Gymnema Sylvestre Plant Used By Peoples of Vidisha District for The Treatment of Diabetes

Tahira Anjum, Dr. Ziaul Hasan  
(Department of Botany Saifia Science College Bhopal)

ABSTRACT: Gymnema sylvestre is regarded as one of the plant with potent property. Leaves of this plant is used by peoples of Vidisha district for treatment of diabetes. The active compound of this plant is a group of acids termed as GYMNEMIC ACID. Gymnemic acid have antidiabetic, antisuweeter, and anti-inflammatory activities. The phytoconstituents of Gymnema sylvestre were isolated and their chemistry and structures were studied and elucidated. The result of this investigation will be helpful for the correct botanical identification of plant and also different sources of medicine and pharmaceutical industry.

KEYWORDS: Gymnema sylvestre, Gymnemic acid, Phytoconstituents, Antidiabetic.

I. INTRODUCTION

Diabetes mellitus is a multi factorial disease which is characterized by Hyperglycemia Lipoprotein abnormalities and altered intermediary metabolism of major food substrates (Scoppola et al;2001). Gymnema sylvestre is a valuable herb belonging to the family Asclepiadaceae, and widely distributed in India, Malaysia, Srilanka, Australia, Indonesia, Japan, Vietnam, Tropical Africa and the South western region of the people’s of republic of China. (Bone 2002, Ankit Saneja et al. 2010;Stocklin 1869). Gymnema is a woody vine like climbing plant that grows in the Tropical forest of central and Southern India. It came to be known as “destroyer of sugar” because, in ancient times, Ayurvedic physicians observed that chewing a few leaves of gymnema sylvestre suppressed the taste of sugar (Mitul shah 2010). The word Gymnema is derived from a Hindu word “Gurmar” meaning “destroyer of sugar” and it is believed that it might neutralize the excess of sugar in the body (Keshawa murthy et al 1990). Gymnema contains a substances that decrease the absorption of sugar from the intestine Gymnema may also increase the amount of insulin in the body and increase the growth of cell in the pancreas, which is the place in the body where insulin is made. Loose leaf of Gymnema sylvestre can be prepared as a tea and will impair the ability to taste sugar by blocking sweet receptors on the tongue (Joseph and Ellen 2005). The plant is commonly known as Periploca of the woods (English); Gurmar, Gurmar booti (Hindi);Meshashringi, Madhunashini (Sanskrit); Kavali, Kalikardori (Marathi) ;Dhueti, Mardashingi (Gujrathi); Adigam, Cherukurinja (Tamil); Podapatri (Telgu); and Sannagrashehambu (Kannada). (Ankit saneja et al. 2010; Kanetkar et al., 2007; paliwal et al., 2009; Rachh et al.2010; potawala et al, 2008).

II. HISTORY

Gymnema has a long history of use in India’s Ayurvedic medicine. Indian first used Gymnema to treat diabetes almost 2,000 years ago. Today Gymnema is used for diabetes (Joseph and Ellen Flannery 2005) metabolic syndrome, weight loss and cough it is also used for malaria and as a snake bite, antidote, digestive stimulant, laxative, Suppressant and diuretic. The primary application was for adult on set diabetes a condition once described as “honey urine” and is continued to be recommended today in India. In the 1920s, preliminary scientific studies found some evidence that Gymnema leaves can reduce blood sugar leaves, but nothing much came of this observation for decades (American botanical council P.O box 201660). Today Gymnema has become increasingly popular in the United states as a supportive treatment of diabetes(Bone kerry2002).

Taxonomical classification

Kingdom - Plantae
Division - Magnoliophyta
Class - Magnolopsida
Order - Gentianales
Family - Asclepiadaceae
Genus - Gymnema
Species - sylvestre
Plant description

G. sylvestre is a slow growing, large perennial woody climber. It is mainly present in tropical forest of Central and Southern India. It is also found in Banda, Konkan, Western Ghats, Deccan extending to the parts of western and northern India (Keshavamurthy et al. 1990; Kritikar and Basu et al. 1998; Grover et al. 2002). The plant is large more or less pubescent woody climber. Rooting at nodes. The leaves opposite usually elliptic or ovate, acuminate base acute to acuminate, glabrous. Flower are small, yellow in axillary and lateral umbel like cymes. Pedicels long. The calyx lobes are long, ovate obtuse and pubescent. Corolla is pale yellow, campylunulate, corona single, with five fleshy scales. Scales adnate to throat of corolla tube between lobes. Anther connective produce into a membranous tip. Pollinia 2, erect, carpels 2 unilocular; locules many ovuled (Madhurima et al., 2009; Potawale et al., 2008; Kritikar and Basu 1998, H. Zhen et al. 2001; Gurav et al. 2007).

