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SHORT COMMUNICATION

Elemental Analysis of selected elements in *Basella alba* L. - a leafy vegetable

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ABSTRACT
Basella alba L is an important green leafy vegetable that is frequently found in tropical regions of the world. It is an edible perennial vine belongs to the Basellaceae family. The elements like Iron, Aluminium, Manganese, Copper, Lead, Nickel and Zinc were selected for the present study and evaluated by using Atomic Absorption Spectroscopy (AAS) The study reveals that the Iron content was very high compared to other elements. Intake of minerals are important for the maintenance of physiological, physicochemical and metabolic processes of human life Iron is required for number of cellular functions, in supporting immune system and help in improving athletic performance, maintaining energy levels etc. in human beings.
Keywords; *Basella alba, Atomic Absorption Spectroscopy (AAS), immune system.*

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INTRODUCTION

Food plants are the main source of essential components for human nutrition. Vegetables offer vital bio-available trace elements that are readily available to the human body, and a constant supply of these different elements is necessary for everyday activities. Trace elements are employed as coenzymes that regulate metabolic processes but do not produce calories. *Basella alba* L is an important green leafy vegetable that is frequently found in tropical regions of the world. It is an edible perennial vine belongs to the Basellaceae family. The discovery of novel, highly adaptable plants that have been tested for their medicinal value, edibility, phytochemical composition, and element analysis may eventually lead to the use of these plants in both the culinary and medical fields.

Basella alba L. possess slender, glabrous, purplish stem that can twist up to 8 meters long. The inflorescence is an unbranched spike that hangs and has a long peduncle. Separate, oval to triangular bracteoles. In addition to being pentamerous, cleistogamous, bisexual, and sessile flowers. The sepals are elliptic to oblong. The fruit is thick and juicy when it is fruiting and turns white to reddish at anthesis. Petals opposite, connate at base, ovate to elliptic, slightly erect. Anthers pale; with five stamens. Fruit is securely wrapped in a persistent, fleshy, urceolate parachute.

Trace element levels in vegetables can be influenced by a number of factors, such as trends in the agricultural system, soil chemistry, and inheritances. Atomic Absorption Spectroscopy help in quantification of these mineral elements and thereby helps in understanding their importance. The spectroscopic and analytical technique known as "atomic absorption spectroscopy" uses the absorption of electromagnetic energy at a specific wavelength—usually the Ultraviolet or visible region—by free atoms in their gaseous state in order to identify the elements both qualitatively and quantitatively. [1]

MATERIALS AND METHODS

STUDY AREA

Fresh leaves and stem of *Basella alba* L were collected from Kollam district of Kerala. The district lies between 8° 48' 0.00" North latitudes and between 76° 35' 60.00" East longitudes.

STUDY METHOD

The collected sample is well dried, mixed well and blended using mortar to get fine powder. The well mixed fine powdered sample of about 1 to 2g is weighed into a pre weighed crucible and heated for overnight at 500 degrees centigrade and let cool. Then strong acid (Concentrated HCl) and weak acid (Concentrated nitric acid) is added in the ratio 1:3 for digestion of the tissues. The solution is made up to 250 ml with distilled water and heated until solution reach 150ml. Then it is finely filtered by using the filter paper and kept under refrigeration until the analysis is done. Samples are analysed within a day and stored in tight sealed pack.

RESULT AND DISCUSSION

Essential elements like Iron (Fe), Manganese (Mn), Copper (Cu), Zinc (Zn) were identified at different parameters which are high recommended for consumption by humans and on the other hand these elements also play a major role in the plants by improving the plants growth and their physiological activities and reproduction. Non essentials elements such as Aluminium (Al), Nickel (Ni) and Lead (Pb) were also seen. Here the amount of Aluminium present in the plant is a safe value which indicates, the least health issues, in humans by their consumption. In plants such low level of Al only promotes the plants root growth and their ability of drought tolerance where the Nickel and Lead is found in very much low level which is completely non-hazardous by consumption.

Seven different elements concentrations such as Nickel, Manganese, Copper, Iron, Lead, Aluminium and Zinc present in the *Basella alba* L. were studied (Table:1)

Table 1. Elemental analysis of *Basella alba* L.

