Oriental Journal of Chemistry Vol. **25**(4), 1109-1112 (2009)

Metals, amino acids and carbohydrate contents of medicinally important plant - *Mimusops elengi*

ANJALI RUIKAR[1], RAJASHREE KASHALKAR[1], SAPANA SHAH[1], VEDAVATI PURANIK[2] and NIRMALA R. DESHPANDE[1]*

[1]Dr. T. R. Ingle Research Laboratory, Department of Chemistry, S. P. College, Pune - 411 030 (India).
[2]Center for Materials Characterization, National Chemical Laboratory, Pune - 411 008 (India).

(Received: July 18, 2009; Accepted: August 24, 2009)

ABSTRACT

Mimusops elengi is a medicinal plant. Different uses of it are mentioned in ayurveda**.** It has profound effect in inflammation and bleeding of gums. It is antipyretic and increases fertility in women. The bark of the plant is astringent. It is used as tonic and febrifuge**.** Because of the medicinal importance it is essential to know its metal content, the presence of amino acids and carbohydrates. Taking this into consideration preliminary chemical analysis for the investigation of metal contents of the bark has been carried out. The presence of carbohydrates and amino acids are detected by using paper chromatography. The investigation showed the presence of six amino acids. The sugars detected are maltose, xylose, fructose, arabinose and dextrose. Detection of metal content showed interestingly higher percentage of calcium.

Key words: *Mimusops elengi,* Metals, Amino acids, Carbohydrates, Paper chromatography.

INTRODUCTION

Herbal and herbo-mineral medicines have been used for thousands of years. In India this knowledge attained in well organized form was systematically recorded and employed as a traditional health care system called Ayurveda. There is a strong belief that ayurveda points at drugs for certain conditions, particularly chronic conditions for which modern system offers inadequate or no remedies.

Mimusops elengi, commonly called as 'Bakul', is a medicinal plant belonging to family Sapotaceae. It is a small to large evergreen tree up to 15 m in height. All parts of the tree have medicinal properties. The bark, flowers and fruits are acrid, astringent, cooling and anthelmintic[1]. Bark is used as a tonic[1-4], febrifuge, as a gargle for odontopathy, inflammation and bleeding of gums[1]. Powder of dried flower is a brain tonic and is useful as snuff to relieve cephalalgia[1]. Young twigs are used for cleaning teeth[2]. It is antipyretic and increases fertility in women[1,3]. It is also useful in urethrorrhoea, cystorrhoea, diarrhea and dysentery. Flowers are used for preparing lotion for wounds and ulcers[3]. Unripe fruit is used as masticatory and helps to fix loose teeth. Seeds are used for preparing suppositories in cases of constipation especially in children[2-4]. Ripe fruit pulp is useful in chronic dysentery[3, 4]. Leaves are used in snake bite[3, 4]. Taking into consideration the medicinal importance of the bark, the preliminary studies for the detection of metal content and the presence of amino acids and carbohydrates is carried out.

EXPERIMENTAL

Determination of metal Content

The bark (1.0 g) was kept at 550ºC to prepare ash till constant weight was obtained. The ash was 6.9%. The major constituents of ash were determined qualitatively and quantitatively. The percentage of acid soluble and insoluble ash was determined (Table 1). For the determination of metals, the ash was converted to chlorides and the solution was tested for metals by applying standard procedures. Initially the total ash was dissolved in 10 % HCl (10.0 ml) and evaporated to dryness on water bath. The material was digested with 25 % HCl (5.0 ml) on a water bath for 30 min. The resulting solution was filtered through Whatmann paper (No. 40). The residue was made chloride free (tested with silver nitrate) and washed with hot water. The filtrate was diluted to 100 ml and used to estimate metals quantitatively by standard methods. The quantitative estimation of metals was carried out with atomic absorption spectrometer AASPM-3110 from Perkin Elmer.

Determination of Carbohydrate

Air shade dried powdered material of the bark (5 gm) was mixed with $CaCO_3$ and distilled water (50 mL). It was refluxed for 2 hr and decanted. The same procedure was repeated for three times. The combined aqueous filtrate was treated with cold 10% w/v solution of lead acetate till the precipitate was obtained. The solution was filtered and made alkaline using liquor ammonia. Hydrogen sulphide gas was bubbled through the filtrate in order to precipitate lead acetate. It was removed by filtration. The neutral solution of filtrate obtained was concentrated on a water bath under reduced pressure. A gummy mass of carbohydrates was obtained[5]. Carbohydrates were detected by paper chromatography using Whatmann filter paper (No. 1). The mobile phase, Isopropyl alcohol: pyridine: distilled water: acetic acid. (8: 8: 4: 1), was used. The paper was spread with aniline hydrogen phthalate reagent[6] and heated to 100° C.

Determination of amino acids

The young twigs of the plant were used for extraction using different procedures. Weighed quantity of sample (1gm) was extracted with known volume (20mL) of different solvents like ethanol, acetone and water. Whatmann filter paper (No. 1) was used for paper chromatography. The mobile phase, Isopropyl alcohol: ethyl acetate: Water (4: 4: 3), was used. The Ninhydrin was used as a spraying reagent.

