IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 3, March 2022
Impact Factor: 6.252

Analysis of Some Medicinal Plants for the Assessment of Elemental Content using NAA and AAS Techniques

Dr. M. L. Andhale
Department of Chemistry
Annasaheb Vartak College of Arts, Commerce, Science, Vasai, Maharashtra, India

Abstract: *Herbal medicines are being employed worldwide in a variety of health care setting .The finger printing of some the medicinal plant from India has been carried out. The analysis can be done by using Neutron Activation Analysis and atomic absorption spectroscopy. Different parts of the plants like, Flowers, Barks, Root, and Fruit etc. are used for the analysis. About five elements estimated in the five medicinal plants. In order to check the reliability of both the techniques. The elements Na, K, Cu, Co and Fe were determined by both the techniques in five medicinal plants. The results obtained by both the techniques agree with each other within experimental uncertainties.*

Keywords: Herbal medicines

I. INTRODUCTION

The various medicinal plants (Table:1) in the form of leaves and roots were collected from and around the Keshav Shrushti , Bhayander and Narsing K. Dube College, Nalasopara, Maharashtra, India. Surface contaminants of the plant samples were removed by washing with deionised double distilled water. The leaves were air dried in a clean drying chamber and then dried at 80°C for overnight in a oven. The samples were powdered in agate mortar and passed through 100 mesh sieve. Sampling was done from this powder. Two biological reference materials namely IAEA CRM V-10 and CTA VTL-2 (IJCT Poland) were used a control and reference multi-elemental standard respectively. The concentrations of all the elements investigated in this study are well certified in the reference material.

II. THE TECHNIQUE OF NEUTRON ACTIVATION ANALYSIS

It is one of the most sensitive and specific methods available for determination of trace quantities of a wide range of elements. Sample to be analyzed exposed to a flux of neutrons. Amount of radionuclides formed is directly proportional to the amount of element present. Intensity of the radiation is measured.

2.1 Irradiation

Table 1: Radionuclides used for the analysis and their γ-energies.

Nuclide	γ-ray energy in keV
^{42}K	1,524
^{24}Na	1,368
^{59}Fe	1,099
^{64}Cu	1,040
^{60}Co	1,332

Note: Thermal neutron flux: 10^{12} - 10^{13} n cm^{-2} s^{-1}

2.2 Irradiation and Counting

About 50-80mg of each sample was sealed in a polyethylene cover. Samples, reference standard and control sample were packed together and irradiated in theE8 position of the Apsara reactor, BARC. Irradiation time was varied

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 3, March 2022
Impact Factor: 6.252

between 30 min and 7 h depending on the half lives of the activation products. The sub-cadmium neutron flux in this position is in the order of 1 × 10^{12} cms . The samples were also irradiated at Dhruva reactor for 1 d in order to determine the elemental concentration of the long-lived radionuclides, such as Fe. The short irradiation and counting were conducted at the reactor site followed by spectra unfolding at the Radiochemistry Division of BARC, Mumbai. The radionuclides used for the analysis at their y energies are given in Table 2. All the samples and SRMs were counted at a calibrated sample-detector distance from a high purity germanium (HPGe) detector (Ortec) with 25% relative efficiency and 2.1 keV resolution at 1,332.5 keV of ^{60}Co line, which was connected, to an IBM PC XT computer system. Most of the short lives isotopes contributing to the dead time belong to the elements present in major Ca and Minor AI levels. The presence of the different element analysed in various medicinal plants was confirmed by measuring their characteristics y-ray energy as well as half lives were which are in good agreement with the literature values. Radioactivity measuring times were chosen not to exceed 0.2 times the half lives of the radionuclide of interest. Long irradiated samples were brought to Radiochemistry Laboratory at Mumbai University and y-activity was measured. Counting was followed for 1 ,2 ,6 and 12 h at different intervals up to 3 m. Care was taken to obtain maximum elemental information from more than one counting and the reproducibility of data was checked. Elemental concentration of various ayurvedic medicinal plants were calculated by relative method using control and reference multi-elemental standard as comparators.

