

## XRF analysis of *Pongamia pinnata* stem of semi arid region of Kachchh

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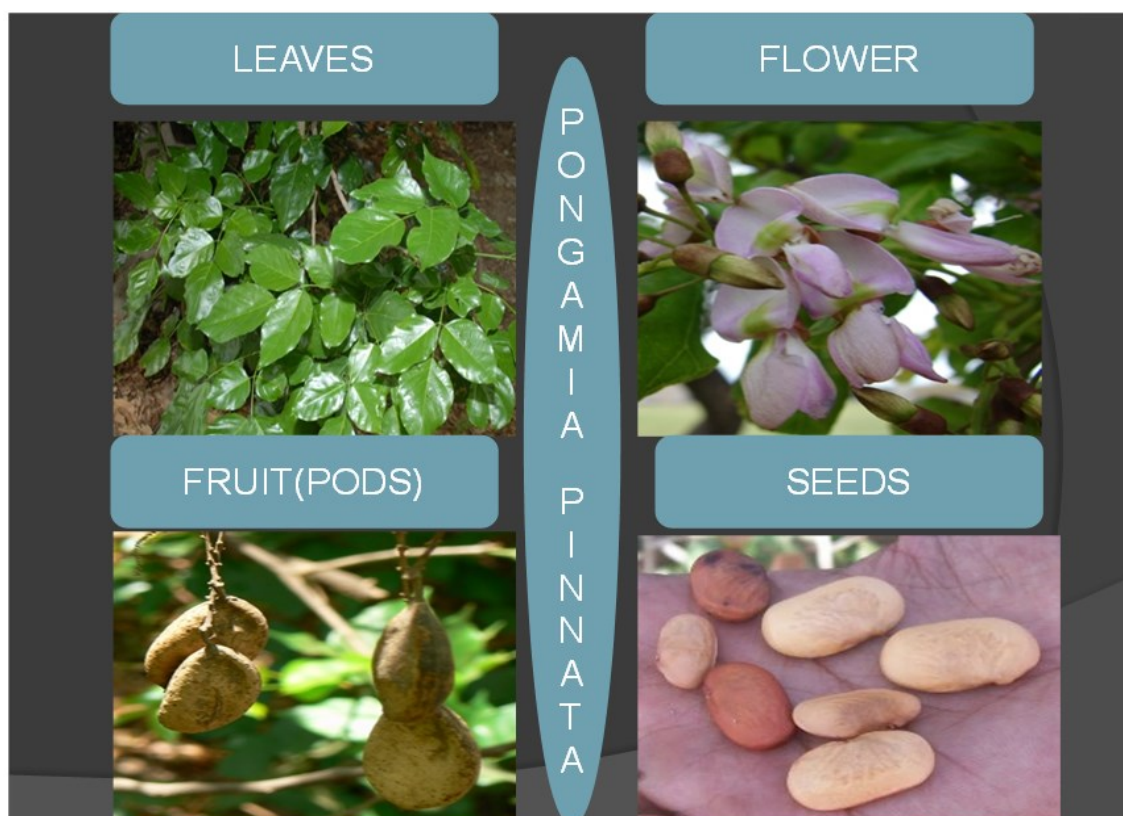
**Keywords:** Energy Dispersive X-ray Fluorescence (EDXRF) analysis; *Pongamia pinnata* stem; Semi arid region; Element

**ABSTRACT.** The objective of the present investigation was to study the chemical composition of stem of *Pongamia pinnata* is a species of tree native to India growing in semi-arid region of Kachchh district, Gujarat, India. The stem of *Pongamia pinnata* 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 Potassium, Chloride, Calcium, Silicon, Sulfur, Aluminum, Phosphorus were noted in higher amounts, compared to that of other elements like Manganese, Iron, Nickel, Copper, Zinc, Bromide, Rubidium, Strontium, Stannous, whereas the elements which were not detected in stem of *Pongamia pinnata* are Titanium, Cobalt, Hafnium and Tantalum.

