



## Study of Major and Minor Elements in Nerium oleander Ayurvedic leaves using FAAS technique

Surekha<sup>1</sup>, B. R. Kerur<sup>1\*</sup>

<sup>1</sup> Department of Physics, Gulbarga University, Gulbarga Karnataka, India – 585106

\*Corresponding Author

B. R. Kerur, Department of Physics, Gulbarga University, Gulbarga Karnataka, India

Email: [v.kerurbrk@gmail.com](mailto:v.kerurbrk@gmail.com)

---

### Abstract

In the current study, the major- and minor-elemental contents like magnesium, calcium, and iron, zinc, manganese, and copper were determined in the Nerium oleander ayurvedic leaves using the Flame Atomic Absorption Spectrometer (FAAS) technique. The leaf sample was collected from the North-Karnataka region from six different districts, including Bidar, Kalaburgi, Yadgir, Raichur, Bijapur, and Baglkot. The result of the study showed that the concentration level of calcium (Ca) was found to be the highest and that Mg was found to be the second-highest concentration level, which is compared to Fe, Zn, Mn, and Cu. These elemental concentrations were found to be within the permissible limits (FAO/WHO). These elements are crucial for energy metabolism and play a role in preventing certain cancer disorders.

Keywords: Elements, Ayurvedic herb, Nerium oleander, Standards, Flame Atomic Absorption Spectrometer.

---

### 1. Introduction

Traditional medicinal plants, particularly Ayurvedic herbs, have been used for centuries as traditional remedies to treat various ailments. The World Health Organization (WHO) has reported that approximately 80% of people worldwide rely on traditional ayurvedic medicine for direct or indirect health purposes. The Ayurvedic herbs effectiveness in treating and preventing diseases is often attributed to their unique chemical composition [1 2]. The level of elemental content in Ayurvedic herbs is also important in determining their pharmacological actions [3 4]. Elemental contents play crucial roles in the body's metabolism and overall health [5 6]. They are required for numerous physiological processes and are involved in enzyme activities, cellular functions, and antioxidant defense mechanisms.

*Nerium Oleander*, commonly known as oleander, is a shrub that is cultivated in temperate and subtropical regions around the world. It belongs to the family Apocynaceae. Oleander has been traditionally used for its medicinal properties, particularly in the treatment of lung, colon, uterine, and breast cancer [7, 8]. It is known for its potential anticancer activity [9]. The present study focuses on the major and minor elemental analyses of selected part of the Nerium oleander Ayurvedic herb. *Nerium oleander* leaves contain a wide variety of bioactive compounds. *Oleander* exhibits many biological and pharmacological activities with its rich phytochemical content [10].

The main aim of this study was to investigate the presence and levels of the following major and minor contents: (Mg, Ca) and (Fe, Zn, Mn, Cu) in the *Nerium Oleander* ayurvedic leaves using the FAAS technique.

### Determination major and minor elements

The major and minor elemental contents likes (Mg, Ca) and (Fe, Zn, Mn, Cu) in leaves of *Nerium oleander* ayurvedic herb sample were analyzed using Flame Atomic absorption spectrometer (FAAS).

## 2. Materials and methods

### a. Sample collection

In figure 1, the image of the selected leaves of *Nerium oleander*, an Ayurvedic herb collected from the North-Karnataka region, is shown in different places in different districts, including Bidar, Kalaburgi, Yadgir, Raichur, Bijayapura, and Baglkot.



**Figure 1:** *Nerium oleander* ayurvedic herb

Collected leaf samples were cleaned in tap water to remove contamination and rinsed with double-distilled water. They were then dried in a shaded laboratory at room temperature for 35 days. Dried samples are powdered in a grinder and stored in an airtight container.

