

STUDY ON PHYTOCHEMICAL INVESTIGATION OF LEAVES OF *SAUROPLUS ANDROGYNUS* L. MERR.

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Abstract

Sauropus androgynus L. Merr. (Kyet-Tha-Hin) is a perennial shrub belonging to the family Euphorbiaceae. Leaf juice was also widely advertised as “natural diet” good for weight reduction. In this study, the plants were collected from Hinthada Township during June to December, 2016. The morphology of vegetative parts as well as reproductive parts was studied and identified by using standard literatures and internet informations. The preliminary phytochemical investigation and physico-chemical properties were carried out. These results showed the presence of alkaloid, glycoside, steroid, phenolic compound, α -amino acid, carbohydrate, and protein. In the physico-chemical properties, the powdered leaves were most significantly soluble in methanol than other solvents. Elemental analysis of powdered leaves was carried out by EDXRF. In this result, the highest concentration of element was found to be Potassium (K). The content of heavy metals were analyzed by using AAS, these results showed higher content of magnesium (Mg). The nutritional values from powdered leaves of *Sauropus androgynus* L. Merr. revealed the present of protein, fiber, fat and carbohydrate. The findings of the present research may be helpful for further investigation.

Introduction

Euphorbiaceae family contains about 283 genera and 7,300 species. The plants of this family are found throughout the world. (Pandey, 1981)

Sauropus androgynus (SA), also called star gooseberry, is a tropical shrub grown as a leafy vegetable. In Malaysia, it is named as Cekor mains or Katuk. The Indian, Indonesian, and Thai names of *Sauropus androgynus* are Chakrmani, Katu, and Phak Wan Ban, respectively. *Sauropus androgynus* is a medicinal plant with high antioxidant potential. The leaves of this plant have been traditionally used to treat certain diseases, for weight loss and as vegetable dishes. (Website-1)

Sauropus androgynus L. Merr. Synonym *Sauropus ablicans* Bl. was commonly known as “Kyet-tha-hin”, Yaungma-kinnyo’ (John Kress, 2003). This plant grown wild and cultivated throughout Myanmar.

Sauropus androgynus L. Merrill is a perennial shrub belonging to the family Euphorbiaceae. It is also known as katuk, star gooseberry, or sweet leaf. In Indian it also known as Multivitamin Plant as it contains an excellent source of vitamins A, B, C, carotenoid and also it has high nutritive value. It is most popular in South Asia and Southeast Asia. *Sauropus androgynus* commonly used as an effective medicinal herb in the treatment of diabetics, cancer, inflammation, microbial infection, cholesterol and allergy due to its antioxidant effect. Leaf juice was also widely advertised as “natural diet” good for weight reduction. (Website-2)

Sauropus androgynus has been known as “multigreen” due to its high vitamin and nutrient content and this vegetable is usually consumed raw in salad, stir-fried, used in curry, or

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cooked in soups in most countries in Southeast Asia. Also, *Sauropus androgynus* is believed to increase lactation in women in Indonesia and Malaysia. Furthermore, Thai people traditionally use the roots of this plant to reduce fever and treat food poisoning and antiseptic agent. People in Taiwan believe that *Sauropus androgynus* could have significant potential as a slimming agent to combat obesity. In India, the leaves of this plant are used as antidiabetic and to improve vision. The plant is widely used in traditional medicine for wound healing, inducing lactation, relief of urinary disorders, as an antidiabetic cure and also fever reduction. (Website-3)

The aim of the present research is to be aware of the medicinal uses of *Sauropus androgynus* L. Merr. The objectives are to study the morphology of this plant and characterization of powdered leaves and to perform the phytochemical and physico-chemical investigation of leaves.

Materials and Methods

Materials

- Samples - Leaves of *Sauropus androgynus* L. Merr. and its dried powder.
- Equipments - Dissecting microscope, Pointer, Razar blades, Brush, Forceps, Digital camera.

Methods

(i) Botanical studies of *Sauropus androgynus* L. Merr.

The specimens of *Sauropus androgynus* L. Merr. was used in this research were collected from Hinthada University. The specimens were personally collected during the flowering and fruiting periods throughout the year, 2016.

The fresh parts of this plant were used for morphological study. In morphological study, the fresh plant parts were thoroughly examined and described according to the standard used in Department of Botany, University of Yangon (Nyo Maung, 2012). The plant parts were recorded by taking photographs. This specimens were identified by available literature such as Flora of Java, (1963).

(ii) Preparation of powdered sample

The fresh specimens were washed with water and dried in shade for three weeks. Then, the dried materials were pulverized with grinding machine, these powdered sample was kept in tightly closed bottles and stored at room temperature to prevent moisture changes and contamination. These powder was used for diagnostic and sensory characters as well as for phytochemical studies.

