European Journal of Medicinal Plants

22(2): 1-11, 2018; Article no.EJMP.39095
ISSN: 2231-0894, NLM ID: 101583475

Determination of Some Minerals and Trace Elements in Medicinal Plants - *Acalypha indica (*L.), *Datura metel (*L.) and *Tylophora indica* Used in the Treatment of Ashtma

Mohanraj Pattar[1,2], B. R. Kerur[2*] and C. Nirmala[3]

[1]H.K.E Society's, Smt. Veeramma Gangasiri Degree College for Women, Kalaburagi -585102, Karnataka, India.
[2]Department of Physics, Gulbarga University, Kalaburagi –585 106, Karnataka, India.
[3]Department of Dravyaguna, Shri Hingulambika Education Society's, Ayurvedic Medical College, Kalaburagi – 585101, Karnataka, India.

Authors' contributions

This work was carried out in collaboration between all authors. Author MP designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors BRK and CN managed the analyses of the study and managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/EJMP/2018/39095
Editor(s):
(1) Marcello Iriti, Professor, Plant Biology and Pathology, Department of Agricultural and Environmental Sciences, Milan State University, Italy.
Reviewers:
(1) Mohsen Kerkeni, University of Monastir, Tunisia.
(2) Salwa Refat El-Zayat, Egypt.
Complete Peer review History: http://www.sciencedomain.org/review-history/22798

Original Research Article

Received 29th October 2017
Accepted 16th January 2018
Published 20th January 2018

ABSTRACT

In the current era, medicinal plants are the major resources of indigenous medicines in the traditional medicine system and are playing an important role. Over 80% of the world population mainly depend only on traditional/folk medicinal plants for plant-based medicines to control many of the diseases and their extracts for health care. In the present study, the medicinal plants commonly used by the local people and traditional practitioners of Kappathgudda area, Gadag District, North Karnataka region for treatment of Asthma viz. *Acalypha indica* L., *Datura metel* L. and *Tylophora indica* belongs to Euphorbiaceous, Solanaceae and *Asclepiadaceae* families were selected for

**Corresponding author: E-mail: kerurbrk@hotmail.com;*
E-mail: mohanrajpattar@gmail.com;

elemental analysis due to its wider application in the traditional medicinal system. Analytical Atomic Absorption Spectrophotometer technique was adopted for the determination of various elements and indicated that Fe, Ca, K, Mg, Ti, Mn, V, Zn, Cu and Cd were present in all samples. The obtained results also revealed that the mineral and trace elemental contents were well within the permissible range and hence the medicinal plants are safe to be utilized in the drug formulations.

Keywords: Medicinal plants; Acalypha indica L.; Datura metel L.; Tylophora indica; asthma and elemental analysis.

1. INTRODUCTION

Medicinal plants are the major resources of indigenous medicines in the traditional medicine systems and are playing an important role in current era. The information on indigenous medicinal plants and their uses in traditional cultures are useful in the conservation of traditional cultures, biodiversity, for community healthcare and drug development [1]. Many of the medicinal plants used today were known to the earlier localized people and traditional practitioners, were highly considered for use in curing diseases and their preservative for the future generations. The authentic knowledge about the traditional medicinal plants passed on from one generation to another, after adding, deletions and refining the then existing methods [2]. Over 80% of the world population depends mainly on traditional medicinal plants and plant extracts for the health care [3]. Therefore man has been using plants and their extracts to protect himself against several diseases and also to improve his/her health and lifestyle over the generations. A report of the World Health Organization in 1990 states that still today a number of the people depends only on traditional medicines and are utilizing for the treatment of various kinds of diseases, due to their easy availability, low cost and more important is fewer side effects or no side effect at all compared with other medicines.

Among several diseases affecting man, asthma is the most common disease that is rising in prevalence worldwide; nearly 7 to 10 percent of the world population suffer from asthma [4] and it has been estimated that a further 100 million will be affected by 2025 [5,6]. It is a chronic condition caused due to smoking, environmental pollution, family history, and exposure to allergens. In ancient Indian system of medicine, a large number of drugs from the traditional medicinal plant for the treatment of asthma; and these plants usually have biochemical properties like anti-inflammatory, immunomodulatory, antihistaminic, smooth-muscle relaxants and allergic activity [7]. These traditional medicinal plants are used by the local people and traditional practitioners either in the form of extract or decoction [8], therefore the study related to mineral and trace elemental composition can help to understand the importance of these plants. The present study is developed with an objective to evaluate some mineral and trace elemental composition of selected traditional medicinal plants used for the treatment of asthma from Kappathgudda area of Gadag District, North Karnataka region.

The traditional medicinal plants under study are *Acalypha indica* l.*, Datura metel* L. and *Tylophora indica. Acalypha indica* L. belongs to the family of *Euphor biaceae* and is a weed widely distributed throughout the plains of North Karnataka region. It has been reported to be useful in treating asthma and several other ailments [9]. *Datura metel* L. belongs to the family of Solanaceae, which grows in warmer parts of the world including India. It is one of the most useful medicinal plants used in treating asthma [10]. Various parts of the plant (leaves, seeds, roots and fruits) are used for different purposes in medicine [11].*Tylophora indica belongs* to family *Asclepiadaceae* and is found in planes, hilly slopes and forests. It grows in a wide range of well-drained soil and prefers scanty localities [12]. It is traditionally used as folk remedy in certain regions of North Karnataka for the treatment of bronchial asthma, inflammation [13, 14] bronchitis, allergy and dermatitis [15-18]. Such traditional medicinal plants are of great medical value. The leaves extracts or decoction or blossoms of the *Acalypha indica* L.*, Datura metel* L. and *Tylophora indica* have been used as a traditional medicine for the treatment of asthma.

