

# Comparative Studies of Millets through Atomic Absorption Spectrometer & SEM & EDXRF

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**Abstract:** *The essential multielemental analysis was carried out using ATOMIC ABSORPTION SPECTROMETER & SEM-EDX of six millets medicinal plants. To understand the elemental analysis of Millets (Medicinal plant) collected from selected regions of North & South Karnataka region, viz., Belagavi & Mysore Districts. In the present investigation, Millets selected. The analysis of the samples was thorough nano-micro photograph obtained by using ATOMIC ABSORPTION SPECTROMETER & SEM & EDXRF and specific weight percent of elemental concentration is analyzed. The elemental concentrations such as C, O, Mg, P, K, Mn, Fe, Cu, Zn, Hg, Pb were estimated in all the collected MILLETS and found to be within the Permissible Limit values of WHO. SEM morphology indicates that fine plane irregularly shaped particles, with size an average diameter 200 nm–1 μm, are observed in the analyzed Millets.*

**Keywords:** Elements, Field Atomic Absorption Spectrometer A Scanning electron microscope-energy dispersive X-ray spectroscopy method, Medicinal plants, North Karnataka, Permissible limits, World Health Organization

## I. INTRODUCTION

The medicinal plants are the natural resources of the environment, which play an important role in the traditional medicine system and recommended as home remedies. The Indian Traditional Medicinal Plants were increased, widely and successfully developed during the period 2500–500 BC, with different indigenous systems of medicine such as Siddha, Herbal, and Unani, and also learnt by the time how to process and extract the curative properties from the plants further our ancestors uses to develop the processed product in a large scale, this information is available in Vedas and other scriptures. Nearly 4 million medicinal plant species are available in India, among them only 50% of plants have been investigated as useful medicinal plants. Trace, major, minor, and heavy elements play vital functions in medicinal plants as well as in the human body for the biological activity of a healthy person. It is very important to investigate baseline information of the type of elemental contents available in the medicinal plants of a particular area/region, in view of the World Health Organization (WHO's) permissible limits. Further, the WHO and Department of Ayurveda, Yoga and Naturopathy, Unani, Siddha, and Homoeopathy (AYUSH) within the Ministry of Health and Family Welfare focused on the implementation of regulations and improvement of standards in the areas of quality control and standard procedures for the production of medicinal plant drugs. According to the WHO, about 75–80% of the world's population depends on medicinal plant-based drugs for their primary health care, and also in India, 60–65% of peoples were relies on folk, traditional, herbal, and Ayurvedic-based medicinal plant treatment for curing different types of diseases. Keeping in view of the above points, the present study deals with the elemental analysis and nano-micromorphological activity is carried out by selecting MILLETS [ Medicinal plants], namely **Pearl Millet, Finger Millet, Foxtail Millet, Kodo Millet, Proso Millet, & Little Millet** collected from different places of, Belgavi, Mysore Districts of North & south Karnataka regions using mapping, through a non-destructive technique/ method

**SAMPLE COLLECTION** of Millets [ Medicinal plants ] such as Pearl Millet, Finger Millet, Foxtail Millet, Kodo Millet, Proso Millet, & Little Millet collected from different places of Belgavi & Mysore Districts of North & South Karnataka regions respectively, Fresh and mature Millets are used for analysis purposes

**Study Area**

In North & South Karnataka Sample are collected from Belgavi & Mysore region respectively a large number of different kinds of ores are available, soil quality varies with ingredients & colour also which may effect yield , in these region most commonly available elements are C, O, Mg , P,K, Mn, Fe, Cu,, Zn ,Hg, Pb East, respectively, which spans a geographical area which covers two districts. The present study covers districts such as,Belgavi,& Mysore Districts .

**Sample Preparation**

The collected millets samples were washed with a distilled water to remove clay, sand, and dust; the cleaned samples were dried in the airtight laboratory at room temperature for 30 days. The dried Millets of the plants were mechanically powdered using a mixer grinder and finally sheaved with a mesh of size 355 µm to get a fine power and then stored in an airtight container. 10 mg of fine powder was taken & subjected for elemental analysis.

