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Vitality of minor millet than other common cereals for human beings

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Abstract
The lack of micronutrient such Fe, Ca, P, Zn in staple food crops in wide spread nutritional and health problem in developing countries. Mineral bioavailability in selected minor millet is higher than the normal cereals. Minor millet is nutricereals. Minor millets are a group of grassy plants with short slender Culm and small grains possessing remarkable ability to survive under severe drought conditions. Because of their important nutritional qualities, there is a need to revive their uses in daily diet. Millets can substitute major cereals for better health benefits. Therefore present study was undertaken to investigation the Fe, Zn, Ca, P content in some common cereals and minor millets. The study also investigated on carbohydrate and protein content.

Keywords: Millets, Sawan millet, Finger millet, Kodo millet

Introduction
Millet is a generic name that includes several small seeded cereals and forage grasses belonging to the family Poaceae. Millets are considered as first cereals, domesticated thousands of years ago at the beginning of human civilization. There are some evidences in Northern China showing that noodles had been made from two millet types, namely proso and foxtail millets 4000 years ago (Lu, *et al*. 2005) [8]. Out of the total millet produced in the world about 9 percent is utilized in the developing countries. The global millet production was about 27 million tonne s in 2009 (FAOSTAT, 2011).

Minor millets are a group of grassy plants with short slender Culm and small grains possessing remarkable ability to survive under severe drought conditions. Because of their important nutritional qualities, there is a need to revive their uses in daily diet. Millets can substitute major cereals for better health benefits Millets are one of the oldest foods known to humans and possibly the first cereal grain to be used for domestic purposes. Minor millets as appeared to major millets (Jowar and Bajra) are often referred to as "coarse grain" or "poor people crop". Millets are also unique due to their short growing season. They can develop from planted seeds to mature crop ready to harvest plant in sixty five days.

Millets are C_4 crops and hence are climate change compliant. There are varieties particularly in little millet and proso millet which mature in 60-70 days; yet providing reasonable and assured harvests even under most adverse conditions.. Six small millets viz, finger millet, barnyard millet, foxtail millet, proso millet, kodo millet and little millet are the most important minor millet crops of India. Anuradha, *et al.* (2014) [1] Millets are very easy to digest which contain high amount of lecithin and excellent for the nervous system. Millets are rich in vitamin B, especially Niacin (Vitamin B_3) and folic acid. Millets are rich source of carbohydrates and minerals, such as calcium, iron, phosphorus, potassium and dietary fiber these mineral is very important constituent of nucleic acid, which is the building block of genetic code. This form of cereal grain is very high in phosphorus content, which plays a vital role in maintaining the cell structure of the human body. The key role of this mineral helps in the formation of the mineral matrix of the bone and is also an essential component of ATP (adenosine tri-phosphate), which is the energy currency of the body. Recent research has indicated that the regular consumption of millet is associated with reduced risk of type 2 diabetes mellitus. This is mainly due to the fact that whole grains are rich source of magnesium, which act as a co-factor in a number of enzymatic reactions in the body, regulating the secretion of glucose and insulin. Magnesium is also beneficial in reducing the frequency of migraine attacks. It is even very useful for people who are suffering from atherosclerosis, diabetes and heart disease. The carbohydrate content is low and slowly digestible, which makes the millet a nature's' gift for the modern mankind who is engaged in sedentary activities. Millet is very easy to digest; it contains high amount of lecithin and is excellent for strengthening the nervous system. Nutritive value of millets is

comparable to other cereals with slightly higher content of protein and minerals (Gopalan, *et al*. 2002) [2]. The districts of Uttar Pradesh mostly suffer due to problem of malnutrition especially in the children and nursing mothers. Most of the deficiency diseases occur due to deficiency of protein, iron, calcium, vitamin A, which are present in sufficient amount in this millet. Keeping these facts in the mind the present investigation was done.

