Review Article:-

PHARMACOLOGICAL ACTIVITIES OF GYMNEMA SYLVESTRE

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ABSTRACT:

An essential part of Indian traditional medicine, Gymnema sylvestre has several pharmacological properties, including anti-inflammatory, anti-hyperlipidemia, hepatoprotective, and anticancer effects. It has also been marketed as a single or multiherbal formulation and used for diabetes for a number of years. The saponins with triterpenoids,

The plant's medicinal properties are attributed to gymnemic acids. Low bioavailability and poor solubility, however, have an impact effectiveness of Gymnema sylvestre. Therefore, developing the formulation might be a better option for improving pharmacodynamics.

And pharmacokinetic profile of the therapeutic plants, improving their bioavailability and dose-dependent therapeutic efficacy decrease. This review advances various facets of G. sylvestre's formulation.

Keywords: Gymnema sylvestre, pharmacological activities, sweet destroyer, medicinal plant, gymnemic acid.

INTRODUCTION:

In recent decades, long-term treatments for human illnesses have been derived from medicinal plants. The use of herbs in therapy is becoming more and more popular these days. Rather than taking a synthetic medication that could have negative impact. Gymnema is typically a large woody Climbing plants are members of the Asclepiadaceae family. Broad throughout Australia, Japan, Indonesia, India, and Indonesia. It is also referred to as madhunashini and gurmar in Hindi. (Tamil) sirukurinjan (Sanskrit) The desiccated leaf and G. sylvestre root powder is used in diabetic medications. It is said that gymnema leaves are bitter. [1]

They have the amazing property of temporarily paralyzing the sense of sweetness; for this reason, they are also referred to as sugar destroyers .(2)

Gymnema leaves contain a combination of tri-terpenes, glycosides, and saponins, which include gymnemic acid and gymnemagenin. and gurmarin, which stands for the attribute of antidiabetic.Additionally, the plant's leaves are utilized as a digestive, antiviral, antiallergic, hypoglycemic, and anti-obesity medication used to treat dental caries, obesity, and diabetes.[3]

The primary components of gymnema are thought to be gymnemic acid, a blend of 17 distinct saponins. The aim of this work is focused on checking the plant's evaluation for antidiabetic and The hypoglycemic characteristics of G. sylvestre leaves. The plant's leaves contain a triterpenoid saponin.gymnemic acid, a substance found in plant parts, is the the primary regulating factor for diabetes mellitus [4]

Plant description :

Morphology of Gymnema sylvestre:

Gymnema sylvestre (Fig. 1) is a large, woody shrub that grows in the Asclepiadaceae family. It is sturdy and large. Its primary locations are in central and southern India.Gymnema sylvestre's leaves are The opposite, elliptic flowers are tiny and yellow in color up to a length of three inches. Long calyxes are present. obtuse and oval in shape. The leaf has a mildly bitter flavor. It is additionally has the amazing ability to destroy the taste buds for sugary foods for a few hours while gnawing on Gymnema sylvestre leaves. Thus It is frequently referred to as a sugar destroyer. Exercise Necessities Powdered sylvestre leaf has no taste and a subtle, pleasant aroma.

Fig.no.1-Plant

Synonyms :

Periploca of the woods (English),

Gurmar (Hindi),

Meshashringi, madhunashini (Sanskrit)

Kavali, kalikardori (Marathi),

Dhuleti, mardashingi (Gujrathi),

Adigam, cherukurinja (Tamil),

Podapatri (Telgu) and Sannagerasehambu (Kannada),

The word “Gymnema” is derived from a Hindu word “Gurmar” meaning “destroyer of sugar”[5]

Taxonomical classifaction :

Table no. 1 : Taxonomical classifaction

Kingdom	Plantae
Division	Angiosperms
Class	Dicotyledons
Order	Contortae
Family	Asclepiadaceae
Genus	Gymnema
Species	G.sylvestre .[6]

Active chemical constituents :

