

Comparing Modified and Relationship Study of *Gymnema Sylvestre* against Diabetes

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Abstract

Leaves powder of medicinal plant *Gymnema Sylvestre* has analyzed for their blood glucose lowering Property. This study has been investigated for the therapeutic effects of the 9:1 methanolic: water extract of *Gymnema Sylvestre* leaves has shown statistically significant hypoglycemic activity in normal and alloxan induced diabetic mice. The normal fasted mice have divided into four groups of five each. One group received vehicle only (0.5% CMC) and served as control group. Other group received standard drug Chlorpropamide (75 mg/kg) and served as standard group. Remaining two groups received methanolic water extract and aqueous extract at a dose of 500 mg/kg B.W. Blood glucose level has monitored just prior to and after 2 hrs of drug treatment. In diabetic mice the same procedure has followed as per normal fasted mice. This study for the acute hypoglycemic activity involved determination of blood glucose levels at 0, 1, 2, 3, 5 and 24 hrs after treatment of single dose. It clearly indicates that the methanolic water extract of *Gymnema Sylvestre* leaves have significant hypoglycemic activity. This hypoglycemic effect has produced after oral administration of extract to normal and diabetic mice. The present investigation suggests that *Gymnema Sylvestre* leaves extracts possesses hypoglycemic effect in rats with alloxan-induced diabetes mellitus. In this paper I have discussed some solvent systems which bring some changes in bioactivity. These solvents are helpful in classical research level to become comparing modified and relationship study of different responses as well as effect of their concentration to get desire results. I have studied several research papers websites and blogs to collect data to show how these unfold plant are very helpful in blood glucose lowering Property.

Keywords: *Gymnema Sylvestre*, Hypoglycemic, Ethanomedical, Diabetes mellitus

Introduction

Gymnema Sylvestre is a species of soft hairs plant from the *Apocynaceae* family, noted for its climber with leaves having soft hairs on the upper surface. The leaves are elongate oval shaped. It has small green inflorescence which is produced throughout the year. *Gymnema Sylvestre* is a perennial woody vine that grows in tropical areas of India, Africa, and Australia and has been used for medicinal purposes in Ayurvedic medicine. Common names include gymnema, Australian cowplant, and *Periploca* of the woods, and the Hindi term gurmaar which means "sugar destroyer" [1]. The leaves and extracts contain gymnemic acids, the major bioactive constituents that interact with taste receptors on the tongue to temporarily suppress the taste of sweetness. The compound leaves have a feathery appearance and are a characteristic light, bright green. They are doubly pinnate: Each leaf is 3-5 cm long and has 2 to 4 pairs of primary leaflets or pinnae on it, and each of these is further divided into 1-2 pairs of secondary leaflets or pinnules.

Statement of problem

Diabetes mellitus is a major public health problem in the developed countries has been accepted. India has projected by World Health Organization as the country with fastest growing population of Diabetes mellitus [2]. A local unani ethnomedical claim has found regarding the hypoglycemic effect of *Gymnema Sylvestre*. Further, there is no scientific study on the hypoglycemic properties of this plant [3]. Hence in this preliminary advancement, an attempt has been made to investigate the local unani ethnomedical claim scientifically by screening the methanolic water and aqueous extracts of *Gymnema Sylvestre* leaves in terms of control of blood sugar level and improvement in glucose tolerance [4].

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Research question

The following research questions have used for the study:

1. What misconceptions do *Gymnema Sylvestre*?
2. To what extent does the use of *Gymnema Sylvestre* approach improves pharmacological activity?

Methodology

This study has meant to determine the effect of *Gymnema Sylvestre* on performance of blood glucose lowering properties.

Validity

In this study, content validity has used to ascertain the validity of the instrument. Content validity is qualitative measures of validity and is often employed in educational research because they are the easiest to ascertain.

Materials and Methods

Collection of plant sample

The leaves of *Gymnema Sylvestre* have collected from the suburb area of Jaipur, Rajasthan during May 2015.

Authentication of Drug

Plant for the present study has been authenticated.

Extraction

The fresh leaves (i.e. leaflets) has cleaned with water, dried under shade and crushed into coarse powder. The powder has loaded into soxhlet extractor (Saksham Technologies Private Limited Mumbai) in 8 batches of 75 gms each and was subjected to complete extraction with methanol (methanolic water extract). Completion of extraction has directly related to the extent that chlorophyll has been removed into the solvent and when the tissue debris, on repeated extraction, is completely free of green colour. Aqueous extract was prepared in the form of decoction, by boiling 400 gms of coarse powder in 500 ml of water. After extraction, the solvent has distilled off and extract has concentrated on heating mantle to a dry residue. Kept into desiccator and made of aliquots [5] (Figure 1).



Figure 1: Soxhlet apparatus.

Animal studies

Wistar albino mice of both sexes, weighing between 20-20 gm, were used. They have housed in polypropylene cages and fed on standard laboratory practices and water. Animals has fasted overnight before commencing the experiment, but had free access to water. All the drugs (standard and test) as well as vehicle has administered per-orally using infant feeding tube [6].

Pharmacological study: According to OECD guidelines for the testing of chemicals

Acute toxicity study

During preliminary toxicity study, no adverse effect or mortality has observed in albino mice with oral administration of methanolic water extract and aqueous extract to a high dose of 5 gm/kg B.W. observed for 24 hrs. Hence a high dose of 500 mg/kg B.W. was selected as a test dose [7].

Standard drug

Chlorpropamide tablet has used as a standard drug. The dose has selected on the extended literature (75 mg/kg B.W.) and stock from AdvaCare GMP China.

