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EVALUATION OF TRACE ELEMENTS IN SOME MEDICINAL PLANTS: JATROPHA, ALBIZIA, AZADIRACHTA INDICA AND DATURA PLANTS

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ABSTRCT

The importance of minerl elements in human, animal and plant nutrition has been well recognized .The most important plants, Jatrpha (JG), Jatroph (JGB), Albizia (AB), Datura (DT) and Azadirachta indica (Neem) are known for various medicinal properties and used widely for the treatment of diseases in humans. Mineral elements show separate entities from the other essential nutrients like proteins, carbohydrates, fats in developing countries. Important elements namely V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Al, Ba, Mo, Ca, Mg and Pb were analyzed from different parts (leaf, stem, seeds and root) of medicinal plants by ICPOES technique. The observed results were compared with the safety standards established by the World Health Organization (WHO) values. The acceptance criteria levels in most of the medicinal plants were within the limits. This data would help for deciding doses in ayurvedic drug prepared from the medicinal plants. The aim of this study is to estimate the amounts of toxic metals present in the selected medicinal plants and their parts which are traditionally used in biochemical processes.

KEYWORDS: Jatropha glandifera (green leaf, JG), Jatrophagossipyfolia (greenish brown (JGB), Albizia (AB), Datura (DT*), Azadirachta indica (Neem)*: Elemental composition, ICPOES.

INTRODUCTION

The accumulation of trace elements in soils , water and medicinal plants and subsequent uptake is of major concern . Early in the twentieth century, scientists were able to qualitatively detect small amounts of several elements in living organisms. At the time, these elements were often described as traces" or "trace amounts." This apparently led to the term "trace elements," which today is usually defined as mineral elements There are twenty six trace elements are considered to be of environmental interest viz; As, Cd, Cr, Hg, Pb, Se, B, Cl, F, Mn, Mo, Ni, Ba, Cu, P, Ba , Co, I, Ra, Sb, Sn and Th. These trace elements can control important biological processes. The toxicity range of trace metals is depending upon their chemical production and immunity.[1] Trace elements play vital role in growth, production and reproduction[2,3] because of their association with environmental issues and the health of plants, animals and humans. Consideration of trace elements must be given to essentiality, nonessentiality and toxicity that depend on concentration, Ph and oxidation -- reduction (redox) conditions and other factors. Trace elements are required in small quantities usually less than 100 mg /kg dry matter[4,5] and are present in very minute quantities in animal serum[3], usually less than 2 ppm . Some of these trace elements when they present in excess are considered as pollutants. They are highly essential for health and immunity.[6,7] Trace elements act as cofactors of enzymes like superoxide (SOD)[8, 9] glutathione reductase, glutathio peraoxidase, thioredoxin reductase, ceruloplasmin and catalase. These are involed in digestive, physiological and biosynthetic processes, hormonal synthesis within the body.[10, 11] Their deficiency reduces disease resistance and increases the susceptibility to diseases.[12] They adversely affect crop growth and animals health ‘‘All substances are poisons; there is none which is not a poison. The right dose differentiates a poison and a remedy. There is much medicinal inorganic chemistry still to be explored. Now the field is at infant state compared to medicinal organic chemistry. There are many examples to explain the role of trace metal ions in metabolic reactions in living beings. For examples synergistic action of two or more elements are observed in biological fuctions. For *example* cytochrome oxidase has both copper and iron in its active site for conversion of oxygen into water , cytoplasmic

superoxide dismutase uses both copper and zinc to convert superoxide into oxygen and water. The cooperation between (Fe 11 and Fe d111) , sulphur and cysteine thiolate is evident in ferridoxin proteins which are crtical for electron storage and transport. Keeping this idea in our studies much importance is given to find out some important trace elements (mineral elements) in some important medicinal plants viz; Albizia, Azadirachta Indica Datura .

Medicinal Plants

Ancient man is known to have utilized plants as drugs for millenniaws. A large number of plants are used in traditional medicinal practices and have been for more than 3000 years . Several years ago the World Health Organization (WHO) made an attempt to identify all medicinal plants that exist in the world . The plant kingdom is considered as major source for traditional drugs since these are less expensive , easily available ,safe and have no side effects, Plants have always played a major role in the treatment of human traumans and diseases worldwide . The demand for medicinal plant is increasing in both developed and developing countries due to growing recognition of natural product. Although modern medicine may be available in these countries, herbal medines have often maintained popularity for historical and cultural reasons. Herbs are the plants which will have desirable odour, taste and other medical uses. Herbal medicines have a strong tradition (or) conceptual base and the potential to be used as drugs in terms of safety. World Health Organization has made an attempt to identify all medicinal plants used globally and listed more than 20,000 species as possible sources for new drugs and chemicals derived from various parts of plants.[5] In recent time there has been a marked shift towards herbal cures because more than 80% of the world's population relies on traditional herbal medicine for their primary health care. Plants continue to serve irreversible reactions of modern drugs. However due to over population, urbanization and continuous exploitation of these herbal reserves along with their related traditional knowledge are depleting day by day.[6] Plants continue to serve as possible sources for new drugs and chemicals derived from various parts of plant.[7] These herbs were found for posses anticancer, cytotoxic (or) antioxidant activity in various preclinical or clinical studies. Cancer is a disease which body cells become abnormal and without control. Herbal medicine is an important part of both traditional and modern system of medicine.[13] In future plants continue to serve as possible sources for new drugs and chemicals derived from various parts of plants.