Table no. 2: Active chemical constituents

Chemical Constituent	**Contents**
Oleanane saponin	Gymnemic acid Gymnemagaspopin
Saponins	Gymnestogenin Gurmarine Gymnemasies
other plant constituents	Flavone trimethylamine Hentriacontane Pentatriacontan Phytin Tartaric acid Formic acid

	Anthraquinone derivative d-quercitol Beta-chlorophylls

Uses :-

- Gymnema sylvestre is used as anti-diabetic.
- It is used for weight loss.
- It is used in asthema.
- It is also used in snake bite.
- It is used as anti-inflammatory.
- It is used as anti-hypercholesterolemic
- It is used in constipation**.**
- It is used in arthritis.
- It is used in cardiopathy.
- It is used in microbial infection.
- It is also used in some respiratory problems like cough.

Mechanism action of Gymnema sylvestre:-

1) Gymnemic acid obliterates the capacity to distinguish between sweet flavors. Gymnemic acid's atomic structure is comparable to that of the glucose molecule.so they occupy the tastebud receptor site, blocking the sugar molecule from activating it.Likewise, gymnemic acid binds to the receptor site in the intestine's absorbtive outer layer, blocking the intestine's ability to absorb sugar molecules. This low blood sugar level has the effect of occurring.

2) The secretion of insulin is one of the potential mechanisms through which gymnemic acid exerts its hypoglycemic action.It encourages the pancreatic islet cells to regenerate.It improves the way that glucose is used.It inhibits the intestinal absorption of glucose.

3) Obesity is also a contributing factor to diabetes because fats release a hormone called resistin, which causes receptors to become resistant to insulin. As a result, blood sugar levels rise.

4) In order to treat obesity, gymnemic acid inhibits the absorption of triglycerides and cholesterol by preventing their binding to their receptors in the intestine.

5) Gymnemagenol, which is found in gymnema sylvestre leaves, has anti-cancer properties and inhibits the proliferation of cells.

6) Gymnemic acid reduces inflammation by protecting against leucotrienes and free radicals while also preventing mast cell histamine release.

7) Gymnema sylvestre leaf ethanolic extract showed antimicrobial activity against staphylococcus aureus, bacillus subtilis, bacillus pumilis, and pseudomonas eruginosa, among other microorganisms.[10,11]

Pharmacological action of *gymnema sylvestre:*

1) Antidiabetic activity : -

The most widely known effect of *gymnema sylvestre is* diabetic activity. Ethanol extract of this plant is reported to reduce glucose level by 46% where the water extract reduced level by 26% and methanol extract be 12%. [12]

Mechanism of action of *gymnema sylvestre* in a Antidiabetic activity :

Blood sugar levels can drop as a result of gymnemic acid's ability to stop the intestine from absorbing sugar molecules. Gymnemic acid, a blend of saponins, is one of Gymnema sylvestre's ingredients. Gymnemic acid molecules have an atomic configuration similar to that of glucose molecules. It lowers blood sugar levels by blocking the intestinal receptor site for sugar and preventing its absorption. Additionally, it was discovered that Gymnema sylvestre increased insulin secretion. It was also suggested that Gymnema sylvestre may play a role in B-cell and insulin regeneration.

According to a study, this plant's methanol extract had a greater impact on B-cell regeneration. This led researchers to hypothesize that the plant could cure type 1 diabetes by fully restoring pancreatic cell function.[13]