Much study has been done on the organic constituents of these three medicinal plants used in the treatment of asthma but little attention has been paid towards their mineral and trace elemental constituents, therefore, the present

study is take-up to find/know/estimate/ determine the presence of which elemental concentration will lead to use of these plants for asthma treatment in the local area of Kappathgudda of Gadag District, Karnataka.

2. MATERIALS AND METHODS

2.1 Plant Material

Table.1 shows the profile of the selected traditional medicinal plants considered for the study. About a few kg of fresh leaves of *Acalypha indica L., Datura metel L.* and *Tylophora indica* were collected from Kappathgudda area of Gadag district. The latitude and longitude lie between 75° 16" to 76° 03" E longitude and 14° 56" to 15° 53" N latitude [19]. Fig. 1. shows the collected medicinal plant leaves considered for the study and Fig. 2. shows the location map of the study area of Kappathgudda, Gadag District, and Karnataka. The leaves of the traditional medicinal plant were washed thoroughly 2-3 times with tap water and finally with de-ionised double distilled water to eliminate contamination due to dust and environmental pollution. The washed leaves were dried in shade fo r30-45 days at 25-30°C, then grinded to a fine powder and stored in dry clean polythene bags for further mineral and trace elemental investigation.

2.2 Sample Preparation for Elemental Analysis

All the plants were kept under shade for about 45 days to remove the moisture content. A fine powder is prepared/made with the help of mesh of 250 micrometer after grinder the leaves of the plants. A total of ten gram of grinded powder was taken in a pre-cleaned silica crucible and heated at 300-400°C for 2-3 hours in an oven. The crucible was brought to the room temperature using a desiccator. At the end of the process, the ash was obtained which was further used for the preparation of solution. One gram of ash was weighed using the Sartorius digital balance and mixed it with 25 ml of concentrated HCl and 25 ml of double distilled deionized water [1 gm of Ash + 25 ml of Conc. Hcl + 25 ml of deionized H_2O]. The mixed solution was then stirred for few minutes to have a clear solution; it was finally filtered using the watt man filter *Paper 41*. A 950 ml of double distilled deionized water was added to the filtered solution to make it to one liter [1000 ml] solution [20]. The same procedure was repeated for all the other three medicinal plant material samples. The obtained solutions were then used for the quantitative measurement of some technique. minerals and trace elemental analysis using Spectroanalytical Atomic Absorption Spectroscopy [AAS] technique.

Table 1. Profile of the selected medicinal plants used for the treatment of Asthma

S.no.	Botanical name	Family	Local name	Other medicinal use
1	*Datura metel* L.	Solanaceae	Unmatta	Rheumatism and to control dandruff.
2	*Acalypha indica* L.	Euphorbiaceous	Kuppigida	Constipation, Scabies, Eczema and Urinary problems.
3	*Tylophora indica*	Asclepiadaceae	Aadumuttada-balli	Cough, bronchitis, dysentery, diarrhea, wounds, ulcer, hemorrhoids, malignant tumor and leukemia

Fig. 1. Collected medicinal plant leaves

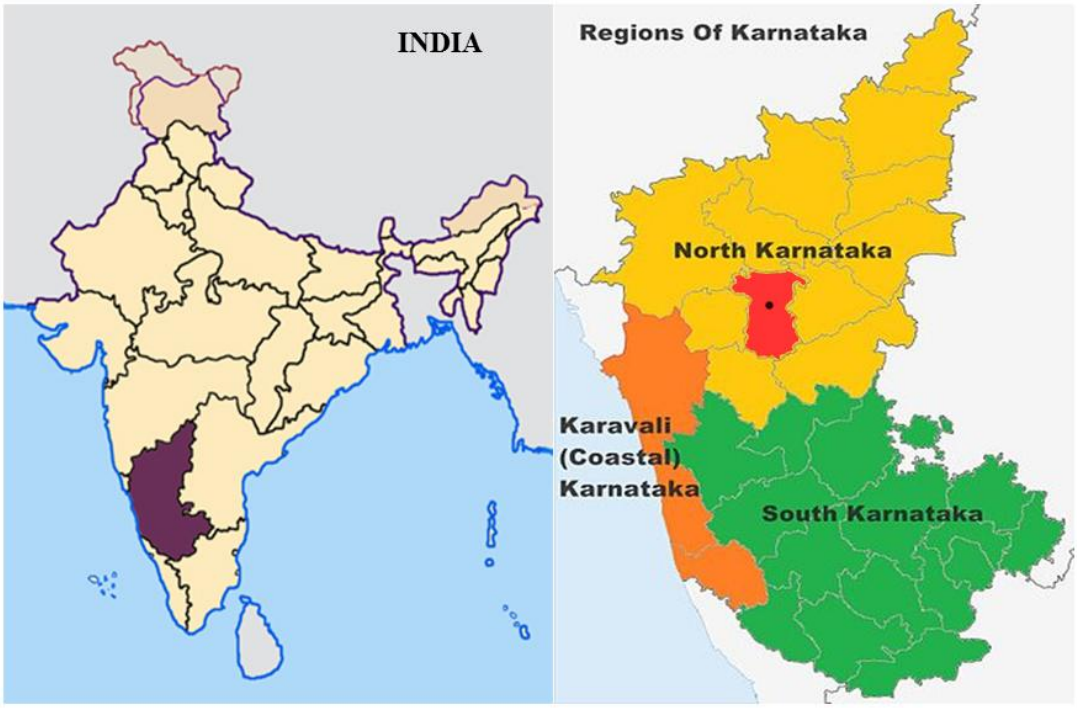


Fig. 2. Map of the study area of Kappathgudda, Gadag District, North Karnataka, India