Plant parts

Plant parts are the different parts of the plant, which are used for various purposes It may be any part i.e leaf , stem, bark, flowers, root rhizomes and seed . Each plant part posses individual beneficial property, which is used as required.

Jatropha

In plant kingdom Jatropha family species are worldwide known medicinal plant. Its variable species are playing a vital role in medicinal aspects. The plant jatropha belongs to the family of Euphorbica. In Euphorbicia family other species also existing namely Jatropha multifidia, Jatropha cureas, Jatropha glandulifera, Jatropha glandilifera, J. tanjorensis are observed. Much study is also observed in medicinal aspects in different countries in the world and good research is also done in medicinal aspects and published in many patent papers and in popular international journals. However, based on the lacuna identified in literature for some trce elements in different medicinal plants and soil .The present work was carried out to investigate some important trace elements by following ICP-OES and spectrophotometric methods.

Selected Plants in Jatropha family

1. Jatropha glandilifera (green leaf)
   Local name : Dundagaku
2. Jatropha gossipyfolia (greenish brown)
   Local name : Nelamida

Jatropha plants are appearing as bushes /gregarious shrubs of 1.5 metrs in height. The above two plants are exbhiting different colors and different root sizes based on the morphological changes. These plants are existing abundantly in all regions. These plants are collected at botanical garden, Y.V.University Kadapa,A.P, India. The physical appearances of these plants are represented as shown below.

Jatropha glandilifera (green leaf)

Greenish brown
Figure 1: Jatropha.

Various parts of the Jaropha plants species are exhibiting significant anticancer hepatoprotective and pesticidal activity.[14] The roots, stems leaves, seeds fruits of the plant have widely used in traditional folk medicine in many parts of different countries . Roots are used to use leprosy and stem latex posse's coagulant activity.[15] The leaves of J.gassipifolia are used for intermittent fevers, carbuncles, itches and sores on the tongues of babies, swollen mammae, stomachache, vernal disease and blood purifier.[16] The leaf is used for bating wounds.[17] The extract has also been used as an anticoagulant for biochemical and haemotological analysis.[18]

Albizia

Albizia plant belongs to the legume family that lives in trophical and tropical areas of the world. Common names for this tree are the Siris tree, Shirisa or womens tongue tree. It is a non – toxic and a nitrogen fixing tree. This tree contains alkaloids, tannins, saponins and flavonoids which show medicinal action. It is used in Ayurvedic in India for allergies caused respiratory disorders. It purifies the blood. This plant exists in humidtropical parts such as, India Bangladesh, China and Srilanka. It is a large erect tree and attains a height of 22-26 m and diameter of 120-150cm. The flowers are white with numerous long stamens (2.5 – 3.8 cm) and very fragrant. The fruit is a pod 15 –30 cm long and 2.5–5.0 cm broad containing six to twelve seeds.[19] It grows sporacally in both dry and moist deciduous forest zones. Albizia Odoratissima has been used in folk medicines for the treatment of Diabetes. Many traditional medicines in use are derived from medicinal plants minerals and organic matter. Herbal drugs play an important role in the treatment of diseases. In the last few years there has been an exponential growth in the field of herbal medicine and these drugs are gaining popularity both in developing and developed countries because of their nature and organic matter. Albizia species are used in folk medicine for the treatment of diabetes rheumatism, stomach ache, cough, diarrhea, wounds etc. There are many reports on the antioxidant property for Albizia species. Diabetes mellitus is caused due to deficiency in production of insulin by pancreas. The plants provide a potential source of hypoglycemic drugs because many plants and plant derived compounds have been used in the treatment of diabetes. The main objective of these study was to focus on the antidiabetic activity of albezia odoratissma. Herbal drugs play an important role in the treatment of diseases. Although modern medicine may be available in these countries, herbal medicines have often maintained Popularity for historical and Cultural reason, treating different diseases**.**

Figure 2: Albizia.

Azadirachta indica

The Azadirachta indica (Neem) plant is a fascinating and versatile plant. The Neem tree is tropical ever green native to India , Burma and in other south countries .It is a tree 40-50 feet or higher, with a straight trunk and long spreading branches forming a broad round crown. It has been used to Ayurvedic medicine for more than 4000 years due to its medicinal properties. The chemical constituents contain many biologically active compounds that can be extracted from neem, including alkaloids, flavonoids, triterpenoids, phenolic compounds, carotenoids, steroids and ketones. Neem leaf is for leprosy, eye disorders, bloody nose, intestinal worms, stomach upset, los of appetite, skin ulcers, diseases of the heart and cardiovasucular disease, fever, diabetes, gum disease and liver problems The leaf is also used for birth control .The bark contains a higher concentration of active ingradients than the leaves with anticeptic and anti-inflammatory action, The bark is used for malaria stomach and intestinal ulcers, skin diseases. The flower is used for reduing bile, controlling phlegm.

