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Comparative study of some Indigenous crops with cereals (wheat and rice) in hilly areas of Uttarakhand (Western Himalaya) with special reference to their nutrients

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Abstract: **Traditional crops were frequently cultivated before two decades in hilly areas of Uttarakhand and economy of the local peoples depends on the production of these crops. But now a day's migration and climate change is two major problems which affecting the farming system of these crops. When people migrate, their lands quickly turn barren because weeds and shrubs take root and are difficult to remove. Even peoples who are staying there, they are not interested to do the farming of such crops due to typical geographical situation. They depend on market for rice and wheat.**

Some indigenous crops i.e *Amarantus hypochondriacus*, *Eleusine coracana*, *Echinochloa frumentacea*, *Setaria italica* and *Fagopyrum tataricum* were selected for the present investigation. Chemical compositions i.e. protein, carbohydrates, mineral, fiber etc. of all the selected crops have been analyzed and their nutrient percentage was compared with rice and wheat. Study showed that the nutrition percentage in indigenous crops was higher than rice and wheat. Maximum 410±22.0 kilo calorie energy was observed in *Amarathus hypochondriacus* in comparison to wheat (346±21.34) and rice (345±21.33). Calcium (222±11.78 mg/100gm) and iron percentage (13.9±.99mg/100gm) was also higher recorded in same crop. However protein percentage in *Fogopyrum tataricum* was higher (12±.98gm/100gm) in comparison to wheat (11.8±.97) and rice (6.8±.09gm/100gm). Overall higher nutrient content was recorded in selected millets in comparison to wheat and rice.

Keywords: **Migration, *Setaria italica*, protein, carbohydrates and nutrition.**

1. INTRODUCTION

Nutrition is the most important source for maintaining human health and complete physical well being. Since nutrition well being is the driving force for development and maximization of human genetic potential[1]. Millets have many nutritional properties that are helpful to prevent many health problems such as lower blood pressure, risk of heart disease, prevention of cancer and cardiovascular diseases etc. Other health benefits are increasing the time span of gastric emptying, provides roughage to gastro intestine[2]. It is very important crop with following characteristics: it is known to drought resistant crop, resistance to pests and disease, short growing season as compared to other major cereals[3]. In addition to be nutritionally rich, the advantage of growing millets is that it as a rain fed crop which forms part of a multi-cropping system, in the since that it is mostly grown along with legumes and oilseed[4,5]. Millets, referred to as ancient grain is an ideal example of such crop. Archaeologist estimate that the cultivation of millet began in the Korean Peninsula before 300 BC [6]. The aim of present study is carried out to observe the biochemical nutrients in some local crops and their

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nutrient content compare with wheat and rice. Actually agriculture is the main source of livelihood in hilly areas of Uttarakhand. Many people may choose to stay in the hills and do agriculture. These are too much hard work in agriculture but not much gain because no proper irrigation sources available in hills. People of hilly areas farming only wheat and rice as cereals with low production and recently they rejected millets crops. However nutritional point of view only millets are the rich source of different nutrients for local people.

2. MATERIALS AND METHODS

Present study has been carried out in Chamba block of district Tehri Garhwal in Uttarakhand state. Eight villages i.e. Kyari, Dharsal gaon, Kanda, Sudada, Budogi, Kuttha, Faugul and Palam were selected for study area and some indigenous crops i.e. *Amarantus hypochondriacus*, *Eleusine coracana*, *Echinochloa frumentacea*, *Fagopyrum tataricum* and *Setaria italica* have been selected for the present investigation. Rice and wheat seeds have collected from the same area for comparative study. Sample of all seeds collected from the villagers and collected seeds samples categorised in two sets. One set have referred to the GB Pant University, Uttrakhand for biochemical analysis while another set of experimentation analysed in tree biology laboratory of the botany department Govt. PG College Gopeshwar. Nutrients contents i.e. protein, fat, fibre minerals etc. of such applied crops have been analysed.

