

XRF analysis of *Aegle marmelos* leaves of semi arid region of Kachchh

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ABSTRACT

The objective of the present investigation was to study the chemical composition of leaves of *Aegle marmelos* is a species of tree native to India growing in semi-arid region of Kachchh district, Gujarat, India. The leaves of *Aegle marmelos* 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 Calcium, Chlorine, Potassium, Magnesium, Silicon, Sulfur, Aluminum, Phosphorus were noted in higher amounts, compared to that of other elements like Manganese, Iron, Nickel, Copper, Zink, Bromide, Rubidium, Strontium, Stannous, Lead, whereas the elements which were not detected in leaves of *Aegle marmelos* are Cobalt, Arsenic, Hafnium, Vanadium, Platinum, Titanium, Chromium and Tantalum.

Keywords: Energy Dispersive X-ray Fluorescence (EDXRF) analysis; *Aegle marmelos* leaves; Semi arid region; Element

1. INTRODUCTION

X-ray fluorescence spectrometry has been a very attractive investigative instrument, because it is a basically simultaneous multi element, exact and nondestructive analytical technique. However, this spectrometry is alike in experiential change procedure (from line intensities to composition) to other instrumental methods of analysis. *Aegle marmelos* (Family:Rutaceae), commonly known as bael, Bengal quince, [1] golden apple,[1] stone apple, wood apple, bili,[2] is a species of tree native to India. It is present throughout Southeast Asia as a naturalized species.[3] The tree is considered to be sacred by Hindus. Its fruits are used in traditional medicine and as a food throughout its range. Recently, similar kind of study on the mineral composition of leaves of *Carica papaya* was analyzed by traditional and normal methodology for mineral analysis [4]. Leaves of arduisi were analyzed by spectrophotometer [5]. One of the biggest effects that viral infections have on papaya is the taste. Right now, the virus is uncontrollable [6]. The difference between the ringspot and the

mosaic viruses is the ripe fruit in the ringspot has mottling of colors and mosaic does not [7]. The fruit ends up being soft and having an off flavor because the fungus grows into the fruit [8]. Bael is the only member of the monotypic genus *Aegle*. It is a mid-sized, slender, aromatic, armed, gum-bearing tree rising up to 18 meters tall. It has a leaf with three leaflets.



Photo-plates of *Aegle marmelos* growing in semi-arid region of Kachchh

1.1. Botanical review

- o Kingdom: Plantae.
- o Order: Sapindales.
- o Family: Rutaceae.
- o Subfamily: Aurantioideae.
- o Genus: *Aegle*.
- o Species: *Aegle Marmelos*.
- o Botanical name: *Aegle marmelos*

1.2. Names in different languages

- o Assamese: বেল
- o Hindi: बेल (Sirphal)
- o Gujarati: બીલી
- o Urdu: (Bael)بیل, (Sirphal) سری پھل
- o Oriya: Baela ବେଲ
- o Bengali: বেল
- o Kannada: ಬೇಲದ ಹಣ್ಣು (edible variety)
- o Kannada: *bilva* (sacred variety)
- o Konkani: *gorakamli*
- o Malayalam: കുറുവളം (koo-valam)
- o Marathi: बेल
- o Punjabi: *Beel*
- o Sanskrit : बिल्व
- o Sindhi: ڪاڻ گڙو
- o Sinhalese: බෙලි (Beli)
- o Tamil: வில்வம் (Vilvam)
- o Telugu: మారేడు (maredu)
- o *Sir Phal* (old Hindi)

2. EXPERIMENTAL

2.1. Sample Preparation

Leaves of *Aegle marmelos* were collected from different habitats of Kachchh region of Gujarat during November, 2014. Leaves were sun dried to evaporate water content from it, after then it was grinded in mixture and with the help of pallette maker, pallets of leaves 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. RESULT AND DISCUSSION

Leaves of *Aegle marmelos* growing in semi-arid region of Kachchh district were collected and were subjected to X-ray Fluorescence instrument for mineral analysis for the present investigation. Various mineral ions like were found during the analysis.

The major component in the leaves of *Aegle marmelos* constituted Calcium (Ca) (percent wise) which was found to be 6.610%, whereas Chlorine (Cl) and Potassium (K) were

noted to be 3.510% and 0.910%, respectively. Magnesium (Mg) content which is considered to be important constituent for the body was found to be 0.882% in the leaves of *Aegle marmelos*. Silicon (Si) which is not only a good soil binder but also is useful for many industrial purposes, it was also found in the leaves of *Aegle marmelos* of 0.586%.