Figure 3: Azadirachta indica.

Datura

Datura is an herbaceous perennial plant which grows in trophical regions of the glow. All species of Datura are poisonous in nature. The seeds and flowers are more poisonous in nature. However, in Ayurveda, it used as medicine and ritual prayers. All the parts of Datura contain dangerous level of poison like tropane alkaloids atropine hyoscyamine , scopolamine. It is also found in the road side area as well as the medicinal plant nursery . Datura is a bushy plant within large egg - shaped leaves, very large white flowers and egg-shaped fruits, covered with prickles. It grows up to one meter in height. The dried leaves portion of the flowers and seed of the plant constitute the drug. The leaf of Datura contains alkaloids, counteracts spasmodie disorders and includes deep sleep.

Botanical name: Datura Stramonium
Indian name: Datura.

The plant material extract is used for heart disorders. It receives cardiac pains distress and in asthma. Datura leaves are used in the treatment of earache. It is also useful in remedy for heart disorders. It relieves cardiac pains, distress, palpitation disorders. The fruit of Datura is a specific remedy for phlegmatic and billions types of malarial fever. Datura leaves are useful in the treatment of earache. Datura is very useful in checking secretion of breast milk. The useful dose of Datura is about 2 decigrams. In large doses it may lead dilation of pupils and dryness of the mouth and throat. The plant material extract is used for heart disorders. It relieves cardiac pains, distress and in asthma. It is also used as an oral medicine and also useful in impotency. The fruit of Datura is a specific remedy for phlegmatic and bilious types of malaria fever. Datura is very useful in checking secretion of breast milk. The useful dose of Datura is about two decigrams. In large doses it may lead to dilation of the pupils and dryness of the mouth and throat.

Figure 4: Datura.

Physiological Roles of Trace Elements

Trace elements have several roles in living organisms. Some are essential components of enzymes where they attract substrate molecules and facilitate their conversion to specific end products. Some donate or accept electrons in reactions of reduction and oxidation, which results in the generation and utilization of metabolic energy. For example, trace element, iron is involved in binding, transporting, and releasing of oxygen in higher animals. Some trace elements which are impotant in physiological functions described below.

MATERIALS AND METHODS

Sample collection

In present study four different medicinal plants were selected namely.

1. Jatropha glandilifera (green leaf) 2.Jatropha glandilifolia (greenish brown) 3. Albizia 4. Azadirachta Indica. 5. Datura. Jatropha plants were collected from botonical garden, Y .V .University, Kadapa (district), A.P, INDIA in the month July 2015. Albizia plant was collected in Kangundi forest, Kuppam. The remaining Datura and Azadirachta indica plants were collected Karakam body industrial area , Tirupati, AP. These plants were identified by taxonomist Dr. Madhusudana Reddy, Dept. Of Botany, Y V. University, Kadapa, A.P.

Sample preparation

The collected various parts of the medicinal plants were washed several times with water, finally with deionized water. The species were dried in shade and ground to fine powder with the helf of mechanical grinder and stored in an air tight glass container. These samples were used for futher analysis.

Digestion process

1g of eatch sample is digested with 20 ml of con. nitric acid by using MARS – CEM Microoven until the reddis brown vapours disappeared . After 1 hour sample liquids are cooled , filtered in 25 ml of standard flask and made upto to the mark with deionized water. 1 ml of the eatch sample is subjected to ICPOES analysis.

Instrumental Methods

Recently many kinds of conventional analytical techniques such as hydride generatively coupled plasma atomic emission spectrometry(HG-ICP-AES)[5], capillary electrophoresis inductively coupled plasma mass spectrometry (CE-ICP-MS)[4], high performance liquid chromatography–inductively coupled plasma mass spectroscopy[11], electro thermal atomic absorption spectrometry(ETAAS)[12], hydride generation – atomic absorption spectrometry[13], hydride generation – atomic fluorescence spectrometry[14], cathodic stripping Voltammetry[15], anodic stripping voltammetry[16], neutron activation analysis[17], photometric analysis[18], ion selective electrodes[19] and energy dispersive X-ray fluorescence spectrometry[20], have been used for the determination of low concentrations of trace metals.

We used an ICP-OES instrument which converts all trace elements in to inorganic Inductively coupled plasma optical emission spectrometry (ICP-OES) and inductively coupled plasma mass spectrometry (ICP-MS) are very feasible techniques for quantitative determination of the trace metals. The most important advantages of these techniques are high sample throughput, simplicity and good sensitivity in comparison to other techniques[28-29] used for trace metals determination.