**Data Analysis**

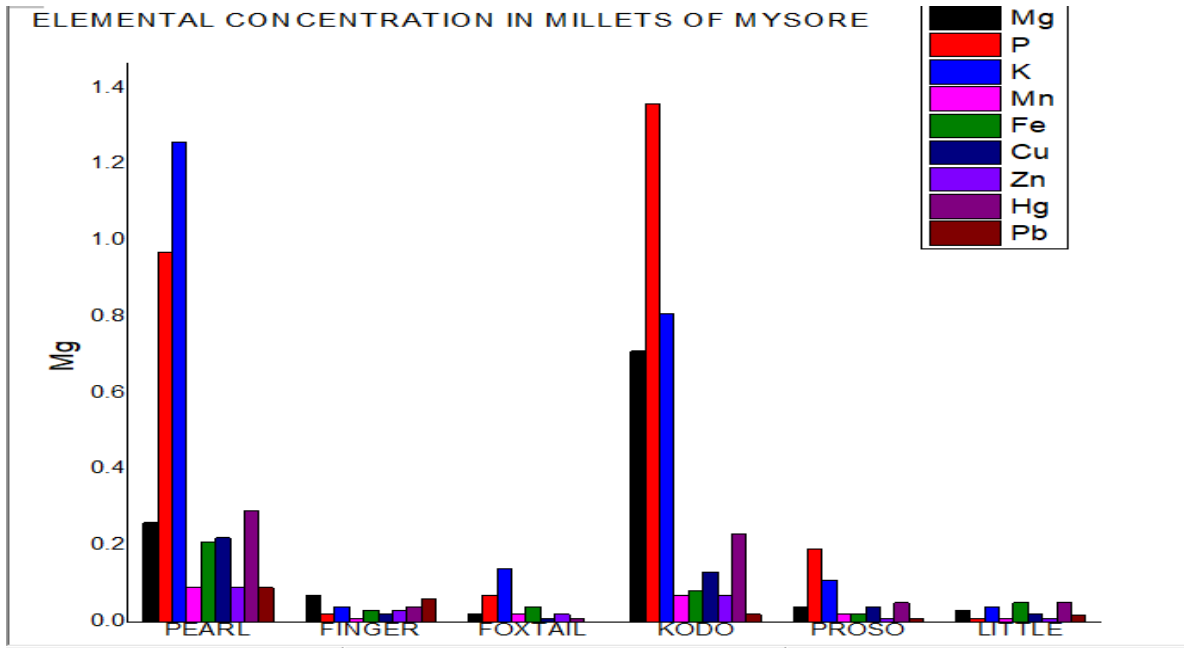
The SEM creates images by raster scanning over it with a high-energy beam of electrons of any sample surface. The incident electron will interaction with the atoms of the sample in turn which emits the photons from the analysis of emitted photos signals the sample information about surface topography, composition and other properties like electrical and mechanical etc. The field emission sources also called a cold cathode field emitter cross-over diameter 10 nm and a resolution of about 2 nm at 1 keV and about 1 nm at 15 keV, respectively. Therefore, the FESEM is a very useful high-resolution tool for surface imaging in the field of nanomaterial science. The technique is non-destructive and has a detectable sensitivity of >0.1% for elements heavier than C. EDS works by detecting X-rays that are produced by a sample placed in an electron beam. The electron beam excites the atoms in the sample that subsequently produces X-rays to discharge the excess energy. The energy of emitted K or L X-rays from the sample are the characteristic peaks corresponding to different elements present in the sample. The increase in the peak x-ray energy corresponds to as many as different elements present in the sample. The intensity of the peak gives information of the percentage of same element present in the sample. Since the electron beam can be precisely controlled, EDX spectra can be collected from a specific area

**Specifications of Various Millets & Medicinal Use**

SR NO		LOCAL NAME	PART	MEDICIINAL USE
1	PENNISETUM GLAUCUM	PEARL	GRAIN	Beneficial in treating stomach ulcers Beneficial for Heart health ,Helps in bone growth development and repair Reduces cancer risk Beneficial for diabetes , Beneficial in Preventing Gall stones , Anti-allergic properties
2	PANICUM SUMATRENSE	LITTLE	GRAIN	Helps control Blood sugar levels when consumed on regular basis. It showed lowered triglyceride levels, LDL/VLDL Cholesterol and increase in HDL Cholesterol. Reduces risk of Heart Attack ,Rich in Anti-oxidants.
3	ELEUSINE COROCANA	FINGER	GRAIN	This helps in controlling blood sugar ,control cholesterol level by eiminating excess fat from Liver Ragi is a very good source of natural Iron It is beneficial in conditions of anxiety, depression and insomnia (sleepless nights). Ragi is also useful for migraines Ragi is also recommended to lactating mothers

