



Assessment of Physico-chemical Constituents, Proximate, Trace Metals, Minerals and Vitamins of *Sarcostemma brevistigma*

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ABSTRACT

Physico-chemical screening and mineral elemental analysis of crude extract of aerial parts of *Sarcostemma brevistigma* were carried out with a view to assess the therapeutic values and the safety of the plant in ethno medicine. The tests were made by following standard procedures. The results revealed the presence of moisture (4.09%), total ash (14.093%), water soluble ash (67.56%), acid insoluble ash (15.33%), and sulphate ash (16.35%), Ca, Mg, P, K, Fe and Na. It also contained vitamins vit- B1, B2, B5, C, B6 and niacinamide. It is therefore concluded that the plants hold tremendous promise in providing the variable vitamins and mineral supply that could enhance the curative process of ill health.

Keywords: Physico-chemical, proximate, aerial parts, *Sarcostemma brevistigma*.

INTRODUCTION

Medicinal plants are group of plants which in one or more of its parts contain substances that can be used for the synthesis of useful drugs. Plants have been used as medicines since the beginning of human civilizations and have been a source of treatment of the common day ailments.¹ About 50% of all modern chemical drugs are of natural product origin. The usage of plants as medicine still presents a very important phenomenon in the traditional medicine which is imbedded in the culture of people of developing countries.²

Indian medicinal plants are well-known universally for its main role in the primary health care systems. Most of the rural people still rely largely on traditional system to cure their ailments. Medicinal plants in their surrounding environments are collected and used largely. As they provide low cost or no cost for practicing knowledge on such medicinal systems have been in the process of transmittance from one generation to the other. It has increased the efficacy and reliability of the medicinal uses as it has been in continuous testing among the population over the years. In recent years, secondary plant metabolites or phytochemicals, previously with unknown pharmacological activities, have been extensively investigated as a source of medicinal agents.³

Sarcostemma brevistigma, Wight & Arn. is one of the important anti-asthmatic medicinal plant, belonging to the family Asclepiadaceae. It is used in the traditional systems of medicine for various ailments. The decoction of the plant is useful to gargle for throat and mouth infection. Fresh roots are prescribed for jaundice.⁴ The juice is used in gleet, gonorrhoea, pain in the muscles, cough and given to children as an astringent.⁵ Leaf powder stimulates articulatory system, increases secretion of urine and activates uterus.⁶ The fruit juice is

used in gonorrhoea and to relieve pain in muscles.⁷ The leaves, roots and latex are employed in treating many diseases like asthma, rheumatism, arthritis, chronic ulcer, fever, cough, bronchitis, dysentery, emetic, purgative, leprosy, tumour, vesicant, constipation, skin diseases and stomach distension.⁸ However, no much scientific validation has been made so far for this species for its medicinal uses.

The present work was designed to investigate the physico-chemical tests, proximate, minerals and vitamins composition of the aerial parts of plant extract of *Sarcostemma brevistigma* in order to gain an insight into the molecular basis for some of its therapeutic properties and folkloric use.

MATERIALS AND METHODS

Collection and identification of plant materials

The plant *Sarcostemma brevistigma* was collected from Pillur Beat (Pillur slope RF and Nellithurai RF), Karamadai Range, Western Ghats, Tamil Nadu, and India. The authenticity of the plant was confirmed in Botanical Survey of India, Southern Circle, and Coimbatore by referring the deposited specimen. The voucher number of the specimen is BSI/SRC/5/23/2015/Tech./2334. The aerial parts of this species was washed under running tap water, shade dried at room temperature and powdered.

Chemicals and reagents

In the present study, all the chemicals and reagents used were purchased from HI-MEDIA Pvt. Ltd., Bombay. The chemicals used were of analytical grade.

