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Research Article

DETERMINATION OF NUTRITIVE VALUE AND MINERAL ELEMENTS OF *FICUS BENGHALENSIS* LINN. SEED

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ABSTRACT

Objectives: This study was undertaken to assess the nutritive value and mineral contents of *Ficus benghalensis* seed locally prescribed as a diet for stomach ulcer.

Methods: The nutrients were analyzed by using different biochemical methods while the mineral elements were analyzed by flame photometry and by using various titration methods.

Results: Mineral element analysis revealed the presence of important macro and micro elements such as P, K, Na, Ca, Fe, Zn, Mg, Mn, Cu and Cr. The results for ash content, crude protein, crude carbohydrate, crude fat, crude fiber, vitamin C, and vitamin E content were 2.55%, 15.02%, 12.95%, 2.56%, 19.45%, 203.45±1.877 mg/g, 517.65±0.875 mg/g respectively. Nutritional value of *F. benghalensis* was 134.92±1.250 Cal/100 g.

Conclusion: Our findings provide evidence that the selected plant seeds contain an appreciable amount of nutrients and minerals and can be included in diets to supplement our daily nutrient needs and to fight against many of the diseases as nutraceuticals.

Keywords: Chemical analysis, *Nutraceutical, Ficus benghalensis*, Seed powder.

INTRODUCTION

Living organism requires a continuous supply of large number of substances from food to complete their life cycle. This supply is called as nutrition. The mineral nutrition is an important aspect, and it play pivoted role in human life for healthy growth. Such type of mineral is easily available in medicinal plants [1]. Along with several organic compounds, it is now well to cure diseases as well as minerals are not providing energy, but they play an important role in many activities in the body [2]. About 14 elements are essential to human health such as N, P, K, Ca, Mg, Na, Cu, Fe, Zn, Mn, Co, Si, Br, and Cr. The deficiency of such element creates some health problems. Human bodies daily need more than 100 mg of major minerals (N, P, K, Ca, Mg, Na) and <100 mg of minor minerals (Cu, Fe, Zn, Mn, Co, Br, Si, Cr) [3,4].

Human beings require a number of complex organic compounds as added caloric requirements to meet the need for their muscular activities, carbohydrates, fats and proteins, while minerals and vitamins form comparatively a smaller part, plant materials form a major portion of the diet; their nutritive value is important [5,6]. Human body comprises chemical compounds such as water, proteins, fatty acids, nucleic acids and carbohydrates, these in turn consists of elements such as carbon, hydrogen, oxygen, nitrogen and phosphorus and may or may not contain minerals such as zinc, calcium, iron, magnesium etc. [7].

Healthcare, which was a part of the traditional culture of the people, has become a profession in the modern industrial world. Synthetic medicines manufactured by the affluent and influential pharmaceutical industries have given rise to side effects that are more dangerous than the diseases they claim to cure. The world's attention has again turned to the traditional medical system. Utilization of natural resources in indigenous products may not only bring about the self-sufficiency in drugs in which we talk of, but may perhaps provide safe and sure remedies for human ailments [8].

Plants have great importance due to their nutritive value and continue to be a major source of medicines as they have been found throughout human history [9]. About 30-40% of today's conventional drugs used in the medicinal and curative properties of various plants are employed in herbal supplements, botanicals, nutraceuticals and drugs [10].

Ficus benghalensis Linn. belongs to the family Moraceae, commonly known as banyan tree. In Tamil it is known as Alamaram. It is the national tree of India [11]. Various parts of *F. benghalensis* used in ayurveda for diabetes, tonic, diuretic, diarrhea and ulcer [12]. The seed of *F. benghalensis* is refrigerant, demulcent, diuretic, pectoral and tonic. It is used in ayurveda for the treatment of stomach ulcer, diabetes, dysentery and allergic conditions of the skin. The seed is also a good vermifuge [13]. A survey of the literature showed no screening has been done on the seeds of *F. benghalensis* and it is being used traditionally for the treatment of various diseases.

Hence, this is the first attempt ever made to investigate on the nutritive value and mineral elements of the seed of *F. benghalensis* Linn.

