STUDY ON ELEMENT CONTENT OF MEDICINAL PLANTS *Clerodendrum colebrookianum* AND *Vitex negundo*

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Abstract: Medicinal plants are important part of health care system. Elements present in medicinal plants have a great role in the management and treatment of various diseases. The concentrations of elements in plant species depend on various factors like geographical location, genetic background, cultivation methods, environmental condition, etc. This present investigation was conducted to analysis the concentration of trace and macro elements in two selected traditionally used medicinal plants collected from local village areas of Nalbari District of Assam. Flame Photometry and Atomic Absorption Spectroscopy (AAS) techniques are used for quantitative analysis of various elements present in *Clerodendrum colebrookianum* and *vitex negundo* leaves. Eight trace elements (Fe, Cu, Ni, Mn, Zn, Na, K, Cr) were determined in these two medicinal plants. The present analysis may helpful for standardization of plant derived pharmaceutical drug.

Keywords: Medicinal plants; elements; Atomic Absorption Spectroscopy; leaves; extracts

1. Introduction:

Medicinal plants are found to be the sources of various types of important drugs of the modern world. Medicinal plants are reported to play an important role in healthcare system and various parts of the plants are widely consumed as home remedies for various types of diseases. It has been found that a major part of traditional therapies mostly depends on either crude plant extracts or their different active ingredients [1]. Various research studies are going on in different parts of the world and medicinal properties of some of the plants have been documented and published by some of the researchers.

Plants are found to be primary sources of food, vitamins, antioxidants as well as micro, macro-elements, and heavy metals. Trace elements have an important role in assessing the medicinal properties of plants. These elements are essential for different biochemical and physiological activities in most of the organisms [2]. Various research workers are investigating the metabolic function of micro and macro-elements throughout the world. It is very much essential to analyze the compositions of elements in medicinal plants. The concentrations of elements are different for different plants; these variations are mainly due to the differences in plant structure and geographical location of plants [3]. Availability of minerals are different in different soils in the earth.

Vitex negundo is widely distributed throughout the greater part of India. *Vitex negundo* is globally distributed in Indo-Malesia and cultivated in Asia, West Indies and many other countries. It is one type of large aromatic shrub. The leaves as well as stems are found to be highly aromatic. The flowers of this plant have characteristics musk-like smell. This plant is generally easily grown plant and commonly planted as a hedge plant. The planting of *Vitex negundo* are useful against soil erosion. Roots are woody with external surface brownish colored. Essential oils extracted from this plant are reported to have antibacterial activity [4]. *Vitex negundo* are reported to be used as psychotropic drugs, including sedatives, anticonvulsants and antipsychotics [5]. Various parts of *Vitex negundo* are reported to have different medicinal properties like hyperglycemic activity, hepatoprotective activity, enzyme-inhibitory activity, anticonvulsant activity, etc. [6].

Clerodendrum colebrookianum is found to be a very common plant in north-eastern part of India. It is an evergreen shrub. The leaves of this plant are reported to be non-toxic. The local name of *Clerodendron colebrookianum* is Nefa ful. Different parts of this plant are used by indigenous people of Assam for the treatment of various diseases like diabetes, cough, jaundice, fever, asthma, rheumatism, dysentery, malaria, blood pressure, stomachache, and dizziness [7]. The objective of this study was to investigate the concentration of elements in the leaves of *Clerodendrum colebrookianum* and *Vitex negundo* by using Flame Photometry and Atomic Absorption Spectroscopy (AAS) techniques.

2. Material and methods:

2.1 Sample Collection:

The plant specimens *Clerodendrum colebrookianum* leaves and *Vitex negundo* leaves were collected from village areas of Nalbari district, Assam, India during the month of April, 2022 to June, 2022. The taxonomic identification of the plant specimens was done in Department of Botany, The Assam Royal Global University. Nalbari district was situated in the bank of the river Brahmaputra.

2.2 Procedure for sample preparation for analysis in Atomic Absorption Spectroscopy and Flame Photometry

Dried plant parts were ground into fine powder. Powder of plant materials were taken in ceramic crucible and heated at 500 °C for six hours in electric Muffle furnace. Almost all the organic materials of plant parts have destroyed at this high temperature. The crucibles with ash samples were then kept in desiccator after removing from muffle furnace. Exact weights of the ash materials were taken. A mixture of concentrated HNO_3, HCl and H_2SO_4 acids in a ratio of 1:2:4 was added in portion to the ash samples. The plant materials were then digested in acid mixtures in a porcelain basin using electric hot plates for five hours. The resultant colourless residue materials were then dissolved in 15 mL of 1:1 mixture of conc. HCl and H_2O and the solution was allowed to stand for 12 hours. The resultant mixture was then filtered into a 100 ml volumetric flask and the volume was made upto exactly 100 mL mark. The resultant sample solution was used for elemental analysis through Atomic Absorption Spectroscopy and Flame Photometry.

