

Identification of metals found in the leaves of *Chonemorpha fragrance*

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ABSTRACT

Chonemorpha fragrance is a medicinal plant found in the western ghats of Maharashtra. The leaves, roots, bark-stem are used in Ayurvedic system of medicines. Leaves are used in the form of churna/extract or in combination with the other plant materials in their formulations. It is administered orally. Metal analysis of the leaves shows a high percentage of metals like, calcium, iron, copper and manganese along with the other metals. These results may help in development of new drug formulations.

Key words: *Chonemorpha fragrance*, copper, oral medicines, atomic absorption spectroscopy.

INTRODUCTION

Some medicinally important plants are a rich source of essential elements including metals. These metals can help to restore and maintain the uptake of the essential nutrients in the body. All parts of *C. fragrance* are used as local medicines. Whole plant including roots and leaves contain alkaloids¹ which are found to be active against parasites and amoeba. Chonemorphine^{1,2} has been isolated from roots and leaves of *C. fragrance* and is found to be antiamoebic and antiparasitic^{1,2}. Funtumafrine³ has been isolated from the roots. Medicinally important plants like *C. fragrance* are of immense use and this work will help in new drug discovery for oral administration. These plants are found in the western ghats of Maharashtra. The leaves of *C. fragrance* are used in the treatment of various diseases like cancer, diarrhea, syphilis etc. The metals like sodium, potassium, calcium, iron, manganese, magnesium play a vital role in the human body metabolism. Metals are of very much importance as they are required to initiate and carry out different enzymatic activities in the body.

Different metals carry out different enzymatic reactions. Consequently, various disorders are developed in the body due to deficiency of metals like Cu, Na, Fe, Mg, Mn etc. The copper is an essential nutrient required for well functioning of brain and central nervous system. Leaf material is also composed of major elements like phosphorous, potassium, calcium etc. The metal deficiencies and imbalances are known to be involved in disorders of the cardiovascular system, gastrointestinal, muscular, skeletal, neurological, immune and endocrine systems. The excess of one particular metal may also lead to various chronic disorders in human body. Hence the perfect balance of percentage of metals in the body is the key for good health of human beings.

MATERIAL AND METHODS

The taxonomic identification was done with the help of Flora of Bombay Presidency⁴ (Cooke 1958) and Flora of Maharashtra⁵ (Singh et. al. 2000) and herbaria were prepared. The specimens were also compared with the authentic herbaria of

Botanical Survey of India, Western Circle, Pune (M. S.) for identification and conformity.

Preparation of ash

Powdered dried leaves (1gm) were kept in the muffle furnace at 550°C till constant weight was obtained. The major constituents of ash were determined qualitatively and quantitatively. For the detection of metals, the ash was converted to chlorides and the solution was tested for metals by applying standard procedures. Initially, the ash was dissolved in 10% HCl (5.0ml) and evaporated to dryness on waterbath. Again 10% HCl (5.0ml) was added and evaporated to dryness. The material was digested with 25% HCl (5.0ml) on waterbath for 30 minutes. The resulting solution was filtered through

Whatman paper (No. 40). The residue was made chloride free (tested with silver nitrate solution) by giving washings with hot water. The filtrate was diluted to 100 ml and used to estimate metal contents by using standard methods as illustrated in Table 1.

RESULTS

The results show higher percentage of elements like magnesium, manganese, potassium, iron etc. which catalyze various metabolic activities in human body. Calcium is present in low concentration whereas elements like zinc, copper are present in trace amounts.

Table 1: Metals analysis of *Chonemorpha fragrance* (Leaves)

Metals	Method used	Amount
Total Phosphorous(P ₂ O ₅) %	Flame photometer	0.11
Total Potash (K ₂ O) %	Flame photometer	0.17
Total Calcium (Ca) %	Flame photometer	0.05
Total Magnesium (Mg) %	Atomic absorption	0.57
Total Zinc (Zn) ppm	Atomic absorption	56
Total Iron (Fe) ppm	Atomic absorption	276
Total Manganese (Mn) ppm	Atomic absorption	334
Total Copper (Cu) ppm	Atomic absorption	70

DISCUSSION

Life is dependent upon body's ability to maintain the balance between different metals. The presence of different metals in the body in correct concentrations is of prime importance as trace elements are spark plugs of life. They are required to carry out thousands of enzymatic reactions.