Macroscopic and microscopic characteristics

Leaves of Gymnema sylvestre are green in colour and stem is hairy and light brown. Leaf is 2-6 cm. in length and 1-4 cm. in width. The leaves are simple, petiolate, rounded to cordate base, margin entire opposite with acute apex, reticulate venation, pubescent on both the surfaces. The odour is characteristics and taste of leaf is slightly bitter and astringent. It also possesses remarkable property of paralyzing the sense of the taste for sweet substances for few hours (Madhurima et al., 2009; Agnihotri et al., 2004).

Lamina:- The epidermal cells of lamina are square shaped with outer convex wall and thin cuticle, when viewed transversally, epidermal cell surface are interrupted with trichomes, which are uniseriate, multicellular with 2-5 celled, present in abundance on both the surfaces single layered closely arranged palisade cells are present just below the adaxial epidermis. V.B. are empichiral and the mesophyll is 3-5 celled thick (Agnihotri et al., 2004; Anonymous 2003; Madhurima et al., 2009).

Stem:- The T.S. of stem is circular in out line. The epidermis is barrel shaped and thick walled. The cortex is multicellular, uniseriate. The cork is 3-5 layered thick and cortical cells are laterally elongated and collenchymatous. The phloem well developed consist of sieve plates, companion cells and phloem parenchyma. The xylem is in the form of a continuous cylinder transverse by narrow medullary rays. The epidermis is conspicuous and the pericycle is broad (Agnihotri et al., 2004; Madhurima et al., 2009).

Petiole:- T.S. of petiole is horseshoe shaped. The epidermis is barrel shaped single layered, thick walled covered with uniseriate, multicellular non glandular trichomes. The cortex is collenchymatous and V.B. are amphichiral and in numbers well developed phloem consist of sieve tubes companion cells and phloem parenchyma. The xylem consist of vessels, tracheids and tracheidal fibres. The starch grains are polygonal simple or compound in two or many groups (Ankit saneja et al., 2010; Agnihotri et al., 2004; Madhurima et al., 2009).

Material and Methods:- The leaves of Gymnema sylvestre were collected from village Semal Khedi which is 10 Km away from Tehsil Sironj District Vidisha and 120 km from Bhopal and 76 km away from its main city Vidisha, in the month of Aug. 2010. The plant was identified by local people of that village and authenticated by Dr. Zia Ul Hasan Professor and H.O.D. Botany Department of Saifia College Bhopal. The voucher specimen had been preserved in laboratory for future reference.

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 screening of Gymnema sylvestre.

Chemicals

All the chemicals and reagents use of analytical grade.
Macroscopic and physiochemical parameters :

The macroscopic evaluation was carried out for shape ,size ,color ,odor ,taste and fraction of the drug .Different physiochemical value ,extractive value loss on drying, foreign organic matter ,crude ,fibre content were also determined .

Preparation of successive extracts:

The Leaves were dried under shed ,powdered and passed through 40nm meshes and stored enclosed vessel for further use .The dried powder material (500gm) was subjected to soxhlete apparatus with petrolimum Either, choloroform , alcohol and water for continues hot extraction.the extract were concentrated under reduced pressure to obtained extract solid residue .

Phytochemistry:

The leaves of G.Sylvestre contain triterpene saponins belonging to oleanane and dammarene classes. Oleanane saponins are Gymnemic acids and Gymnema saponins , while dammarene saponins are Gymnema sylvestre (Khramov ,et al,2008; Yoshikawa et al,1992; Datio and Long 1973). Besides this other plant constituents are flavones, anthraquinones pentatriacontane ,α and β - Chlorophylls . Phytin, resins, d-Quercitrol ,tartaric acid, formic acid, butric acid , lupeol, β amyrin related glycosides and stigma sterol.The plant extract also tests positive for alkaloids. Leves of this plans yield acidic glycoside and anthroquinones and their derivatives (Mitulshah 2010) .The leaves contains resins albumin chlorophyll , carbohydrates tatic acid, formic acid, butyric acid , anthraquinone derivatives, inositol, alkaloids, organic acid(5.5%) parabin, calcium oxalate(7.3%) , lignin (4.8%) ,cellulose (22%) (Sinsheimer and Rao,1970). Gymnema leaves contains gymnemic acid as an effective substance (mitul shah,2010). The Primary chemical constituents of Gymnema include gymnemic acid, tartric acid,Guarmarine, calcium oxalate,glucose stigma stiro, betain and cholin. Few new triterpenoid saponins ,Gymnenmasins A,B,C and D were also isolated from the leaves of Gymnema sylvestre ( Suttisri et al,1995;Sahu et al,1996) three new oleanane type triterpene glycosides were isolated from the leaves of plants .six oleanane types saponins isolated from the leaves (Ye et al,2000,2001).

