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Full Proceeding Paper

ELEMENTAL AND NUTRACEUTICAL VALUES OF COMMON PLANTS OF SASTRA CAMPUS A SELECT STUDY

NITHYA DEVI, M, BALAJI, P AND BRINDHA, P*

Centre for Advanced Research in Indian System of Medicine (CARISM) SASTRA University, Thanjavur.

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ABSTRACT

Health improvement mediated by "Nutraceuticals" has triggered an increased global interest and the current global market size of herbal Nutraceuticals is estimated between 30 and 60 billion. In order to contribute to the human health and National economy, attempts were made to evaluate Nutraceutical potentials of certain common plants available in the SASTRA University campus, Thanjavur, Tamil Nadu, India. Common plants such as *Achyranthus aspera L, Boerhavia diffusa* L, *Mukia madraspatana* (L) Roem, *Scoparia dulcis,* and *Phyllanthus madaraspatensis* L were collected, identified, authenticated and evaluated for their nutracceutical potential. Before analysis collected drugs were shade dried, coarsely powdered and extracted with water and alcohol. Both powder and extracts were subjected to nutraceutical analysis and their nutraceutical values were determined. Among the selected plants *Mukia madraspatana* (L) Roem possessed high nutraceutical values.

Keywords: Nutraceuticals, Elemental analysis and dietary supplements.

INTRODUCTION

"Nutraceutical: name was coined by Stephan DeFelice in 1989. Nutraceuticals are non-specific biological interventions used for health promotion, in prevention of malignant processes and symptoms control. Owing to their safety and potential nutritional and therapeutic values, nutraceuticals have attracted considerable interest. Supplements are products derived from natural sources which are included with the diet with ingredients like vitamins, minerals, amino acids, but without any therapeutic effects. However nutraceuticals have the additional advantage in the prevention or management of diseases or disorders and used as a conventional food (1, 2, 3).

A number of biological mechanisms and pathophysiological processes are influenced by Nutraceuticals and positioned well due to their safety (4, 5).

Considering the above aspects, an attempt was made to develop herbal dietary supplements with high nutraceutical value from commonly available plants such as *Achyranthus aspera L* (Aa), *Boerhavia diffusa* L (Bd), *Mukia madraspatana* L Roem (Mm), *Scoparia dulcis* (Sd) and *Phyllanthus madaraspatensis* L (Pm) which are also known for their therapeutic values. *Achyranthus aspera L* is used as an Immunomodulatory and antiobese drug (6, 7). *Boerhaavia diffusa* is used for treating rheumatism, cardio vascular diseases and anemia (8, 9). *Mukia madraspatana* is used in arthritic conditions and to reduce blood Pressure, besides it is a proven Immunomodulatory and hepatoprotective agent (10, 11). *Scoparia dulcis* is traditionally used in the management of hypertension and diabetes (12, 13). *Phyllanthus maderaspatensis* is not only an antioxidant but also used as an antibacterial and hepatoprotective agent (14, 15).

MATERIALS AND METHODS

Selected plants were collected from the campus of SASTRA University Thanjavur, Tamil Nadu, India and botanically identified and authenticated. After proper identification and authentication, collected drugs were washed thoroughly three times with running water, dried under shade, ground into coarse powder and extracted with water and alcohol. Both powder and extracts were subjected to chemical analysis as per standard operating procedure employing X-ray Fluorescence spectrometer (XRF) and Carbon, Hydrogen and Nitrogen analyzer (CHN) and their nutracceutical values determined along with major Phytochemical constituents as per standard textual procedures.

