ELEMENTAL COMPOSITION OF DIFFERENT PARTS OF *MORINGA OLEIFERA* BY X RAY FLUORESCENCE TECHNIQUE FROM SEMI-ARID CLIMATIC REGION

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ABSTRACT:

The objective of the present investigation was to study the elemental composition of bark, flower, leaves, seed and seed cover of *Moringa oleifera* is a species of tree native to India growing in semi-arid region of Kachchh district, Gujarat, India. The Bark, flower, leaves, seed and seed cover of *Moringa oleifera* were subjected to Energy Dispersive X-ray Fluorescence (EDXRF) and were analyzed for different mineral composition. As the X-ray Fluorescence is one of the most reliable and accurate, as well as it is also a consistent and non-destructive method for analysis of major and trace elements using a single pressed pellet. During the study it was found that maximum amount of oxides in bark sample was calcium oxide which was 52.6 %, in flowers sample it was potassium oxide which was 34.2%, in leaves sample was calcium oxide which was 42.9 %, in seed sample was potassium oxide which is 95.0 % and in seed cover sample was potassium oxide which is 67.9 %.

Keywords: Energy Dispersive X-ray Fluorescence (EDXRF) analysis, *Moringa oleifera* Bark, flower, leaves, seed and seed cover, Semi-arid region, Element

1.0 INTRODUCTION

XRF is one of the non-destructive methods in the elemental analysis of solid or liquid samples for major and minor constituents. Most of the elements in the periodic table, both metals and nonmetals, respond to this technique. Detection limit is between 10 to 100 ppm. *Moringa oleifera* is usually known as "Drumstick". It is a small or average sized tree, about 10m height, found in the sub-Himalayan tract [1].Usually, the leaves, fruits, flowers, and immature pods of this tree are edible; they are used as a extremely nutritive vegetable in many nations, particularly in India, Pakistan, the Philippines, Hawaii, and certain African nations [2–4].

It is reported to encompass alkaloids, flavonoids, anthocyanins, proanthocyanidins and cinnamates. It is used in abortion [6], diabetes [7] and as an antipyretic [8], anthelmentic [9] and antiherpes simplex virus type I (HSV-I) [10]. All parts of the tree are considered to possess medicinal properties and used in the treatment of ascites, rheumatism, and venomous bites and as cardiac and circulatory stimulant. The root is laxative, expectorant, diuretic, and good for inflammations, throat, bronchitis, piles, cures stomatitis, urinary discharges and obstinate asthma [11]. The root bark is useful in heart complaints, eye diseases, inflammation, dyspepsia, and enlargement of spleen. The root and bark are abortifacient [12]. XRF technology was used to evaluate the soil pollution with heavy metals like Ti, Cr, Mn, Fe, Cu, Zr [13].

1.1 Botanical review:

- Kingdom : *Plantea*
- Sub kingdom : *Tracheobionta*
- Super Division : *Spermatophyta*
- Division : *Magnoliophyta*
- Class : *Magnoliopsida*
- Subclass : *Dilleniidae*
- Order : *Capparales*
- Family : *Moringaceae*
- Genus : *Moringa*
- Species : *Oleifera*

1.2 Names in different languages:

Arabic: rawag	Gujarati: midhosaragavo, saragavo
Assamese: saijna, sohjna	Hindi: mungna, saijna, shajna
Bengali: sajina	Kannada: nugge
Burmese: daintha, dandalonbin	Konkani: maissang, moring,moxing
Chinese: la ken	Malayalam: murinna, sigru
English: drumstick tree, horseradish tree, ben tree	Marathi: achajhada, shevgi
French: moringe à graine ailée, morungue	Nepali: shobhanjan, sohijan
Portuguese: moringa, moringueiro	Oriya: sajina

2. METHODOLOGY

2.1 Sample Preparation

Moringa oleifera plant samples were collected from the campus of K.S.K.V. Kachchh University. Bark, flower, leaves, seed and seed cover were sun dried to evaporate water content from it, after then it was grinded in mixture and with the help of pallete maker, pallets of Bark, flower, leaves, seed and seed cover sample were prepared and were used for further elemental analysis in X-ray Fluorescence instrument.

2.2 Instrumental Parameter

Bench-top Energy Dispersive X-ray Fluorescence (EDXRF) of make Rigaku elemental analyzer with element range Na to U having Pd anode X ray Tube with high performance SDD detector with the use of NEX CG software.