Gymnemic acid the active compound of this plant widely used as antidiabetic (Shanmugasundaram etal, 1983; Mitul Shah,2010), anti sweetener(Kurihara,1992), anti inflammatory activities (Mitul Shah, 2010), anti hypercholesterolemic (Bishayee and Chatterjee,1994) ,antimicrobial(Sative et al,2003) and ethno-veterinary medicinal properties (Kalidas et al,2009). The anti diabetic array of molecule has been identified as a group of closely related Gymnemic acids (Liu et al ,1992;Sinsheimer and Manni,1965) after it was successfully isolated and purified from the leaves of Gymnema sylvestre. Later the phyto constituents of Gymnema Sylvestre were isolated and their chemistry and structure were studied and elucidated

Mechanism of action of Gymnema Sylvestre (Gymnemic acid):

Recent pharmacological and clinical studies have shown that Gymnema sylvestre act on two side first ,the taste buds in the oral cavity second, the absorptive surface to the intestine.the structure of those taste buds which detect sugar in the mouth is similar to the structure of the tissue that absorbs sugar in the intestine .The important active ingredients of G.Sylvestre is an organic acid called Gymnemic acids . The Gymnemic acid is made up of molecules that seotam arrangement is similar to that of glucose molecules. Those molecules fill the receptor locations on the taste buds for a period of one or 2 hours, thereby preventing the taste buds from being activated by any sugar molecules present in the food, similarly the glucose like molecule in the Gymnemic acids fill the receptor locations in the absorptive external layers If the intestine , thereby preventing the intestine from absorbing the sugar molecules. It has also been noted that G.sylvestre takes away the bitter taste of bitter substances ,such as quinine, in much the same way that it affects the sense of sweetness associated with candies and other sweet foods .However it has no effect on pungent, salty astringent or acidic tastes. therefore when leaf extract of plant administrated to a diabetic patient , there is stimulation of the pancreas by virtue of which there
is an increase in insulin release. These compounds have also been found to increase fecal extraction of cholesterol (Kanetkar et al, 2004; Persaud et al, 1999). There are some possible mechanisms by which the leaf extract of G. Sylvestre (Gymnemic acid) possesses its hypoglycemic acid effects are:

1. It promotes regeneration of islet cells.
2. It increases secretion of insulin.
3. It causes inhibition of glucose absorption from intestine.
4. It increases utilization of glucose as it increases the activities of enzymes responsible for utilization of glucose by insulin dependent pathways, an increase in phosphorylase activity, decrease in gluconeogenic enzymes and sorbitol dehydrogenase (Kanetkar et al 2007; Ankit Saneja et al 2010).

**Antidiabetic activity**

The first scientific confirmation of G. Sylvestre use in human diabetes came almost a century back when it was demonstrated that the leaves of G. Sylvestre reduce urine glucose in diabetes (Ankit Saneja et al, 2010). In an animal study Paliwal et al have investigated that Gurmar leaf powder is effective in lowering the fasting as well as post prandial blood glucose level (Paliwal et al 2009) Sugihara et al have investigated the antihyperglycemic action of crude saponin fraction and five triterpene glycosides derived from a methanol extract of G. Sylvestre (Sugihara et al 2000). Mary Sujin et al reported the antidiabetic effect of G. Sylvestre powder in the stomach of rats (Mary Sujin 2008 et al).

**III. PHYTOCHEMICAL EVALUATION**

Preliminary phytochemical screening of drug was carried out as per method describe by Peach and Tracy et al, 1995. The chemical classes of constituents in the freshly prepared various extract (P. ether, Hexane, Chloroform, Water and alcohol) were detected using standard phytochemical reagents. In general test for the presence or absence of phytochemical compound using the above methods involve the addition of an appropriate chemical agent to the extract in a test tube. The mixture is shaken vigorously or gently as the case may be the presence or absence of Flavonoids, Alkaloids, Glycoside, Saponins, Tannins etc. was observed.

**Table-1 Phytochemical screening of the powdered stem and leaf of G. Sylvestre**

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Test</th>
<th>Hexane</th>
<th>Chloroform</th>
<th>Ethanol</th>
<th>Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Alkaloids</td>
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<tr>
<td>2</td>
<td>Terpenoids</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>Steroids</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Coumarin</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5</td>
<td>Tannin</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>6</td>
<td>Saponin</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>7</td>
<td>Flavonoids</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>Quinones</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>-</td>
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<tr>
<td>9</td>
<td>Anthraquinones</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>Phenol</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
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<tr>
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<td>Xanthoprotein</td>
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<td>-</td>
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<td>+</td>
<td>-</td>
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<tr>
<td>14</td>
<td>Fixed oil</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
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</tbody>
</table>
Gymnema Sylvestre Plant Used By Peoples Of Vidisha...

IV. RESULT AND DISCUSSION

Phytochemical screening of the powdered stem and leaf of G. Sylvestre is listed in table-1. From table-1 it is clear that on polarity the extractive values of the leaves of G.sylvestre were analysed .The extractive value was highest in water and was recorded to be 30.56% w/w and methanol soluble extractive value was about 20.8% w/w.

REFERENCES

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