Family: Amaranthaceae

***(A) Achyranthus aspera L* (Aa)**

Family: Nyctaginaceae

(B) *Boerharia diffusa L* (Bb)

Family: Cucurbitaceae

(C) *Mukia madraspatana* (L) Roem (Mm)

Family: Scrophulariaceae

(D) *Scoparia dulcis* (Sd)

Family: Phyllanthaceae

(E) *Phyllanthus madaraspatensis L* (Pm)

Fig .1:

RESULTS AND DISCUSSION

Nutraceutical values

Table 1: Macronutrients

Name of the Parameters	*Phyllanthus Madraspatensis* (Pm)	*Achyranthes Aspera* (Aa)	*Mukia Maderaspatana* (Mm)	*Boerhavia diffusa* (Bd)	*Scoparia dulcis* (Sd)
Carbohydrates mg/kg	1.89	1.56	1.26	1.52	1.43
Protein (mg/kg)	0.83	0.87	0.76	0.75	0.72
Fats (mg/kg)	0.06	0.03	0.06	0.08	0.03
Energy Kcal	7.91	6.53	5.27	6.36	5.99

Table 2: Micronutrients

Name of the Parameters	*Phyllanthus Madraspatensis* (Pm)	*Achyranthes Aspera* (Aa)	*Mukia Maderaspatana* (Mm)	*Boerhavia diffusa* (Bd)	*Scoparia dulcis* (Sd)
Carbon (%)	1.59	1.63	3.49	3.19	4.58
Nitrogen (%)	0.89	0.92	2.49	2.93	1.79
Phosphorus%	0.19	0.22	0.58	0.59	0.87
Potassium %	3.16	2.56	3.18	3.15	4.28
Sodium (%)	0.12	0.26	0.08	0.12	0.69
Calcium (%)	4.59	4.63	5.13	3.48	5.23
Magnesium%	3.18	3.42	3.19	2.54	3.91
Sulphur (%)	0.23	0.26	0.18	0.29	0.52
Zinc (ppm)	1.29	1.52	4.93	2.65	4.53
Copper(ppm)	0.83	0.87	0.51	0.58	1.29
Iron (ppm)	55.69	63.26	50.29	32.49	56.32
Manganese (ppm)	9.62	8.46	14.20	6.79	12.54
Boron (ppm)	0.19	0.12	0.10	0.06	0.12
Molybdenum (ppm)	0.06	0.09	0.06	0.09	0.16

Table 3: Major Phytochemical constituents

Name of the Parameters	*Phyllanthus Madraspatensis* (Pm)	*Achyranthes Aspera* (Aa)	*Mukia Maderaspatana* (Mm)	*Boerhavia diffusa* (Bd)	*Scoparia dulcis* (Sd)
Alkaloids (mg/kg)	0.82	0.87	1.44	0.62	0.79
Flavonoids (mg/kg)	2.63	1.59	2.56	1.63	2.54
Tannin (mg/kg)	0.12	0.16	0.69	0.22	0.79
Lignin (mg/kg)	0.09	0.12	0.72	0.20	0.87
Glycosides (mg/kg)	0.09	0.12	0.09	0.12	0.06
Serpentines (mg/kg)	0.12	0.09	0.06	0.16	0.08
Terpenoids (mg/kg)	0.05	0.08	0.09	0.05	0.03
Saponins (mg/kg)	0.03	0.05	0.05	0.03	0.02
Phenols (mg/kg)	0.18	0.22	0.12	0.08	0.10

Data of the results obtained revealed interesting information on the nutraceutical potentials of the selected plants which will be discussed in sequel

Phyllanthus madaraspatensis **(Pm) *(*Fig 1.E)** is rich in Calcium and Iron content which was present as much as 4.59% and 55.69 ppm (Table.2) respectively hence can be a good dietary supplement to Anaemic and Arthritic patients. Calcium is an essential basic nutrient that is important for healthy bones and to prevent osteoporosis (brittle bones). Individuals with arthritis are at risk for developing osteoporosis. Lack of dietary calcium can also increase the risk of developing osteomalacia (soft bones). Recommended calcium intake for healthy adults between the age group of 19 - 50 is 1000 milligrams (mg) every day. Adults over the age of 50 should take 1200 mg daily. Many people with arthritis are also anaemic (16). This plant is rich in Flavanoids content (2.63%), hence it can be a good antioxidant and could be much useful as a diet for patients suffering from arthritis and anaemia. Besides being rich in Flavone a proven antioxidant, can contribute in improving the disease resistance particularly in inflammatory conditions.

