

Need of *Gymnema Sylvestre* in Today's Era

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Introduction

According to International Diabetic Federation 537 million people are living with diabetics and by 2030 this number will grow to 643 million people. In India approximately 101 million will be diabetic by this estimate. People becoming diabetic due to genetic factors and changing life style which increases weight, cholesterol, obesity. Synthetic drugs and medications which are used to cure diabetes are insulin therapy, alpha-glucosidase inhibitors, biguanides, acarbose, miglitol, metformin, sulphonylureas, DPP-4 inhibitors, glucagon like peptides, SGLT-2 inhibitors, etc. All these are expensive as well as cause critical, deleterious complications and side-effects. Reports are there that these drugs cause skin rash, tremor, sickness with alcohol, kidney damage, gas, dyslipidemia, bloating, diarrhea, stomach upset resulting in a general reservation about their use by public.

So, Now focus has been shifted towards herbal medicines due to less side effects. Medicinal plant like *Gymnema sylvestre* which is also known as Gurmar or Madhunashini is a sugar destroyer herb in ayurvedic system of medicine. Its leaves are bitter in taste and provide highly therapeutic effect in type I and type II diabetes mellitus along with role in arthritis, diuretic, anaemia, osteoporosis, hypercholesterolemia, asthma, inflammations and snake bite, hepatoprotective. In India, it is distributed in forests of Andhra Pradesh, Bihar, Chhattisgarh, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Orissa, Tamil Nadu, Uttar Pradesh and West Bengal. The seeds are sown in the months of November-December and harvest from September to February. This is supplementing a growing demand for leaves and roots of *G. sylvestre* in the pharmaceutical trade because its use as a remedy for diabetes and also as a tonic of the nerves and as a laxative. It also has stomachic, diuretic and cough suppressant property, and it belongs to class dicotyledonous of the family Asclepiadaceae.

Gymnema sylvestre contain bioactive compounds viz gymnemic acid, gymnema saponins, gymnemasides, anthraquinones, flavones, hentriacontane, pentatriacontane, phytin,

resin, tartaric acid, formic acid, butyric acid, lupeol, β -amyrene related glycosides and anthraquinones, alkaloid like gymnamine, flavonoids, cinnamic acid, folic acid, ascorbic acid etc. This is attributed to the ability of gymnemic acids to delay the glucose absorption in the blood. The atomic arrangement of gymnemic acid molecules is similar to that of glucose molecules. These molecules fill the receptor locations on the taste buds thereby preventing its activation by sugar molecules present in the food, mechanisms by which the leaves and especially gymnemic acids from *G. sylvestre* employ its hypoglycaemic effects increases secretion of insulin, promotes regeneration of islet cells, increases utilization of glucose. 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.



How gymnemic acid works

The mode of action of the drug is through stimulation in insulin secretion from pancreas. It also exerts a similar effect by delaying the glucose absorption in the blood. The atomic arrangements of gymnemic acids to the taste buds are similar to sugar molecules which fill the receptors in the taste buds preventing its activation by the sugar molecule in the food. Similarly, in intestine it attaches to the receptor present in external layer of intestine,

thereby preventing the absorption of sugar molecules by intestine, leading to reduction in blood sugar levels. Hypoglycemic effect of gymnemic acids includes a cascade of events starting from modulation of insulin activity which triggers insulin secretion and release. It also increases regeneration of pancreatic islet cells to enhanced enzyme mediated uptake of glucose. It has been previously reported in the literature that the action of gymnemic acids is similar to that of insulin-mimetic mechanism of action. Gymnemic acid (GA) has been found to interact with glyceraldehyde-3-phosphate dehydrogenase (GAPDH), a key enzyme in glycolysis pathway. The findings also indicated that the acyl moieties present in gymnemic acids play an important role for the GA-induced smearing of GAPDH and G3PDH and play an integral role in the anti-hyperglycemic activity of GA derivatives.