4	SETARIA ITALIICA	FOXTAIL	GRAIN	Foxtail millets are rich in iron and calcium, and thus maintain health of bones and muscles. Foxtail millet is high in Vitamin B1, thus helping to keep various neurological disorders Foxtail millet is gluten free, rich in protein and low in carbs
5	PANICUM MILIACEUM	PROSO	GRAIN	Proso millet is rich in magnesium which helps to lower the blood pressure and also decreases the chances of strokes, heart attacks and atherosclerosis. The high amount of fiber found in Millet helps to lower the cholesterol.
6	PASPASUM SCROBICULATUM	KODO	GRAIN	Kodo millets are an impressive Source of powerful antioxidants the phenolic extracts in this tiny millet reduce LDL or bad cholesterol keep heart healthy bring down blood pressure levels & prevent various other chronic conditions these antioxidants also act against free radicals causing damage to the cells tissues thus preventing radicals causing damage to the cells tissues thus preventing various types of cancers

**INFORMATION OF ELEMENTAL CONCENTRATION IN MILLETS SELECTED FROM MYSORE**

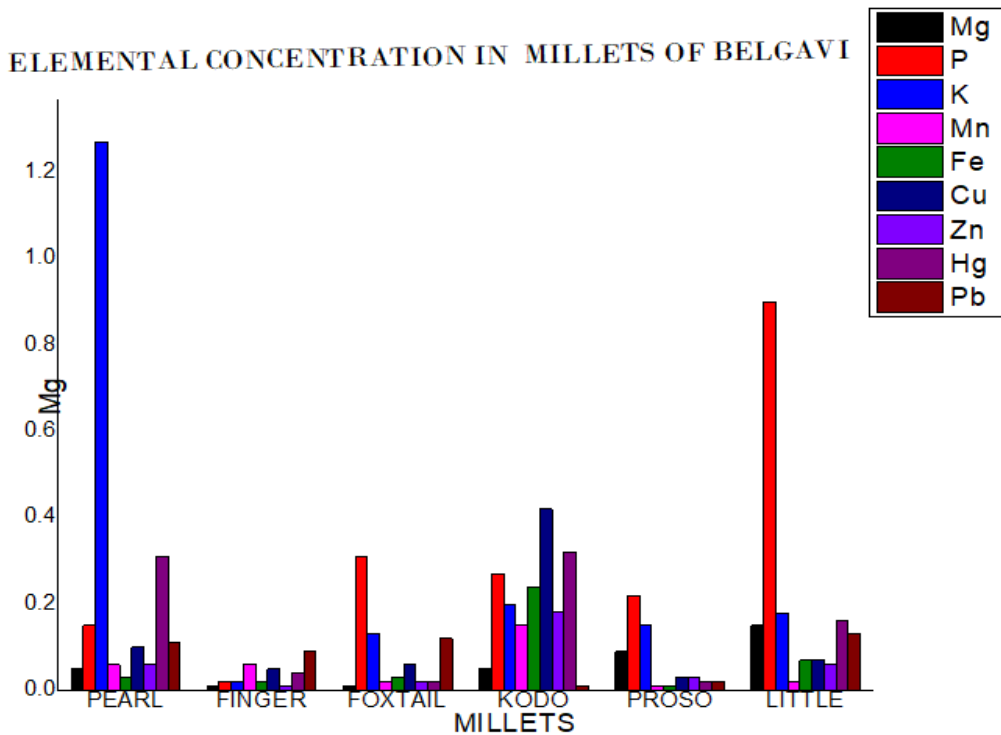


LOCATION	MILLETS	Mg	P	K	Mn	Fe	Cu	Zn	Hg	Pb
MYSORE	PEARL MILLET	0.26	0.97	1.26	0.09	0.21	0.22	0.09	0.29	0.09
	FINGER MILLET	0.07	0.02	0.04	0.01	0.03	0.02	0.03	0.04	0.06
	FOXTAIL MILLET	0.02	0.07	0.14	0.02	0.04	0.01	0.02	0.01	0.00
	KODO MILLET	0.71	1.36	0.81	0.07	0.08	0.13	0.07	0.23	0.02
	PROSO MILLET	0.04	0.19	0.11	0.02	0.02	0.04	0.01	0.05	0.01
	LITTLE MILLET	0.03	0.01	0.04	0.01	0.05	0.02	0.01	0.05	0.019



INFORMATION OF ELEMENTAL CONCENTRATION IN MILLETS SELECTED FROM BELGAVI

LOCATION	MILLETS	Mg	P	K	Mn	Fe	Cu	Zn	Hg	Pb
BELAGAVI	PEARL MILLET	0.05	0.15	1.27	0.06	0.03	0.10	0.06	0.31	0.11
	FINGER MILLET	0.01	0.02	0.02	0.06	0.02	0.05	0.01	0.04	0.09
	FOXTAIL MILLET	0.01	0.31	0.13	0.02	0.03	0.06	0.02	0.02	0.12
	KODO MILLET	0.05	0.27	0.20	0.15	0.24	0.42	0.18	0.32	0.01
	PROSO MILLET	0.09	0.22	0.15	0.01	0.01	0.03	0.03	0.02	0.02
	LITTLE MILLET	0.15	0.90	0.18	0.02	0.07	0.07	0.06	0.16	0.13



