due to the lack of awareness are not used by the people extensively. Millets are sturdy, drought and adverse climate-resistant also resistant to pests and diseases, of medium duration, required low labor cost (Anonymous, 2013). Owing to C_4 plants they are more eco-friendly. On account of their nutritional and therapeutic potential, they are known as the Nutri-cereals.As well, their phytochemical richness makes them functional food. Because of it, they are helpful for food security and in the reduction of malnutrition (Sarita and Singh, 2016).In spite of these benefits, the cultivation of millets is now decreasing constantly due to various reasons.

Little millet *(Panicum sumatrense)* is a kind of minor millet extensively grown in Melghat province. Kutki is a Hindi/ Marathi or local language name of this foremost crop. It is the native crop of India. The minor millets have a capacity to grow in insignificant environmental situations in which the other major cereals such as wheat, rice, maize, etc, proved to be unsuccessful to grow. They are also called the bioenergy crop because of their short duration as well as high yield of biomass production (Hemalatha *et al*., 2006).

Regardless of its nutritional supremacy, very less work was done on the properties of millets and the literary documentation is more scrappy and poorer than other popular cereals like wheat, rice, etc. Its consumption as a portion of food is restricted to tribal populations which are

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the traditional consumers. The scenario might be due to the non-availability of the products that are ready to eat and friendly to consumers.

It was observed that very little research was done on little millet especially, of the Melghat. The research on Kutki may open the new dimensions of study and nutrition and be found beneficial for the progress of the region as well as the people. In the current study, Kutki from Melghat was studied for its physicochemical and functional properties.

MATERIALS AND METHODS

The Kutki grains were procured from the local market in the year 2019. The refractions were removed from the grains. Refractions may be defined as the materials present in the grains. These materials are different from normal food grains in many dimensions. Refractions include other food grains, broken grains as well as grains that are damaged, etc. The refractions were identified as per the definitions mentioned in the Regulation of the Food Safety and Standard Authority of India (FSSAI) manual (Anonymous, 2016).

Kutki is analyzed for the determination of its physicochemical and functional properties. The methods published in the standard journals were used for the analysis. Grain weight, grain volume, bulk density, hydration capacity, and swelling capacity were measured as suggested by Kamatar *et al*.(2013) and Reddy *et al*.(2019). Moisture content was determined by using the method given in the FSSAI manual (Anonymous, 2016). Ash, protein, total fat, dietary fibers, and calcium were estimated by following the methods by Ranganna, (2007). While sodium and iron were determined as per the FSSAI manual (Anonymous, 2016) and total carbohydrates were calculated as per the standard method (Anonymous, 2007).

RESULTS AND DISCUSSION

The results obtained are presented in Table 1 and 2.

The weight of 1000 grains of Kutki was measured as 3.91 grams and its volume was 4.12 ml. Thus the bulk density of dry grains of little millet was 0.95 g ml^{-1}. The grain dimensions affect strongly the 1000 grain weight. As per Reddy *et al*.(2019) the 1000 grain weight is a very important characteristic of cereals and millets as it helps in designing and performing the plenty of unit operations such as cleaning and grading. It is especially helpful during the execution of threshing operations where the particular sizes of screens are essential used for the separation of the grains from other unwanted materials.

Table 1. Physical and functional properties of Kutki

S.N.	Physical/Functional parameters	Values obtained
1	Dry grain weight in gram (1000 grains)	3.91
2	Dry grain volume in ml (1000 grains)	4.12
3	Bulk density of dry grains (g ml^{-1})	0.95
4	Weight of 1000 grains in gram (Soaked)	4.5
5	Volume of 1000 grains in ml (Soaked)	4.76
6	Bulk density of soaked grains (g ml^{-1})	0.94
7	Hydration capacity (g)	0.59
8	Hydration Index	15.09
9	Swelling capacity (ml 100 g^{-1})	0.64
10	Swelling Index	15.53
11	Moisture (mass %)	11.25
12	Total Ash (mass %)	1.06

Table 2. Nutritional and chemical composition of Kutki

S.N.	Nutritional/Chemical Parameter	Values obtained
1	Total carbohydrates (mass %)	73.65
2	Total fat (mass %)	4.05
3	Total proteins (mass %)	9.99
4	Energy (Kcal 100 g^{-1})	371.01
5	Dietary fibers (mass %)	6.03
6	Monounsaturated fats (mass %)	0.79
7	Saturated fats (mass %)	0.63
8	Poly unsaturated fats (mass %)	2.59
9	Ash content (mass %)	1.06
10	Sodium (mg 100 g^{-1})	12.45
11	Calcium (mg 100 g^{-1})	4.18
12	Iron (mg 100 g^{-1})	5.23

In a similar way, the dimensions of soaked grains were measured. The weight of 1000 soaked grains was observed as 4.5 grams, while its volume was 4.76 ml. There was a similar increase was found in the weight and volume of grains after soaking which resulted in the similarity of the bulk density of dry and soaked grains. The bulk density of soaked grains was calculated as 0.94 g ml^{-1} similar to the dry grain density which was 0.95 g ml^{-1} in this case.

