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Study of elemental analysis of a medicinal plant- *Morinda pubescence*

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ABSTRACT

Morinda pubescence, one of the important plants of Rubiaceae family, is a small tree distributed through out the tropics. Most parts of the plant are reported to possess medicinal properties. Leaves are digestive, carminative, febrifuge and tonic. Morinda P. contains health promoting factors such as minerals and metals in different concentrations which is used in indigenous medicines. Elemental analysis of leaves of Morinda P. is quantized using atomic absorption spectrophotometry. The quantitative metal analysis of leaves shows the presence of vital essential minerals like magnesium, calcium, zinc, copper and iron. The present study provides fundamental data on the availability of some essential minerals, which can be useful to provide dietary information for designing value added food and for food biofotification.These results may help in development of new drug formulations.

Key words: *Morinda pubescence,* Quantitative, Elemental analysis, Atomic Absorption Spectrophotometry.

INTRODUCTION

Some medicinally important plants are a rich source of essential elements including metals in trace amounts. These metals can help to restore and maintain the uptake of the essential nutrients in the body. In Ayurvedic system of medicines *M. pubescence* has a great value [1]. Genus “Morinda” is known to elaborate a number of anthraquinones [2] both in a free condition and in the form of glycosides. The roots are used as cathartic [3-5] and febrifuge and applied externally to relieve pain in gout. Leaves are considered as tonic and febrifuge [6]. These are used in healing application for wounds and ulcers. The juice of leaves is externally applied in gout. Fruits are used for spongy gums, throat complaints, dysentery, leucorrhoea and sapraemia.The coloring principle of plant root is present in the bark mainly as the glycoside[7-11].Literature survey revealed the presence of anthraquinones[12,13].Considering the vast

medicinal applications of the royal species, an attempt is made to technically analyze the plant material. Present work is an analytical study to determine the elements present in the leaves of *Morinda Pubescence.*

MATERIALS AND METHODS

The plant material was collected from Maharashtra. It was authenticated by comparing with herbarium specimen preserved in Agharkar Research Institute, Pune Maharashtra, India. Its authentication No. is AHMA-21220. Air shade dried and pulverized material of leaves was used for experiment. Ash was prepared by taking 1gm. dried and powdered sample of leaves and keeping it in muffle furnace at 550 deg.C till constant weight was obtained. The major constituent of ash was determined qualitatively and quantitatively. For detection of metals the ash was converted to chloride and was tested for metals by applying standard procedures. Initially the ash was dissolved in 10% HCL (0.5ml.)And evaporated to dryness on water bath. The material was filtered through Whatmann filter paper no. 40. The residue was made chloride free (tested with $AgNO_3$) by washing with hot water. The acid soluble and acid insoluble parts of ash determined gravimetrically (**Table-1**). The filtrate was diluted to 50ml. and used to estimate metal contents by standard methods shown in (**Table-2).** A Perkin-Elmer 3110 Atomic Absorption Spectrophotometer was used for the quantitative determination of transition elements. A determination of alkali and alkaline earth metal was performed on the Flame photometer of Madiflame, model 127.Photoelectric colorimeter of systronics, model 113 was utilized for phosphorus.

TABLE-1: Ash content from leaves of Morinda Pubescence.

Particulars	Leaves sample(%by weight)
Acid soluble ash	0.433
Acid insoluble ash	68.25

TABLE-2: Element content of leaves of Morinda Pubescence

Element	Method	Percentage
Nitrogen	Kjeldahl method	2.09
Phosphorus	Colorimetric method	0.61
Potassium	Flame photometry	2.14
Calcium	Flame photometry	0.60
Magnesium	Flame photometry	0.17
Zinc	Atomic absorption spectrophotometry	0.0052
Copper	Atomic absorption spectrophotometry	0.0032
Iron	Atomic absorption spectrophotometry	0.0146

RESULTS AND DISCUSSION

Minerals are the basic spark-plugs in the chemistry of life, on which the exchange of energy in the combustion of foods and building of living tissues depend. Metals present in the body in trace concentrations carry out a large number of enzymatic reactions. Thus their deficiency or overdose can cause severe disorders in different metabolic pathways. The minerals are interrelated with each other, as well as being linked with the metabolism of proteins, carbohydrates, fats, and of course, vitamins. Taking into consideration the above facts metal