### 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. Medicinal plants continue to provide valuable therapeutic agents, both in modern and in traditional medicine [1]. *Pongamia* is a genus having one species only *Pongamia pinnata* (L.) [Syn. *Pongamia glabra* (Vent); *Derris indica* (Lamk.)] which belongs to family Leguminosae and sub-family Papilionaceae [2]. It is a medium sized glabrous, perennial tree grows in the littoral regions of South Eastern Asia and Australia [3]. *Pongamia pinnata* is a preferred species for controlling soil erosion and binding sand dunes because of its dense network of lateral roots. Root, bark, leaves, flower and seeds of this plant also have medicinal properties and traditionally used as medicinal plants. All parts of the plant have been used as crude drug for the treatment of tumors, piles, skin diseases, wounds and ulcers [4]. In the traditional system of medicines, such as Ayurveda and Unani, the *Pongamia pinnata* plant is used for anti-inflammatory, anti-plasmodial, anti-nonciceptive, anti-hyperglycemic, anti-lipidperoxidative, anti-diarrhoeal, anti-ulcer, anti-hyperammonic and antioxidant activity [5].

The *Pongamia pinnata* seeds contain about 40% oil, which can be converted to biodiesel by transesterification method [6]. *Pongamia* biofuel requires no engine modification, when blended with diesel in proportions as high as 20 percent. In the present article information on various aspects of *Pongamia pinnata* and its role as a source of biodiesel is reviewed.



*Photo of Pongamia pinnata growing in semi-arid region of Kachhh*

### 1.1 BOTANICAL REVIEW:

- Kingdom: Plantae
- Division: Magnoliophyta
- Class: Magnoliopsida

- Order: Fabales
- Family: Fabaceae
- Genus: Pongamia
- Species: Pongamia pinnata

## 1.2 NAMES IN DIFFERENT LANGUAGES:

- Hindi, Beng., Mar. and Guj: Karanj, Karanja
- Sanskrit : Naktamala
- English : Indian beech
- Telgu : Pungu, Gaanuga
- Tamil : Ponga, Pongam
- Malayalam : Pungu, Punnu
- Oriya : Koranjo
- Punjab : Sukhehein, Karanj, Paphri
- Assam : Karchuw

## 2. EXPERIMENTAL

### 2.1 Sample Preparation

*Pongamia pinnata* (L.) pierre were collected from the campus of K.S.K.V. KACHCHH UNIVERSITY at 10:00 am on 6/1/2014. Stem 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 stem 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

Stem of *Pongamia pinnata* 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.

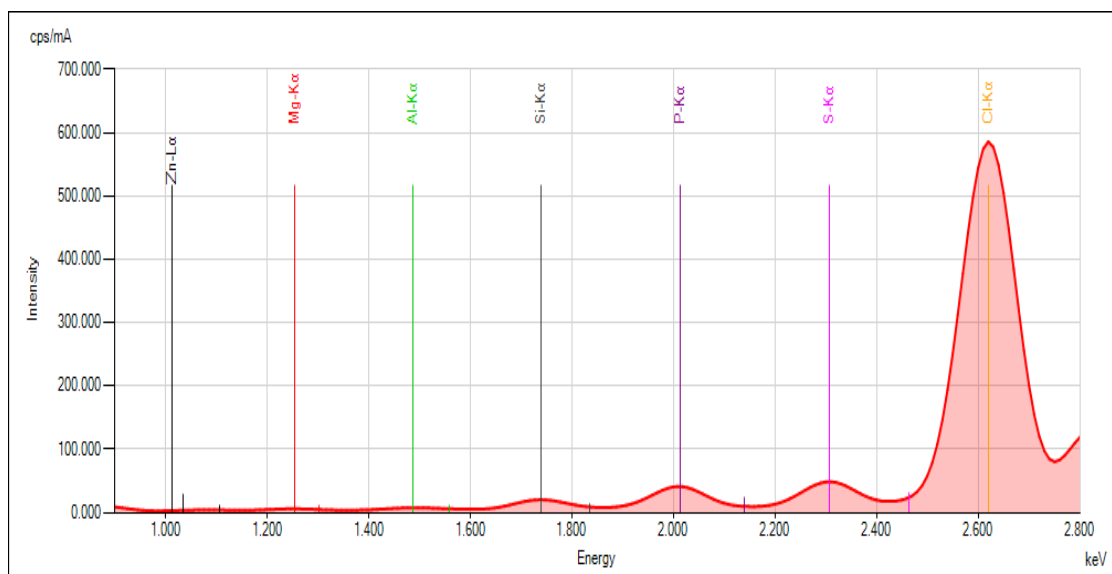
The major component in the stem of *Pongamia pinnata* constituted Potassium (K) (percent wise) which was found to be 2.0%, whereas Calcium (Ca) and Chlorine (Cl) were noted to be 0.517% and 0.428%, respectively. Magnesium (Mg) content which is considered to be important constituent for the body was found to be 0.239% in the stem of *Pongamia pinnata*. Silicon (Si) which is not only a good soil binder but also is useful for many industrial purposes, it was also found in the stem of *Pongamia pinnata* of 0.112%.