RESULTS AND DISCUSSION

Vanadium

Vanadium is an essential element. It is widely dispersed in the environment in several ways including leaching of rocks, the combustion in higher plants of coal, the use of fertilizers and residual slags. The presence of vanadium is also observed in the liver, kidney and lungs. It is mainly stored in fat and serum lipids. It forms numerous inorganic compounds and complexes with organic compounds. Vanadium compounds exhibit carcinogenic properties especially vanadium (V). In cells vanadium compounds activate numerous signaling path ways and transcription factors. Vanadium is essential for normal feather development in chicks and rats. The required level of vanadium is very low <0.1 to 2.0 ppm. The physiological role for vanadium is yet to be determined. Vanadium compounds have wide range of other biological functions on glucose metabolism and also in lipid metabolism. A vanadium nitrogenase is used by some nitrogenase fixing microorganisms such as azotobacter. On this process vanadium replaces common molybdenum or iron and gives nitrogenase which has slight different properties. The growth of an amatic plant is stimulated by trace qualities of vanadium but concentrations above 100 mg /l are toxic.

Chromium

Chromium is an essential element for animals and humans. The main sources of Chromium are meat, liver, brewers yeast, whole grains, nuts and cheese. Trivalent chromium (III) plays an important role in glucose metabolism and serving as a component of glucose tolerance factor (GTF). It is also playing an important role in maintaining the configuration of RNA because it acts as a cross-linking agent for collagen. Chromium deficiency in children leads to reduced life span and interferences with insulin action. High concentration of chromium in humans causes failure of kidney, liver, nervous system, growth abnormalities, Chromium also acts as an activator of several enzymes. The World Chromium Health Organization (WHO) recognized Cr (VI) as a carcinogenic agent. One of the most common elements in the earth's crust and sea water. Chromium exhibits as metallic, trivalent and hexavalent. The later is largely synthesized by the oxidation of Cr (+3). High concentration of chromium exhibited severe chlorosis, necrosis, abnormalities in the growth and anatomical disorders. The hexavalent form of Cr (VI) is considered more toxic species than Cr (III) form chromium stress in one of the important factors that affect photosynthesis in terms of CO_2 fixation, transport photophosporelation and enzyme activities. In bacterial activities, cationic form of Cr (III) derivatives bind tightly to salmonella lip polysaccharides bacillus subsidies and cell walls. The concentration chromium element was observed in between 0.3614 and 2.196 ppm range values with respect to various parts of four medicinal plants as mentioned in the table . These values were below the permissible limit chromium as set by FAO / WHO in edible plants which is 2 ppm.

Manganese

Manganese is one of the 16 elements and is essential for plant growth and reproduction. Manganese is considered as a micronutrient since plants require only small amounts. Large quantities of manganese can occur in soils. The most common oxidation states of manganese are +2, +3, +4, +6 and +7 .The most stable oxidation state is +2 which exhibits pale pink color. In most of the biological system +2 state is observed. It is acting as cofactor in phospohydrolases and tranferase enzymes .It is also involved in urea formation of pyruvate. It works as an antioxidant helps develop bones and heals wounds by increasing collapse (d) production. The kidney and liver are the main storage places for the manganese in the body. Manganese deficiency causes failure of

reproductive system in both male and female. The permissible limit set by FAO/WHO (1984) for the manganese was 2 ppm in edible plants. However, the permissible limit of manganese in medicinal plants have not yet been fixed. Mn is used in plants as a major contributor to various biological functions including photosynthesis, respiration and nitrogen assimilation. Mn is also playing a key role in pollen germination, pollen tube growth, root cell enlongation and resistant to root pathogens. Mn is an important micronutrient in plant and in many functions it is similar to iron. Mn deficiency can occur when the PH of the growing medium exceeds 6 to 5 because it is tied up and unavailable for uptake. Deficiency can also occur from low fertilizer application rates.

Iron

Among the trace elements iron is playing a key role in the formation of heme proteins viz. Hemoglobin and Myoglobin and some other non heme proteins. In biological functions hemoglobin transfers oxygen from lungs to various cells but myoglobin stores oxygen in the cells due to its more affirnalities towards oxygen. It acts as a redox element that accepts and donate electrons to oxygen that can result in the formation of reactive oxygen species (radicals). These can damage cellular components such as fatty acids, proteins and nuclear acids. It can also acts as antioxidant to prevent the formation of oxygen radicals. Antioxidants are molecules or enzymes that prevent the formation oxygen radicals. Iron is an essential micronutrient for almost all living organisms since it plays critical role in metabolic processes such as DNA synthesis, respiration, and photosynthesis. It acts as prosthetic group constituent of many enzymes. It serves a component of many vital enzymes such as cytochromes of the electron transparent chain. In plants iron is involved in the synthesis of chlorophyll and it is essential for the maintenance chloroplast structure and function . Iron deficiency is a common nutritional disorder in many plants resulting poor in yields and reduced nutritional qualities. However iron is toxic when high levels accumulate. Approximately 80% of iron is found in photosynthetic cells where it is essential for the biothessis of cytochromes, other heme molecules and chlorophyll. Iron is essential for the formation of iron-clusters. In iron-sulphur clusters iron undergoes redox system to transfer electrons. It acts as a co-factor of key enzymes involved in plant hormone synthesis and particulates in numerous electron transfer reactions.

In all samples the concentration iron element found as the highest value in root of JBR 106.94 ppm, 104.69 ppm in DTL, 667.20 ppm in DTS and 587.30 ppm in DTR. The permissible level set by WHO for iron in edible plants was 20 ppm.