Material method

The present investigation was carried out at the students instructional farm of Narendra Dev University of Agriculture & Technology, Narendra Nagar (Kumarganj), Faizabad (U.P) located in the Indo-Gangetic plains of Eastern Uttar Pradesh at 26.47º N latitude and 82.12 E longitude at an altitude of 113 meter above the mean sea level (MSL). The experiment was laid out in Randomized Block Design with three replications and seven treatments. At the crop duration the minimum temperature was 22.5 ^{o}C and the maximum temperature was 41.0 ^{0}C, the relative humidity raged between 35- 98% and total rainfall received during crop period was 792.3 mm.

Mineral Profiling for calcium zinc and iron

The standard for ICP- OES was prepared from stock solution of Pb obtained from Perkin Elmer.

Instrumentation

Sample was analyzed by ICP-OES (Perkin Elmer optima 8000) with following optimal conditions

Table 1:

S. No	Operating condition	Value
1.	Plasma gas flow (L/min.)	8
2.	Auxillary gas flow (L/min)	0.2
3.	Carrier gas flow (L/min.)	0.55
4.	RF power [W]	1300
5.	View Distance (mm)	15
6.	Plasma View	Axial
7.	Sample Flow Rate	1.0

Total mineral content

The total mineral content was estimated by the methods as described by Hart and Fisher (1971).

Total carbohydrate content

Total carbohydrate in sawan millet sample was analysed by method of Yemm and Willis (1954)

Protein content

Protein content in sawan millet was determined by the Lowry's method (1951).

Table 2: Nutritional Composition of Minor Millet and Common Cereals Per/ 100g

S. No	Sample	Ca (mg/100g)	Fe (mg/100g)	mg (mg/100g)	p (mg/100g)	Zn (mg/100g)	Total Mineral	Carbohydrate (g)	Protein (g)
1	Barnyard millet	27.20	10.73	83.00	356.00	3.90	4.17	55.59	11.04
2	Kodo millet	44.20	7.30	149.00	296.10	0.70	3.49	66.49	11.59
3	Finger millet	351.00	2.68	136.00	28.00	2.30	2.78	68.99	7.79
4	Wheat Flour	40.99	3.91	129.00	355.00	2.2	1.60	72.00	11.00
5	Rice (raw)	12.05	0.80	71.00	160.16	1.4	1.35	77.12	7.59

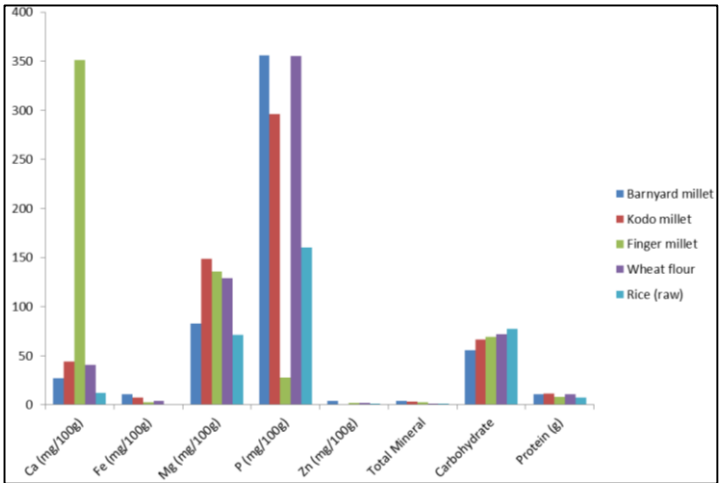

Fig 1: Nutritional Composition of Minor Millet and Common Cereals

Result and Discussion

Calcium acts as important intracellular messenger involved in regulation of various enzymes. Calcium is mediated via multipurpose calcium binding protein calmodulin. Which is a regulatory protein, calcium, calmodulin complex activates certain enzymes eg.Ca^{+} dependent protein Kinases and Adenylate cyclase. The absorption of calcium from food and its bioavailability is depend on factors in the gut as well as the occurrence of the inhibitory component such as oxalate phytate in the food source (Weaver and Hemey, 1991). Millet offers unique advantage for health being rich in micronutrients, particularly. Iron which structural part of form of the structure of haem, cytochrome and non heam iron proteins also needed for synthesis of chlorophyll. A number of iron sulphur proteins are component of mitochondrial electron transport chain. These proteins contain iron sulphur centers with either two or four iron atoms bound to an equal electron transport number of sulphur atoms. These iron sulphur centers act as carrier. Bioavailability of micronutrient particularly zinc and iron is low in plant food (Gibson, *et al*. 1994). Bioavailability of iron is known to be influenced by various dietary component which include both dietary inhibitor and enhancer of absorption. Bio accessibility was found to be associated with high concentration of ant nutrient