3.0 RESULTS AND DISCUSSION

Bark, flower, leaves, seed and seed cover of *Moringa oleifera* growing in semi-arid region of Kachchh district were collected and were subjected to X-ray Flourescence instrument for mineral analysis for the present investigation. During the study it was found that maximum amount of oxides in bark sample was calcium oxide which was 52.6 %, in flowers sample it was potassium oxide which was 34.2 %, %, in leaves sample was calcium oxide which was 42.9 %,

in seed sample was potassium oxide which is 95.0 % and in seed cover sample was potassium oxide which is 67.9 %.

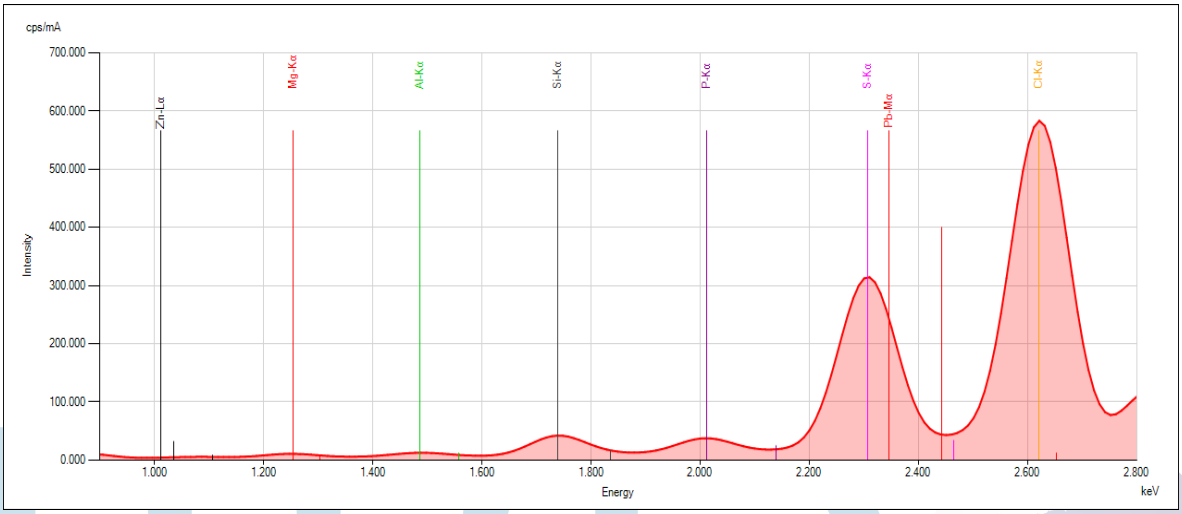
Table 1: *Composition of elements present in different parts of Moringa oleifera by X-ray Fluorescence*

Sr. No.	Element	Percent (%) Mass				
		Bark	Flower	Leaves	Seed cover	Seed
1.	MgO	4.17	3.80	4.75	2.96	0.322
2.	Al_2O_3	1.87	3.49	4.14	1.12	Not detected
3.	SiO_2	3.97	10.9	14.5	1.90	0.0912
4.	P_2O_5	1.23	5.12	2.22	4.22	0.744
5.	SO_3	8.86	19.0	11.5	7.93	2.48
6.	Cl	4.10	1.92	2.13	3.59	0.0360
7.	K_2O	19.8	34.2	9.98	67.9	95.0
8.	CaO	52.6	15.2	42.9	8.06	0.126
9.	TiO_2	0.235	0.603	0.721	0.151	Not detected
10.	V_2O_5	0.0101	0.0281	0.0080	0.0146	Not detected
11.	Cr_2O_3	0.0228	0.0099	0.0181	0.0246	Not detected
12.	MnO	0.0555	0.124	0.163	0.0718	0.0436
13.	Fe_2O_3	1.54	4.80	5.53	1.44	0.766
14.	NiO	0.0052	0.0066	0.0079	0.0079	0.0024
15.	CuO	0.114	0.0606	0.465	0.165	0.109
16.	ZnO	0.0432	0.140	0.0826	0.104	0.142
17.	Br	0.296	0.269	0.171	0.171	0.0473
18.	Rb_2O	0.0296	0.0567	0.0174	0.0684	0.0286
19.	SrO	0.914	0.0986	0.567	0.0641	0.0199
20.	SnO_2	0.0514	0.0617	0.0423	0.0472	0.0371
21.	I	0.0065	Not detected	Not detected	Not detected	Not detected
22.	Au_2O	0.0026	0.0027	0.0023	0.0048	Not detected
23.	PbO	0.0041	0.0046	0.0065	Not detected	Not detected
24.	Ta_2O_5	Not detected	0.0046	0.0087	0.0200	Not detected
25.	SeO_2	Not detected	0.0030	0.0027	Not detected	Not detected
26.	Co_2O_3	Not detected	0.0202	0.0020	Not detected	Not detected
27.	Ga_2O_3	Not detected	Not detected	Not detected	0.0042	Not detected