Cobalt

Co is an essential component of several enzymes and Co-enzymes. It affects the growth and metabolism of plants, in different degrees , develop on the concentration and status of cobalt in rizo sphere and soil. Co interacts with other elements to form complexes. The cytotoxic and phototoxic activities and its compounds depend on the physico-chemical properties of these complexes including their electronic structure in parameters and coordination. The distribution of Co in plants is entirely species dependant. Toxic concentration inhibit the of active ion transport. In higher plants, Co active transport involves by roots. The lower mobility of Co (+2) in plants restricts its transport to leaves from stem. High concentrations of Co hamper RNA synthesis, and decrease the amount of the DNA and probably by modifying the activity of a large number of endo and exo nucleases. Relatively higher concentration are toxic .Toxic effects of cobalt on morphology including leaf fall, inhibition of greening, discolored veins, premature leaf closure and reduced shoot weight. Being a component of vitamin B_{12} and carbamide Co enzyme, Co helps in the fixation of molecular nitrogen in root nodules of leguminous plants. But in cyano bacteria, $CoCl_2$ inhibits the formation of heterocyst, ammonia uptake, and nitrate reductase activity.[23] Effects of cobalt on plants. Cobalt has not been proven essential for higher plants growth, modulating bacteria need it for fixing atmospheric nitrogen in legumes. It is generally recognized that vitamin B_{12} is synthesized only by microorganisms.

Nickel

Nickel is one among the important pollutants of great concern to the environment and human health. Nickel is known as an important micronutrient and for having a multitude of biological functions. The average nickel content in soil is approximately 20 mg .However the content may vary depending upon the nature of the soil. Nickel and its compounds were rated at 1.2 as health hazard and 1.0 as an environmental hazard. The normal range for Ni in most plant tissue is in between 0.05 to 5ppm. Nickel is a component of same plant enzymes, most notably urease, which metabolizes urea nitrogen into useable ammonia within the plant. Nickel is also used as a catalyst in enzymes used to fix nitrogen in legumes. There is evidence that nickel helps to known disease tolerance in plants. Nickel deficiency causes poor growth and yield in plants. The amount of nickel concentration in all the parts of four different medicinal plants are below permissible value o.3188 ppm. The standard WHO value is 1.5 ppm.

Copper

Copper is playing an important role to the health of the plants and mankind. It is an essential element for the normal biological activities of amine oxidase and tyrosinase enzymes. The copper containing enzyme, tyrosenase is required for the catalytic conversion of tyrosinase to malanine. Copper is a constituent of enzymes like cytochrome-oxidase, amine oxidase, catalase, peroxidase, ascorbic acid oxidase, cytochrome oxidase, plasma mono amine oxidase, erythrocuprin, lactase, uricase, tyrosinase, cytosolic superoxide

dismutase etc. It plays a role in iron absorption.[24] Copper is an essential micro-nutrient necessary for the hematologic and neurologic systems.[25] It is necessary for the growth, formation of bone, myelinshealths in the nervous systems and also helps in the incorporation of iron in hemoglobin. It assists in the absorption of iron from the gastro intestinal tract (GIT) and transfer iron from tissue to the plasma.[26]

2 to 3 mg of Cu is recommended for human adults. The ingestion of copper salts may result in hemolysis, hepatotoxic and neprotoxic effects. Copper content more than 470 mg in man causes coma, uremia, and hypertension damage to brain tissues. Cu prevents damage to cells due to its antioxidant action. However permissible limits for copper for medicinal plants were 20 ppm - 150 ppm respectively.[27] Cu is essential to the growth of plants. Among other things, it plays a part in several enzyme processes and is key to the formation of chlorophyll. Among other things, it plays a part in several enzymes processes and is key to the formation of chlorophyll. Cu is one of the micronutrients needed in very small quantities by plants. The normal range in the growing medium is 0.05-0.5ppm While in most tissues the normal range is between 3 --10 ppm. Copper activates some enzymes in plants which are involved in lignin synthesis. Copper also serves to intensify flavor and colour in vegetables and color in flowers 2 to 3 mg of copper is recommended for human adults.[28] Excess copper in the growing medium can restrict root growth by burning the root tips. All of the observed values for elements in plant studied here are below WHO permissible level for medicinal plants and may not be affected health hazard.

The concentration of copper in different parts of the four medicinal plants (NL), (JG), (AB) and DT) was determined. These values are well below the permissible values as shown in table. These values do not give any harm to the plants. But in Datura leaf (11.18 ppm), stem (9.36 ppm) and root (4.328 ppm) found these values as high values.