Each 0.20g sample of powdered plant leaves is put in a long volumetric flask and digested in a 7-ml acid solution. The acids used for digestion are nitric acid (HNO<sub>3</sub>), sulfuric acid (H<sub>2</sub>SO<sub>4</sub>), and perchloric acid (HClO<sub>4</sub>). After digestion, the solution is heated until white vapours form. Following digestion, 100 ml of double-distilled water are added to the clear solution to dilute it. The diluted solution is filtered via Whatman filter paper no. 42. A 100 ml solution has been filtered for elemental analysis using Flame Atomic Absorption Spectroscopy (FAAS).

### c. Elemental analysis

#### c.1. Instrumentation

An advanced technique for elemental analysis is the Thermo Scientific iCE 3000 series Atomic Absorption Spectrometer (AAS), which is depicted in figure 2. It is intended to be totally automatic, which makes element detection quick and easy. The AAS Spectrometer is used in the current investigation with two different types of flames: the C<sub>2</sub>H<sub>2</sub> flame and the N<sub>2</sub>O-C<sub>2</sub>H<sub>2</sub> flame. These various flames are employed to enhance the sensitivity of the analysis and optimize the atomization process for particular elements. Data stations are used to manage the AAS instrument and gather data. Thermo Scientific's iCE SOLAAR software, which runs on the Windows operating system, makes it easier to use the equipment.



**Figure 2:** Model of Thermo Scientific iCE 3000 Series Atomic Absorption Spectrometer at USIC Department, Gulbarga University Kalaburgi Karnataka India.

Overall, the combination of the iCE 3000 series Atomic Absorption Spectrometer,  $C_2H_2$  and  $N_2O-C_2H_2$  flames, data stations, and the iCE SOLAAR software enables accurate and efficient elemental analysis

### 3. Results and Discussion:

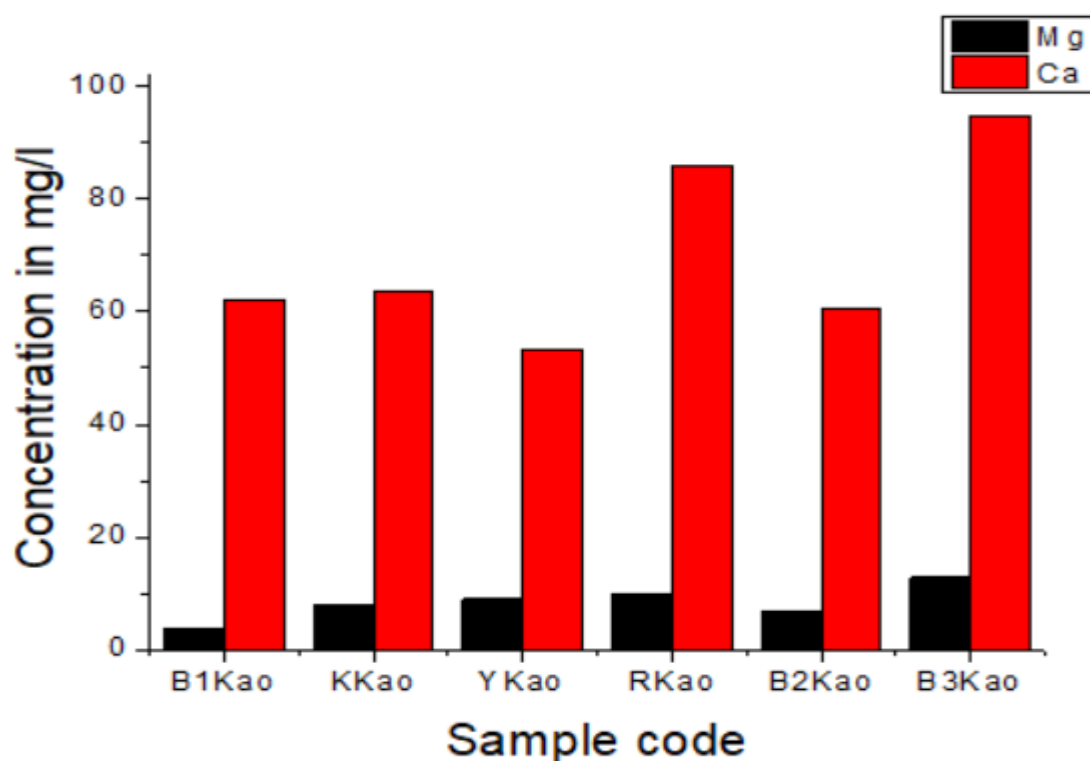
Analysis of the six elements namely major –elements (Mg, Ca) and minor- elements (Fe, Zn, Mn, and Cu) was determined in the selected leaves of *Nerium oleander* medicinal plant using flame atomic absorption spectrometer (FAAS). Specific operating parameters of Flame atomic absorption spectrometer (FAAS) are obtained in Table 1. The concentrations level of the ayurvedic herb samples resulting from the analysis of the six major and minor elements are given in table 2.

