Academic Sciences International Journal of Pharmacy and Pharmaceutical Sciences

ISSN- 0975-1491 Vol 4, Issue 1, 2012

Research Article

QUANTIFICATION OF PRIMARY AND SECONDARY METABOLITES OF *SVENSONIA HYDEROBADENSIS* – A RARE MEDICINAL PLANT

M. LINGA RAO* AND N. SAVITHRAMMA[1]

*[1]Department of Botany, Sri Venkateswara University, Tirupati 517502, A.P. India. *Email: matti2010rao@gmail.com, prof.savithri@yahoo.in

Received: 28 Sep 2011, Revised and Accepted: 29 Oct 2011

ABSTRACT

Medicinal plants are the most exclusive source of life saving drugs for the majority of the world's population. The present work is quantification of primary and secondary metabolites, such as chlorophyll, proteins, lipids, starch, sugars, phenols, flavonoids, tannins and saponins in leaves of *Svensonia hyderobadensis*. Results showed that the primary metabolites like starch (353 mg/gdw) is highest amount, followed by proteins (190.09 mg/gdw), sugars (8.5 mg/gdw), lipids (0.20 mg/gdw) and chlorophyll (0.057 mg/gdw) and the secondary metabolites like phenols (73.75 mg/gdw) are highest, followed by tannins (53 mg/gdw), flavonoids (0.26 mg/gdw) and saponins (0.198 mg/gdw). It concluded that *Svensonia hyderobadensis* leaves are rich source of primary and secondary metabolites and can be used as raw material in industries mainly for starch and phenolic compounds.

Keywords: *Svensonia hyderobadensis*, Primary metabolites, Secondary metabolites, Quantification, Starch, Phenols.

INTRODUCTION

Since ancient times, people have been exploring the nature particularly plants in search of new drugs. Medicinal plants are used by 80% of the world population for their basic health needs. The relationship between human, plants and drugs derived from plants describe the history of mankind, the industrialized societies has been traced to the extraction and development of several drugs from these plants as well as from traditionally used folk medicine[1]. India is the birth place of renewed system of indigenous medicine such as Siddha, Ayurveda and Unani, traditional systems of medicines are prepared from a single plant or combinations of more than one plant. These efficacy depends on the current taxonomic identify of plant species, use of proper plant part and its biological potency which in turn depends upon the presence of required quantity and nature of primary and secondary metabolites in a raw drugs[2].

Plant synthesizes a wide variety of chemical compounds which can be sorted by their chemical class, biosynthetic origin and functional groups into primary and secondary metabolites. Primary metabolites directly involved in growth and development of plants. These are widely distributed in nature, occurring in one form or another in virtually all organisms. They are like chlorophyll, amino acids, nucleotides and carbohydrates have a key role in metabolic processes such as photosynthesis, respiration and nutrient assimilation. They are used as industrial raw material and food additives. Many plants such as *Nerium indicum*[3], *Gloriosa superba*[4], *Ricinus communis* and *Euphorbia hitra*[5], *Pongamia pinnata*[6] and *Moringa oleifera*[7] have been evaluated for their composition of primary metabolites. Secondary metabolites are the basic source for the establishment of several pharmaceutical industries. The constituents present in the plants play a significant role in the identification of crude drugs. Phytochemical screening is very important in identifying new sources of therapeutically and industrially important compounds like alkaloids, flavonoids, phenolic compounds, steroids etc[8]. Previously the crude drugs were identified by comparison only with the standard descriptions available, but recently due to advancement in the field of pharmacognosy various techniques have been following for the standardization of crude drugs. Several plants are studied for quantification of secondary metabolites in *Jatropha*[9], *Clerodendron colebrookianum* and *Zingiber cassumunar*[10] and *Spondias mombin* [11]. *Svensonia hyderobadnesis* is a delicate shrub belongs to the family Verbenaceae and listed under rare medicinal plants, used to cure hepatotoxic diseases[12]. The plant has efficiency against microbial growth[13] and the qualitative phytochemical screening also revealed that the plant is rich source of secondary metabolites[14]. Hence the present work has been conducted to study the quantification of primary and secondary metabolites viz., chlorophyll, proteins, lipids, starch and sugar; and phenols, tannins, flavonoids and saponins of *Svensonia hyderobadensis*.

MATERIALS AND METHODS

Fresh and healthy leaves of *Svensonia hyderobadensis* were collected from Mamandur forest area of Chittoor District, Andhra Pradesh, India. Primarily the leaves were washed with distilled water, cleaned and pressed with blotted paper. Then the leaves were shade dried and ground to make a fine powder. These powder was used for quantitative analysis of proteins[15], chlorophyll [16], starch[17], sugars[18] and lipids[19]; and phenols and tannins[20], flavonoids[21] and saponins[22].