Zinc

This trace element is the only one that is found as an essential component in enzymes from all six enzyme classes It is involved in digestion, metabolism, reproduction and wound healing. Zinc is distributed widely in plant and animal tissues and occurs in all living cells. Zinc is an essential element and present in plasma, bones, hair, nails, blood, eyes, kidney, muscle, pancreas and also in liver. It functions as cofactor and is a constituent of many enzymes like lactate hydrogenase, alcohol dehydrogenase, glutamic dehydrogenase, alkaline phosphatase, carbonic anhydrase, carboxy peptidase, suoeroxide dismutase, retinene reductase, DNA and RNA polymerase. It plays vital role in protein synthesis. It is needed for tissue repair, wound healing and digestion. Zinc dependent enzymes are involved in macronutrient metabolism and cell replication.[29] Zinc deficiency causes retardation of growth, coronary, heart diseases and various metabolic disorders._15mg of Zinc is recommended daily for an adult in the form of nutrient. Zinc improves immune function, helps blood clot, and maintains sense of taste, growth and development.[30] Zn is important for immune function[31] and the biochemical physiology.[32] Zinc is involved in the secretion and function of male harmone testosterone through the enzymes[33] and reproductive disorders in dairy cows.[34] Zinc is also essential for thyroid hormone secretion and function. Thus Zinc plays an essential role in sexual development and super mutagenesis, Zn has a catalytic coactive or structural role in a wide variety of enzymes that regulate many physiological processes including metabolism and growth.[35]

In case of zinc , the measured concentrations values of four medicinal plants are below the standard values. These are represented in the table. These low values cause retardation of growth and various metabolic disorders.

Aluminium

Aluminium is the most abundant element present in the earth crust, water, soil and air but most of it is incorporated into alumino silicate soil minerals and very small quantities (at submicromolar levels) appear in soluble forms capable of influencing biological systems.[36] Since many plant species are sensitive to micro molar concentrations of aluminium, the potential for soils to be aluminium is considerable. Fortunately most of the aluminium is bound by ligands or occurs in other nonphytotoxic forms such as alumino silicates and precipitates. Aluminium toxicity is a major constraint for crop production in acidic soils and worldwide.[37] The most easily recognized symptom of aluminium toxicity is the inhibition of root and shoot growth is a visible symptom.[38] Roots are usually stubby and brittle and root tips and lateral roots become thick and may turn brown.[39] Such roots are inefficient in absorbing both nutrients and water Aluminium toxicity phenomena in biology is possible as common features for both animal plant cells.[40] The concentration of aluminium was also determined in leaf ,stem and root of Neem and Jatropha plants. The amounts of aluminium are mere eual to WHO values. But in Datura leaf high value (66.21 ppm) is observed.

Molybdenum

Molybdenum is an important micronutrient both in plants and animals.[41] It also plays an important role in nitrogen fixation. Nitrate reductase is a key enzyme in many metabolic reactions including xanthine oxidase, aldehyde oxidase, nitrate which play a role in iron utilization and involved in electron transport in cellular metabolism and in electransport. Molybdenum acts as a catalyst for two very important enzyme activities. Plants like cruciforms and legumes require higher amounts of molybdenum as a result plants grow more

vigorously and protein contents of the legumes are enhanced. Molybdenum (VI) is the most common form found in agricultural soils. The availability of Mo for growth depends on the soil Ph, Concentration of Molybdenum in Albizium was observed as higher value in leaves 0.764 ppm and 0.848 in bark . The permissible limit set by WHO is 0.5.

Calcium

All water sources are considered as source of calcium. Calcium toxicity rarely occurs. High levels of calcium can compete with magnesium and potassium uptake, causing their deficiency. It is used for the construction cell wall and to stabilize the permeability of cell membranes. It is used for the structure and function of proteins . It is also essential for muscle contraction, proper heart and nerve function. Calcium is essential for strong bones and teeth. In present study high concentration of calcium 284.2 ppm in leaves , 313.5 ppm in seeds , and 268.3 ppm in the root of Datura plant.

Magnesium

Magnesium is a macronutrient that is necessary to both plant growth and health. It is in several different processes, including photosynthesis, which nearly all living organisms are dependent on magnesium along with calcium and sulphur. Many enzymes in plant cells require magnesium in order to perform metabolic reactions properly. Mg can act as the central atom in the chlorophyll molecule. Chlorophyll is the pigment that gives plants their green color and carries out the process of photosynthesis. It can also helps in the activation of many plant enzymes needed for growth and contributes to protein synthesis. Mg toxicity is very rare in greenhouse and nursery.

Lead

The effect of lead on plants, especially at high concentrations are harmful. It causes inhibition of growth, interference with cell devison, reduction of photosynthesis. Organic lead compounds (tetraethyl lead , tetra methyl lead) are extremely toxic to aquatic animals. Chronic lead poisoning is commonly observed in young children arising from sucking.[42] A serious public health problem is also noticed when lead is exposed on humans.[43]