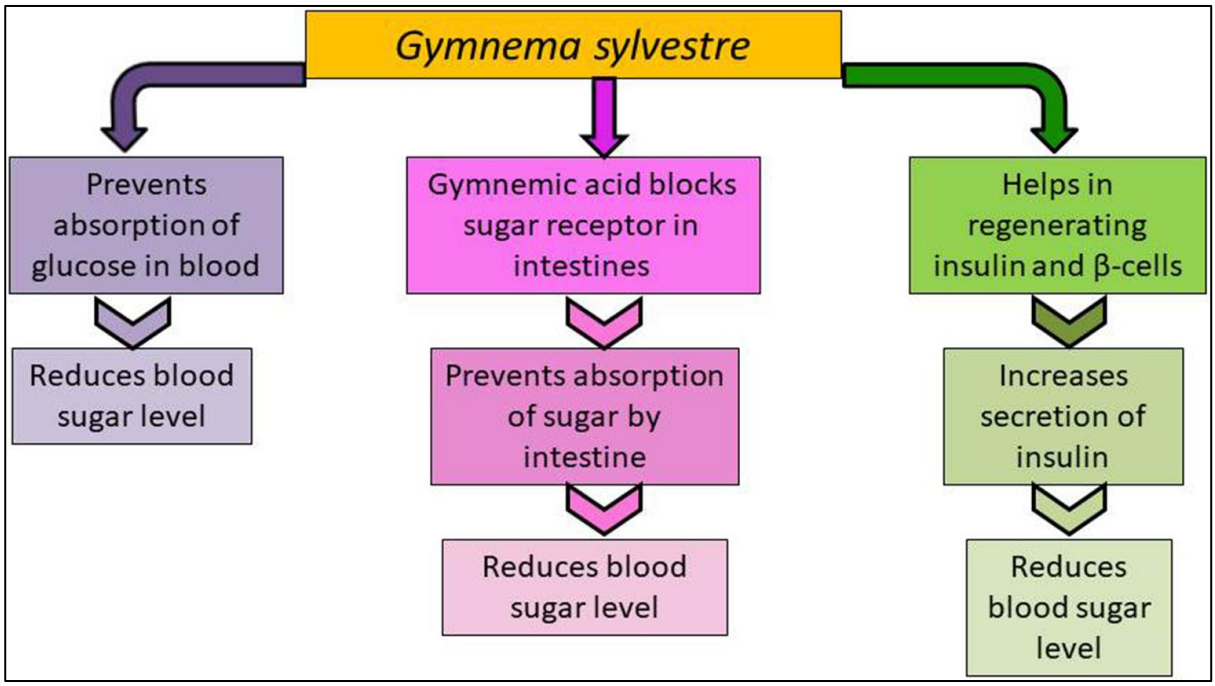

Fig. 2 : Mechanism of action of *gymnema sylvestre* in a Antidiabetic activity

2) Antiobesity activity :-

It's possible that G. Sylvestre aids in weight loss by lowering sweet cravings and regulating blood sugar levels. Gurmarin peptide has been reported to decrease cravings for sweet foods by blocking the perception of bitter or sweet flavors.

Mechanism of action of G.sylvestre in a antiobesity activity :-

An assessment of the antiobesity potential of a standardized G. sylvestre extract, niacin-bound chromium, and hydroxycitric acid has been conducted through changes in body weight, body mass index (BMI), appetite, lipid profiles, serum leptin, and excretion of urinary fat metabolites.

This study demonstrated that hydroxycitric acid, niacin-bound chromium, and Gymnema Sylvestre extract can be combined to provide a safe and effective weight loss formula that can help reduce excess body weight and BMI while supporting normal blood lipid levels.

3) Antimicrobial activity :-

G. sylvestre leaf ethanolic extract demonstrated good antimicrobial activity against Bacillus pumilis, B. subtilis, Pseudomonas aeruginosa, and Staphylococcus aureus, but no activity against Proteus vulgaris or Escherichia coli..

G. sylvestre leaf extracts were also found to have moderate activity against three pathogenic Salmonella species (Salmonella typhi, S. typhimurium, and S. paratyphi).