RESULTS AND DISCUSSION

Percentage of acid soluble and insoluble ash is reported (Table 1). Metal analysis showed the presence of potassium, calcium, magnesium, zinc, copper and iron along with nitrogen and phosphorous. Interestingly high percentage of calcium was observed (Table 2).

Minerals are the basic spark-plugs in the chemistry of life, on which the exchange of energy in the combustion of foods and the building of living tissues depend. The minerals are interrelated with each other, as well as being linked with the metabolism of proteins, carbohydrates, fats and of course, vitamins. Mineral deficiencies and imbalances are known to affect and be involved in disorders of the cardiovascular system,

Table 1: Percentage of acid soluble and insoluble ash

Particulars	Percentage
Acid Soluble Ash	6.0 %
Acid Insoluble Ash	0.9 %

Table 2: Percentage of minerals from Bark of *Mimusops elengi*

Mineral	Percentage
Nitrogen	0.33
Phosphorus	0.33
Potassium	1.25
Calcium	0.39
Magnesium	0.06
Zinc	0.0029
Copper	0.0014
Iron	0.0409
Aluminium	0.007408
Manganese	0.005185

gastrointestinal, muscular, skeletal, neurological, immune and endocrine systems.

Calcium is closely associated with the bones and teeth. Calcium carries signals that initiate specific activities within the cells. It helps to control the normal blood clotting mechanism, acid-alkaline balance and nerve conduction. Calcium also helps to control endocrine secretions and is necessary to open the secretary ability of these glands, causing them to release their hormones[7].

Table 3: Amino acids from the bark of *Mimusops elengi*

Name of Acid Amino	R_f for Standard Amino Acid	R_f for Sample
Tryptophan	0.63	0.64
Lysine	0.73	0.75
Methionine	0.74	0.75
Proline	0.75	0.75
Glysine	0.63	0.64
Alanine	0.76	0.75

Magnesium is known to be antagonistic to calcium. Magnesium is a key element in cellular metabolism. It can help calm nerves and improve mental concentration in many anxiety-ridden individuals. It is also useful for sufferers of athero- and arteriosclerosis which results from fat and calcium deposits in arteries. The balance between calcium and magnesium controls the release of many of the hormones. Adequate amounts of magnesium in the diet or magnesium supplementation can greatly reduce Lead absorption from the intestinal tract[7].

Copper is an essential constituent of many important cellular enzymes. A deficiency or excess of copper can disrupt the function of these enzymes. When a copper deficiency is present the body has difficulty-utilizing iron properly and thus causes anemia. Copper is a critical component for the integrity of the cardiovascular system. An adequate amount of copper is required to produce necessary enzymes, which maintain among other things, the connective tissues.

Zinc is important in both male and female hormones production and plays a pivotal role in human health and diseases. Zinc can destroy some viruses on contact. Vitamin A, an anti-infectious vitamin, in combination with zinc can be a powerful antagonist for many types of viruses. Zinc has been especially useful in combating the adverse effects of toxic heavy metals like cadmium, mercury and lead[7].

Manganese is a constituent of some enzymes and activates others. This trace element activates enzymes associated with fatty acid metabolism, carbohydrate metabolism and protein synthesis. Manganese plays a very important role in protecting cells from damage due to free radical production, particularly super oxide radicals. Normal thyroid function requires manganese, since it is involved in the formation of thyroxin. Impaired reproductive functions can also result from a manganese deficiency. Defective ovulation, ovarian and testicular degeneration and increased infant mortality are corollaries of too little manganese in the tissues[7].

Potassium deficiency can result in fatigue, weakness, muscle cramping and heart arrhythmia. Principle hormones that affect the cellular uptake of potassium include insulin and epinephrine.

Iron is beneficial for bone marrow, bone tissue, red blood cells, liver and spleen. Iron deficiency is known to weaken the immune system, making the body more susceptible to infections[7]. The amino acids are basic units of proteins and therefore their presence was detected. Qualitative estimation of amino acids by paper chromatography showed the presence of glycine, tryptophan, proline, lysine, alanine and methionine (Table 3).

The qualitative estimation of carbohydrates showed presence of different sugars like maltose, xylose, fructose, arabinose and dextrose.

ACKNOWLEDGMENTS

Authors are thankful to the Principal and the Head, Department of chemistry, S.P. College, Pune for providing the necessary laboratory facilities for the work.

REFERENCES

1. Database on Medicinal Plants used in Ayurveda, **1**, Central Council for Research in Ayurveda and Siddha, Department of ISM & H, Ministry of Health and Family Welfare (Govt. of India), 65-68, (2000).
2. The Wealth of India, Raw Materials, CSIR, New Delhi, India, **6**: 383-384, (1962)
3. S.G. Joshi, Medicinal Plants, Oxford & IBH publishing Co. Pvt. Ltd., 362, (2000).
4. Chopra R.N., Nayar S. L. and Chopra I.C., Glossary of Indian Medicinal Plants, National Institute of Science Communication and Information Resources (CSIR), New Delhi, 167 (2000).
5. Yadav R.N. and Barsainya D., *Asian J. Chem.,* **8**: 813 (1996).
6. Patridge S.M., *Nature,* **164**: 443 (1949).
7. Watts D., Trace Elements and Other Essential Nutrients, Clinical Application of Tissue Mineral Analysis, Writer's B-L-O-C-K Edn. United States of America (1997).