Major content of Phosphorus (P) is found in the bones and teeth, in stem of *Pongamia pinnata* it was found to be 0.0846%. Sulphur concentration in stem of *Pongamia pinnata* was marginally higher (0.0613%) to that of sulphur. Aluminum (Al) and Strontium (Sr) were found to be 0.0933% and 0.0067%, respectively. Iron (Fe) concentration was noted to be 0.00226%. Nickel (Ni), 0.001% and Cupper (Cu), 0.006% were found to be in similar range. Important findings from the stem of the *Pongamia pinnata* was to note the presence of Zinc (Zn) of 0.0011%. Heavy metal Manganese (Mn) were found to be 0.0016%. Bromine (Br) in the stem of *Pongamia pinnata* was found to be 0.0141%, whereas Rubidium (Rb) was noted to be 0.0016%. Whereas the elements which were not

detected in stem of *Pongamia pinnata* are Cobalt, Titanium, Hafnium and Tantalum in the stem of *Pongamia pinnata* growing in semi-arid region of Kachchh district in Gujarat.



*Figure 1: Shows the palate of stem powder of P.Pinnata*



*Figure 1(a): Graph of XRF for mineral ion in the stem of Pongamia pinnata*

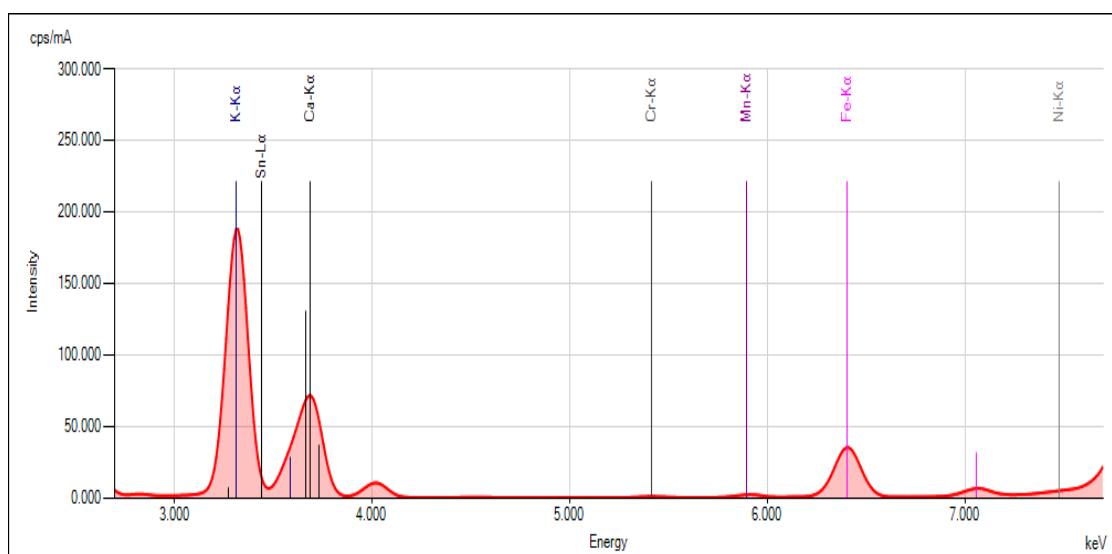


Figure 1(b): Graph of XRF for mineral ion in the stem of *Pongamia pinnata*

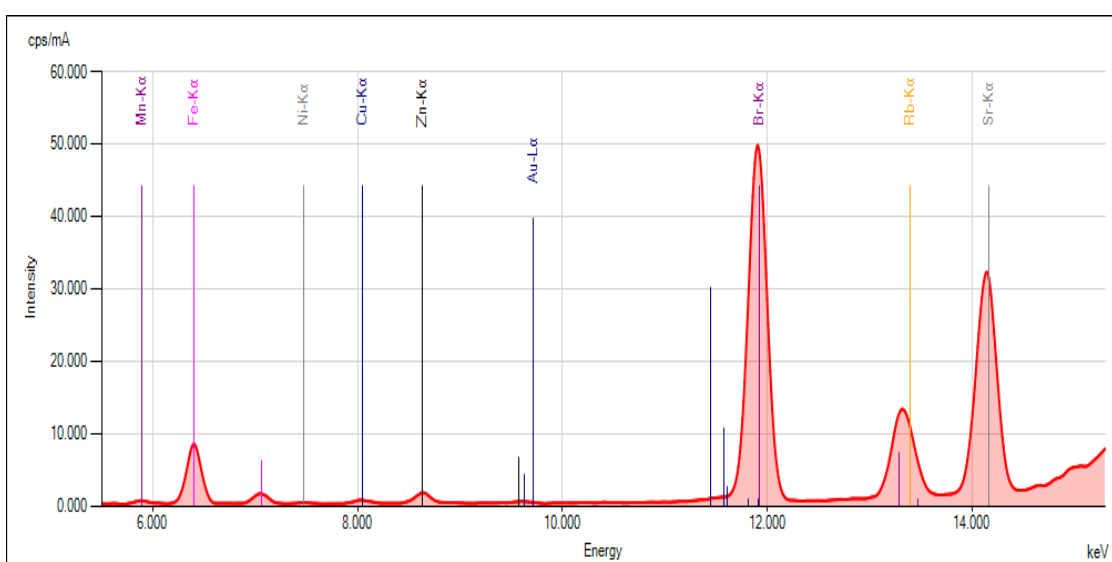


Figure 1(c): Graph of XRF for mineral ion in the stem of *Pongamia pinnata*

Table 1: Composition by X-ray Fluorescence

Sr. No	Element	% Mass	Oxide	Mass %
1.	Mg	0.239	MgO	3.89
2.	Al	0.0933	Al <sub>2</sub> O <sub>3</sub>	1.78
3.	Si	0.112	SiO <sub>2</sub>	2.71
4.	P	0.0846	P <sub>2</sub> O <sub>5</sub>	2.40