RESULTS AND DISCUSSION

In the present study is quantification of primary and secondary metabolites in leaves of *Svensonia hyderobadensis* has been undertaken, the results are present in table-1 & 2. Plants are rich sources of primary metabolites like chlorophyll, proteins, sugars, starch and lipids which are useful in flavoring, fragrances, insecticides, sweeteners and natural dyes[23]. The quantitative estimation of total chlorophyll content found in leaves of *Svensonia hyderobadensis* is 0.57 mg/gdw. Chlorophyll is the most indispensable class of primary compounds as they are the only substances that capture sunlight and make it available to plant system for its cultivation on photosynthesis[24]. The total lipids of 0.20 mg/gdw found in the leaves. The higher amount of plant lipid can be used as essential oils, spice oleoresins and natural food colors. With a strong foundation in research and development, plant lipids have developed products that work with diverse requirements, be it culinary, medicinal or cosmetics[25]. The leaves showed higher levels of starch than the other primary metabolites. Starch is biodegradable and renewable in nature, they are increasingly being considered as an eco-friendly alternative to the use of synthesis additives in many other products, including plastics, detergents, pharmaceutical tablets, pesticides, cosmetics and even oil-drilling fluids[26]. Quantitative estimation of sugar showed is 8.5 mg/gdw, plant sugars can be used as artificial sweeteners and they can even help diabetes by supporting the body in its rebuilding[27]. Proteins are the primary components of living things. The presence of higher protein level in the plant points towards their possible increase food value or that a protein base bioactive compound could also be isolated in future[28]. Total protein content of 190.09 mg/gdw is found in the leaves of *Svensonia hyderobadensis*. Based on the results starch is highest amount in the leaves of *Svensonia hyderobadensis*, followed by proteins, sugars, lipids and chlorophyll (Fig.1). Total levels of starch were found to be higher in *Nerium indicum* leaves as compared to its root, stem and flower[3], the highest content of starch was observed in leaf of *Moringa oleifera*[29].

The quantitative estimation of tannins found in the leaves as 53 mg/gdw, the growth of many fungi, yeasts, bacteria and viruses was inhibited by tannins. Apart from this tannins contribute the property of astringent activity i.e. faster the healing of wounds and inflamed mucous membrane[30-31]. The saponins are found in leaves as 0.198 mg/gdw. Traditionally saponins have been extensively used as detergents, as pesticides and molluscicides, in addition to their industrial applications as foaming and surface active agents and also have beneficial health effects[32]. The flavonoids and phenols are found to be present in a quantitative of 0.26 and 73.75 mg/gdw. Flavonoids are have been reported to possess many useful properties, including anti-inflammatory, antimicrobial, enzyme inhibition, oestrogenic, antiallergic, antioxidant and anti tumour activity[33-34]. Phenols possess a number of biological activities such as antioxidant, antiseptic, disinfectant fungicide and pesticides. The higher amount of phenols is important in the regulation of plant growth, development and disease resistance. Plant phenols may interfere with all stages of cancer process, potentially resulting in a reduction of cancer risk[35]. Based on the results phenols is rich in leaves of *Svensonia hyderobadensis* followed by tannins, flavonoids and saponins (Fig.2). Total levels of phenols were found to be higher in leaves of *Pongamia pinnata*[6]. As the leaves of *Svensonia hyderobadensis* showed rich starch and phenolic content the plant can be exploited for industrial and pharmaceutical purposes.

Table 1: Quantification of Primary metabolites

S. No.	Primary metabolites	Weigh (mg/gdw)
1.	Chlorophyll	0.057
2.	Lipids	0.20
3.	Proteins	190.09
4.	Starch	353
5.	Sugars	8.5