The aqueous extract outperformed the other extracts in terms of activity against Salmonella species. Extracts of the aerial parts of G. sylvestre in ethanol, chloroform, and ethyl acetate have also been reported to have antibacterial effects against P. vulgaris, E. coli, P. aeroginosa, Klebsella pneumoniae, and S. aureus.[14]

4) Antihyperlipidemic Activity :-

More deaths are caused by coronary artery disease than by all other causes combined. Hyperlipidemia is the primary cause of atherosclerosis and related conditions such as coronary artery disease. Lowering serum cholesterol levels has the potential to significantly reduce the risk of coronary heart disease. Plant-based formulations offer a promising alternative for the treatment of heart disease because synthetic drugs are less likely to cause side effects. Supplements containing gymnemic acid have been found to be beneficial in the fight against obesity. Triterpene saponins, which include tigloyl, methylbutyryl, and others, are acrylate derivatives of deacylgymnemic acid. Gymnemic acids are composed of gymnemic acids I–VII, gymnemosides A–F, gymnemasaponins, and other compounds. [15]

5) Anticancer and Cytotoxic Activity :-

Many plant-derived saponins, including ginsenosides, soyasaponins, and saikosaponins, have anticancer activity.

Several studies have been conducted to investigate the plant's potential anticancer properties via various mechanisms**:**

Antioxidant Activity: The plant Gymnema sylvestre has been found to have antioxidant properties. Antioxidants help to neutralize dangerous free radicals in the body, which can contribute to cancer development..

Immunomodulation: According to some research, Gymnema sylvestre may have immunomodulatory effects, meaning it may influence immune system activity. A strong immune system is required for detecting and eliminating cancer cells..

Anti-Inflammatory Effects: Cancer development and progression have been linked to chronic inflammation. Gymnema sylvestre has anti-inflammatory properties, which may help it fight cancer.

Induction of Apoptosis: Apoptosis is a type of programmed cell death that is required for normal cellular function and the prevention of cancer cell growth. Some research has looked into Gymnema sylvestre's ability to induce apoptosis. [16]