3. RESULTS AND DISCUSSION

The significant results of all applied crops have been observed and their nutrient percentage was compared with wheat and rice (Table-1&2). Maximum (15.6±1.02) protein percentage was recorded in *Amarantus hypochondriacus* in comparison to wheat (11.8±.97). It is important source of protein, which is highly digestible and is an excellent source of dietary fibre with good amounts of soluble and insoluble fractions[7]. Fat percentage was also higher (6.3±.03) in same crop in comparison of rice (0.5±.0002) and wheat (1.5±.003). *Fagopyrum tataricum* was found most effective in fibre content and it was maximum (10.3±.96). Thus the millet grain have good amount of fibre as compared to the rice. Minerals percentage was higher (4.7±.02) in *Echinochloa frumentacea*. The energy level of all the applied crops also been recorded (Fig.1). A maximum energy level 410 kilo calorie was observed in *Amarantus hypochondriacus* which is followed by *Setaria italica* (60.90±5.94) in comparison to rice (0.7±.0002). Nutritive value of these millets is quite comparable to wheat and rice. Millets are unique among the cereals because of their richness in calcium, dietary fibre, polyphenols and protein[8]. Higher energy level was noticed in all the applied crops in comparison to wheat and rice. *Eleusine coracana* and *Amarantus hypochondriacus* showed maximum calcium percentage (Fig.2) however, minimum was recorded in rice (10%). The calcium of barnyard millet as 20mg/100gm[9] and other millet and rice as 10.0 mg/100gm[10]. Lysine and iron percentage was higher noticed in all the tested crops but iron % was noticed least in *Eleusine coracana* in comparison to wheat and rice (Table-2). Millets contain higher quantity of essential amino acids methionine and cytosine and are higher in fat content than maize, rice and sorghum[11]. The iron content of *Echinochloa frumentacea* was found higher 18.6±1.78 mg/100gm which is followed 3.9 in *Eleusine coracana*. *Eleusine coracana* is good source of amino acids except lysine and threonine but are relatively high in sulphur containing amino acids methionine and cysteine[12]. Significant amount of sulphur containing essential amino acids like methinine and cysteine are reported in millets[13]. Millets have also nutraceutical properties in the form of antioxidants which prevent deterioration of health[14].

Table-1 Nutrients (gm/100gm) present in different millets in comparison of wheat (*Triticum aestivum*) and rice (*Oryza sativa*).

Nutrients	Millets					Cereals	
	Amaranthus hypochondriacus	***Eleusine coracana***	***Echinochloa frumentacea***	***Fogopyrum tataricum***	***Setaria italic***	***Triticum aestivum***	***Oryza sativa***
Protein	15.6±1.02	7.3±.08	6.2±.02	12.0±.98	5.8±.04	11.8±.97	6.8±.09
Fat	6.3±.03	1.3±.002	5.8±.04	2.4±.008	4.3±.01	1.5±.003	0.5±.0002
Fibre	2.4±.02	3.6±.03	9.8±.09	10.3±.96	14±1.0	1.2±.001	0.2±.0001
Minerals	2.9±.06	2.7±.007	4.7±.02	2.9±.009	3.3±.09	1.5±.008	.07±.0003

± SE of means
(Analysed by GB Pant University)

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Table-2 Lysine and Iron (mg/100gm) present in different millets in comparison of wheat (*Triticum aestivum*) and rice (*Oryza sativa*).

Millets					Cereals	
Amaranthus hypochondriacus	***Eleusine coracana***	***Echinochloa frumentacea***	***Fogopyrum tataricum***	***Setaria italic***	***Triticum aestivum***	***Oryza sativa***
Lysine 5.5±.21	3.5±.03	16.6±1.03	6.2±.03	14.7±1.01	2.9±.06	3.7±.08
Iron 13.9±.99	3.9±.07	18.6±1.78	13.2±.99	17.5±1.44	3.5±.03	1.8±.003

± SE of means
(Analysed by GB Pant University)