METHODS

Plant collection and authentication

The seed of *F. benghalensis* was collected from a forest in the Thennampattu village of Thiruvannamalai District of Tamil Nadu, India. The plant was identified and authenticated by Prof. Dr. Jayaraman, Plant Anatomy Research Centre, Chennai by comparing with the voucher specimen.

Powder preparation

The seeds were collected, washed thoroughly with fresh running water, dried under shade with room temperature (25±1)°C for a few weeks and coarsely powdered in a blender. The powdered sample was separately kept in an airtight container until use [14].

Determination of nutritive contents

For the chemical analysis, aliquots were made from 0.5 g of fresh weight from sample analyzed. Three replicates were made from aliquots. Ash, crude protein, crude carbohydrate, crude fat, crude fiber, vitamin C and vitamin E and nutritional value were analyzed by the reported methods. Ash content was determined by the incineration of a sample (4 g) in a

muffle furnace at 600°C for 6 hrs until the ash turned white [15]. Crude protein was estimated by the Kjeldahl method [16]. Determination of available carbohydrate in the sample was calculated by the difference method as described by James [17]. Crude fat was determined by petroleum ether extraction in a soxhlet apparatus. A representative 3 g of sample was extracted for 6 hrs. Crude fiber was analyzed by an enzymatic gravimetric method [18]. Vitamin C (ascorbic acid) was determined by redox titration with potassium iodate in the presence of potassium iodide method [19]. Total tocopherols (vitamin E) were determined by a reaction with cupric ions and complexation with 2, 2'-biquinoline (cuproine) methods [20]. The nutritional value of the plant was calculated as per the formula used by Nile and Khobragade [21].

Determination of macrominerals

Na, K and Ca were estimated by the Thunus and Lejeune method [22]. Mg was estimated by the method of Chopra and Kanwar [23]. P was determined by Mendham method [24].

Determination of microminerals

Fe, Mn, Cr, Cu and Zn were determined by Chopra and Kanwar method [23].

Statistical analysis

All the experiments were done in triplicates. The experimental results are expressed as the mean±standard deviation of triplets. Statistical analysis was performed using Graph Pad Prism Software, Version 4.0.3 (Graph Pad Software, San Diego, CA, USA).

RESULTS AND DISCUSSION

In the present study, the results of the various nutrients are summarized in Table 1 and the nutritive value is summarized in Table 2.

The high ash content (2.55%) of the *F. benghalensis* seed is a reflection of the mineral contents preserved in the food materials. The results, therefore suggest a high deposit of mineral elements in the seeds. The protein content (15.02%) of the seed was quite high. This makes the *F. benghalensis* seed to be a good source of proteins. It is evidently witnessed that the seed is very rich in carbohydrates (12.95%). These findings have resemblance with the results of Jamun fruit [25]. The crude fat content of *F. benghalensis* seed (2.56%) was lower. Dietary fats function to increase food palatability by absorbing and retaining flavors [26]. A diet providing 1-2% of its caloric energy as fat is said to be sufficient to human beings, as excess fat consumption yields to certain cardiovascular disorders such as atherosclerosis, cancer and aging [27].

Table 1: Nutritional composition of *F. benghalensis* seed

Nutritional composition	Amount (%)
Ash content	2.55 w/w
Protein content	15.02 w/w
Carbohydrate content	12.95 w/w
Lipid content	2.56 w/w
Fiber content	19.45 w/w
Vitamin E	517.65±0.875 mg/g
Vitamin C	203.45±1.877 mg/g

Values are expressed as mean±SD (n=3), SD: Standard deviation, *F. benghalensis: Ficus benghalensis*

Table 2: Nutritive value of *F. benghalensis* seed

Plant	Nutritive value (Cal/100 g)
F. benghalensis seed	134.92±1.250

Values are expressed as mean±SD (n=3), SD: Standard deviation, *F. benghalensis: Ficus benghalensis*