2.3 Determination of Elements

Various mineral and trace elements such as Fe, Ca, K, Mg, Ti, Mn, V, Zn, Cu and Cd in the leaves of *Acalypha indica L., Datura metel L. and Tylophora indica* medicinal plants collected from Kappathgudda of Gadag district, North Karnataka samples were estimated using spectro analytical atomic absorption spectrometer. The make and model of the AAS instrument are Thermo Scientific™ and model No. iCE™-3000 series, respectively. This atomic absorption spectrometer is equipped with dedicated flame, furnace or combined flame and furnace option. Air-C_2H_2 andN_2O- C_2H_2 flame was used for estimation of minerals and trace elements content in the sample. The Thermo Scientific ™-iCE™-3000 series atomic absorption spectrometer was operated in a flame mode with the certain conditions shown in Table 2 and the temperature parameters were followed as recommended by the manufacturer. The standard solutions of elements of interest were prepared to make the standard calibration curve. Absorption for a sample solution uses the calibration curves to determine the concentration

Table 2. Operating parameter for working elements

Elements flow	Wavelength (nm)	Slit width(nm)	Lamp Current	Flame type	Fuel low (L/min)	CharacteristicConc. mg/L	Burner Height (mm)
Fe	248.3	0.5	75%	Air-C_2H_2	0.9	0.2344	7
Ca	422.7	0.5	100%	N_2O- C_2H_2	4.2	0.2340	11
K	766.5	0.5	100%	Air-C_2H_2	1.2	0.0567	7
Mg	285.2	0.5	75%	Air-C_2H_2	1.2	0.0170	7
Ti	365.4	0.5	75%	N_2O- C_2H_2	4.7	45.6638	11
Mn	279.5	0.2	75%	Air-C_2H_2	1.0	0.0860	7
V	318.5	0.5	75%	N_2O- C_2H_2	4.7	4.2067	11
Zn	213.9	0.2	75%	Air-C_2H_2	1.2	0.0333	7
Cu	324.8	0.5	75%	Air-C_2H_2	1.1	0.1119	7
Cd	228.8	0.5	50%	Air-C_2H_2	1.2	0.0344	7

of a particular element in that sample. Different hallow-cathode lamps used as a radiation source in the experiments for the determination of minerals and trace elements. This method provides both sensitivity and selectivity since other elements in the sample will not generally absorb the chosen wavelength and thus, will not interfere with the measurement.

3. RESULTS AND DISCUSSION

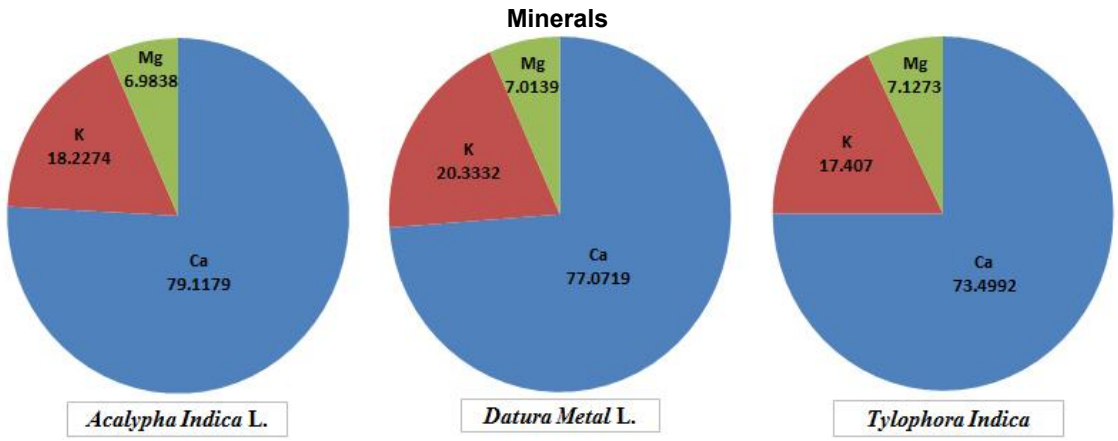
Information on the minerals and trace elements content in medicinal plants is very momentous, because, some of them play important roles in the formation of active constituents responsible for the remedial properties. Furthermore, some of these minerals and trace elements are vitally significant for different metabolic processes in the human body and are closely related to human growth and general health.

