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Original Article

Pharmacognostical and phytochemical investigation studies on *Gymnema sylvestre* R.Br.

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Abstract

Gymnema sylvestre R.Br. is commonly known as "Gur-mar" in India and Vietnam well known for masking sweet taste. It is widely used in indigenous system of medicine for treatment of Diabetes mellitus. The aim of the present study was focused on the pharmacognostical, physico-chemical and phytochemical properties were carried out, which would like to facilitate quick identification and selection of the drug from various adulterates.
Keywords**:** *Gymnema sylvestre*; Asclepiadaceae; pharmacognostical, indigenous system, physico-chemical

Introduction

The use of plants as medicine is as old as human civilization. Peoples of all ages in both developing and undeveloped countries use plants in an attempt to cure various diseases and to get relief from physical sufferings. Herbal drugs, in India are also used as household remedy for common ailments since time immemorial. Our ancestors have a profound knowledge of these medicinal plants and they knew innumerable remedies, a fact indicated in the writings of *Siddhars* of Tamil Nadu. Their expertise if documented properly would help the modern man find more effective prophylactic use of these herbs. The relevance of pharmacognosy in standardization of herbal drugs was been long been stressed. Many monographs on pharmacognostic have emerged as an aid in the pharmacognostic investigations (Kalidass *et al*., 2009a;Edward,1956). The process of standardization can be achieved by stepwise pharmacognostic studies. These studies help in identification and authentication of the plant material (Ozarkar, 2005).

Gymnema sylvestre R.Br. is one of the important anti-diabetic medicinal plant, there is a growing demand for *G. sylvestre* leaves in the pharmaceutical trade. Gymnemic acid, the active indigradients of this plant, is extracted from leaves and used widely as anti-diabetic (Shanmugasundaram *et al*.,1983), anti-sweetner (Kurihara,1992) and antihypercholesterolemic (Bishayee and Chatterjee,1994). It also has stomatic, diuretic and cough suppressant property (Kapoor,1990 and Sastri,1956). The plant has been reported to possess antimicrobial (Sative *et al*.,2003) and ethno-veterinary medicinal properties (Kalidass *et al*.,2009b). Hence, because of these properties, *Gymnema sylvestre* is most important for plant prospecting. The present investigation an attempted has been made to evaluate various pharmacognostic standards like ash and extractive values, fluorescence analysis of aerial parts of the plant and preliminary phytochemical analysis of *Gymnema sylvestre*.

Materials and Methods

The plants of *Gymnema sylvestre* R.Br. (Asclepiadaceae) were collected from the well grown healthy plants inhabiting the natural forests of Kalakad Mundathurai Tiger Reserve Forest, Western Ghats, Tamil Nadu, India. The plant material was properly identified and confirmed with help of various floras (Gamble, 1991; Matthew,1991). *G. sylvestre*, a perennial plant, stout woody climber with long slender branches is distributed throughout India, in dry forests. The leaves of this plant are opposite, entire, 1 to 3 inches long, and 1 to 2 inches broad, elliptic or obovate, acute or cuspidate, rarely cordate at the base, membranous, thinly pubescent on both sides, the upper surface often darker green than the lower.

Physicochemical constant and fluorescence analysis

These studies were carried out as per the standard procedures (Lala,1993). In the present study, the powder of aerial part was treated with 1N aqueous sodium hydroxide and

1N alcoholic sodium hydroxide, acids like 1N hydrochloric acid, 50% sulphuric acid, nitric acid, picric acid, acetic acid and nitric acid with ammonia. These extracts were subjected to fluorescence analysis in visible/daylight and UV light (254nm & 365nm). Various ash types and extractive values were determined by following standard method by African Pharmacopoeia (1986) and Anonymous (1996).

Preliminary phytochemical analysis

Shaded dried and powdered of aerial part of plant samples were successively extracted with hexane, chloroform, ethanol and water. The extracts were filtered and concentrated using vaccum distillation. The different extracts were subjected to qualitative tests for the identification of various phytochemical constituents as per standard procedure (Lala,1993; Brindha *et al.*,1981).

Results and Discussion

The detailed and systematic pharmacognostical evaluation would give valuable information for the future studies. In the present study, physical constant as ash value of the drug gives an idea of the inorganic composition and other impurities present along with the obtain from this plant species. Extractive values are useful for the determination of adulterated drugs. The results of the physical constants of the drug powder are given in table-1. For determining ash, the powdered drug is in aerated so as to burn out all organic matter. The ash value was determined by four different methods, which measured total ash, water soluble ash, and acid soluble ash. The total ash for aerial parts was found to be 8.22% of which, acid insoluble ash was 1.08% and water soluble ash was 3.39%. The extraction values were found to be 18.21% and 20.19% for water and alcohol respectively.