III. Elemental Analysis by Atomic Absorption Spectrometer

The samples in the powered form are weighted and digested in the mixture of nitric acid and perchloric acid (5:1) after digestion few drops of HCl solution was added. This solution was heated gently and then filtered. This residue was again subjected to digestion and filtrate is taken. This process is repeated and the total filtrate is diluted suitable with distilled water. The obtained solution is used for the analysis of elements of interest by AAS using suitable hollow cathod lamps. The concentration of various elements was determined by comparator method using A.R. grade solutions of elements of interest.

IV. Results and Discussion

Samples were assayed for gamma activity of the activation products using an 40% HPGe detector couple to a PC based 4K channel analyzer in an efficiency. Plants, flower, bark, root etc. listed in Table 1.1

Table 1.1: Botanical names of the plants and different parts used in Various Diseases

Sr. No.	Common names of the plants	Botanical Name of the plants	Part used	Medicinal uses
1	Babul	Acacia Arabica	Fruit	Epilepsy
2	Jayafal	Myristica Fragraus	Seed	Warms
3	Parsi Bhavani	Hyouymes Niger	Seed	Pain
4	Pimpal	PiperLongure	Root	Anemia
5	Cutfal	Myrica Esculanta	Bark	Piles

Table 1.2: Analysis of some medicinal plants for K, Na, Cu, Co and Fe Content by NAA and AAs Techniques

Sr. No.	Medicinal Plant	Element	NAA	AAS
1.	Babul	K (mg/gm)	8.79	8.55
		Na (mg/gm)	0.08	0.05
		Co(mg/gm)	2.8	3.72
		Cu(mg/gm)	21.4	21.0
		Fe(mg/gm)	261	201
2.	Jayafal	K (mg/gm)	17.5	10.5
		Na (mg/gm)	0.83	0.69
		Co(mg/gm)	18.0	17.1
		Cu(mg/gm)	8.35	8.00
		Fe(mg/gm)	660	610

IJARSCT
ISSN (Online) 2581-9429
International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
Volume 2, Issue 3, March 2022
Impact Factor: 6.252

3.	Parsi Bhavani	K (mg/gm) Na (mg/gm) Co(mg/gm) Cu(mg/gm) Fe(mg/gm)	1.80 3.90 0.25 1.77 571	2.10 4.25 0.20 1.55 621
4.	Pimpal	K (mg/gm) Na (mg/gm) Co(mg/gm) Cu(mg/gm) Fe(mg/gm)	3.71 0.31 0.91 6.25 914	2.50 0.20 0.81 6.30 960
5.	Cutfal	K (mg/gm) Na (mg/gm) Co(mg/gm) Cu(mg/gm) Fe(mg/gm)	43.4 0.12 0.46 7.72 248	42.2 0.20 0.32 6.20 260

It shows that the various elements estimated in the present work show that the following order of concentration in most of the plants, K>Na> Fe> Co> Cu. in order to check the reliability of both techniques the elements sodium, potassium, copper, cobalt, and iron were determined by both the techniques in some medicinal plants. These results are recorded in Table:1.2

The results obtained by both techniques agree with each other within experimental uncertainties. It is to be noted that the result presented in the Table 1.2 are an average of atlest independent measurements and show a precision of ~±2 to 10%.

REFERENCES

[1]. Ambasta S.P.The useful plants of india, CSIR,New Delhi,India (1986)
[2]. T. Balaji, Rad.Nucl Chem,243,3 (2011).
[3]. F.J.Foche, Rad.Nucl. Chem, 257,1(2013).
[4]. Abou Arab, A.A.K and Donia M.A.A, Heavy metals in Egyptian spices and medicinal plants and the effect of processing on their levels, J.Agri, Food Chem,Vol.48.No.6(2000).
[5]. Rajurkar N.S, Damame M.M, Appl Radit.lost 1998Jul49(7) 773-6.