In the present study, the analysis for various mineral and trace elements in the sample prepared using the leaves of medicinal plants used for the treatment of asthma indicated that Fe, Ca, K, Mg, Ti, Mn, V, Zn, Cu and Cd were present in all the samples of *Acalypha indica* L., *Datura metel* L. and *Tylophora indica*. The presences of these elements in the collected medicinal plant species are responsible for curing various diseases including asthma and also play a vital role in the formation of secondary metabolites which are responsible for biological functions or pharmacological actions of traditional medicinal plants. The mineral and trace elemental analysis of *Acalypha indica* L., *Datura metel* L. and *Tylophora indica* through spectro-analytical Atomic Absorption Spectroscopy shows different concentration of various elements such as Iron, Calcium, Potassium, Magnesium, Titanium, Manganese, Vanadium, Zinc, Copper and Cadmium. The comparative concentration of the determined elements in *Acalypha indica* L., *Datura metel* L. and *Tylophora indica* medicinal plants are graphically presented in Fig. 3. These experimental results show that the elements such as Iron, Calcium, Titanium and Manganese are at higher concentration level in the leaves of *Acalypha indica* L compared to the elemental contents of *Datura metel* L. and the*Tylophora indica medicinal plant leaves.* The elements like Potassium, Zinc and Copper shows higher concentration level in the leaves of *Datura metel* L. and the elemental concentration level of Magnesium and Vanadium are high in the leaves of *Tylophora indica* plant. Further, it is also observed that the concentration of Calcium is found to be maximum and Cadmium concentration is found to be minimum in the three medicinal plants samples which are used for the treatment of asthma collected from Kappathgudda of Gadag district, North Karnataka.

The investigated minerals and trace elements play both curative and preventive role in combating diseases [21] and there is a wide scope to exploit the preventive medicinal aspects of various minerals and trace elements [22].

3.1 Iron (Fe)

Iron is one of the essential mineral that is naturally present in medicinal plants and it is required for human body since it immensely helps to transport oxygen from the lungs to the tissues. Iron has several key functions in the



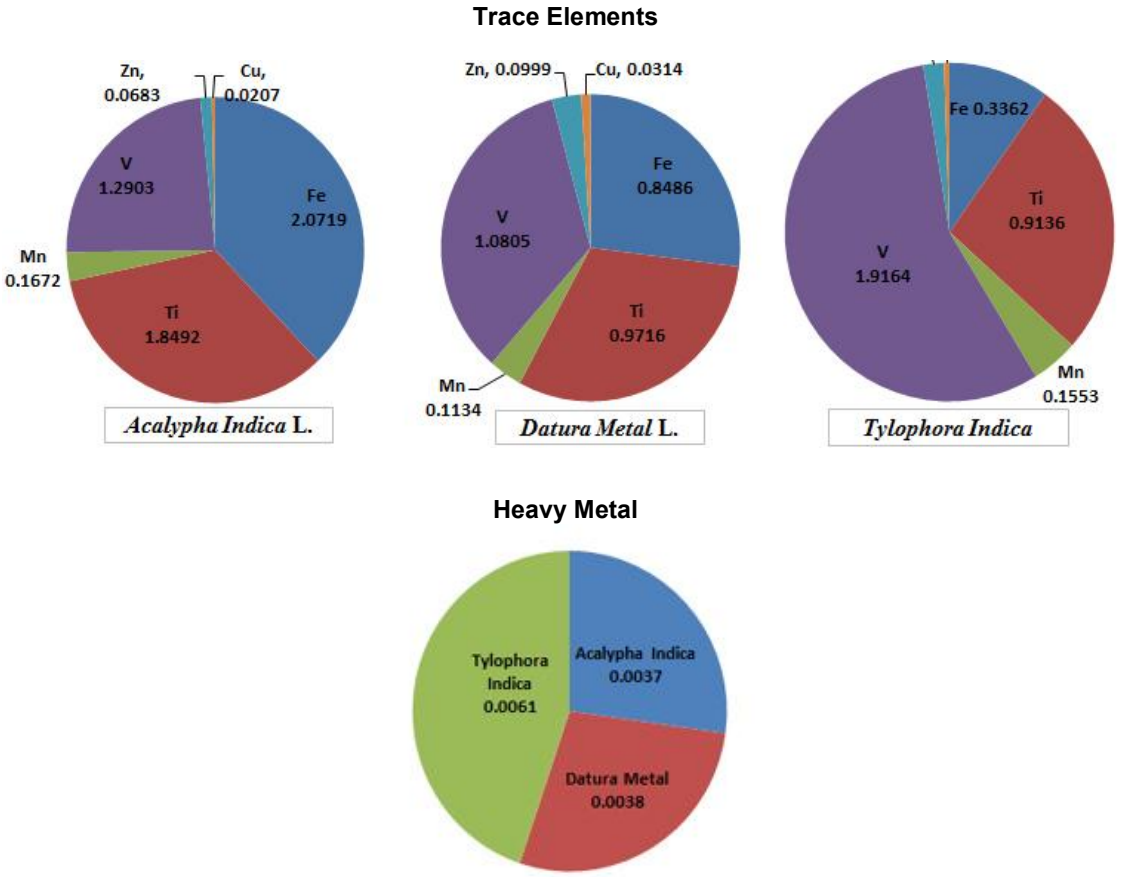


Fig. 3. Graphical representation of an elemental composition in the leaves of traditional Medicinal Plants used in the treatment of Asthma collected from Kappathgudda

human body including oxygen supply, energy production, and immunity. Red blood cells contain an iron component that binds to oxygen. The results of the earlier research [23] show that without the iron molecules, oxygen could not be attached to the blood cells and the body would not be able to produce the energy essential for life. Iron is also necessary for growth, development, normal cellular functioning, synthesis of some hormones and connective tissue, to prevent anaemia and asthma [24]. Iron deficiency exerts adverse effects on immune response and alters the metabolism and growth of pathogens. The elemental concentration of Iron (Fe) in the collected medicinal plant leaves is found to be 2.0719 mg/L in *Acalypha indica* L, 0.8486 mg/L in *Datura metel* L and 0.3362 mg/L in *Tylophora indica*. The estimated elemental concentration level of Iron in the medicinal plant samples were within the permissible limit given by FAO/WHO (1984).