The extracts obtained by exhausting plant materials with specific solvents are indicative of approximate measure of their solvents from a specific amount of air dried plant material. The values depend on the chemical nature, quality, properties of constituents, the solvent employed, and the type of plant part and the method of extraction employed. This parameter is employed for materials for which a jet no suitable biological assay exists (Evans, 2002).

Table -1: Ash values and extractive values of the powdered aerial part of *Gymnema sylvestre*

S. No.	Nature of the extract	Extractive value (%)
1	Alcohol (Ethanol)	20.19 ± 0.01
2	Water (Aqueous)	18.21 ± 0.11
S. No.	**Type of Ash**	**% of Ash**
1	Total ash value of powder	8.22 ± 0.15
2	Water soluble ash	3.39 ± 0.04
3	Acid insoluble ash	1.08 ± 0.01

The results showed greater extractive values in hot extraction indicating the effective of elevated temperature on extraction. In all methods alcohol has unique feature of dissolving all polar and nearly all new polar constituents (Mukherjee,2002). Studies on physico-chemical constants can be serving as a valuable source of information and provide suitable standards to determine the quality of this plant. Many phytochemical fluoresce when suitably illuminated. The fluorescence colour is specific for each compound. A non-fluorescent compound may fluoresce if mixed with impurities that are fluorescent. The fluorescent method is adequately sensitive and enables the precise and accurate determination of the analyze over a satisfactory concentration range without several time consuming dilution steps prior to analysis of pharmaceutical samples (Pimenta *et al.*, 2006). In the present study is the powdered aerial parts of *G. sylvestre* emitted light green under short UV light and dark green in long UV light (Table 2).

Table -2: Fluorescence analysis of the powdered aerial part of *G. sylvestre*

Experiments	Visible/Day light	UV Light	
		254nm	365nm
Drug powder as such	Green	Green	Light green
Powder + 1N NaOH (aqueous)	Brown yellow	Light green	Dark green
Powder + 1N NaOH (alcohol)	Light yellow	Fluorescent green	Orange
Powder + 1N HCL	Brown	Light brown	Brown
Powder + 50% H_2So_4	Brown	Light blue	Light green
Drug powder + Nitric acid	Reddish brown	Light green	Light green
Drug Powder + Picric acid	Green	Fluorescent green	Green
Drug Powder + Acetic acid	Yellow	Fluorescent green	Fluorescent green
Drug Powder + Ferric chloride	Light brown	Light green	Green
Drug Powder + HNO_3 + NH_3	Light brown	Light green	Pale green

Table -3: Phytochemical screening of the powdered aerial part of *G. sylvestre*

No.	Test	Hexane	Chloroform	Ethanol	Water
1	Alkaloids	-	+	+	+
2	Terpenoids	+	+	-	-
3	Steroids	-	+	-	-
4	Coumarin	+	-	-	-
5	Tannin	+	-	-	+
6	Saponin	-	-	-	+
7	Flavonoids	-	-	+	-
8	Quinones	-	+	-	-
9	Anthraquinones	-	-	+	-
10	Phenol	+	+	+	+
11	Xanthoprotein	-	-	+	-
12	Carbohydrate	-	-	+	+
13	Glycosides	-	-	+	-
14	Fixed oil	+	+	-	-

The results of preliminary phytochemical screening of aerial part of plant extracts of *G. sylvestre* are presented in table 3. The ethanol extracts of the leaf shows the presence of alkaloids, terpenoids coumarin, tannin, saponin, flavonoids, phenols, anthraquinones, quinones, carbohydrate and glycosides. This is comparable with values reported for several medicinal plants such as *Gynandropsis gynandra* and *Buchholzia coriaceae* (Ajaiyeoba,2000); *Erythrina senegalensis* (Bako and Madu, 2007); *Vitex negundo* (Panda *et al*., 2009); *Terminalia glaucescens* (Adebayo and Ishola, 2009). The various phytochemical compounds detected are known to have beneficial importance in medicinal sciences. For instance saponin is used as mild detergents and in intracellular histochemistal staining. It is also used to allow antibody access in intracellular proteins. In medicine, it is used in hypercholesterolaemia, hyperglycaemia, antioxidant, anticancer, anti-inflammatory, etc. it is also known to have antifungal properties (De-Lucca *et al*.,2005).

Pharmacognostic studies and phytochemical screening can serve as a basis for proper identification, collection and investigation of the plant. These parameters are to be useful in the preparation of the herbal monograph for its proper identification. Any crude drug which is claimed to be *G. sylvestre*, but whose characters significantly deviate from the above accepted standards would then be rejected as contaminated, adulterated or downright fake. Since *Gymnema sylvestre* is used in various medicinal preparations; Hence the present study may be useful to supplement information in respect to its identification, authentication and standardization.

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