**Table: 1** Specific operatic parameters of Flame atomic absorption spectrometer (FAAS)

Elements	Wavelength (nm)	Slit width (nm)	Lamp Current	Flame Type	Fuel (L/min)	Flow	Characteristic Conc. mg/L	Burner Height (mm)
Mg	285.2	0.5	75%	Air-C <sub>2</sub> H <sub>2</sub>	0.9		0.1734	7
Ca	422.7	0.5	100%	N <sub>2</sub> O-C <sub>2</sub> H <sub>2</sub>	4.0		0.0627	11
Cr	357.9	0.5	100%	N <sub>2</sub> O- C <sub>2</sub> H <sub>2</sub>	4.0		0.1734	11
Mn	279.5	0.5	75%	Air-C <sub>2</sub> H <sub>2</sub>	1.0		0.1027	7
Fe	213.9	0.5	75%	Air-C <sub>2</sub> H <sub>2</sub>	0.9		0.5614	7
Cu	324.8	0.5	75%	Air-C <sub>2</sub> H <sub>2</sub>	0.8		0.1956	7
Zn	213.9	0.2	75%	N <sub>2</sub> O- C <sub>2</sub> H <sub>2</sub>	0.9		0.0757	7

**Table: 2** Concentrations of major and minor- elements (mg/l) in leaves of *Nerium oleander*.

SI.NO	Sample code	Major Elements		Minor-Elements			
		Mg	Ca	Fe	Mn	Zn	Cu
1	B1Kao	3.60	62.12	3.01	0.07	0.24	0.22
2	KKao	7.70	63.74	0.45	0.03	0.11	0.17
3	YKao	8.91	53.37	0.11	0.05	0.17	0.23
4	RKao	9.85	86.02	0.23	0.05	0.11	0.22
5	B2Kao	6.66	60.51	1.14	0.03	0.24	0.19
6	B3Kao	12.7	94.77	1.07	0.01	1.03	0.21