2.3 Atomic Absorption Spectroscopy

Concentrations of various elements were evaluated through Atomic Absorption Spectroscopy. Perkin Elmer AAnalyst200 model was used for the present study. The AAS analysis was done in the Gauhati University.

2.4 Flame Photometry (FP)

Na and K were estimated using Flame Photometry. Elico Flame Photometer of CL-361 Model was used for present analysis. Flame Photometry was done in Gauhati University.

3. Result and Discussion:

Table 1. Weight of the crude and ash samples.

Sample	Weight of dried powdered leaves	Weight of Ash of the leaves
Clerodendrum colebrookianum leaves	4.0 g	0.198 g
Vitex negundo leaves	4.0 g	0.217 g

Table 2. Standard conditions for Atomic Absorption Spectroscopy measurement

Element	Wavelength (nm)	HC Lamp current (mA)	Slit width (nm)	Optimum working range (ppm)	Types of Flame
Fe	248.3	5	0.2	0.06-15.0	Air-C2H2
Cu	324.8	4	0.5	0.02-3.0	Air-C2H2
Zn	213.9	5	1.0	0.01-2.0	Air-C2H2
Ni	232.0	4	0.2	0.1-20.0	Air-C2H2
Mn	279.5	5	0.2	0.02-5.0	Air-C2H2
Cr	357.9	7	0.2	0.06-15.0	Air-C2H2

Table 3. Concentrations of trace elements by Atomic Absorption spectroscopy and Flame photometry in ash sample of *Clerodendrum colebrookianum* leaves.

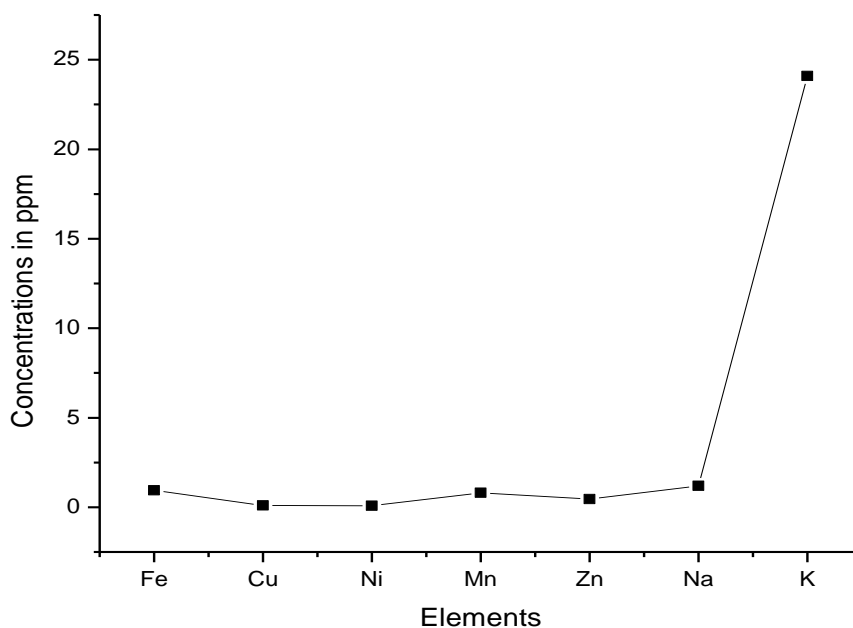| Elements	ppm in 100 ml of aqueous extract of the ash
Fe	0.934
Cu	0.092
Ni	0.076
Mn	0.809
Zn	0.457
Na	1.189
K	24.09

Fig. 1. Concentrations of elements in ash sample of *Clerodendrum colebrookianum* leaves.

Table 4. Concentrations of trace elements by Atomic Absorption spectroscopy and Flame photometry in ash sample of *Vitex negundo* leaves.

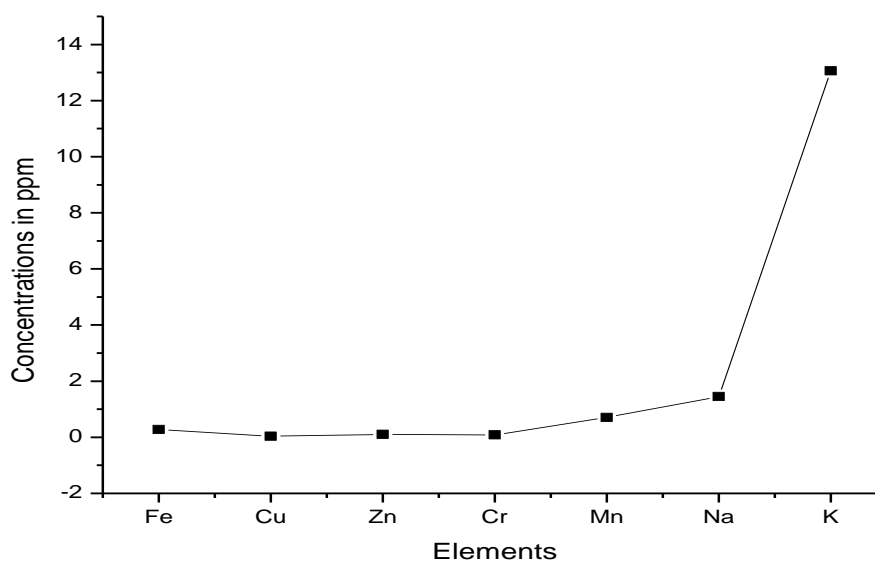| Elements	ppm in 100 ml of aqueous extract of the ash
Fe	0.275
Cu	0.039
Zn	0.108
Cr	0.088
Mn	0.709
Na	1.455
K	13.06