5.	S	0.0613	So <sub>3</sub>	2.02
6.	Cl	0.428	Cl	6.04
7.	K	2.00	K <sub>2</sub> O	46.7
8.	Ca	0.517	CaO	30.8
9.	Ti	-	TiO <sub>2</sub>	-
10.	Cr	0.0003	Cr <sub>2</sub> O <sub>3</sub>	0.040
11.	Mn	0.0016	MnO	0.124
12.	Fe	0.0226	Fe <sub>2</sub> O <sub>3</sub>	1.85
13.	Co	-	Co <sub>2</sub> O <sub>3</sub>	-
14.	Ni	0.001	NiO	0.0082
15.	Cu	0.006	CuO	0.0338
16.	Zn	0.0011	ZnO	0.0778
17.	Br	0.0141	Br	0.856
18.	Rb	0.0016	Rb <sub>2</sub> O	0.106
19.	Sr	0.0067	SrO	0.468
20.	Sn	0.0044	SnO <sub>2</sub>	0.108
21.	Hf	-	Ta <sub>2</sub> O <sub>5</sub>	-
22.	Ta	-	Au <sub>2</sub> O	0.0076

#### 4. CONCLUSION

The XRF method is a powerful tool for the analysis of different cations and anions. In the stem of *Pongamia pinnata* found in this semi-arid region of Kachchh in Gujarat, India, The major component in the stem of *Pongamia pinnata* constituted Potassium (K) (percent wise) which was

found to be 2.0%, whereas Calcium (Ca) and Chlorine (Cl) were noted to be 0.517% and 0.428%, respectively. Magnesium (Mg) content which is considered to be important constituent for the body was found to be 0.239% in the stem of *Pongamia pinnata*. Silicon (Si) which is not only a good soil binder but also is useful for many industrial purposes, it was also found in the stem of *Pongamia pinnata* of 0.112%.

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### Acknowledgement

The authors are thankful for facilities provided by Department of Chemistry, KSKV Kachchh University, Bhuj-Kutch-370 001 (INDIA).

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