**Figure 3:** concentration of major elements in *Nerium oleander* Leaves

#### 4. Discussion

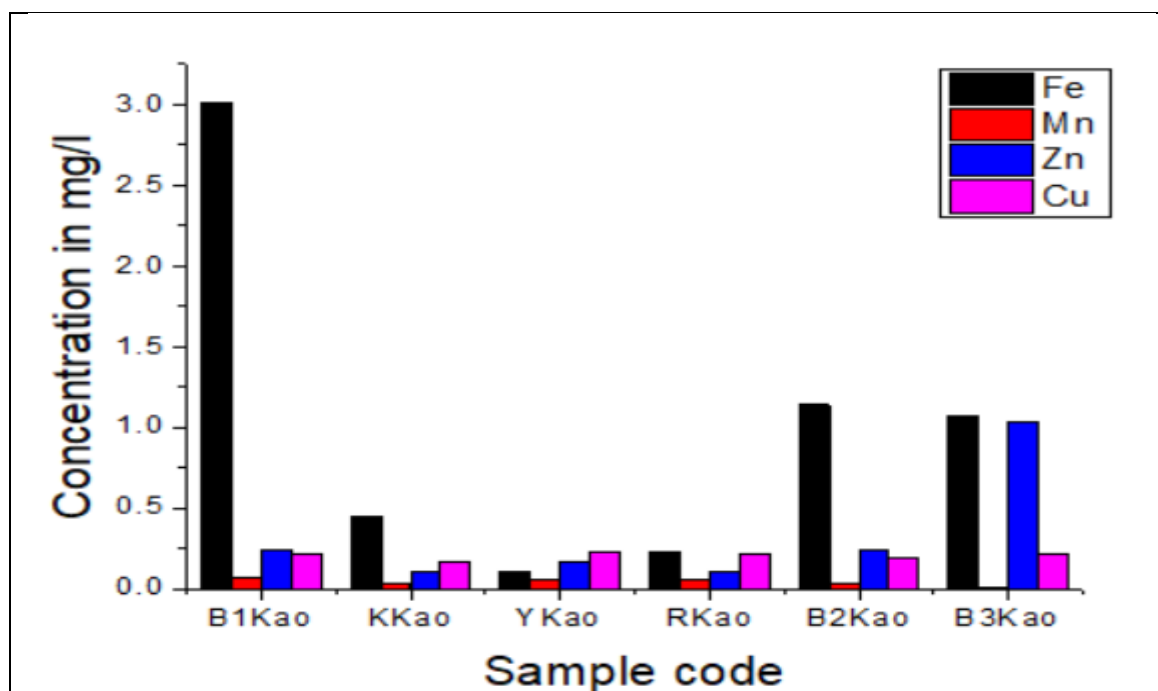
##### a. Major elements

##### Magnesium

Mg levels in the leaves of *Nerium oleander* ranged from 3.60 mg/l to 12.7 mg/l in all regions of the sample. The Baglkot region had the highest level of magnesium, as shown in Table 2 and Figure 3. Magnesium is the second most prevalent intercellular agent in the body and is involved in a wide range of biological processes [11]. Magnesium is an essential mineral that plays numerous crucial roles in the human body. It is involved in a wide range of physiological processes, and its presence is necessary for overall health and well-being. [12].

##### Calcium

In *Nerium oleander*, calcium levels ranged from 53.37 mg/l to 94.77 mg/l in all regions of the sample. The result reveals that the Baglkot region has high levels of calcium, as shown in Table 2 and Figure 3. Calcium is a vital mineral that plays a crucial role in various essential functions within the body [13].



**Figure 4:** Concentration of Minor-Elements in leaves of *Nerium Oleander* ayurvedic herb

#### b. Minor elements

##### Iron

The iron content of *Nerium oleander* leaves ranged from 0.11 to 3.01 mg/l. The results indicate that the Bidar region has higher levels of iron when compared to other regions, as shown in Table 1 and Figure 4. Iron is a crucial mineral that the body requires for various vital functions, particularly growth and development. Iron is an essential component of many proteins and enzymes that play essential roles in physiological processes [14].