Fig. 2. Concentrations of elements in ash sample of *vitex negundo* leaves.

Analysis of eight elements namely Cr, Fe, Cu, Ni, Mn, Zn, Na, K in two selected traditionally used medicinal plants was done. *Clerodendrum colebrookianum* and *Vitex negundo* leaves are used for elemental analysis. The element concentrations of selected plants are given in Table-3 and 4. The distribution levels of selected elements in the present analysis for *Clerodendrum colebrookianum* leaves follows the order K>Na>Fe>Mn>Zn>Cu>Ni. The distribution levels of elements for *Vitex negundo* leaves follows the order K>Na>Mn>Fe>Zn>Cr>Cu. Element Cr was found to be absent in *Clerodendrum colebrookianum* leaves and Ni was found to be absent in *Vitex negundo* leaves.

Herbal medicines may be valuable source of essential and trace elements for human bodies. Medicinal plants contain various trace elements in different concentrations. Human body can easily absorb trace elements from medicinal plants. Medicinal plants may be the potential source of various necessary elements for human bodies. Metals are classified as macro and micro or trace elements. Calcium, sodium, chloride, etc. are considered as macro-minerals whereas iron, manganese, molybdenum, chromium, iodine, zinc, selenium, etc. are considered as micro-elements [8]. Various research works are going on to determine the exact role of trace elements in the metabolic function in human bodies. These elements are required in human bodies in some particular ranges. In many cases abnormal quantity of these elements in human bodies causes various problems in health. In majority of the cases it has been found that medicinal plants are safe for human consumption in terms of their concentrations of trace elements [9].

Many important information are obtained from the present research works. Different types of trace elements like iron, copper, zinc, chromium, selenium, manganese, molybdenum, etc. are essential for human bodies and they have different vital roles for maintenance good health [10]. Trace elements are considered as potential agent for the improvement of various types of metabolic disorders including diabetes. Some trace elements are used as cofactors of enzymes and play vital role for the protection of pancreatic β-cells from free radical damage. The analysis of concentrations of trace elements are important for finding the efficacy of medicinal plants. Some of the biologically important trace elements are considered for analysis in this study.

Copper is one of the important essential elements for proper growth of human health. Deficiency of Cu may cause different health issues like anaemia, neutropenia in animals. Copper is an important element for various enzymatic reactions. The excess amount of copper causes different health problems such as hypertension, liver damage, coma etc. [11]. Manganese is mainly stored in liver. Manganese has important role in the proper functioning of central nervous system. Deficiency of Manganese may cause reproduction failure. Zinc has an important role in some processes of genetic activities. Zinc has important role in various activities of human bodies like maintenance of immune system, cytokines production, DNA synthesis, maintenance of proper cell cycle, RNA transcription. One of the important functions of nickel is that Ni is used as nucleic acid stabilizer in DNA and RNA. Chromium has an important role in glucose tolerance [12]. Chromium is an essential part of some of the enzymes involved in metabolism processes of human bodies. High level of chromium may be responsible for kidney failure and lungs damage. Low level of chromium may reduce the insulin activity.

Various trace elements have important roles in the management and prevention of different human diseases.

Indigenous medicinal plants are important source of these elements. These elements have multiple roles in human bodies. These are involved in different cellular, subcellular functions and metabolic processes. Some of these elements are required in daily basis in regular diet for the proper maintenance of human health. Vanadium, manganese, copper, zinc, chromium, calcium, etc. are some of the elements which are involved in the maintenance of blood sugar level in human bodies. These elements are involved in enhancing insulin sensitivity and are used as cofactors for some of the important enzymes involved in carbohydrate metabolism [13].

4. Conclusion:

The results from the elemental analysis it has been found that the medicinal plants can be considered as potential sources of the required essential elements. The present investigation have shown that *Clerodendrum colebrookianum* and *Vitex negundo* leaves contain various elements having important biological roles. It is believed that herbal medicines are safe and nontoxic. But herbal preparations may also contain various toxic elements in different quantities. Therefore, it is always helpful to investigate the medicinal plants properly before formulating a particular herbal drug. The plants under study are found to be rich in the some of the important elements having health benefit. The concentrations of these elements were detected at different levels. The data obtained from the elemental analysis will be useful for the preparation of herbal medicines.

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