(iii) Phytochemical studies of *Sauropus androgynus* L. Merr.

The powdered leaves were used for phytochemical screening. The analysis of elemental concentrations was carried out by using the Energy Dispersive X-rays Fluorescence Spectrometer (EDXRF) and Atomic Absorption Spectrometry (AAS) at University Research Center, University of Yangon.

Preliminary phytochemical screening was carried out from *Sauropus androgynus* L. Merr. with a view to determine the presence of alkaloid, glycoside, reducing sugar, saponin, phenolic compound, α -amino acid, carbohydrate, tannin and protein according to standard test given in Trease & Evans, (1978). The results were shown in Table 2.

In Physico-chemical properties study, the powdered samples from leaves of *Sauropus androgynus* L. Merr. were carried out according to Harborne (1973) and Trease & Evans (1978). The results were shown in Table 3.

Elemental analysis (EDXRF) was used to analyse the sample. The fundamental parameter for elemental analysis are:

- (a) X-ray tube, (b) Si (Li) detector diode, (c) Cooling system,
(d) Preamplifier, (e) Multi-channel analyzer (MCA), (f) Digital computer

AAS method is especially for trace elements analysis. The sample ash was digested with 10ml of HCL or HNO₃ to form a solution. The solution may be carefully closed and heated at 200°C for 10 minutes. The sample solution are cooled and filtered with filter paper and then 1ml of sample solution was added into the 100ml volume metric flask. And then 1 ml of this solution was diluted with 99ml of de-ionized water and placed at room temperature for 24 hours. These solution samples were analyzed by using Atomic Absorption Spectrometer and the results were shown in Table 4.

The nutritional values of the powdered leaves of *Sauropus androgynus* L. Merr. was determined by using AOAC method at Food Industries Development of Supporting Laboratory. The results were shown in Table 6.

Results

I. Botanical studies

- Scientific Name - *Sauropus androgynus* L. Merr.
English name - Katuk, Stargooseberry
Myanmar Name - Kyet-tha-hin, Yaung- ma- kin- nyo
Family - Euphorbiaceae
Location - Hinthada Township
G P S - North Latitude 17⁰38' 37.621"/ East Longitude 095⁰26' 06.568"

Morphological characters of *Sauropus androgynus* L. Merr.

Habit: shrubs 1 -3 m tall, erect, glabrous throughout, branchlets angular when young, slender, green; **leaves:** simple, alternate, entire, ovate, lanceolate about 5.2 - 7.3 cm long, about 1.9 - 2.4 cm wide, stipule minute, lanceolate 1 - 2 mm long, petiole short 1 – 5mm long, leaf blade ovate lanceolate or oblong lanceolate, sub-membranous or thinly papery, base rounded, leaf apex acuminate, venation, pinnate, lateral veins 5 - 7 pairs, reticulate veins obscure; **inflorescence:** axillary, 1 - 2 flowered cymes; **flower:** minute, axillary, apetalous, unisexual, solitary or cluster; **male flower:** pedicle slender 6 – 8mm; **calyx:** shallowly disk shaped 3 - 4 mm diameter, persistent, 6 lobed, sepal obovate; **stamens:** 3, filament connate, anther extrorse; **female flowers:** axillary, pedicel 6 – 8mm; **calyx:** red, 6 lobed, outer lobes 3 and inner lobes 3, sepals obovate 4 -5 mm long, persistent, base attenuate; **ovary:** depressed globose 0.7 - 1 mm long, style 3, stigma bifid, 3 locular, two ovules in each locule, placentation axile; **fruit:** depressed globose or globose 1.4 - 1.5 cm, fleshy white; **seeds:** black, triquetrous; 0.7 - 1.3 cm; flowering time : June - November, fruiting time: November - December.



Fig 1 Habit



Fig 2 Inflorescence



Fig 3 Male Flower



Fig 4 Female Flower

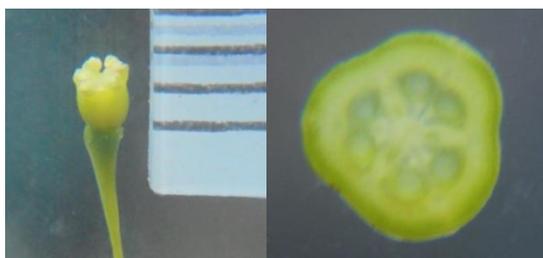


Fig 5 Gynaecium

Fig 6 T.S of Ovary



Fig 7 Fruits

Fig 8 Seeds

Sensory Characters of Powdered Leaves of *Sauropus androgynus* L. Merr.