Metal analysis of acid soluble ash of leaves of *Chonemorpha fragrance* shows potassium, phosphorous, calcium, magnesium, zinc, copper, iron and manganese as the metals. Out of these, potassium, calcium and magnesium are found as major constituents where as iron, copper, zinc and manganese are as minor constituents. As the leaves of *C. fragrance* are consumed in ancient Ayurvedic systems, its metal analysis plays an important role.

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)⁶ a fundamental energy source in the living beings. It is a principle material of teeth and bones⁷ and found in many organic compounds in blood, muscles and nerves. In order to overcome the phosphorous deficiency, phosphorous compounds need to be included in the diet or taken as dietary supplements. Ayurvedic preparations and formulations of leaves would be a good source of naturally occurring phosphorous.

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 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. It is present in moderate quantity in the leaves of *Chonemorpha fragrance* (Table 1).

Copper is a sedative mineral. A too high or too low concentration of copper may affect central nervous system⁸. 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 liver it is distributed throughout the body to place where it is needed. Copper is crucial for the normal formation of brain and nervous system. It also plays an important role in making neurotransmitters and the movement of electrical impulse along the nerves. Copper helps to sustain electricity of blood vessels which allows maintenance of proper blood pressure. Its 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 the healthy immune system. Copper is required for the normal myelination of nerves. Myelination is fatty substance that acts as insulation around nerves, the absence of which can lead spasticity, tremors and paralysis. Copper deficiency can cause a syndrome of anemia or pancytopenia. The deficiency can also cause hypertension, antibiotic sensitivity, hyperactivity, disorders of digestive, cardiovascular and nervous system⁹ and many more. Its accumulation in the leaves of *C. fragrance* would encourage the inventors to develop new medicines based on the leave of this plant. (Table-1).

Magnesium is a key metal in cellular metabolism. A balance of magnesium is vital for the well being of all living organisms. Mg²⁺ 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 membrane¹⁰. The adult human daily requirement of magnesium is 300-400 mg per day. Inadequate intake of magnesium frequently causes muscle

spasms, cardiovascular disorders, diabetes, hypertension, anxiety disorders, migraines etc. Leaves of *C. fragrance* are having a high accumulation of magnesium metal. (Table-1).

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% complex with substances like citrate. Normal value of serum or plasma calcium is 8.5-10.5 mg/100 ml. Calcium plays a major role in central nervous system function. Calcium is seen as a major factor in neurotransmission and required in the synaptic discharge of neurotransmitters. Calcium is essential for nerve impulse conduction and activates some enzymes¹¹, 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 moderate. (Table-1).

Potassium plays an important role in protein synthesis, activating many enzymes, stimulation of movements of intestinal track etc. It helps to regulate body's fluid level. It also regulates the blood pressure¹². It is essential for 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 to 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. The immune system needs iron. It assists the metabolism and is crucial in body's ability to control the temperature. One of the most noted symptoms of iron deficiency is anemia¹³. Its symptoms include fatigue, insomnia, reduced mental capacity, loss of appetite, headaches and incapability of body to maintain the body temperature. Iron deficiency also diminishes capacity of immune system. In adequate concentration, iron is present in the leaves of *C. fragrance*. (Table 1)

The human body contains 10-20 mg of manganese and is widely distributed in body especially in intestinal track, liver and reproductive organs. Its role is vital in defense mechanism of body. It helps the synthesis of hemoglobin. A combination of iron, copper and manganese is given in case of hypochronic anemia. Manganese ions activate many enzymes and help in proper utilization of vitamin B and E. Manganese as a component of

different enzymes helps to metabolize carbohydrates, proteins and fats. Manganese helps and nourishes brain and nerves to maintain a better co-ordination between brain, nerves and muscles in every part of the body. The deficiency of manganese can result in bone malformation, infertility, weakness, seizures, convulsions, eye problem, hearing problem and many more. A moderate amount of manganese is present in the leaves as can be seen in (Table 1).

The above 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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