3.2 Calcium (Ca)

Calcium is a common mineral found in many medicinal plants and is also one of the most abundant mineral found in the human body. The bones, teeth and nails retain the most calcium. Blood, nerve cells, and other body fluids contain the rest of the calcium [25]. The body needs calcium to help muscles and blood vessels contract and expand, and to send messages through the nervous system. Calcium is also used to help release hormones and enzymes that affect almost every function in the human body and play an important role in asthma. Calcium is involved in excitation-contraction of the bronchial smooth muscle and also in secretory processes including the release of most cell mediators which cause inflammation and Bronchoconstriction [26]. It is immensely essential for strong teeth and bones in children and young adults, to overcome the problems of high blood pressure, heart attack, premenstrual syndrome, colon cancer and keeping the bones

strong and reduces the risks of osteoporosis in old age [27].The elemental concentration of Calcium in the collected medicinal plant leaves found to be 79.1179 mg/L in *Acalypha indica* L, 77.0719 mg/L in *Datura metel* L and 73.4992 mg/L in *Tylophora indica*. Our data revealed that the Calcium contents of all studied medicinal plants are high compare to other elemental contents and are not deficient in Calcium.

3.3 Potassium (K)

Like Calcium, Potassium is an important mineral for proper functions of the tissues, cells, conduction of nerve impulse and organs in the body [28]. Potassium is crucial to the heart functions and plays a pivotal role in smooth skeletal muscle contraction, making it important for normal muscular and digestive function. It is helpful in reducing hypertension and maintaining cardiac rhythm. In the human body, Potassium plays an important role in many physiological reactions. The potassium deficiency or excess can affect human health [29]. The elemental concentration of Potassium in the collected medicinal plant leaves is found to be 18.2274 mg/L in *Acalypha indica* L, 20.3332 mg/L in *Datura metel* L and 17.4070 mg/L in *Tylophora indica*.

3.4 Magnesium (Mg)

Magnesium is the most abundant element present in the body and it's critical in over 300 different enzymatic reactions in the human body. Magnesium is very essential that it has become the initial treatment in many emergency life-threatening medical conditions. In asthma, it is not just airway inflammation but also smooth muscle contraction that leads to the narrowing of the airways, wheezing and shortness of breath. When given intravenously, magnesium dilates and relaxes the smooth muscles of the bronchi. Studies on Magnesium element shows that diabetes, migraine headaches, high blood pressure, stroke, gallstones, constipation and cardiovascular disease could all simply be signs of Magnesium deficiency and can all improve greatly with some extra magnesium supplements [30]. Magnesium is very essential element for treatment of asthma that it prevents and cures the Asthma [31]. The concentration of Magnesium found significantly high in the collected medicinal plant samples. The elemental concentration of Magnesium (Mg) in the collected medicinal plant leaves is found to be 6.9838 mg/L in *Acalypha indica* L, 7.0139 mg/L in *Datura metel* L and 7.1273 mg/L in *Tylophora indica*.

3.5 Titanium (Ti)

Titanium is the ninth most abundant element in the earth's crust. It is not a poison Metel and the human body can tolerate titanium in a large dose since titanium does not react within the human body. Elemental titanium and titanium dioxide are toxic but at a higher level [32]. Titanium present in the earth is reflected in the plants and it doesn't have neither side effect and nor majorly contributing in treating of asthma. The elemental concentration of Titanium (Ti) in the collected medicinal plant leaves is found to be 1.8492 mg/L in *Acalypha indica* L, 0.9716 mg/L in *Datura metel* L and 0.9136 mg/L in *Tylophora indica*.

3.6 Manganese (Mn)

Manganese is a very common compound that can be found everywhere on earth and it is a trace mineral that is present in the human body in very small amounts. Manganese is one out of three toxic essential trace elements, which means that it is not only necessary for humans to survive, but it is also toxic when too high concentrations are present in a human body. Manganese exists primarily in the bones, liver, kidneys and pancreas [33]. It is important in the formation of bones, connective tissues, blood-clotting factors and sex hormones, and also is plays a role in fat and carbohydrate metabolism, calcium absorption and blood sugar regulation [34]. In addition, it is important for brain and nerve function [35]. Manganese may be helpful in treating osteoporosis, arthritis, premenstrual syndrome, diabetes and epilepsy. The elemental concentration of Manganese (Mn) in the collected medicinal plant leaves is found to be 0.1672 mg/L in *Acalypha indica* L, 0.1134 mg/L in *Datura metel* L and 0.1553 mg/L in *Tylophora indica.*

3.7 Vanadium (V)

Vanadium is a mineral and it has been known for long to possess antidiabetic properties [36]. It acts primarily as an insulin mimetic agent and affects various aspects of carbohydrate metabolism including glucose transport, glycolysis, and glucose oxidation and glycogen synthesis [37]. Earlier studies show the beneficial effects of various vanadium salts in mild or severe diabetes [37]. Vanadium supplements are used as medicine for treating diabetes, low blood

sugar, high cholesterol, heart disease, tuberculosis, syphilis, a form of "tired blood" (anaemia), and water retention (edema); for improving athletic performance in weight training; and for preventing cancer [38]. The elemental concentration of Vanadium (V) in the collected medicinal plant leaves is found to be 1.2903 mg/L in *Acalypha indica* L, 1.0805 mg/L in *Datura metel* L and 1.9164 mg/L in *Tylophora indica*.