Table 2: Quantification of Secondary metabolites

S. No.	Secondary metabolites	Weigh (mg/g)
1.	Flavonoids	0.26
2.	Phenols	73.75
3.	Saponins	0.198
4.	Tannins	53

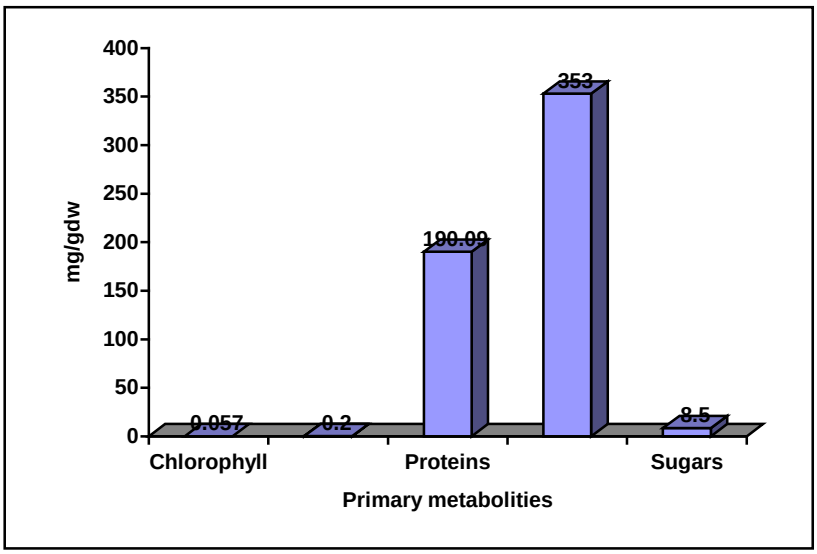

Fig. 1: Quantification of Primary metabolites

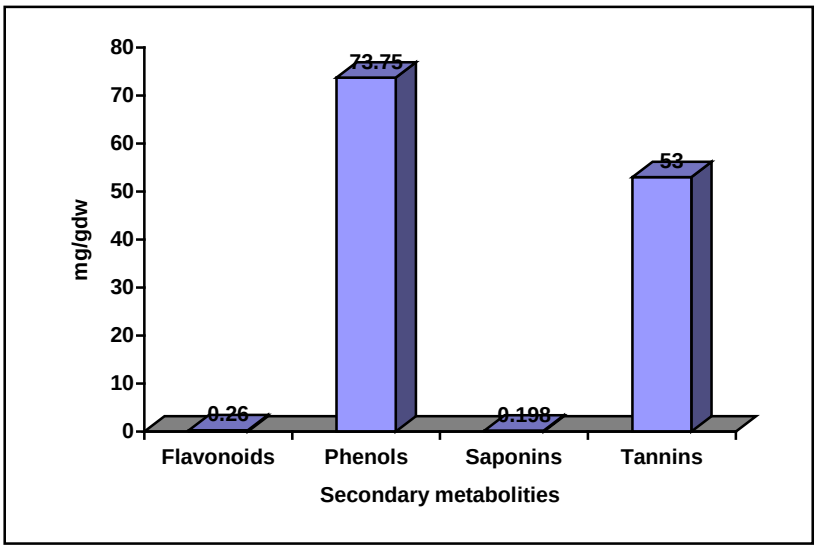

Fig. 2: Quantification of Secondary metabolites

CONCLUSION

In the present study, *Svensonia hyderobadensis* contain many primary and secondary metabolites like chlorophyll, proteins, lipids, starch, sugar, phenols, flavonoids, tannins and saponins. Highest amount of primary metabolites of starch and the secondary metabolites of phenols were found to be rich in leaves of *Svensonia hyderobadensis*. These results are suggestive of primary and secondary bioactive compounds are commercially and pharmaceutically importance. Primary metabolites analysis is necessary for knowing the nutritional potential of plants and secondary metabolites are used for extraction, purification, separation, crystallization and identification of bioactive compounds.