##### Manganese

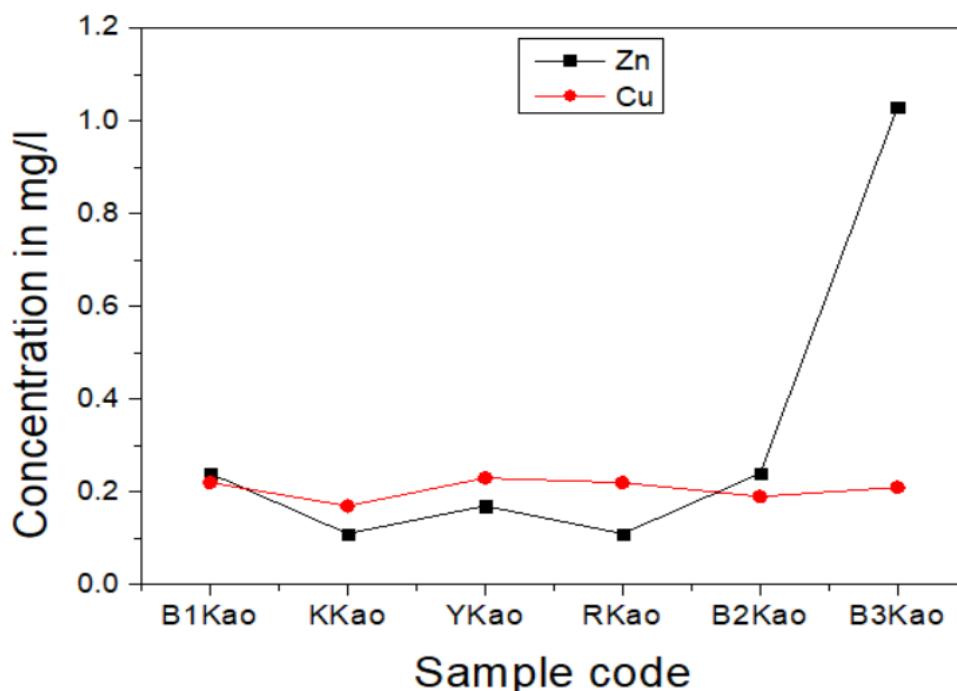
The manganese content in *Nerium oleander* leaves ranged from 0.01 mg/l to 0.07 mg/l, as shown in Table 2 and Figure 4. The result shows the Bidar region's high manganese content in comparison to other places. Manganese helps the body form connective tissue, bones, and blood clotting factors.

##### Zinc

Zinc levels in *Nerium oleander* leaves ranged from 0.11 to 1.03 mg/l. It shows that the Baglkot region has a higher level of zinc than other regions, as shown in Table 1 and Figure 4. The result shows the high concentration of zinc in the Baglkot region as compared to others. Zinc is important for your body because it helps your immune system and metabolism function.

##### Copper

Copper levels in *Nerium oleander* leaves ranged from 0.17 mg/l to 0.23 mg/l, as shown in Table 2, Figure 4 and Figure 5 shows the correlation between zinc (Zn) and copper (Cu) in *Nerium oleander* leaves. Copper concentration was obtained within the WHO limit. Copper is an essential mineral for bone strength, heart health, and immune health [17]. Copper is an essential trace element that plays a crucial role in various physiological processes in the human body. It is required in small amounts, but its presence is vital for overall health.



**Figure 5:** The correlation between zinc (Zn) and copper (Cu) elements in *Nerium oleander* leaves.

## 5. Conclusion

In this study, the major and minor elements in *Nerium oleander* Ayurvedic leaves were precisely determined using the FAAS technique. These leaves may have beneficial nutritional and therapeutic characteristics with application in Ayurvedic medicine due to the significant presence of major minerals like calcium and magnesium as well as minor elements like iron, manganese, zinc, and copper. The amount of these elements in herbal remedies was crucial in understanding the pharmacological activity of ayurvedic herb because it is well known that these elements play a significant role in the body's metabolism and in the therapeutic action of Ayurvedic herbs. These elements play vital roles in various physiological processes and are necessary for the overall health and proper functioning of the body.

## Acknowledgement

I would like to most sincerely thank my research supervisor, prof. B.R Kerur. And USIC Department (FAAS, Spectroscopy), Gulbarga University Kalaburgi for experimental characterization.