Arsenic

Arsenic compounds are widely distributed in earth crust and in trace quantities in rocks, soils, water and air.[44, 45, 46] It occurs in two forms inorganic arsenic and organic arsenic. Inorganic arsenic species i.e; arsenite and arsenate are present in ground water which causes tremendous epidermic poisoning across the globe. Arsenic also occurs in mineral forms, usually in combination with sulphur and metals, but also as a pure elemental crystal. Animals vary in their arsenic accumulation depending upon the type of food they consume (John &Jeanne, 1994)[47,48] Increasing industrialization more and more industrial waste get accumulated in various regions and make their passage through soil cause severe environmental and wide life toxicity[49] and also soil into animal body especially in their liver, kidney and lean meat. Consumption of even low levels of arsenic over a long period can cause a multitude pollution of diseases. The maximum permissible limit for arsenic (III) drinking water is 0.05 mg/L as recommended by WHO.[50] Arsenic stimulates the growth of tissue cultures[51] and the beneficial effects various organic arsenicals on the health and performance of pigs and poultry had been reported. Its action is similar to that of antibiotics and appears to be mainly related to the control of harmful intestinal micro-organisms.[52]

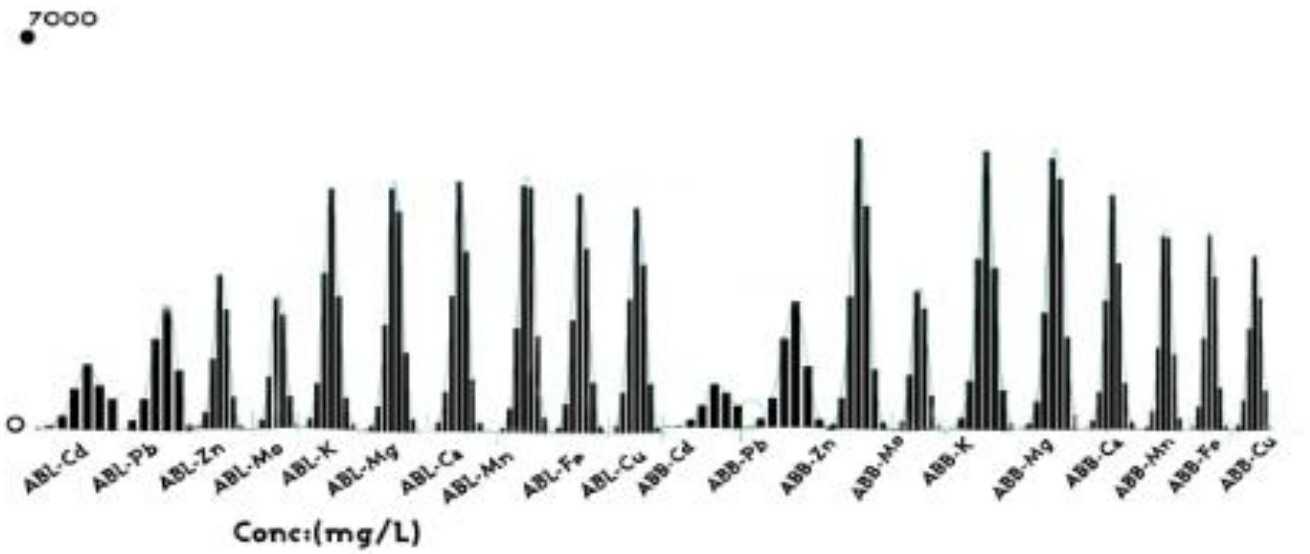

Figure 5- Mineral contents in Medicinal Plants in ABL and ABB.

Table 1: List of medicinal plants and parts and uses.

Plant Name	Parts used	Medcinal uses / Actions
1 . Jatropha	Leaf	Used for bathing wounds. Plant is antibiotic , insecticidal and used for toothache and used as blood purifier ,blood clotting ,used for intermittent fevers , itches ,sores , stomach ache and vernal diseases .
	Stem	The stem of plant is used as tooth brush as well as to clean the toung, the stem sap stops bleeding and itching of cuts and scratches . The stem lactex acts as coagulant.
	Root	

Jatropha gossipii folia	Leaf	The leaves are used for intermittent fevers, itches and sores the tongues of babies, swollen mammae stomach ache, blood purifier.
	Stem	
	Root	Roots are underground plants parts, which obtain nutrients i.e. Food and water from the soil.

3. Albizia	Leaf	Albizia odoratissima has been used in folk medicines for the treatment of diabetes . These species are used for the treatment of rheumatism , stomach ache , cough , diarrhoea , wounds etc. Diabetes mellitus is caused due to deficiency in production of insulin by pancreas .
	Bark	

4.Azadirachta Indica (Neem)	Leaf	Product of this plant have been used as Anthelmintic , Antifungal,Antidiabetic,Antibacteril,Antiviral Contraceptive sedative, Skin care products and hair oils
	Bark	Used for antiseptic and anti-inflammatory

5.Datura	Leaf	Datura leaves are useful in the treatment of ear ache asthma, heart disorders. It is a specific remedy for phlegmatic and bilicious types of malarial fever . Datura is very useful in checking secretion of breast milk .It relieves cardiac pains, distress, palpitation and aerobic disorders .
	Bark	Bark is the outer covering of the stem, branches and roots of the tree .
	Seed	When the oil of seed is applied on bald patches it stimulate the hair growth .

Table 2: Mineral contents in Medicinal Plants.