Major content of Phosphorus (P) is found in the bones and teeth, in leaves of *Aegle marmelos* it was found to be 0.130%. Sulphur concentration in leaves of *Aegle marmelos* was marginally higher (0.503%) to that of sulphur. Aluminum (Al) and Strontium (Sr) were found to be 0.238% and 0.0445%, respectively. Iron (Fe) concentration was noted to be 0.0657%. Nickel (Ni), 0.0030% and Copper (Cu), 0.0013% were found to be in similar range. Important findings from the leaves of the *Aegle marmelos* was to note the presence of Zinc (Zn) of 0.0012%. Heavy metals like Zinc (Zn) and Manganese (Mn) were found to be 0.0012% and 0.0037%. Bromine (Br) in the leaves of *Aegle marmelos* was found to be 0.0266%, whereas Rubidium (Rb) was noted to be 0.0009%. Whereas the elements which were not detected in leaves of *Aegle marmelos* are Cobalt, Arsenic, Hafnium, Vanadium, Platinum, Titanium, Chromium and Tantalum in the leaves of *Aegle marmelos* growing in semi-arid region of Kachchh district in Gujarat.

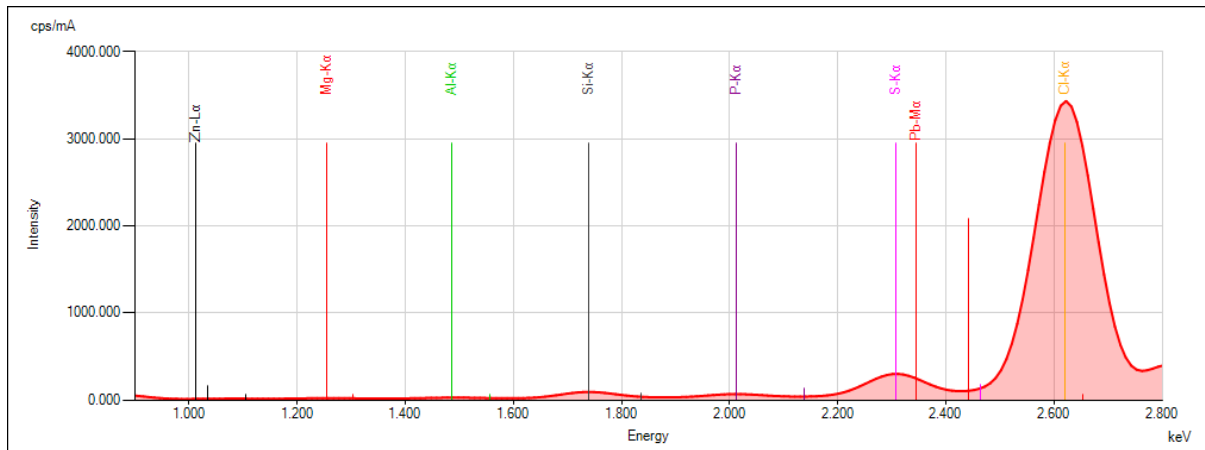


Fig. 1(a). Graph of XRF for mineral ion in the leaves of *Aegle marmelos*.

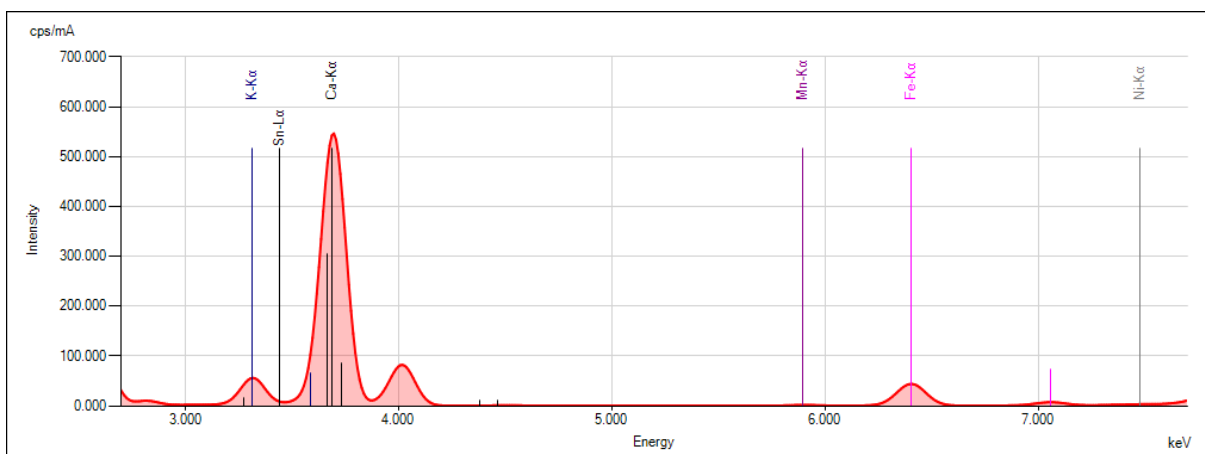


Fig. 1(b). Graph of XRF for mineral ion in the leaves of *Aegle marmelos*.