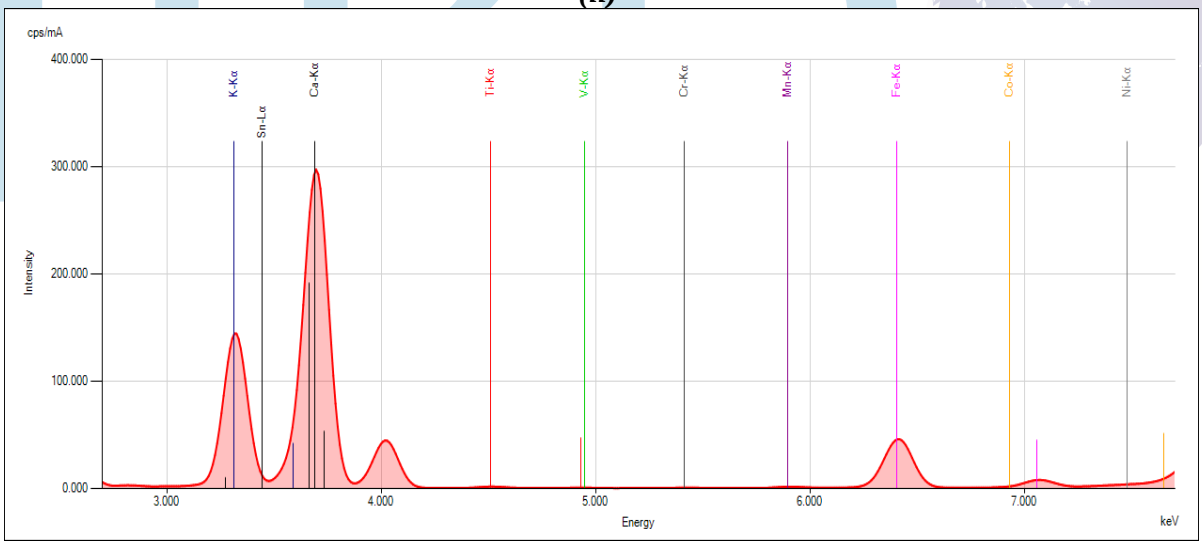
28.	HfO_2	Not detected	Not detected	Not detected	0.0070	Not detected
29.	Ir_2O3	Not detected	Not detected	Not detected	0.0048	Not detected
30.	U_3O_8	Not detected	Not detected	Not detected	0.0017	Not detected

Figure 1: XRF graphs for bark of M. oleifera (i – iv)

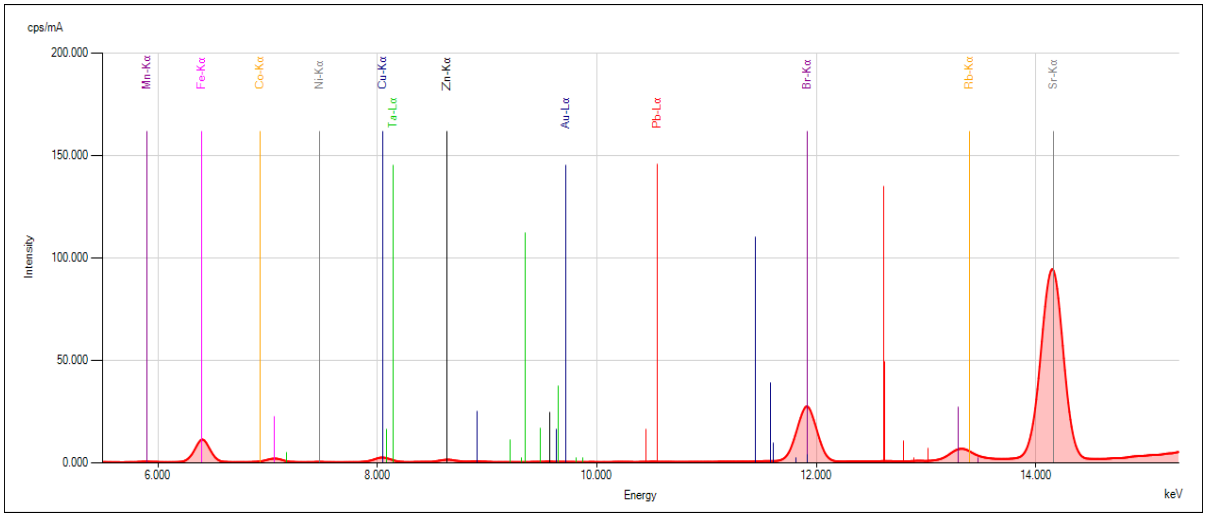
(i)