Achyranthus aspera **(Aa) (Fig 1.A)** - Zinc and Iron was found to be high in this plant, 1.52 ppm and 63.26 ppm along with 0.87 mg/kg of protein (Table.1) respectively. It can be a good dietary supplement because of the significance of Iron towards providing remedy for diabetes and its complications including microangiopathy and atherosclerosis (17) and adequate protein intake is essential for the compensation of protein loss often encountered in hypoglycaemic conditions (18). Zinc is a component of many enzymes which is involved in the maintenance of several tissue functions (19). This plant can also act as a slimming supplement for obese patients, due to its increased production of glycogen in liver and its appetite suppressing property which increases body heat production by activating thermogenesis and encourages weight loss (20). As *Achyranthus aspera* is rich in Iron, Zinc and protein content can serve as a good dietary supplement especially for diabetes and obese people.

Mukia madraspatana **(Mm) (Fig 1.C)** – In this plant Calcium (5.13%), Zinc (4.93 ppm), Iron (50.29ppm), Manganese (14.20ppm), Magnesium (3.19%) and Flavanoids (2.56mg/kg) (Table.2 & 3) content are present in appreciable amount hence it can also be a good supplement to Diabetic and Anaemic patients and can also serve as a good antioxidant (17, 19). Diabetic older people require a daily intake of 1 g–1.5 g of calcium. Safety and reduction of osteoporosis suggests that usage of this plant might be beneficial to elderly people (18). Manganese deficiency leads to defective pancreas and results in impaired insulin secretion causing diabetes and lead to glucose intolerance. Manganese supplementation might be useful in reverting these conditions (21, 22). Flavanoids stimulate glucose uptake in periphery and regulate carbohydrate metabolism pathway. As a result, flavanoids have emerged as natural supplement to the current diabetes therapy (23). As this plant drug posses appreciable quantity of these elements that can help in reducing sugar can be an excellent herbal diet for diabetic patients.

Boerhavia diffusa **(Bd) (Fig 1.B)** – Having good amount of calcium (3.48%) (18), Iron (32.49 ppm) and Potassium (3.15%) this plant can be a dietary supplement to children and anemic patients. In anemic patients iron depletion affects the functions of several organ systems necessitating iron supplements which owing to their poor absorption are administered with liquids (24, 25). Potassium regulates intracellular enzyme function and neuromuscular tissue excitability. During anemia the patients with decreased potassium level will develop sickle cell anemia (26, 27). This plant source possessing good amount of potassium can prevent such serious anemic conditions and with the moderate amount of calcium, Zinc and Iron can be a good supplement for anemic patients. Besides flavanoids content (1.63 mg/kg) present can contribute in increasing the disease resistance power among the anemic patients.

Scoparia dulcis **(Sd) (Fig 1.D) -** is rich in Zinc (4.53ppm), Iron (56.32ppm), Calcium (5.23%) (18), Sodium (0.69%) Magnesium (3.91%) and Flavanoids(2.54 mg/kg) so this plant can also be useful for anaemic patients and could act as an antioxidant (17, 19). The accumulation of fat in the cells leads to injury or cell death, sodium supplement either abolishes or significantly reduces the accumulation of fat and it also completely prevents the myofibre death. Cardioprotective effect of sodium is independent of its hypothermic action (28). During cardiac hypoxia, increased levels of extracellular magnesium show cardio protective effects. Decreased Mg resulting due to hypoxic perfusion will lead to Mitochondria KATP channel blocking. Due to the increased Mg content this plant drug can supply magnesium thus prevent KATP channel blocking and could offer cardiac protection (29). Thus a moderate percentage of sodium (0.69%) and Magnesium (3.91%) makes it a good dietary supplement for heart patients (28).

The data and results obtained in the present work revealed that among all the plants evaluated for Nutraceutical potential ***Mukia madraspatana*** turned out to be more significant with desired nutraceutical values. Further in depth studies coupled with preclinical and clinical trials on this plant may result in the development of an efficacious, cost effective and an eco friendly dietary supplement. Though these herbs are valued as potent herbal dietary supplements, while preparing any product from these sources care must be taken to collect them from clean environment washed thoroughly and must be checked for heavy metal and microbial contamination. Authentic herbs, processes as per ayurvedic methods will certainly contributes significantly towards nutrceutically developed an ecofriendly herbal supplement.

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