Determination of blood glucose level

Blood glucose level was monitored by using Hypoguard Advance Blood Glucose Meter, imported and manufactured by Arkray USA.

Hypoglycemic screening in normal mice

The normal fasted mice have divided into four groups of five each. One group received vehicle only (0.5% CMC) and served as control group. Other group received standard drug Chlorpropamide (75 mg/kg) and served as standard group. Remaining two groups received methanol extract and aqueous extract at a dose of 500 mg/kg B.W. Blood Glucose level has monitored just prior to and after 2 hrs of drug administration.

Induction of diabetes

Mice have fasted for 18 hrs and experimental diabetes was then induced by three *intraperitoneal* administration of alloxan monohydrate (150 mg/kg) at intervals of 48 hrs. Seven days after the last administration, the animals has fasted for 18 hrs and blood glucose levels have determined. Animals with fasting blood glucose a level between 200-300 mg/dl has used for the study.

Hypoglycemic screening in alloxan-induced diabetic mice

The diabetic mice have divided into four groups of six each. Group one received vehicle only (0.5 % CMC) and served as control group. Group two received standard drug Chlorpropamide (75 mg/kg) and served as standard group. Remaining two groups received methanol extract and aqueous extract at a dose of 500 mg/kg B.W. Study for the acute hypoglycemic activity involved determination of blood glucose levels at 0, 1, 2, 3, 5 and 24 hrs after administration of single dose.

Oral glucose tolerance test

The normal fasted has been divided into three groups of five each. Group One received vehicle only (0.5% CMC) and served as control group. Other group two received standard drug Chlorpropamide (75 mg/kg), should be based upon response may increase or decrease and served as standard group. Group three

received methanol extract at a dose of 500 mg/kg B.W. All the mice have loaded with glucose solution 2.5 gm/kg B.W. per orally after 0.5 hr of drug administration. Blood glucose level has monitored just prior to drug administration and 30, 90 and 120 min. after glucose loading. Care has taken to ensure that the animals have treated in the most humane and ethically acceptable manner.

Statistical Data Analysis

Results are expressed as mean \pm SD and analyzed statistically by one way ANOVA followed by Dunnett's multiple comparison tests using graph pad in stat software. All the experimental results have compared with control group.

** $p < 0.01$, very significant; * $p < 0.05$, significant; and ^{ns} $p > 0.05$, Non-significant.

Results and Discussion

Methanolic water extract of *Gymnema Sylvestre* leaves significantly reduced the fasting blood glucose level in normal mice after 2 hrs as compared to control group. It also showed significant reduction in fasting blood glucose level in diabetic mice after 2, 3 and 5 hrs interval as compared to control group. Maximum reduction in fasting blood glucose level (%) has seen after 5 hrs of administration of dose with a significance level of $p < 0.01$. Chlorpropamide showed maximum reduction (%) after 5 hrs with a significance level of $p < 0.01$. After 24 hrs, the mean fasting blood glucose levels of all the groups has almost equal to that at 0 hr. Methanolic water extract of *Gymnema Sylvestre* leaves and Chlorpropamide significantly depressed the peak of blood glucose level at 90 min. after glucose loading with a significance level of $p < 0.01$. Aqueous extract (500 mg/kg B.W.) neither had shown any hypoglycemic activity nor improved glucose tolerance. Bioassays are considered as the first step necessary for the drug discovery process from ethnomedical systems. Numbers of plants have been documented as hypoglycemic agents. The purpose of this research has to study the hypoglycemic effect of *Gymnema Sylvestre* leaves, a less known common medicinal plant. Results clearly indicate that the Methanolic water extract of *Gymnema Sylvestre* leaves have significant hypoglycemic activity. These hypoglycemic effects have produced after oral administration of extract to normal and diabetic mice. The exact mechanism of action needs further studies. Acute toxicity studies (no death even with 10 times the effective dose), indicates high margin of safety. However, the above are the preliminary indications and it is worth undertaking further studies on possible usefulness of *Gymnema Sylvestre* leaves in diabetes mellitus. The results of this investigation indicate that the leaf extracts of *Gymnema Sylvestre* have a hypoglycemic effect on normal fasted & induced diabetes in mice. One possible mechanism of action was increased insulin secretion and enhancement of the glycogenesis process. Methanolic water extract of *Gymnema Sylvestre* leaves significantly reduced the fasting blood glucose level in normal mice after 2 hrs as compared to control group. It also showed significant reduction in fasting blood glucose level in diabetic mice after 2, 3 and 5 hrs interval as compared to control group. Results clearly indicate that the Methanolic water extract of *Gymnema Sylvestre* leaves have significant hypoglycemic activity. These hypoglycemic effects have produced after oral administration of extract to normal and diabetic mice. Acute



Figure 2: *Gymnema Sylvestre* leaves.

toxicity studies (no death even with 10 times the effective dose), indicates high margin of safety. Further studies are in progress to isolate the active principles of the extracts as well as to elucidate their exact mechanism(s) of action (Figure 2).

Conclusion

Results of the present study indicate that *Gymnema Sylvestre* leaves extracts possesses hypoglycemic effect in rats with alloxan-induced diabetes mellitus. The present study has carried out to evaluate the possible glucose tolerance efficacy of methanolic extract of *Gymnema Sylvestre* leaf using glucose induced hyperglycemic mice. The extracts of different doses have administered one hr prior to glucose administration and blood glucose levels have measured after two hrs of glucose administration. The statistical data indicate significant oral hypoglycemic activity on glucose loaded mice at every dose which have comparable to that of a standard drug. The methanolic extract of leaf of *Gymnema Sylvestre* had beneficial effect in reducing the elevated blood glucose level of hyperglycemic mice.

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