Physico-chemical test, proximate, minerals and vitamins composition

The fresh aerial plant parts were used to determine the organoleptic characters, behaviour of the powder with



different chemical reagents/solvents, fluorescent analysis according to methods described in Indian pharmacopeia. The moisture content of the powdered plant parts was determined by loss on drying method. The ash value, acid insoluble ash, water-soluble ash and sulphated ash were determined as described by African pharmacopeia.⁹

RESULTS AND DISCUSSION

The details of organoleptic characters, various analytical parameters such as fluorescence analysis, extractive values, ash values and the results of preliminary and detailed phytochemical analysis established will facilitate in identifying the genuine drug from any substitute or spurious samples and will also be useful in preparation of monographs of the plants. The medicinal value of plants lies in bioactive phytochemical constituents that produce definite physiological action on the human body.¹⁰

Organoleptic investigation of the study plant exhibits no odour and no taste (Table 1). The fresh aerial parts of the plant are green in colour. Upon drying and powdering, the dark green colour turned into pale green colour. The successive solvent extracts of *S. brevistigma* showed pale brown to dark green. Organoleptic profile is one of the many diagnostic parameters in the proper identification of raw materials.¹¹ Related study was carried out by Geetha *et al.*¹²

Table 1: Organoleptic characters of plant powder of *Sarcostemma brevistigma*

S.No	Characters	Observation
1.	Color	Brownish Yellow
2.	Texture	Fine powder
3.	Taste	Tasteless
4.	Odour	Odorless

Table 2: Fluorescence behavior of plant powder of *Sarcostemma brevistigma* in different solvents

S.No	Solvent	Day light	Short UV	Long UV
1.	Ethanol	Green	Pale green	Pale pink
2.	Water	Green	Pale green	Pale green
3.	Hexane	Very pale Green	Green	Dull green
4.	Methanol	Green	Pale green	Dark pink

Fluorescence analysis of the present study, revealed that the powder as such showed pale green to dark green colour, under fluorescence and UV light it showed pale green to dull green and pale pink to dark pink (Table 2). On treating with various reagents, it exhibited characteristic variations (Table 3). Analytical tests based on fluorescence in day light and UV light can be used to check identity of powdered drugs.¹³ Fluorescence profile denoted different phytochemical components that were useful in the assessment of active constituents of a drug, responsible for their pharmacological action that was useful for the

preparation of genuine Ayurvedic drugs. Similar fluorescence profiling had been undertaken by many authors.^{14, 15}

Table 3: Fluorescence behavior of plant powder of *Sarcostemma brevistigma*

S. No	Powder + Chemical reagents used	Behaviour of plant powder		
		Visible light	UV Range	
			254nm	365nm
1.	Powder as such	Brown	Black	Black
2.	Powder + 1 N NaOH (aq)	Reddish Brown	Black	Black
3.	Powder + 1 N NaOH (alc)	Reddish Brown	Black	Black
4.	Powder + 1 N HCL	Dark Reddish Brown	Black	Pale green
5.	Powder +50 % H2SO4	Black	Black	Black
6.	Powder + 50 % HNO3	Pale Brown	Brown	Green
7.	Powder + Picric acid	Brown	Green	Black
8.	Powder+ Ferric chloride	Pale green	Pale green	Dull green
9.	Powder + HNO3/ NH3	Dark green	Dark green	Black

The results of the moisture content of the study plant showed that the moisture content (Table 4) was not too high, indicated less chances of microbial degradation of drugs during storage because excess moisture can result in the breakdown of important constituents by enzymatic activity and as a result may encourage the growth of yeast and fungi during storage.⁹ Hence, with the values obtained it implies that the plant can be stored for a longer period with lower chances of microbial attack.

Acid insoluble ash value was 19.33%. This implies that a large portion of the ash content was acid insoluble and hence may be physiologically important as salts in the body when consumed. It was also indicative of high digestibility of the plant when eat.¹⁶ Sulphated ash value was 16.35% in the aerial parts showed that the extract was moderately pure, thus, sulphated ash was a good criterium used to judge the identity and purity of crude drugs.¹⁷ The amount of macro and micro elements was depicted in Table 5. The aerial part of *Sarcostemma brevistigma* contains Calcium (56.7mg/100g), magnesium (12.4mg/100g) and sodium (23.67mg/100g). Magnesium, calcium and sodium were required for the production of red blood cells and for body mechanism.¹⁸ Heavy metals such as Cu, Zn, Mn and Fe were essential for plant growth; many of them do not have any significant role in the plant physiology.¹⁹