Table 1 Sensory characters of the powdered samples

Sensory characters	Leaves
Colour	Yellowish green
Odour	Slightly-pungent
Taste	Sweet
Texture	Granular



Fig 9 Sensory characters of the powdered Samples

II. Phytochemical Studies of *Sauropus androgynus* L. Merr.

Table 2 Preliminary phytochemical screening of powdered samples of leaves from *Sauropus androgynus* L. Merr.

No.	Chemical constituents	Extract	Reagent used	Observation Leaves	Results leaves
1	Alkaloid	EtOH	1. Mayer's reagent 2. Wagner's reagent 3. Hager's reagent	White ppt Orange ppt Yellow ppt	+ + +
2	Glycoside	EtOH	H ₂ O+NaOH	White ppt	+
3	Reducing sugar	H ₂ O	Fehling solution A and B	White ppt	+
4	Saponin	H ₂ O	Distilled water	No persistent foam	-
5	Cyanogenic glycoside	H ₂ O	Con: H ₂ SO ₄ + sodium Picrate paper	No colour change	-
6	Steroid	EtOH	CHCl ₃ +Conc:H ₂ SO ₄	Green colour	+

No.	Chemical constituents	Extract	Reagent used	Observation Leaves	Results leaves
7	Terpenoid	EtOH	CHCL ₃ +Conc:H ₂ SO ₄	No colourcolour	-
8	Phenolic compound	EtOH	10%FeCL ₃	Brown colour	+
9	Flavonoid	EtOH	HCL/ Mg	No colour change	-
10	α -amino acid	H ₂ O	Ninhydrin	Violet	+
11	Carbohydrate	H ₂ O	Benedict's solution	White ppt	+
12	Tannin	H ₂ O	5%FeCL ₃	No colour change	-
13	Protein	H ₂ O	Millon's reagent	Brown ppt	+
14	Starch	H ₂ O	I ₂ KI	No colour change	-

(+) = present, (-) = absent, (ppt) = precipitate

Table 3 Physico-chemical examination of powdered leaves of *Sauropus androgynus*L.Merr.

No	Physicochemical Characters	Quantity Determined Percent (%)
1	Moisture content	22.17
2	Total ash content	6.87
3	Water – soluble ash content	51.63
4	Acid insoluble matter content	12.29
5	Ethanol soluble matter content	28.8
6	Methanol soluble matter content	35.6
7	Pet-ether soluble matter content	6.6
8	Ethyl –acetate soluble matter content	8.6
9	Chloroform soluble matter content	4.67
10	Acetone soluble matter content	8.2
11	Water soluble matter content	22.1

Table 4 Elemental analysis of powdered leaves of *Sauropus androgynus* L. Merr. by using EDXRF

Elements	Sample	Average (% w/w)
Sulphur (S)		0.056
Potassium (K)		0.354
Calcium (Ca)		0.177
Iron (Fe)		0.007
Manganese (Mn)		0.002
Rubidium (Rb)		0.000
Strontium (Sr)		0.000
Copper (Cu)		0.001
CH balance		99.401

Table 5 Elemental analysis of powdered leaves of *Sauropus androgynus* L. Merr. By using AAS

No	Elements	Mg / l
1	Calcium (Ca)	0.914
2	Manganese (Mn)	0.158
3	Lead (Pb)	0.003
4	Magnesium (Mg)	1.781
5	Cromium (Cr)	0.003
6	Cadmium (Cd)	0.009
7	Zinc (Zn)	0.084
8	Copper (Cu)	-0.003

Table 6 Nutritional values of powdered leaves of *Sauropus androgynus* L. Merr. (According to AOAC Method).

Sr.No.	Test Parameter	Test Method	Result
1	Moisture	AOAC-2000(930.04)	8.52%
2	Ash	AOAC-2000(930.05)	10.60%
3	Crude Protein	AOAC-2000(920.152) (Kjeldahl Method)	22.74%
4	Crude fiber	AOAC-2000(978.10)Fiber cap Method	9.95%
5	Crude fat (Ether Extract)	AOAC (BuchiSoxhlet Method)	6.39%
6	Carbohydrate	By Difference	41.80%
7	Energy Value Kcal/100g)		314

Discussion and Conclusion

Sauropus androgynus L. Merr. has been studied in this research. The morphological characters of both vegetative and reproductive parts of leaves and the preliminary phytochemical analysis were undertaken. This plant was found to be cultivated throughout Myanmar, fairly frequently near the compound, monasteries and gardens, as leaf vegetable for their food and as their medicinal value.