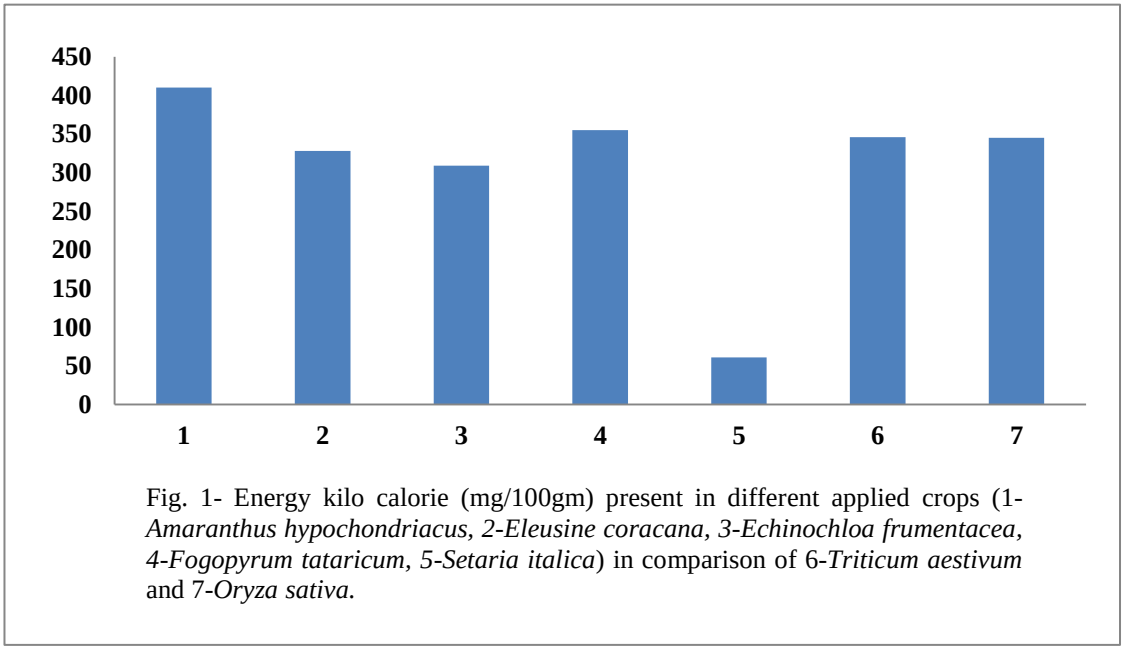

Fig. 1- Energy kilo calorie (mg/100gm) present in different applied crops (1-*Amaranthus hypochondriacus, 2-Eleusine coracana, 3-Echinochloa frumentacea, 4-Fogopyrum tataricum, 5-Setaria italica*) in comparison of 6-*Triticum aestivum* and 7-*Oryza sativa.*

(Analysed by GB Pant University)

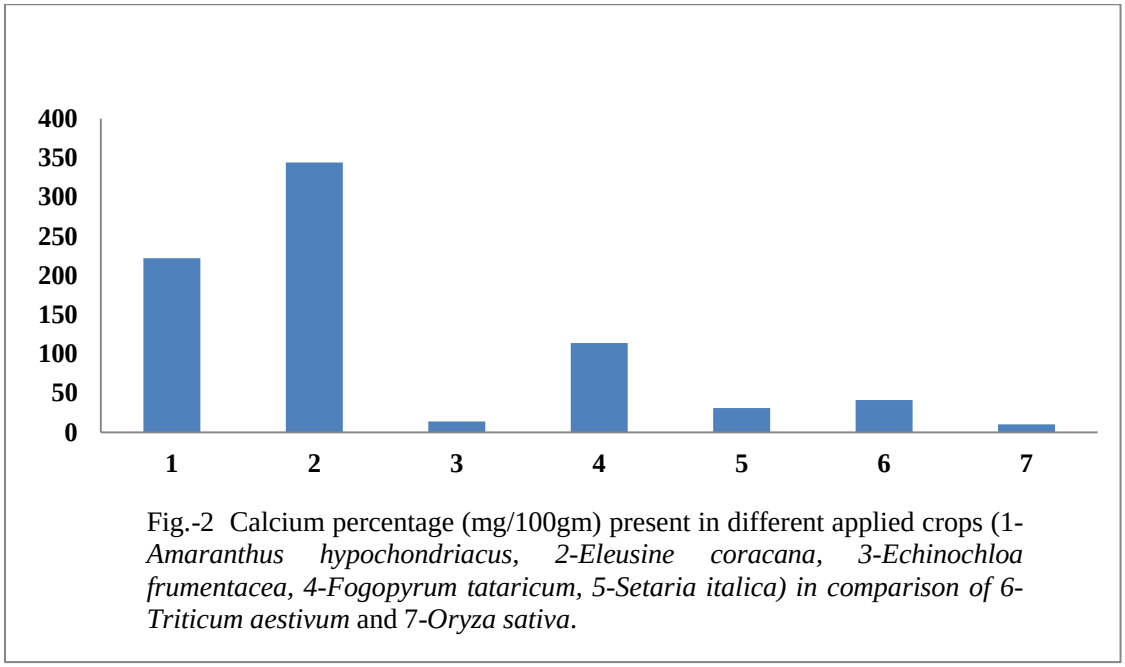

Fig.-2 Calcium percentage (mg/100gm) present in different applied crops (1-*Amaranthus hypochondriacus, 2-Eleusine coracana, 3-Echinochloa frumentacea, 4-Fogopyrum tataricum, 5-Setaria italica) in comparison of 6-Triticum aestivum* and 7-*Oryza sativa*.

(Analysed by GB Pant University)

4. CONCLUSION

Studied crops are underutilized and neglected in the hills area because of little knowledge to people and some critical problem like lower cooking quality, taste and low bioavailability. Study showed that need to millet farming properly and regularly, by the local peoples and it could be beneficial for him. Millets crops may generate the income sources and peoples no need to go outside from the village for money. Even regular use of millets gets free from diseases.

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