analysis of an acid soluble ash of leaves of *Morinda Pubescence* showed the presence of very common elements like Phosphorus, Calcium, Magnesium, Zinc, Copper, and Iron. Interestingly high percentage of Nitrogen and Potassium were observed. Phosphorous is required in the human body to carry out many complex reactions in the body. There is over 1 lb (464gm) of phosphorous found in the body. It is a component of adenosine tri phosphate (ATP) a fundamental energy source in the living beings. It is a principle material of teeth and bones and is found in many organic compounds in blood, muscles and nerves as such the amount of phosphorous in the body becomes a matter of great importance. Inadequate intake of phosphorous results in abnormally low serum phosphate levels (hypophosphatemia). The symptoms are anorexia, muscle weakness and osteomalacia. Phosphorous deficiencies can be caused by excessive intake of aluminum containing agents as aluminum can bind to phosphorous. Symptoms of phosphate deficiency include loss of appetite, anxiety, bone pain, bone fragility, stiffness in the joints, fatigue, irregular breathing, irritability, numbness and many more. In order to overcome the phosphorous deficiency, phosphorous compounds need to be included in the diet or taken as dietary suppliments. Ayurvedic preparations and formulations of leaves would be a good source of naturally occurring phosphorous**.** Copper is a sedative mineral. A too high or too low concentration of copper may affect central nervous system. Copper, after ingestion, gets absorbed in the stomach and small intestine from where it is absorbed in the blood stream. In the blood stream it is bound to carrier proteins and is delivered to the liver. From the liver it is distributed throughout the body to places where it is needed. Copper is crucial for the normal functioning of brain and nervous system. It also plays an important role in making neurotransmitters and the movement of electrical impulses along the nerves. Copper helps to sustain elasticity of blood vessels which allows maintenance of proper blood pressure. Copper plays a vital role in collagen formation which is crucial for bone formation, health and repair and also a connective tissue in the skin. Copper is necessary for the maintenance of a healthy immune system. Copper is required for the normal myelination of nerves.

Myelination is a fatty substance that acts as insulation around nerves the absence of which can lead to spasticity, tremors and paralysis. Copper deficiency can cause a syndrome of anemia or pancytopenia. The deficiency can also cause hypertension, antibiotic sensitivity, hyperactivity and many more. *Morinda pubescence*, leaves contain an adequate amount copper. **Table-2**

Magnesium is a key metal in cellular metabolism. A balance of magnesium is vital to the well being of all living organisms. Mg^{2+} ions have been evolved for signaling, enzyme activation and catalysis. In presence of higher percentage of potassium and phosphorous, absorption of magnesium increases. Magnesium can affect nerve relaxation through direct action on the cell membrane. The adult human daily requirement of magnesium is 300-400 mg/day. Inadequate intake of magnesium frequently causes muscle spasms, cardiovascular disorders, diabetes, hypertension, anxiety disorders, migraines etc. Leaves of *M.pubescence* are having a less accumulation of magnesium metal. **Table-2** Calcium plays an important role in building of bones and teeth in our body. Besides it, calcium is also important for nerves and muscles. Plasma calcium has a role in blood coagulation. Calcium is present in three forms in plasma and serum. About 50% is in ionized form, 40% bound to proteins and 10% complexed with substances like citrate. Normal value of serum or plasma calcium is 8.5-10.5 mg/100ml. Calcium plays a major role in the Central Nervous System function. Calcium is seen as a major factor in neurotransmission and required in the synaptic discharge of neurotransmitter. Calcium is

essential for nerve impulse conduction and activates some enzymes such as protein kinases6, which generate neurotransmitters. A long term deficiency of calcium may result in weak and fractured bones, cramp pains in legs, poor sleep disorder, extremely irritable nerves etc. In leaves calcium percentage is high **Table-2** Potassium plays an important role in protein synthesis, activating many enzymes such as pyruvic phosphoferase, adenosine triphosphatase7, stimulation of movement of intestinal track etc. It helps to regulate body's fluid level. It also regulates the blood pressure. It is essential for the nervous system and also for maintaining normal heart beats. Potassium helps to promote the proper functioning of the tissue that makes up the nervous system. It also serves to enhance muscle control plus the health and growth of cells particularly through its importance in waste product removal. This metal is also vital to kidneys for their waste removal tasks. It also plays an important role in mental as well as physiological functions. It helps to promote efficient cognitive functioning by playing a significant role in getting oxygen to brain. Potassium deficiency can cause symptoms of fatigue, weakness, depression, abnormal heartbeat and irregularities in the ECG, dry skin, glucose intolerance, low blood pressure, muscle cramps and many more. Zinc is extremely important to numerous body functions. Deficiency of zinc may be associated with mental lethargy, emotional disorders etc. Without iron no world can live. The human body reuses or conserves approximately 90% of its iron each day. The remaining 10% is eliminated and this 10% must be replenished otherwise the body can develop iron deficiency. The major role of iron is in the oxygen transport to the cells. It is found in a protein called hemoglobin which carries oxygen from lungs to all over the body, to each and every cell. It has an ability to donate and accept electrons. Iron present in the free state, will catalyze the conversion of hydrogen peroxide to free radicals which cause damage to the cells and kill them. Thus iron is bound to different proteins like hemoglobin, transferring etc. One of the most noted symptoms of iron deficiency is anemia. Its symptoms include fatigue, insomnia, and reduced mental capacity, loss of appetite, headaches and incapability of body to maintain the body temperature. Iron toxicity results when the amount of circulating iron exceeds the amount of transferring available to bind it, but the body is able to vigorously regulate its iron uptake. People with increased amount of iron are more susceptible to bacterial infections. The human body prevents iron overload solely by regulating its absorption, but in some cases where there is iron tablet overdose, the toxicity of iron starts overwhelming body'sability to bind and store it. In adequate, concentration, iron is present in the leaves of *Morinda pubescence.* **Table-2**

CONCLUSION

The results indicate that the leaves are a good source of essential metals required for the well being of human body. Although there are not many reports on the administration of the leaves, excepting for the treatment in certain diseases, the presence of the biologically important metals in the plant point towards the possibility of their use to restore the different imbalances caused in the body.

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