3.8 Zinc (Zn)

Zinc is an essential trace element and is so important because it is found in every tissue in the body and is directly involved in cell division. It plays an important role in the modulation of the immune system as well as acting as an antioxidant, anti-inflammatory and anti-apoptosis [39,40]. Because of its immune modulating effects, zinc has also gained considerable interest with respect to airway inflammation and asthma. Many articles have documented a relative zinc deficiency in asthmatics, or patients who wheeze, implicating a loss of inflammatory modulation as a potential initiator of symptoms [41]. Zinc deficiency may also contribute to hair loss, growth retardation, diarrhoea, eye and skin sores, loss of appetite, weight loss, problems with wound healing, emotional disturbance, decreased the ability to taste the food, and lower alertness levels can also occur [42]. The elemental concentration of Zinc (Zn) in the collected medicinal plant leaves is found to be 0.0683 mg/L in *Acalypha indica* L, 0.0999 mg/L in *Datura metel* L and 0.0691 mg/L in *Tylophora indica*. The permissible limit set by FAO/WHO (1984) in edible plants was 27.4 mg kg^{-1}.

3.9 Copper (Cu)

Copper is an essential trace mineral necessary for human health. It is found in all body tissues and plays an important role in making red blood cells and maintaining nerve cells and the immune system [43]. Copper works with enzymes and assists many of these enzymes in crucial reactions in the body. It also helps the body to form collagen and absorbs iron, and plays a role in energy production [43].Copper deficiency is rare, but it can lead to cardiovascular disease and other problems like anaemia, bone loss, a decrease in certain white blood cells, loss of hair colour, neurologic problems, and pale skin due to certain genetic problems, long-term shortages of dietary copper, or excessive intakes of zinc and iron [44]. The elemental concentration of Copper (Cu) in the collected medicinal plant leaves if found to be 0.0207 mg/L in *Acalypha indica* L, 0.0314 mg/L in *Datura metel* L and 0.0184 mg/L in *Tylophora indica*. The permissible limit set by FAO/WHO (1984) for copper in edible plants is 3.00 mg kg^{-1}. However, for medicinal plants the WHO limits not yet been established for Cu.

3.10 Cadmium (Cd)

Cadmium is a toxic element can mainly be found in the earth's crust and is non-essential for humans. It always occurs in combination with zinc. Small quantities of Cadmium cause adverse changes in the arteries of human kidney. It replaces zinc biochemically and causes high blood pressure, Kidney damage and etc [45]. The elemental concentration of Cadmium (Cd) in the collected medicinal plant leaves is found to be 0.0037 mg/L in *Acalypha indica* L, 0.0038 mg/L in *Datura metel* L and 0.0016 mg/L in *Tylophora indica*.

Overall the results of the analysis showed that minerals and trace elements present in varying concentrations in the collected three traditional medicinal plants commonly used in the treatment of asthma using medicinal plants of Kappathgudda area of Gadag District, North Karnataka region. The presence of elements in the medicinal plants can be considered as their biological, ecological and geochemical characteristic, reflecting the combined impact of natural processes. The wide variations in elemental concentrations in the analyzed three medicinal plants used for the treatment of asthma could be attributed to differences in the plant element uptake and translocation capabilities. Element uptake by plants depends on several environmental factors including the abundance of elements in the earth crust and the soil, atmosphere and pollution, plant species, season of collection sample, age of plant, the soil type and soil conditions in which plant grows affect the concentration of elements as it varies from plant to plant and region to region [21]. Fig. 3 is pie chart graph of the variation of minerals and trace elemental concentrations in the collected medicinal plants. These plants are heavily used by the traditional practitioners because of the above said elemental concentrations are available with rich quantities compared with other plants of this region. In spite of significant differences between presences of several elements in medicinal plants, the general patterns of presence of elements are of the same trend as the abundance of Earth's crust elements which can be seen in Fig. 4.

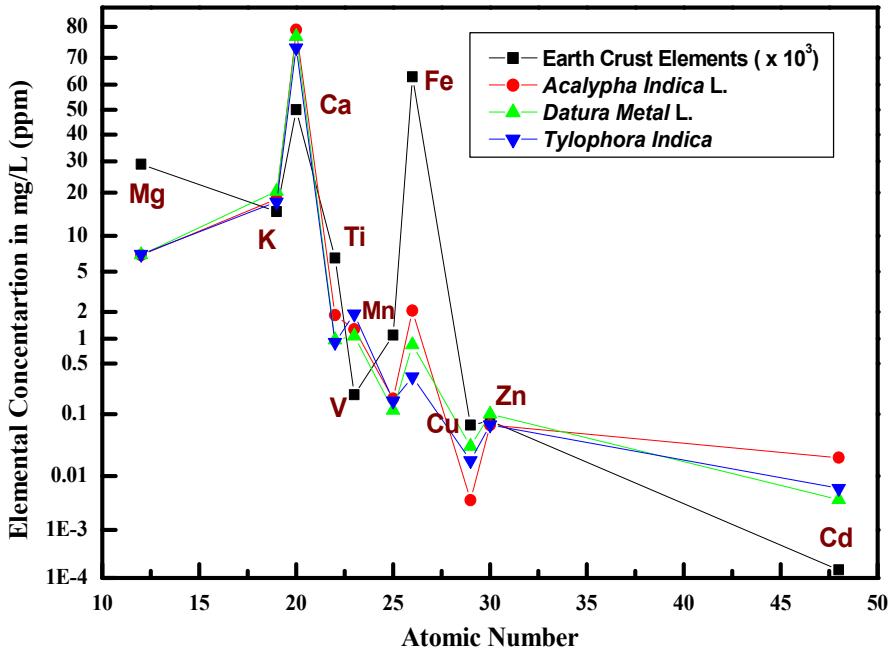


Fig. 4. Variation of elemental concentration in the leaves of medicinal plants collected from Kappathgudda area of Gadag District, North Karnataka region plotted along with variation of abundances of elements in Earth's Crust (ppm)