Sample code	Vanadium (V)		Chromium (Cr)		Manganese (Mn)		Iron (Fe)		Cobalt (Co)		Molybdenum (Mo)	
	Actual concen.	% RSD	Actual concen.	% RSD	Actual concen.	% RSD	Actual concen.	% RSD	Actual concen.	% RSD	Actual concen.	% RSD
NL	0.119	0.0067	0.9561	0.0575	1.86	0.0323	63.92	0.00137	0.0313	0.572	22.34	0.181
NB	-	-	-	-	5.667	0.0124	492.3	0.0115	-	-	18.25	0.0174
JGL	0.09	0.5612	1.484	0.0122	3.119	0.07	48.81	0.00364	0.2245	0.3829		
JGS	0.0097	3.4042	0.3614	0.0443	1.6087	0.00994	10.86	0.0049	0.048	0.5392		
JGR	0.0187	1.6829	0.589	0.0492	1.698	0.0088	13.90	0.0561	0.062	0.465		
JBL	0.064	0.487	0.549	0.059	2.658	0.0127	28.74	0.0048	0.1254	0.455		
JBS	0.0737	0.2171	0.771	0.0428	0.340	0.0097	34.53	0.00489	0.1515	0.158		
JBR	0.3474	0.410	2.196	0.223	3.536	0.0175	106.94	0.0032	0.554	0.3281		
ABL					2.116	0.105	24.96	0.0067	0.465	0.5560		
ABB					3.012	0.0531	24.90	0.0124				
DTL	0.1653	0.9854	1.6227		5.387		387.4		0.5545	0.1228	26.35	0.0210
DTS					8.254	o.0149	667.2	o.0349			15.25	
DTR					5.315	o.04478	587.3				19.36	0.0201

Sample	Nickel (Ni)	Copper (Cu)	Zinc (Zn)	Aluminium (Al)	Lead (Pb)	Barium (Ba)

code	Actual concen.	% RSD	Actual concen.	% RSD	Actual concen.	% RSD	Actual concen.	% RSD	Actual concen.	% RSD	Actual concen.	% RSD
NL	0.185	0.8195	1.24	0.06288	1.077	0.013	51.07	0.00161	2.04	0.1556	3.64	0.1075
NB	0.3198	1.0289	6.336		1.258	0.0167			0.135	1.0211	7.728	0.06377
JGL	0.3188	0.0594	0.5983	0.3135	1.369	0.0175	46.535	0.00356	0.060	3.637	7.728	0.06291
JGS	0.0401	0.5698	0.6379	0.0297	2.74	0.0605	16.5373	0.0095	0.072	4.5014	8.723	0.1437
JGR	0.0937	0.497	2.749	0.0175	4.306	0.00882	16.7362	0.0184	0.2198	0..6475	0.249	0.8989
JBL	0.1266	0.0221	0.6329	0.0300	1.2813	0.0249	35.773	0.0184	0.062	3.7425	10.09	0.0434
JBS	0.1357	0.00019	0.8916	0.032	2.4881	0.015	44.97	0.00260	0.0413	8.5153	14.72	0.02777
JBR	0.448	0.2998	0.7699	0.0488	2.199	0.0145	180.23	0.0014	0.0265	5.1132	14.008	
ABL	0.09	0.4974	2.400	0.1015	1.403	0.1559			0.454	0.3775		
ABB			2.100	0.1146	2.403	0.077			0.445	0.3741		
DTL	0.1867		11.18	0.0343	4.28	0.09056	66.21		6.81	0.0513	7.77	0.02200
DTS			9.36	0.03524	2.854	0.0931			0.161	1.4772		
DTR			4.328	0.0261	3.667	0.08238			0.215	o.8313		

CONCLUSION

Analytical methods have been developed for quantification of trace amounts of trace elements i.e V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Al, Mo, Ca and Mg etc, present in some medicinal plants namely 1. Jatropha gossifolia (green leaf) 2. Jatropha glandilifera (greenish brown) 3. Albizia 4. Azadirachta Indica 5. Datura. These plants could serve as supplement of macro and micro elements in the body. These medicinal plants contain trace elements whose activities were observed on overall pharmacological action. The variation in elemental concentration is mainly attributed based on their structures as well as in their mineral composition of soil in which the medicinal plants are cultivated. Many other factors are also responsible for a variation in elemental content. Therefore ,the results of elemental analysis suggest that the plants may be used for preparation of herbal products. These herbal products should be standardized to get desirable effects otherwise these medicinal plants products cause health hazards. In order to overcome all these health hazards medicinal plants have to be collected from the area that is not contaminated with heavy metals. The proposed analytical method, ICPOES showed good sensitivity, accuracy and highly selectivity for the determination important trace metals. In our study, the results found in four different medicinal plants are checked with standard (WHO) values in order to make it safe for human consumption. Based on reported values, in many parts of five different medicinal plants subnormal and normal values are observed which do not give any harm either to plants nor animals. But high content of iron is observed in NB, JBR, DTL as 492.3 ,106.94 and 387.4 ppm values respectively . Similarly more concentration of Al is also observed in JBL, JBS, JGL, JBR, DTL as 35.77, 44.97, 46.55, 180.23 and 66.21 ppm values respectively. These higher range values are more harmful and cause health hazards in plants and animals .

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