The hydration capacity and hydration index were calculated for the grains. The hydration capacity was obtained to have a value of 0.59, while the hydration index

was 15.09. As well as swelling capacity and swelling index were also calculated and got the values of 0.64 ml and 15.53 respectively for the Kutki grains under examination.

As suggested by Reddy *et al.* (2019) the knowledge about these water-related functional properties could be useful in the contribution to the quality of the value-added products, both in the preservation and processing as the addition of water i.e. hydration or wetting of the grains is one of the most important steps involved in the manufacturing of value-added and extruded products such as noodles, pasta, bakery items, ready to eat materials, etc. The interaction between water and flour particles is responsible for the formation of dough or other mixes. The values said that little millet might be appropriate for large-scale use in the manufacturing of certain processed products.

The moisture content of little millet was found at the level of 11.25 % and the ash content was 1.06 %. The values of moisture and ash are well in accordance with the values estimated by Reddy *et al.* (2019) i.e. 11.53% and 1.26% respectively.

There were 73.65 % of total carbohydrates found in the Kutki sample. Total carbohydrates are the material that is remained after deducting the amount of moisture, protein, fat, and ash. The carbohydrates present in the little millet are mostly in the form of starch followed by dietary fibers as well as other mono and disaccharides in minute amounts. The energy value of Kutki was found to be 371.01 Kcal 100 g^{-1}. Since the content of carbohydrates, proteins, and fats are at a significant level in the Kutki, it is an excellent source of food energy and proved to be one of the cheapest sources of energy.

As mentioned by Padulosi *et al.*(2015) it was given in the report by WHO that nutritionally little millet is more advantageous than rice since it has a low glycemic index than rice. The complex carbohydrates contained in the little millet release glucose during the digestion at a quite slower rate which is found to be beneficial for diabetic patients since the level of satiety of millet is better than other cereals. According to Bhat *et al.*(2018) high content of fibers in the millets gives additional support in preventing diabetes by lowering the rate of digestion. Thus, the consumption of little millet is beneficial over rice.

The dietary fiber content of the Kutki was found to be 6.03 %, which is a good level compared to other cereals and millets. The moisture content of the Kutki sample was measured as 11.25% while the amount of total fat was 4.05%.

The amount of saturated fats was observed as 0.63%, that of monounsaturated fat was 0.79%, and polyunsaturated fats were observed to have a level of 2.59%. The polyunsaturated fats that are good for health were in the highest amount on the other hand less beneficial saturated fats were observed at a very low level. As revealed by Jaybhaye *et al.*(2014) and Kamatar *et al.*(2013) the excellently beneficial fat profile of little millet makes them preventive agents against various fat-related clinical disorders such as hyperlipidemia, obesity, cardiovascular diseases, etc.

A total amount of 9.99% of proteins was found in the Kutki under examination. It is a good amount as compared to other cereals and millets. The total ash content of Kutki was 1.06%, which shows that it has a significant amount of minerals in it. The minerals were found as sodium- 12.45 mg 100 g^{-1}, calcium- 4.18 mg100 g^{-1}, and iron- 5.23 mg 100 g^{-1}.

The values obtained were in accordance with the data given bySivakumar *et al.* (2006) (8%), while was some what lower than Kajuna (2001) (13.4%) for FAO of UN and Rao *et al.* (2018) (10.1%). It can be postulated from the observation that the Kutki from the Melghat is of good quality.

There is a need for the implementation of modern methods of cultivation and cropping to enhance the yield and overall quality of the Kutki in this region. The crop might not only be proved as a remedy for the problem of malnutrition due to its splendid nutritional quality but also could be helpful in the conservation of the environment. It is said that this crop is an agent that can withdraw environmental carbon, hence helpful to deduct the burden of GHG (Green House Gases) (Anonymous, 2013).

The little millet might be helpful in the prevention of several clinical disorders such as diabetes, high blood pressure, cardiac-related problems, and many more. It is a gluten-free crop that is proved to be a gift for celiac patients. The anti acidic nature of millets might help in the detoxification of the body.

As declared by Anonymous, n.d. and Himanshu *et al.*(2018) consumption of millets might reduce gastrointestinal tract-related diseases like colon cancer or gastric ulcer. The problems of gasses, constipation, etc. can be solved by using millets regularly in food. It is also beneficial in the treatment of respiratory disorders such as asthma and the optimization of the capacity of the liver, kidney, and overall immune system. The phytochemicals, nutraceuticals, and antioxidants present in the millets are capable of maintaining good health. It also can serves as a probiotic.

It can be concluded that the Kutki (little millet) grown in Melghat was of excellent quality. It is superior in nutrition and medicinal properties than the other popular cereals and millets. The functional properties shows that it can be utilized for making various value added products and it can sustain the rigorous mechanical operations during its processing. It can be said that for the preparation of various products such as infant foods, snacks, flakes, instant mixes, etc, on a large scale, Kutki might be proved as a popular and suitable food ingredient. There is a need for more research work and implementation of modern methods of cultivation and cropping in order to enhance the yield and overall quality of the Kutki in this region.

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