## Conflicts of Interest

Authors declared no conflicts of interest

## References

- [1] Sanjay Asthana, swarn lata Bansal, 2016, Role of ayurvedic medicinal plants in ancient India. Int. J. of Advanced sci. and Res., 2455-4227.
- [2] Lavanya R and Pramod V Pattar, 2017. Traditional Knowledge on folk medicine by rural women in chikkanayakahalli taluka. International journal of Herbal medicine. Int. j. of herbal medi. 5(2): 05-10.
- [3] Rajeshwari morabad, Sharangouda J. Petal, 2017. Elemental profile analysis of some Indian traditional medicinal spice seeds of Ballary district, Karnataka using AAS

- Technique. Int. J. Of current pharm. R., 0975-7066.
- [4] Abdul Ghani, Zulfaqar Ali, Muhammad Ishtiaq, Mehwish Maqbool and Saira Praveen, 2012. Estimation of macro and micro nutrients in some important medicinal plants of soon valley, district khushab, Pakistan. Academic J., 1684-5315.
- [5] Vijay Paul, Rakesh pande, Ramesh K.V. and R.C. Meera, 2017. Atomic Absorption spectroscopy (AAS) for elemental analysis of plant sample. ICAR, 16-25.
- [6] Kubmarawa D, Magomya A.M., yebpella G.G. and Adedayo S.A1, 2011. Nutrient content and amino acid composition of the leaves of cassia tora and celtis integrifolia. Int. res. J. of bio. And bioinformatics, 222-225. 2011.
- [7] Pattar M. Teerthe S B.R Kerur, 2017. Determination of major and trace elements of traditional medicinal plants of Gulbarga region. Int Ayurvedic Med J. 5:4401-8.
- [8] Shirin K amid S. Shania S. Fatima K, 2010. Determination of major and trace elements in the indigenous medicinal plant withania somnifera and their possible correlation with therapeutic activity. J Saudi Chem. Soc., 14:97-100.
- [9] Ali HFM, El-Ella FMA, Nasr NF. Screening of chemical analysis, antioxidant, antimicrobial and antitumor activity of essential oil of oleander (*Nerium oleander*) flower. Intern. J. Biol. Chem. 2010; 4(4):190–202. Doi: 10.3923/ijbc.2010.190.202. ]
- [10] Namian P, Talebi T, Germi KG, Shabani F. Screening of biological activities (antioxidant, antibacterial and antitumor) of *Nerium oleander* leaf and flower extracts. Am. J. Phytomed. Clin. Ther. 2013; 1(4):378–384.
- [11] Shailaja Mahadappa and B. R Kerur, 2021. Mineral Elements content in Ayurveda medicinal plants by Absorption and Emission Spectroscopic Method. TOJQI, 3436-3442.
- [12] Santosh Teerthe and B.R Kerur, 2017. Elemental Analysis of Medicinal plants from North Karnataka region by AAS method. Int. J. Res. Ayurveda pharm. 8(3).
- [13] Mohanraj pattar, Santoshkumar Teerthe, B R kerur, 2017. A study on major and trace elements in some traditional medicinal plants using AAS technique. 2455-698X. 2017
- [14] Muhammand Saar, Mir Ajab khan Mushtag Armanda, Gul Jan' Shazia sultana, Kifayat Ullah, Safaris' khan margay, 2010. Elemental analysis of some medicinal plants used in traditional medicine by AAS. J. of medi. Plants R. 4(19), 1987-1990.
- [15] Mohanraj Pattar, Soumya, B.R Kerur and Balaji Biradar, 2019. Elemental profile of Herb and Medicinal plant using Spectro. Analytical AAS technique. AIP Conf. proc., 2100(1): 020164.
- [16] Ratikanta Maiti, Humberto Gonzales Rodriguez, Hewing demises Edge, ch. Arun kumara and N.C Sarkar, 2016. Macro and Micronutrients of 44 medicinal plants species, used Traditional in Nuevo Leon Mexico. Int J. of Bio-resource and stress mange. 7 (5):1054-1062.
- [17] Sonika Jain, Jaya Dwiveda, Pankaj Kumar Jain, Swaha satpathy and Arjun patra, 2016. Medicinal plants for treatment of cancer