like phytate and tannin (Shashi, *et al.* 2007). 36.4 ppm during nutritional study of various minor Zinc plays an important role in DNA and RNA metabolism. Regulatory protein binds to this nucleic acid through number of different recognition sites. Some of these protein contain zinc which is established by formation of tetrahedral complex with zinc and amino acid histidine and cystine. Zinc is an essential micronutrient and is known to prevent muscle degeneration, growth retardation, dermatitis immunologic disfunction, impaired spermatogenesis congenital malformation and bleeding disorder (Charvedi, *et al.* 2012) [2]

Plant growth depends on the presence of considerable number of elements. Some of them required in large amount and some of them in very small quantities. Maximum mineral content was observed in barnyard millet 4.17 g/100 edible portions and minimum mineral content was observed in rice 3.5 g/100 edible portions in kodo millet 3.49 g/100, in finger millet it was reported 2.2 g/100g and in wheat mineral content was 1.60 g/100 edible portions. Similar range of total mineral content in millet was observed by (Kulkarni, *et al.* (1991). Veena, *et al.* (2005) [13] observed nutrient and antinutrient content in barnyard millet and reported 2.7 to 4.21 per cent total mineral content in sawan millet. The health benefits of sawan millet was observed by Ugare (2008) [10] and total mineral content reported as (2.02%). Hadimani and Mallesi (1993) also studied several genotypes of sawan millet revealed the total mineral content ranging between 1.5 to 4.0 per cent. Total ash content (4.5 g/100g) sawan millet, kodo millet (3.9g/100g) and finger millet (1.5 g/100g) were reported by Saleh, *et al.*, (2013) [9]

Carbohydrate is hydrates of carbon and acts as precursor for many organic components such as fats and amino acids. Carbohydrate in the form of glycoprotein's and glycolipids participate in the structure of cell membrane and cellular functions carbohydrate content in various minor millet was obtained between 55.9 g/100 to 68.99 g/100g edible portions. Highest Carbohydrate content was observed in rice 77.12 g/100g followed by wheat 72.00g/100g. 68.8 per cent carbohydrate as reported by Ugare (2014) [11]. Veena, *et al.* (2003) observed nutrient content in barnyard millet and reported 54.44 to 66.19 g/100g carbohydrate. 66.69 g carbohydrate in sawan millet and 68.25 g in kodo millet was also reported by Kulkarni, *et al.* Similar range of carbohydrate content in different varieties of sawan millet was reported by Gupta *et al*. (2014) [3].Similar range of carbohydrates content in millet and cereals was also was reported in air dried seed by *Jaybhaye, et al.* (2014) [6]. Jaybhaye, *et al.* (2014) [6] observed the protein content of sawan millet was greater than other major cereals. Similar range of Carbohydrate content in different varieties of sawan millet was reported by Gupta *et al* (2014) [3] Protein content (11.00g) in sawan millet was also noticed by Saleh, *et al.* (2013) [9] Khanna and Negi (2008) evaluated seed protein by SDS-PAGE and found a total of 12 bands in 33 genotypes under investigation. Similar range of protein content was reported by Kulkarni, *et al* (1991). Veena and Naik (2005) [13]. Evaluated nutritional properties of sawan millet and found protein between 8.50-15.5 per cent. Ugare (2008) [10] also found protein content 10.52 per cent protein in barnyard millet. Konapur, *et al.* (2014) reported (6.2%) protein in sawan millet.

Conclusion

Millet are nutritious healthy, versatile and hence worthy addition to one's diet.

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