II. RESULTS AND DISCUSSION

Graph represents elements in the first column and Millet type in the first row along with WHO/Food and Agriculture Organization (FAO) permissible limits presented at the last row of Table 1. The coarse grain size of MILLETS was found to be in between 200 nm and 1 μm, and the surface morphology of the Millet family having a Circular surface was found in almost all Millets. From Table 1, it is shown that Mg , P , K , Mn , Fe , Cu , Zn are then found to be higher content in all MILLETS, the essential element, such as Phosphorus (P) which is in better range & play an important role Phosphorus is a mineral that the body uses to build bones and teeth and to make proteins that grow and repair cells and tissues. Phosphorus also plays a role in how the body Processes carbohydrates, or sugars. In addition, it contributes to bodily functions that involve Magnesium (Mg) found to be in the it is an important element which helps to control and maintain the insulin level in blood, and it is a supplementary element to the calcium. The other important element Potassium (K) the chances of getting heart attack are very much minimized. Similarly, the remaining elements such as Iron, copper, and zinc are the supplementary elements which help the formation of hemoglobin content in blood. The present study focused on toxic elements such as Mercury [Hg] & Led [Pb] present in the Mercury, but there is availability found to be very less quantity as low as permissible limits given by the WHO. Health effects of **MERCURY** exposure **Neurological and behavioural disorders** may be observed after inhalation, ingestion or dermal exposure of different mercury compounds. Symptoms include tremors, insomnia, memory loss, neuromuscular effects, headaches and cognitive and motor dysfunction. Led Exposure to high levels of lead may cause **anemia, weakness, and kidney and brain damage**. Very high lead exposure can cause death. Lead can cross the placental barrier, which means pregnant women who are exposed to lead also expose their unborn child.

### III. CONCLUSION

From the present results, MILLETS shows that Pearl Millet, Finger Millet, Foxtail Millet, Kodo Millet, Proso Millet, & Little Millet collected from different places sample contains higher concentration of Mg, P, K, Mn, Fe, Cu, Zn different elements as compared to the normal grains in two districts. Further, from the SEM analysis, the surface morphology is amorphous and semicrystalline in nature with 200 nm grain size for the plant. The analysis reveals that the surface morphology with grain size associated element plays an important role in medicating the diseases at the earliest. The analyzed elemental concentrations of Mg, P, K, Mn, Fe, Cu, Zn, Hg, Pb are below the permissible limits WHO/FAO. The present work data information Graph 1 represents highest concentration of Magnesium (Mg) is an important element which helps to control and maintain the insulin level in blood, and it is a supplementary element to the calcium. Highest concentration of Phosphorus (P) which is in better range & play an important role Phosphorus is a mineral that the body uses to build bones and teeth and to make proteins that grow and repair cells and tissues. Phosphorus also plays a role in how the body Processes carbohydrates, or sugars. From graph Highest concentration Potassium (K) the chances of getting heart attack are very much minimized.

### REFERENCES

- [1]. Swargiary A, Nath P, Basumatary B, Brahma D. Phytochemical, antioxidant, and trace element analysis of anthelmintic plants of NorthEast India. *Int J Pharm Pharm Sci* 2017;9:228-32.
- [2]. Pednekar PA, Raman B. Estimation of variation in the elemental contents of methanolic soxhlet leaf extract of *Ampelocissus latifolia* (Roxb.) plant by ICP-AES technique. *Int J Pharm Pharm Sci* 2013;5:938-41.
- [3]. Pandey MM, Rastogi S, Rawat AK. Indian traditional ayurvedic system of medicine and nutritional supplementation. *Evid Based Complement Alternat Med* 2013;2013:1-12.
- [4]. Muruganatham S, Anbalagan G, Ramamurthy N. FT-IR and SEMEDS comparative analysis of medicinal plants, *Eclipta alba* Hassk and *Eclipta prostrata* Linn. *Rom J Biophys* 2009;19:285-94.
- [5]. Bamola N, Verma P, Negi C. A review on some traditional medicinal plants. *Int J Life Sci Sci Res* 2018;4:1550-6.
- [6]. Street RA. Heavy metals in medicinal plant products-an African perspective. *S Afr J Bot* 2012;82:67-74.