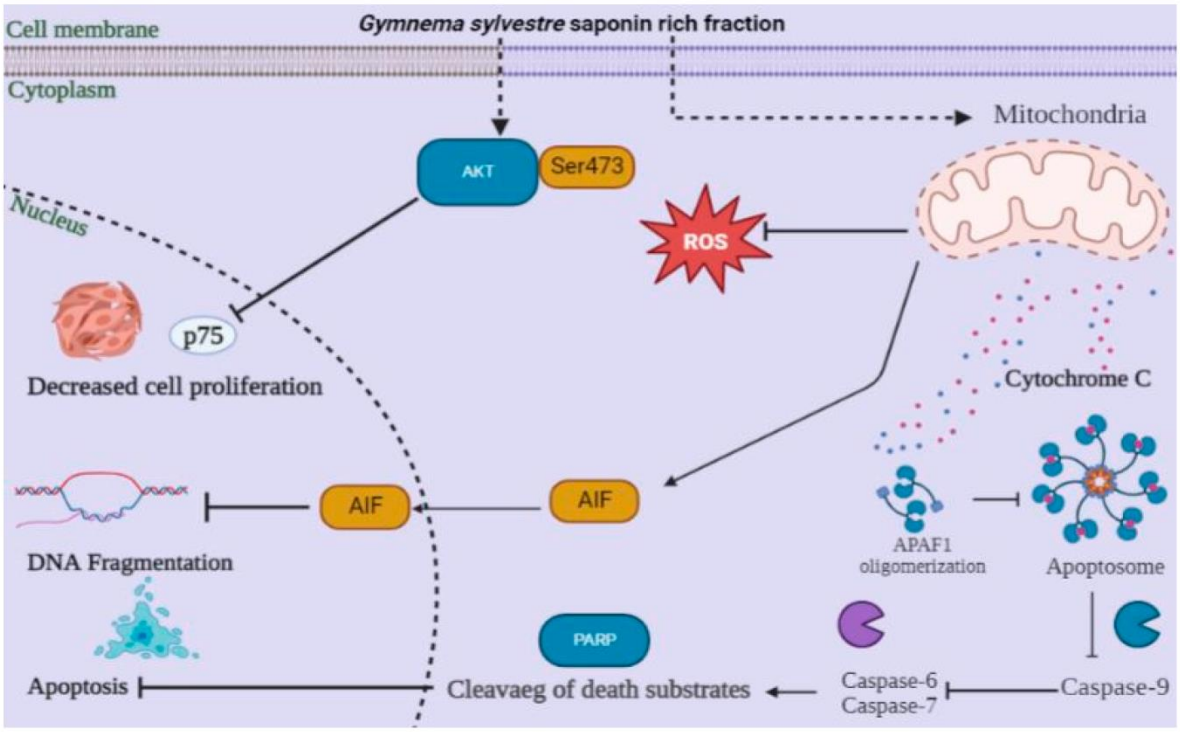

Fig.3: Anticancer mechanism of action of gymnema sylvestre

6) Treatment of Dental Caries :

Dental caries is defined as tooth infection caused by grampositive cariogenic bacteria such as Staphylococcus aureus, Staphylococcus mitis, and Staphylococcus mutans, as well as the fungus-like Candida albicans that attaches to teeth.The tooth surface is demineralized as a result of extracellular polysaccharide release from sucrose and sugar metabolization to organic acid lactic acid.

Mechanism of acion :

1) **Antibacterial Properties** Some studies have shown that Gymnema sylvestre has antibacterial properties. Dental caries are primarily caused by the activity of bacteria, specifically Streptococcus mutans, which produces acids that cause tooth enamel demineralization. Gymnema sylvestre has the potential to reduce the risk of dental caries by inhibiting the growth and activity of these bacteria.

2) Inhibition of Sugar Absorption: Gymnema sylvestre is well-known for suppressing the taste of sweetness. This is due to its active ingredients, gymnemic acids, which bind to taste receptors on the tongue that detect sweet flavors. This property may reduce the desire for sugary foods and beverages, thereby indirectly contributing to the prevention of dental caries.

3) Anti-Inflammatory Effects: Inflammation contributes to the progression of dental caries. Gymnema sylvestre has been shown to have anti-inflammatory properties. It may help to prevent or control dental caries by reducing inflammation in the oral cavity

Precaution :

- Don not use in pragnency and in lactation.
- Don not use for those patients who are suffered already in liver and kidney disorders.
- Diabetic patients on medication should be carefully monitored their blood sugar level when taking this herb because it may further reduce blood sugar level.
- Consult with your physician because high dose of it can cause hypoglycemic effect.

INTERACTION WITH DRUG :

- The optimal doses of hydroxy-citric acid with gymnema sylvestre, and to a large extent the combination of hydroxycitric acid, niacin bound chromium, and gymnema sylvestre extract, can serve as an effective and safe weight loss farmula that can facilitate weight loss.
- The combination of glibenclamide (Sulphonylurease) and gymnema sylvestre demonstrated the greatest hypoglycemic action and serum cholesterol reduction. This combination was more effective at lowering blood sugar levels than gymnema sylvestre alone.
- When combined with oral diabetes medications such as glipizide, glyburide, glyset, and precose, Gymnema sylvestre may increase the blood sugar lowering effect.
- The lowering effects of drugs such as crestor, lovastatin, lipitor, pravastatin may be increased by taking these drugs with gymnema sylvestre.

INTERACTION WITH HERBS :

- Combination of gymnema sylvestre and some herbs increase its hypoglycemic activity like,
- Eleutherococcus senticoses
- Zingiber officinale
- Pueraria lobata
- Panax ginseng
- Gymnema sylvestre with some herbs inhance effect of lowering of cholesterole such as,

  1) Allium sativum

  2) Commiphora wightii

SIDE EFFECTS :-

- Hepatotoxicity is its side effect.
- Chronic use of this herb can lower blood pressure.
- Gymnemic acid and Gurmarine suppresses the ability of the tonge to detect sweet taste.

TOXICITY :-

1. Some neurological effects are observed after taking the over dose of this herb.
2. Some autonomic effects are also observed.
3. Hypoglycemic effects are also seen after taking over dose of gymnema sylvestre. . [17].

Marketed product :

Fig.3: Marketed product

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