Other pharmacological properties *Gymnema sylvestris*

In treatment of Dental caries like as infection of tooth, occurring due to various kinds of gram-positive bacteria like *S. aureus*, *S. mitis*, and *S. mutans*, and fungus-like *Candida albicans* which attaches to the tooth surface through release of extracellular polysaccharides from sucrose and metabolize sugar to organic acid mainly lactic acid resulting in demineralization of the tooth enamel. Chloroform, petroleum ether, and methanolic leaf extract of *G. sylvestris* found to be significantly effective against these bacteria particularly the methanolic extract which showed highest activity at minimum concentration. The good potential of the hydro alcoholic extract of the plant leads to the development and manufacture of Gurmar tooth powder marketed as “Gurmar Herbal tooth paste” and “Gurmar Herbal Tooth powder.” These herbal formulations offer new prospects in the treatment of dental caries once clinically approved by the scientific community.

The most potent antiarthritic activity of the leaves may be due to the nature of triterpenoids, steroids, and saponin glycosides. The swelling in multiple joints on induction with an adjuvant and exhibited inflammation in cells, bone destruction, reduce paw swelling possibly due to inhibiting the response of inflammatory cells or blocking the release of mediators like cytokines (IL-1 β and TNF- α), GM-CSF, interferon's, and PGDF which are responsible for pain and disabilities arising due to destruction of bone and cartilage. *Immunostimulatory activity* is the regulation or control of the immunity which involves the enhancement or reduction in the immune responses. The body response to a particular condition might be regulated by agent that enhances or suppresses its action. *G. sylvestris* is

reported to be an immune-stimulatory plant and the leaves possess immune stimulatory effect. Herbal extract use in dietary supplements to reduce body weight, blood cholesterol level, triglyceride levels use in tea bags, health tablets, beverages, confectioneries.

Oxidative stress is used to describe the high level of oxidative damage in a cell, tissue or organ, caused by the ROS (Reactive Oxygen Species) and imbalance between the Reactive species (RS) and antioxidants result in the development of Type 2. Oxidative stress in diabetes causes alteration in enzymatic systems, lipid peroxidation, impaired glutathione metabolism and low level of Vitamin C. ROS is responsible for damaging lipids, proteins and DNA, Glutathione, Catalase and Superoxide Dismutase (SOD) that are different types of bio-markers of oxidative stress in Diabetes Mellitus. Three factors are responsible for creating ROS like i) increasing oxidant generation, ii) lowering anti-oxidant protection and iii) failure to repair oxidative damage. Both ROS and RNS (Reactive Nitrogen Species) are types of free radicals which have got negative regulation on insulin signalling, interpreting them to develop insulin resistance which is a risk factor for Type 2 Diabetes. RNS has same type of functions as ROS like lipid peroxidation, non-enzymatic protein glycosylation and glucose oxidation.

Current *Gymnema sylvestre* formulations available in market includes JIVA ayurveda -DIATRIN 500 mg tablet have 100 mg gudmar extractor balancing sugar and kapha naturally, mother tincture homeopathic medicine *Gymnema Sylvestre* MT prescribed uses for diabetes, efficacious in poisonous snake bites also have immunological and anti-tumor activities. Himalaya *Gymnema* use as sugar destroyer and reinforces pancreatic functions, Swanson Full spectrum *Gymnema Sylvestre* Leaf which have 400 mg leaf extract to control blood sugar, Bixa Botanical Gudmar also have *Gymnema sylvestre* leaf extract about 450 mg per capsule, Just Jaivik Organic *Gymnema* tablet have 600 mg extract.

Conclusion:

Gymnema sylvestre is drastically disappearing from its natural habitat due to exploitation for pharmaceutical needs and because conventional propagation is hampered due to its poor seed viability, low rate of germination and poor rooting. To meet the requirement of pharmaceutical industries and save the species from extinction for improvement, conservation, mass propagation through in-vitro micro propagation.