Sauropus androgynus L. Merr. was shrub. The leaves were simple, ovate lanceolate and stipule lanceolate, leaf blade was sub-membranous or thinly papery. Inflorescence axillary, 1-2 flowered were observed. Flower minute, unisexual, axillary, apetalous, solitary. Male-flower; calyx shallowly disk-shaped, and female flower; calyx red were observed. Ovary was 3 locules, 2 ovules in each locule in T.S, style 3, stigma bilobed. Capsules were depressed globose. Seeds were triquetrous, black. The sensory characters of powdered sample on leaves were yellowish green in colour, slightly pungent and sweet taste. The texture of powdered sample was granular.

The results of preliminary phytochemical analysis of *Sauropus androgynus* L. Merr. were showed that the presence of alkaloid, glycoside, reducing sugar, steroid, phenolic compound, α - amino acids, carbohydrate and protein were detected. Cyanogenic glycoside, saponin, terpenoid, flavonoid and tannin, starch were absent in its leaves.

In physico-chemical properties, the most soluble matter content of the powdered samples was in methanol and least soluble in chloroform.

In this result, the Elemental Analysis of (EDXRF), Spectrum from powdered samples of leaves consist of Potassium (K), Calcium (Ca), Sulphur (S), Iron (Fe), Manganese (Mn), Copper (Cu) were found.

The elemental analysis of powdered leaves sample was carried out by Atomic Absorption Spectrophotometer (AAS) showed that the presence of high elemental concentration was Magnesium (Mg) and the lowest concentration was Copper (Cu).

In the determination of nutritional values moisture, ash, crude protein, crude fiber, crude fat, carbohydrate and energy values present in the powdered leaves of *Sauropus androgynus* L. Merr. were found.

Sauropus androgynus is a medicinal plant with high antioxidant potential. The leaves of this plant have been traditionally used to treat certain diseases, for weight loss and vegetable dishes. The leaf of *Sauropus androgynus* is a nutritious food. (Website-1) In Indian it also known as Multivitamin Plant as it contains an excellent source of vitamins A, B, C, carotenoid and also it has high nutritive value. Leaf juice was also widely advertised as “natural diet” good for weight reduction. (Website-2) The plant is widely used in traditional medicine for wound healing, inducing lactation, relief of urinary disorders, as an antidiabetic cure and also fever reduction. (Website-3) According to this research, the leaves of *Sauropus androgynus* were rich in nutrient content, would also be used for traditional medicine and nutritional value. Thus, this plant should be carried out for further research.

References

- Backer, C.A. 1963. **Flora of Java**. Vol-I. Noordhoff N.V.P. Groningen. The Netherlands.
- British Pharmacopoeia. 1968. **General Medicinal Council**. London.
- Central Council for Research in Unani Medicine. 1987. **Physico-chemical Standards of Unani Formulation**. India: New Delhi, Ministry of Health and Family Welfare.
- Dassanayake, M.D. 1999. **Flora of Ceylon**. Volume XIII. University of Peradeniya, Department of Agriculture, Peradeniya, National Science Foundation of Sri Lanka and the Overseas Development Administration, United Kingdom.
- Harborne, J.B. 1981. **Phytochemical methods**. A Guide to Modern.
- Hooker, J.D. 1885. **Flora of British India**. Vol. V, L. Reeve & Co. Ltd., London.
- Hundley, H.G and Chit KoKo. 1987. **List of Trees, Shrubs, Herbs and Principles of Climbers**. Government Printing Press, Yangon, Myanmar.
- Kokate, C.K. 2000. **Practical pharmacognosy**.
- Kress, J. and Yin Yin Kyi. 2003. **A Checklist of Trees, Shrubs, Herbs and Climbers of Myanmar**. Washington D.C., New York.
- Lawrence, G. H. M. 1963. **Taxonomy of Vascular Plants**. 9th Ed. New York, USA. The McMillian Company.
- Marini Bettolo et. al. 1981. **Plant Screening by Chemical and Chromatographic Procedure**, under field condition J. Chromatography.
- Nyo Maung. 2012. **Taxonomy of Angiosperms**.
- Pandey, B.P. 1981. **A Text Book of Botany Angiosperms**. 1st Ed. S. Chand and Company Ltd. Ram Nagar, New Delhi.
- Qi-ming. 2008. **Flora of Hong Kong**. Vol. II, Agriculture, Fisheries and Conservation Department, Government of the Hong Kong Administrative Region, Hong Kong.
- Trease, G.E & W.C Evans. 1978. **Pharmacognosy**. 11th Ed, Baillier Tindall, London.
- Wallis, T.E. 1985. **Text book Pharmacognosy**. Technique of plant Analysis 2nd Ed, New York.

Websites

1. <https://www.Researchgate.Net/publication/280062692>
2. www.jprounline.info
3. <https://dx.Dox.Org/10.1155/2015/714158>