The crude fiber content of *F. benghalensis* seed was higher (19.45%) and this makes it a more favorable thing since the high fiber content of foods help in digestion and prevention of colon cancer [28]. Non-starchy vegetables are the richest sources of dietary fiber and are employed in the treatment of diseases such as obesity, diabetes and gastrointestinal disorders [29]. Vitamin C content of *F. benghalensis* seed was higher (203.45±1.877 mg/g). Vitamin C is one of the most crucial vitamins in human that plays a large role in hundreds of the body's functions. The most plentiful tissue in the body is collagen, which is a connective tissue. The primary role of vitamin C is to help this connective tissue. Because collagen is the defense mechanism against disease and infection and because vitamin C helps build collagen, it makes sense that it is also a remedy for scurvy by contributing to hemoglobin production. Even in small amounts, vitamin C can protect indispensable molecules in the body, such as proteins, lipids, carbohydrates, and nucleic acids from damage by free radicals and reactive oxygen species that can be generated during normal metabolism as well as through exposure to toxins and pollutants (e.g., smoking). Vitamin C may also be able to regenerate other antioxidants such as vitamin E [30].

Vitamin E is higher (517.65±0.875 mg/g) in *F. benghalensis* seed. Vitamin E is an important component of antioxidant. It is considered as a master of antioxidant because [31] it inhibits the bad cholesterol (low-density lipoprotein) - which is believed to be the first step in atherosclerosis. Nutritive value of seed of *F. benghalensis* was high (134.92±1.250 Cal/100 g). On a dry matter, these medicinal plants have good nutritive value, which supports their use as food, fodder and a good source of various important nutrients for livestock. Seem to be good for younger people, anemic people.

The results of various macrominerals of *F. benghalensis* are given in Fig. 1, while the result of various microminerals is summarized in Fig. 2.

Results showed that sodium (399.4±1.041 mg/100 g) and potassium (192.3±1.417 mg/100 g) was higher in *F. benghalensis* seed. Sodium and potassium take part in the ionic balance of the human body and maintains tissue excitability, carry normal muscle contraction and help in the formation of gastric juice in the stomach [32]. K helps in the release of chemicals which acts as nerve impulses, regulate heart rhythms, deficiency causes nervous irritability, mental disorientation, low blood sugar, insomnia, and coma [33]. Calcium is higher (731.2±0.852 mg/100 g) in *F. benghalensis* seed. Calcium plays an important role in building and maintaining strong bones and teeth and also a large part of human blood and extra cellular fluids. It is also necessary for normal functioning of the cardiac muscle, blood coagulation, milk clotting and regulation of cell permeability [34]. Calcium deficiency causes rickets, back pain, osteoporosis, indigestion, irritability, premenstrual tension and cramping of uterus [35]. Results showed that magnesium is also higher (220.7±1.180 mg/100 g) in *F. benghalensis* seed. Mg plays important role in formation and function of bones, muscles and prevents high disorders, high blood pressure and depression [36] also Mg plays important role in enzyme activity, deficiency interferes with transmission of nerve and muscle, impulses, causing irritability and nervousness, prevent heart diseases [37]. Phosphorous is higher (250.9±1.024 mg/100 g) in *F. benghalensis* seed. Phosphorous maintains blood sugar level, normal heart contraction dependent on phosphorous [38] also important for normal cell growth and repair, needed for bone growth, kidney function and cell growth. It plays an important role in maintaining the body's acid-alkaline balance [39].

Iron sufficient (33.46±1.306 mg/100 g) in *F. benghalensis* seed, is involved in making of body tendons and ligaments, certain chemicals of the brain are controlled by the presence or absence of iron. It is essential for the formation of hemoglobin, which carry oxygen around the body [40]. Fe deficiency causes anemia, weakness, depression, poor resistance to infections [41]. Manganese is also higher (21.55±0.842 mg/100 g) in *F. benghalensis* seed. Mn is a component of several enzymes, including manganese-specific glycosyltransferase and phosphoenolpyruvate