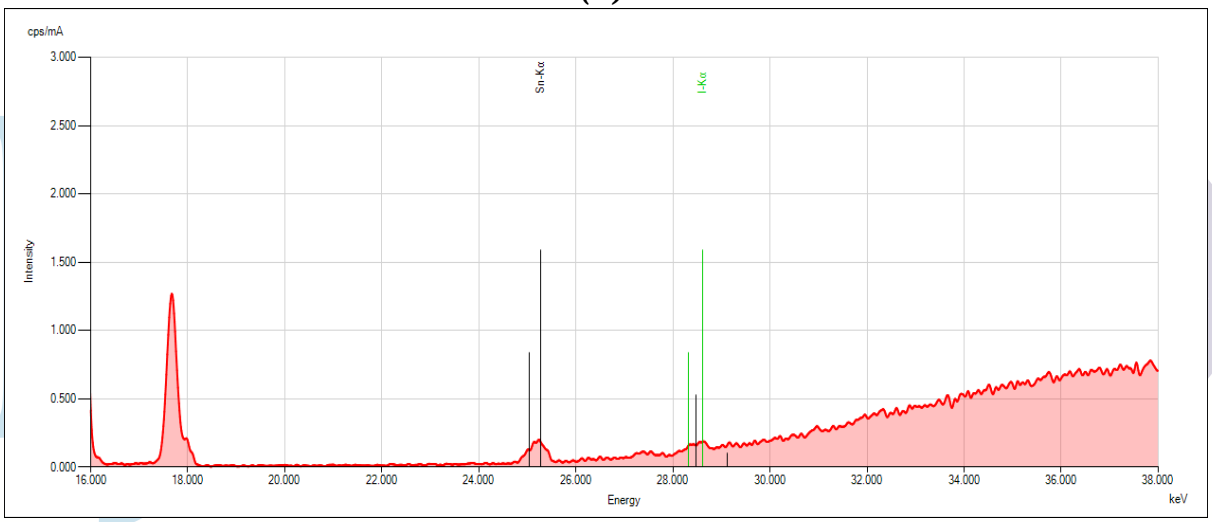
(ii)



(iii)



(iv)



4.0 DISCUSSION:

During the present work much literature was surveyed, it was noticed that, very scanty data on X-ray Fluorescence of different parts of *M. oleifera* were analyzed. Different parts of the plant showed significant content of important parameters like magnesium, chloride, calcium, and potassium. Magnesium oxide in the *M. oleifera* was recorded to be in the range of 0.322 to 4.75 % mass with minimum value in seed and maximum in leaves content.. Chloride content was also observed in the similar range of 0.036 to 4.1 % mass, but here it was found maximum in bark of the tree of *M. oleifera*. Interestingly, out of different mineral composition, maximum concentration of oxides of potassium was observed in seeds of the plant. Whereas, oxide of calcium was noticed to be higher in bark of the plant and it decreased in seeds. Oxides of heavy metals like Fe, Ni, Cu and Zn analyzed during the study were ranging from 0.0024 to 5.53 % mass, in which highest concentration of oxides of Fe were observed whereas, lower

concentration of oxides of Ni were noticed in the present study. From the results shown in the table, it can also noticed that maximum elements were found in higher concentration in leaves of *M. oleifera* from XRF analysis.

5.0 CONCLUSION

The XRF method is a powerful tool for the analysis of different elemental analysis. The major component in bark sample was calcium oxide which was 52.6 %, in flowers sample it was potassium oxide which was 34.2 %, in leaves sample was calcium oxide which was 42.9 %, in seed sample was potassium oxide which is 95.0 % and in seed cover sample was potassium oxide which is 67.9 %.

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