REFERENCES

1. Shrikumar S, Ravi TK. Approaches towards development and promotion of herbal drugs. Phcog. Rev, 2007; 1: 180-184.
2. Vinoth S, Rajeshkanna P, Gurusaravanan P, Jayabalan N. Evaluation of phytochemical, Antimicrobial and GC-MS analysis of Extracts of *Indigofera trita* L.f. Spp. *Subulata* (Vahl ex poir). Int. J. Agri. Res, 2011; 6: 358-367.
3. Vijayavergia R, Kumar J. Quantification of primary metabolites of *Nerium indicum* Mill. Asian J. Experim. Sci, 2007; 21: 123-128.
4. Rishi A, Sarin R. Estimation of primary metabolites from *Gloriosa superba* L. *in vivo* and *in vitro*. Int. J. Mendel, 2009; 26(1-4): 87.
5. Vijayavergia R, Sharma S, Sing T. Biochemical estimation of primary metabolites of some medicinal plants of Euphorbiaceae family. J. Indian. Bot. Soc. 2009; 88: 116-119.
6. Sagwan S, Rao DV, Sharma RA. Biochemical estimation of primary metabolites from *Pongamia pinnata* (L.): An important biodiesel plant. Int. J. Pharma. Sci. Rev. Res, 2010; 5: 146-149.
7. Talreja T. Biochemical estimation of three primary metabolites from medicinally important plant *Moringa oleifera*. Int. J. Pharma. Sci. Rev. Res, 2011; 7: 186-188.
8. Akindele AJ, Adeyemi OO, Antiinflammatory activity of the aqueous leaf extract of *Byrsocarpus coccineus.* Fitoterapia, 2007; 78: 25-28.
9. Nwokocha A, Blessing IO, Agabagwa, Okoli BE. Comparative phytochemical screening of *Jatropha* L. Species in the Niger Delta. Res. J. Phytochem, 2011; 5: 107-114.
10. Majaw S, Moirangthem J. Qualitative and quantitative analysis of *Clerodendron colebrookia*num Walp. Leaves and *Zingiber cassumunar* Roxb. Rhizomes. Ethnobot. leaf, 2009; 13: 578-89.
11. Njoku PC, Akumefula MI. Phytochemical and nutrient evaluation of *Spondias mombin* leaves. Pak. J. Nutri., 2007; 6: 613-615.
12. antihepatoxicity.blogspot.com
13. Lingarao M, Savithramma N. Biological synthesis of silver nanoparticles using *Svensonia hyderobadensis* leaf extract and evaluation of their antimicrobial efficacy. J. Pharma. Sci. Res, 2011; 3: 1117-1121.
14. Lingarao M, Savithramma N. Phytochemical studies of *Svensonia hyderobadensis* (Walp.) Mold – A rare medicinal plant. Der Pharm. Lett, 2011; 3: 51-55.
15. Lowry OH, Rosebrough NJ, Farr AL, Randall RJ. Protein measurement with the Folin phenol reagent. J. Biol. Chem, 1951; 193: 265-275.
16. Holden M. Chlorophylls, In chemistry and biochemistry of plant pigments. Goodwin. T.W. (Ed.). Academic Press. London, (1960), 462-488.
17. McCready RM, Guggoiz J, Silviera V, Owens HS. Determination of starch and amylase in vegetables. Anal. Chem, 1950; 22: 1156-1158.
18. Dubois M, Gills KA, Hamilton JK, Rebers PA, Smith F. Colorimetric method for determination of sugar and related substances. Anal. Chem, 1956; 28: 350-351.
19. Jayaraman J. Laboratory manual in biochemistry. Wilsey Eastern Limited, New Delhi. (1981), 96-97.
20. Makkar HPS, Blummel M, Borowy NK, Becker K. Gravimetric determination of tannins and their correlations with chemical and protein precipitation methods. J. Sci. Food. Agri, 1993; 61: 161-165.
21. Boham BA, Kocipal – Abyazan R. Flavonoids and condensed tannins from leaves of *Hawaiian vaccinium vaticulatum* and *V. Calycinum*. Pacific. Sci, 1974; 48: 458-463.
22. Obadoni BO, Ochuko PO. Phytochemical studies and comparative efficacy of crude extracts of some homeostatic plants in Edo and Delta states of Nigeria. Glo. J. Pure. Appli. Sci., 2002; 8: 203-208.
23. Kaufman PB, Dake JA, Briclmam H, Cseke S, Warber S. Natural products from plants. CRC Press. Boca Ratton, F.L. (1999).
24. Murray AP, Gibbs CF, Longmore AR. Determination of chlorophyll in marine waters: Inter comparison of a rapid HPLC method with full HPLC, Spectrophotometric and fluorometric methods. Mari. Chem, 1986; 19: 211-227.
25. Yadav PR, Tyagi R. Lipid Biotechnology, 1 Discovery Publishing House – New Delhi. 2006: 89.
26. Garth E, Sheila B, Elaine B, Kerr W. Economics of starch production in the 20. Yadav PR and Tyagi R (2006), Lipid Biotechnology, 1 Discovery publishing House – New Delhi. 89, 1998.
27. Freeze H. Disorders in protein glycosylation and protein therapy. J. Pediatrics, 1998; 133(5): 553-600.
28. Thomsen S, Handen HS, Nymn V. Ribosome inhibiting proteins from *in vitro* cultures of *Phytolacea decandra*. Planta. Medica, 1991; 57: 232-236.
29. Sharma A, Yadav A, Barman N, Malwal M. Quantification of primary metabolites of *Moringa oleifera* Lam. The Bioscan, 2010; 5: 403-405.
30. Chung KT, Wong TY, Wei CL, Huang YW, Lin Y. Tannins and human health: a review. Criti. Rev. Food. Sci. Nutri, 1998; 6: 421-64.
31. Okwu DE, Josiah C. Evaluation of the chemical composition of two Nigerian medicinal plants. Afri. J. Biotech., 2006; 5: 357-361.
32. Shi J, Arunasalam K, Yeung D, Kakuda Y, Mittal G, Jiang Y. Saponins from edible legumes: Chemistry, processing and health benefits. J. Med. Food, 2004; 7: 67-78.
33. Havesteen B. Flavonoids a class of natural products for antimicrobial agents. Eur. J. Clin. Microbiol. Infect. Dis, 1990; 9: 455-61.
34. Harborne JB, Williams CA. Advances in flavonoids research since 1992. Phytochemistry, 2000; 55: 481-504.
35. Hollman PC. Evidence for health benefits of plant phenol. J. Sci. Food. Agr, 2001; 89: 842-852.