Table 4: Physiochemical values of *Sarcostemma brevistigma* powder

S. No	Parameters	Values obtained in percentage
1.	Moisture content	4.09
2.	Total ash	14.093
3.	Water soluble ash	67.56
4.	Alkalinity of water soluble ash	16.35
5.	Acid insoluble ash	19.33
6.	Solubility % in Ethanol	78.35
7.	Solubility % in Methanol	28.36
8.	Solubility % in Hexane	19.67
9.	Solubility % in Water	29.19

Sometimes, the heavy metals effects affects the photosynthetic ability of leaves, closure of leaf stomata, plant growth, physiology and productivity of plants.²⁰ The uptake of these heavy metals by plants was an avenue of their entry into the human food chain with harmful effects on health.²¹ In the present study, the amount of mercury and lead was found to be lesser than the toxic level (Table -6). Less than 1 ppm of lead, nil amount of cadmium, arsenic, lithium and nickel in the sample analyzed indicating the water pollution free edaphic condition of the study hills.

Table 5: Estimation of minerals in the plant powder of *Sarcostemma brevistigma*

S. No	Minerals	Values (mg/100g) dry weight
Macro elements		
1.	Calcium	56.7
2.	Magnesium	12.4
3.	Sodium	23.67
4.	Potassium	15.78
Microelements		
1.	Zinc	1.36
2.	Iron	2.95
3.	Copper	0.45
4.	Manganese	0.92

Vitamins were organic compounds required as vital nutrients in tiny amounts by an organism. Vitamins serve as biocatalysts in many chemical reactions as well as precursors to various body factors. They also required for a variety of biological processes such as mental alertness necessary in vision,²² gene transcription,²³ immunity, dermatology,²⁴ growth and development.²⁵ Vitamins will reduce the damage caused by free radicals and check degenerative diseases.²⁶ In *S. brevistigma* sample Vitamin B₂ and Vitamin B₅ were present in traces and vitamin B₆, B₁, vitamin C and niacinamide were present in maximum amount (Table 7).

Table 6: Estimation of heavy metals in the plant powder of *Sarcostemma brevistigma*

S. No	Heavy metals	Values (ppm)
1.	Mercury	0.045
2.	Lead	Less than 1 ppm
3.	Cadmium	Nil
4.	Arsenic	Nil
5.	Lithium	Nil
6.	Nickel	Nil

Vitamin C was an important antioxidant. It acts as an electron donor for eight important enzymes in humans.²⁷ Ascorbic acid may protect against the oxidative damage of light in the eye²⁸ and may also play an important role in sperm maturation.²⁹ It helps in stabilizing various plasma components and has been shown to be an effective scavenger of superoxide radical anion, H₂O₂, the hydroxyl radical, singlet oxygen and reactive nitrogen oxide.³⁰ Vitamin B complexes which are water soluble vitamins can be used or maintaining health in humans and animals.³¹ The presences of ascorbic acid (vit.C), thiamine (vit.B1), riboflavin (vit. B2), vitamin B5, vitamin B6 and niacinamide indicate that *S. Brevistigma* was a potential medicinal plant.

Table 7: Estimation in the plant powder of *Sarcostemma brevistigma*

S. No	Vitamins	Values in mg/100g
1.	Vitamin B1 (Thiamine)	0.15
2.	Vitamin B2 (Riboflavin)	In traces
3.	Vitamin B5	In traces
4.	Vitamin B6	0.029
5.	Vitamin C	0.112
6.	Niacinamide	1.33

CONCLUSION

The present study demonstrated that the aerial parts of *Sarcostemma brevistigma* have many beneficial effects with respect to the presence of the above said secondary metabolites which are likely to combat many diseases. The physico-chemical test, minerals and vitamins composition were not only used to search for bioactive agents but also serves as starting product for the partial synthesis of some useful drugs. Therefore more research should be carried out on the aerial parts of *Sarcostemma brevistigma*.

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