4. CONCLUSIONS

The present study gives a new perspective about the presence of some minerals and trace elements in indigenous medicinal plants used in the treatment of asthma. The studied medicinal plants show wide variations in the observed element concentrations/levels. The variation in elemental concentration is may be attributed to the differences in botanical structure, as well as in the mineral composition of the soil in which the plants grows. Other factors responsible for a variation in elemental content are preferential absorbability of the plant and climatologically conditions. The study shows that all medicinal plants used for the treatment of asthma are rich sources of mineral and trace elements. These medicinal plants can be utilised to treat asthma and other diseases that are mainly caused due to deficiency of these minerals and trace elements. The studied medicinal plants contain an appreciable quantity of K, Ca and Mg which are an essential component of human nutrition. The highest concentration of Fe (2.0719 mg/L), Ca (79.1179 mg/L), Ti (1.8492 mg/L) and Mn (0.1672 mg/L) found in *Acalypha indica* L. Concentration of K (20.3332 mg/L), Zn (0.099 mg/L) and Cu (0.0314 mg/L) found highest in *Datura metel* L and *Tylophora indica* had the highest concentration of Mg (7.1273 mg/L) and V (1.9164 mg/L) respectively. Thus, the studied medicinal plants are heavily used by the traditional practitioners in the treatment of Asthma because of the Magnesium, Iron and Zinc elemental concentrations along with biochemical constituents available in rich quantities compared with other plants of region. The obtained results also revealed that the minerals and trace elemental contents in the collected medicinal plants are within the WHO/FAO (1984) permissible limits.

Further work is in progress on other medicinal Plants which can be used for the treatment of Asthma and other diseases.

CONSENT

It is not applicable.

ETHICAL ISSUE

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Ajaib M, Khan Z, Khan N, Wahab M. Ethnobotanical studies on useful shrubs of District Kotli, Azad Jammu & Kashmir, Pakistan. Pak. J. Bot. 2010;42(3):1407-1415.
2. Haq F, Ahmad H, Alam M. Traditional uses of medicinal plants of Nandiar Khuwarr catchment (District Battagram), Pakistan. Journal of Medicinal Plants Research. 2011;5(1):39-48. 4 January, 2011
3. Sheela Kumar VK. Agnihotri, Sunita Thakur, Anita Verma, Saxena RC, Kapil K. Soni, some important medicinal plants used in the treatment of asthma – A review. International Journal of Pharma Sciences and Research (IJPSR). 2012;3(10):502.
   ISSN: 0975-9492,
4. Govindan S, Viswanathan S, Vijayasekaran V, Alagappan R. A pilot study on the clinical efficacy of Solanum xanthocarpum and Solanum trilobatum in bronchial asthma. J Ethnopharmacol. 1999;66:205. [PMID: 10433479],
5. Masoli M, Fabian D, Holt S, Beasley R. The global burden of asthma: Executive summary of the GINA Dissemination Committee report. Allergy. 2004;59:469-478.
6. Bousquet J, Bousquet P J, Godard P, Daures JP. The public health implications of asthma. Bull World Health Organ. 2005; 83:548-554.
7. Greenberger PA. Therapy in management of rhinitis asthma complex. Allergy Asthma Proc. 2003;24:403-407.
8. Kirtikar KR, Basu BD. Indian medicinal plants. The Prabhasi Press, Calcutta, India; 1923.
9. Chopra RN, Nayar SI, Chopra IC. Glossary of Indian medical plants. CSIR, New Delhi; 1956.
10. Navaratnarajah Kuganathan, Sashikesh Ganeshalingam. Chemical analysis of *Datura metel* leaves and investigation of the acute toxicity on grasshoppers and red ants. E-Journal of Chemistry. 2011;8(1): 107-112.
11. Nadkarni KM. Indian materia medica, popular Prakashan, Bombay; 1976.
12. Nadkarni, K M, Indian materiamedica, vol. I. Bombay: Popular Prakashan. 1976;303–304.
13. Gopal Krishnan C, Shankarnarayan D, Kameswaran L, Natarajan S. pharmacological investigation of tylophorine. Indian J. Med. Res. 1979;69: 513-520.
14. Faisal M, Anis M. In vitro regeneration and plant establishment of *Tylophora Indica*: Petiole callus culture. In vitro Cell. Dev. Biol. Plant. 2005;41:511-515.
15. Shivpuri DN, Menon MP, Prakash D. Preliminary studies in 6932 *Tylophora indica* in the treatment of asthma and allergic rhinitis. J. Assoc. Physicians India. 1968;16(1):9-15.
16. Gore KV, Rao K, Guruswamy MN. Physiological studies with *Tylophora asthmatica* in bronchial asthma. Ind. J. Med. Res. 1980;71:144-148.
17. Rodushkin I, Ruth T, Huhtasaari A. Comparison of two digestion methods for elemental determinations in plant material by ICP techniques. Anal. Chim. Acta. 1999;378:191-200.
18. Yagi S, Abdul Rahman AC, Elhassan GM. Elemental analysis of ten Sudanese medicinal plants using X-ray fluorescence, J AppIndustr Sci. 2013;1:49-53.
19. Shivakumar HM, Parashurama TR. Phyto-ethno-medicinal knowledge of folklore people in Kappathgudda Region of Gadag District, Karnataka, South India, International Journal of Science and Research (IJSR). 2014;3(11):3080-3091.
20. Mohanraj Pattar, Santoshkumar Teerthe, Kerur BR. A study on major and trace elements in some traditional medicinal plants using AAS technique, Int. Journal of Research in Pharmacy and Sciences (IJRPPS), Nov. Pharmaceutical. 2017;2(6): 86-90.
21. Faizul Haq, Rahat Ullah. Comparative determination of trace elements from *Allium sativum*, *Rheum australe* and *Terminalia chebula* by atomic absorption spectroscopy. International Journal of Biosciences (IJB). 2011;1(5):77-82.
22. Hameed I, Dastagir G, Hussain F. Nutritional and elemental analyses of some selected medicinal plants of the family polygonaceae. Pak. J. Bot. 2008;40(6): 2493-2502.
23. Nazanin Abbaspour, Richard Hurrell, Roya Kelishadi, Review on iron and its importance for human health. J Res Med Sci. 2014;19(2):164–174.
24. Preeti Tomar Bhattacharya, Satya Ranjan Misra, Mohsina Hussain, Nutritional aspects of essential trace elements in oral health and disease: An extensive review.