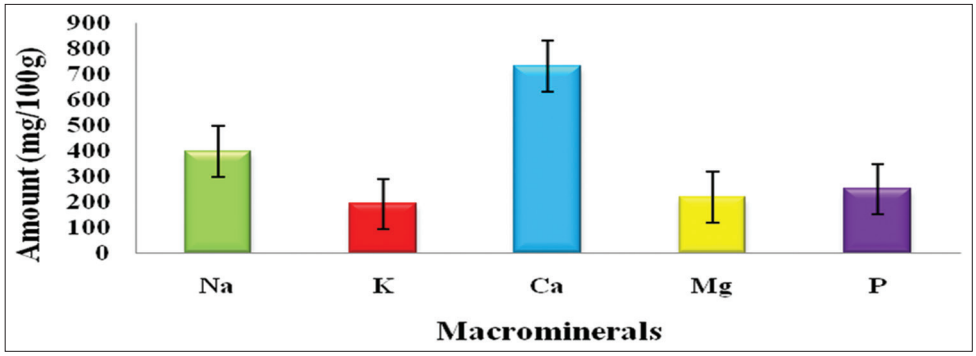

Fig. 1: Analysis of various macrominerals content of *Ficus benghalensis* seed. Values are expressed as mean±standard deviation (n=3)

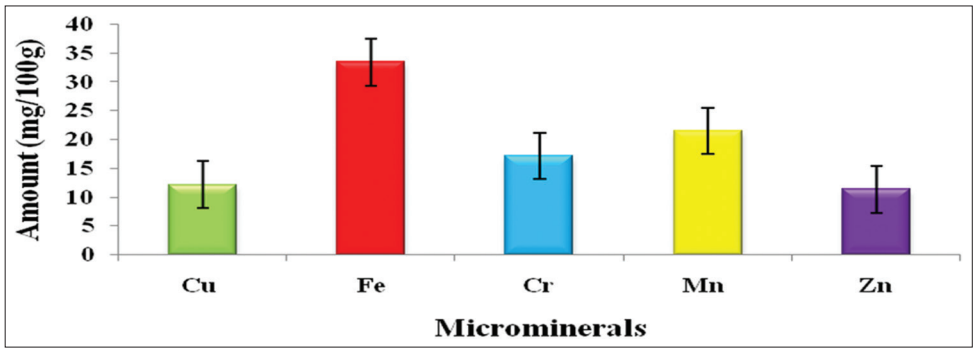

Fig. 2: Analysis of various microminerals content of *Ficus benghalensis* seed. Values are expressed as mean±standard deviation (n=3)

carboxykinase and essential for normal bone structure. The deficiencies of manganese are unusual but may lead to bone deformities, rashes, reduced hair growth, hypocholesterolemia [42]. Chromium is sufficient (17.11±1.143 mg/100 g) in *F. benghalensis* seed. Cr is a vital element as it works with insulin to stabilize blood sugar level, help to absorb energy from blood and increase muscle mass by reducing fat mass in the human body [43]. Deficiency of Cr results in growth failure, hyperglycemia, neuropathy, atherosclerosis, and diabetes [44]. Copper is also sufficient (12.19±1.112 mg/100 g) in *F. benghalensis* seed. Cu is a universally important cofactor for many hundreds of enzymes. It functions as a cofactor and activator of numerous enzymes, which are involved in the development and maintenance of the cardiovascular system. Cu deficiency has been associated with cardiac abnormalities in human and animal; causes anemia and neutropenia [45]. Zinc is again higher (11.34±1.160 mg/100 g) in *F. benghalensis* seed. Zn maintains various reactions of the body, which helps to construct and maintain DNA, required for growth of body tissues, an important element of ligaments and tendons. Zn deficiency causes clinical consequences, including growth delay, diarrhea, pneumonia, disturbed neurophysiologic performance and abnormalities of fetal development [46].

CONCLUSION

Minerals are important in the diet because they serve as cofactors for many physiological and metabolic functions. The biological effects of the trace elements in a living system strongly depend upon their concentration and thus should be carefully controlled, especially when herbs and drugs are used in human. Although the plant has good nutritive value and mineral content, which shows that the plant has good medicinal value and extracts can be used in medicinal formulations. These plant seeds might be explored as a viable supplement and a ready source of dietary minerals in human food to fight various diseases.

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