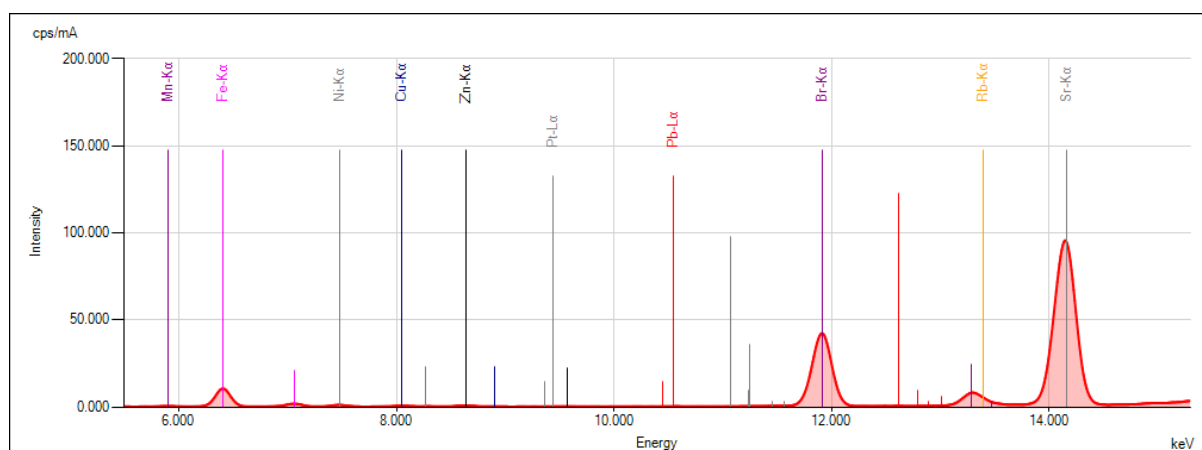


Fig. 1(c). Graph of XRF for mineral ion in the leaves of Aegle marmelos.

Table 1. Composition by X-ray Fluorescence.

Sr. No	Element	% Mass
1.	Mg	0.082
2.	Al	0.238
3.	Si	0.586
4.	P	0.130
5.	S	0.503
6.	Cl	3.51
7.	K	0.910
8.	Ca	6.61
9.	Ti	ND
10.	V	ND
11.	Cr	ND
12.	Mn	0.0037
13.	Fe	0.0657
14.	Co	ND
15.	Ni	0.0030
16.	Cu	0.0013
17.	Zn	0.0012
18.	As	ND
19.	Br	0.0266
20.	Rb	0.0009
21.	Sr	0.0445
22.	Sn	0.0043
23.	Hf	ND
24.	Ta	ND
25.	Pt	ND
26.	Pb	0.0002

4. CONCLUSION

The XRF method is a powerful tool for the analysis of different cations and anions. In the leaves of *Aegle marmelos* found in this semi-arid region of Kachchh in Gujarat, India, The major component in the leaves of *Aegle marmelos* constituted Calcium (Ca) (percent wise) which was found to be 6.610%, whereas Chlorine (Cl) and Potassium (K) were noted to be 3.510% and 0.910%, respectively. Magnesium (Mg) content which is considered to be important constituent for the body was found to be 0.882% in the leaves of *Aegle marmelos*. Silicon (Si) which is not only a good soil binder but also is useful for many industrial purposes, it was also found in the leaves of *Aegle marmelos* of 0.586%. Major content of Phosphorus (P) is found in the bones and teeth, in leaves of *Aegle marmelos* it was found to be 0.130%. Sulphur concentration in leaves of *Aegle marmelos* was marginally higher (0.503%) to that of sulphur. Aluminum (Al) and Strontium (Sr) were found to be 0.238% and 0.0445%, respectively. Iron (Fe) concentration was noted to be 0.0657%. Nickel (Ni), 0.0030% and Copper (Cu), 0.0013% were found to be in similar range. Important findings from the leaves of the *Aegle marmelos* was to note the presence of Zinc (Zn) of 0.0012%. Heavy metals like Zinc (Zn) and Manganese (Mn) were found to be 0.0012% and 0.0037%. Bromine (Br) in the leaves of *Aegle marmelos* was found to be 0.0266%, whereas Rubidium (Rb) was noted to be 0.0009%. Whereas the elements which were not detected in leaves of *Aegle marmelos* are Cobalt, Arsenic, Hafnium, Vanadium, Platinum, Titanium, Chromium and Tantalum in the leaves of *Aegle marmelos* growing in semi-arid region of Kachchh district in Gujarat. Traditionally, the leaves of *Aegle marmelos* are used by local population for various medicinal purposes like curing dengue and other diseases.

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