Hindawi Publishing Corporation, Scientifica. 2016;Article I D 5464373:12.
25. Kumar S, Kumar V, Reena Mittal, Jain DC. Trace elemental analysis in epileptic children. Open Journal of Applied Sciences. 2013;3:449-476.
26. Fanta CH, Role of calcium in airway smooth muscle contraction and mast cell secretion, J Asthma. 1984;21(6):387-405.
27. Khan KY, Khan MA, Niamat R, Munir M, Fazal H, Mazari P, Seema N, Bashir T, Kanwal A, Ahmed SN. Element content analysis of plants of genus Ficus using atomic absorption spectrometer. African Journal of Pharmacy and Pharmacology. 2011;5(3):317-321.
28. Soetan KO, Olaiya CO, Oyewole OE. The importance of mineral elements for humans, domestic animals and plants: A review. African Journal of Food Science. 2010;4(5):200-222.
29. Ekinci N, Ekinci R, Polat R, Budak G. Analysis of trace elements in medicinal plants with energy dispersive X-ray fluorescence. J. Radioanal. Nucl. Chem. 2004;260:127.
30. Uwe Gröber, Joachim Schmidt, Klaus Kisters. Magnesium in prevention and therapy. Nutrients. 2015;7(9):8199–8226.
31. Carlos A. Camargo Jr, Gary Rachelefsky, Michael Schatz. Managing asthma exacerbations in the emergency department. Proc Am Thorac Soc. 2009; 6:357–366.
32. Matej Skocaj, Metka Filipic, Jana Petkovic, Sasa Novak. Titanium dioxide in our everyday life; is it safe?, Radiol Oncol. 2011;45(4):227–247.
33. Marcela Davalos Bichara, Ran D. Goldman. Magnesium for treatment of asthma in children, Can Fam Physician. 2009;55(9):887–889.
34. Rowe BH, Bretzlaff JA, Bourdon C, Bota GW, Camargo CA, Jr. Magnesium sulfate for treating exacerbations of acute asthma in the emergency department. Cochrane Database Syst Rev. 2000; 2:CD001490.
35. Wilhelm Jahnen-Dechent, Markus Ketteler. Magnesium basics. Clin Kidney J. 2012; 5(Suppl 1):i3–i14.
36. Cefalu WT, Rood J, Pinsonat P, et al. Characterization of the metabolic and physiologic response to chromium supplementation in subjects with type 2 diabetes mellitus. Metabolism: Clinical and Experimental. 2010;59(5):755–762.
37. Thompson KH, Orvig C. Vanadium in diabetes: 100 years from phase 0 to phase i. Journal of Inorganic Biochemistry. 2006; 100(12):1925–1935.
38. Shukla R, Bhonde RR. Adipogenic action of vanadium: A new dimension in treating diabetes. Biometals. 2008;21(2):205-10.
39. Shankar AH, Prasad AS. Zinc and immune function: The biological basis of altered resistance to infectio. Am J Clin Nutr. 1998;68:447S-63S.
40. Zalewski PD, Truong-Tran AQ, Grosser D. Zinc metabolism in airway epithelium and airway inflammation: Basic mechanisms and clinical targets. A review. Pharmacol Ther. 2005;105:127-49.
41. Baybeen K, Alselevany. Role of serum zinc level in patients with bronchial asthma, World Journal of Pharmacy and Pharmaceutical Sciences. 2014;3(8):51-64.
42. Prasad AS. Clinical manifestations of zinc deficiency. Annu Rev Nutr. 1985;5:341-63.
43. Josko Osredkar, Natasa Sustar. Copper and zinc, biological role and significance of copper/zinc imbalance, osredkar and sustar. J Clinic Toxicol. 2011;S:3.
44. Ullah R, Khader JA, Hussain I, Abd NM, Elsalam M. Talha, Khan N. Investigation of macro and micro-nutrients in selected medicinal plants. African Journal of Pharmacy and Pharmacology. 2012;6(25): 1829-1832.
45. Monisha Jaishankar, Tenzin Tseten, Naresh Anbalagan, Blessy B. Mathew, Krishnamurthy N. Beeregowda, Toxicity, mechanism and health effects of some heavy metals. Interdiscip Toxicol. 2014; 7(2):60–72.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sciencedomain.org/review-history/22798