Sl No:	Elements Parameters)	(mg/L)
1.	Al	1.5
2.	Cu	0.042
3.	Fe	2.246
4.	Mn	0.835
5.	Ni	0.055
6.	Pb	0.1
7.	Zn	1.03

The present study of *Basella alba* L. shows high amount of Iron 2.246 mg/L. Iron is required for the synthesis of oxygen transport proteins, in particular hemoglobin and myoglobin, for formation of heme enzymes and other iron containing enzymes involved in the electron transfer and oxidation reactions. Iron deficiency led to many serious conditions like functional impairments affecting cognitive development [2], immunity mechanisms [3] and work capacity, it adversely affects the pregnant mother and infant by maternal mortality, low birth weight and perinatal mortality. Since Iron is required for number of cellular functions, a balance between iron uptake, transport storage and utilization are required to maintain Iron homeostasis [4]. The dietary limit of iron in the food is 10-60mg/day. Iron play key role in supporting immune system and help in improving athletic performance, maintaining our energy levels.

The second largest amount detect was aluminium 1.5 mg/L. Humans are regularly exposed to aluminium, a non-essential metal. Natural sources, water used for food preparation, food ingredients, and tools used in food preparation are the sources of aluminium in the food supply.

Zinc is the second most abundant trace mineral in body after iron and are essential for the growth and development. The amount of zinc present in the plant is 1.03mg/L. Zinc is a trace mineral and it play major role in growth of cells, building proteins, DNA synthesis, healing damaged tissue, supporting healthy immune system as it helps cells to grow and multiply. Zinc deficiency result in poor growth and retarded development. Zinc intake beyond permissible limits produce toxic effects on immune system of the body [5]. FAO and WHO set permissible limit of medicinal plant to be 50mg/kg and edible plant to be 27.4mg/kg (Food and Agriculture Organization (FAO)/World Health Organization The established daily amount of Recommended Dietary allowance for Zn is 8mg/day for women and 11mg/day for men [6]

Manganese is an essential element in all living organisms. It commonly functions as a co factor for variety of enzymes including those involved in neurotransmitter synthesis and metabolism [7]. In the current study manganese composition in *Basella alba* L. is 0.835mg/ L Comparing other micronutrients, manganese deficiency is rare in humans. Manganese deficiency result in slow growth of hair and nails, decreased level of clotting proteins, dermatitis, increased alkaline phosphatase activity [8]. The

permissible set for manganese by FAO and WHO in Medicinal plants is 200mg/kg and its daily intake can be 11mg/day [9]. Nickel is a trace element which is essential and toxic to mankind. The nickel concentration is low in *Basella alba* (0.055 mg/L) Nickel is one of the micro nutrients essential for proper functioning of human body and it increases the hormonal activity and is also involved in the lipid metabolism [10]. There is no Recommended Dietary Allowance for nickel. Even though nickel is vital for function of organisms, its high concentration may be toxic to living organisms.

For the normal growth and development of a plant copper plays a major role. While copper is a necessary cofactor for many metalloproteins and is involved in a wide range of physiological activities, excess copper in cells can cause issues. In *Basella alba* L. it was detected to about 0.042mg/L. Early in pregnancy, a severe copper deficiency can result in serious organ deformities in the developing child. If this deficiency persists, the infant may experience neurological and immunological problems [11]. The deficiency of copper may cause diseases like arthritis, osteoporosis, anemia, and neutropenia.

Lead is neither a necessary element nor does it play any part in the process of cell metabolism. The amount of Lead is comparatively very low as compared to other elements detected from the plant *Basella alba* L. that is 0.1mg/L.

According to the study the amount of these trace elements was found in a safe amount. The elements Aluminium was identified which was also seen in a limited amount which must have been affected by the soil quality. Apart from that the non-hazardous elements Lead was also seen in the least amount which was of no side effects.

CONCLUSION

This study successfully determined the elemental composition of *Basella alba* revealing adequate level of essential elements and the low levels of toxic elements ensuring their safety for consumption. The finding contributes to our understanding of plant nutrition highlighting the potential of *Basella alba* for phytoremediation and sustainable agriculture. The plant is very much capable in surviving in the tropical environment with high temperature and humidity, by efficient water and nutrient uptake through their extensive root system. Apart from that this plant can also be used in the horticultural field as it can be used as an ornamental plant also.

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CONFLICT OF INTERESTS

The authors declare that there is no conflict of interests regarding the publication of this paper.

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