E-ISSN No: 2456-6713

International Educational Applied Research Journal

Peer-Reviewed Journal-Equivalent to UGC Approved Journal

A Multi-Disciplinary Research Journal

Impact Factor: 5.924

Combination Effects of *Glycyrhizza Glabra and Solanum Anguivi* extract on lipid profile in alloxan induced - wistar albino rats

[1]Prabas Nand Raut, [2]Dr. Prasanna Purohit

[1, 2]Dr. A. P. J. Abdul Kalam University Indore M.P.

DOI: https://doi.org/10.5281/zenodo.12208741

Abstract:

This study investigated the impact of extracts of Glycyrrhizza glabra and Solanum anguivi on the lipid level of alloxan-induced diabetic rats as its primary purpose. This evaluation was done in light of World Health Organization (WHO) recommendations on the use of medicinal plants for the management of diabetes mellitus. The Glycyrrhizza glabra and Solanum anguivi extracts were administered daily for 31 days to Wistar rats divided into three groups of five rats each. Group I served as the normal (Negative) control; Group II received 10 mg/kg of extract as a positive control; and Group III received body weight doses of the aqueous extracts of Glycyrrhizza glabra and Solanum anguivi, respectively, in Groups II and III. With the administration of 10 mg/kg of extract (positive control), Group I's negative control results are satisfactory, Group II's positive control results are satisfactory, and Group III's results are significantly different from the control in terms of HDL cholesterol, triglycerides, total cholesterol, LDL, and urea levels. As a result, it can be concluded that the Glycyrrhizza glabra and Solanum anguivi plants have antidiabetic, antilipemic, and antioxidant properties.

Keywords: Lipid Profile, Glycyrhizza glabra and Solanum anguivi, Negative, Positive and Control

1. Introduction:

Nature has always been a great source of therapeutic substances, delivering us various medicinal plants that produce valuable phytochemicals. Licorice is scientifically known *as Glycyrrhiza*

E-ISSN No: 2456-6713

International Educational Applied Research Journal

Peer-Reviewed Journal-Equivalent to UGC Approved Journal

A Multi-Disciplinary Research Journal

Impact Factor: 5.924

glabra and belongs to the Leguminosae family. *G. glabra* is an ayurvedic herb that is frequently utilized. This medicinal plant is found throughout Asia as well as in areas of Europe [1]. Licorice is thought to have originated in Iraq [2]. *G. glabra*, the most extensively dispersed species, is found in Italy, Spain, Turkey, the Caucasus, western China, and Central Asia. In contrast, *G. uralensis* is located in Central Asia to China and Mongolia [3]. It is grown commercially in Italy, Spain, Greece, France, Iran, Iraq, Turkey, Turkmenistan, Uzbekistan, Syria, Afghanistan, Azerbaijan, India, China, the United States, and England [4,5]. Licorice is one of the most commercially valuable plants globally, having a wide range of uses in tobacco, cosmetics, the food industry, and pharmaceuticals [6]. Phytochemical and pharmaceutical analysis has been extensively explored thoroughly of licorice [3,7,8,9,10]. The diabetes is define by a increase in blood sugar levels supplementary, commonly known as diabetes mellitus the vital cause if increase in blood glucose levels is a insufficiency of glucose metabolism cause by faulty insulin production from pancreatic β cells. g. glabra has a verity of medicinal property [11]. The development of glycyrrhizin was calculated on streptozotocin (STZ)-induced diabetic changes and associated oxidative stress, including hemoglobin-induced free iron-mediated oxidative response. Glycyrrhizin therapy upgrade significantly the diabetogenic effects of STZ, it modulated blood glucose level, glucose intolerant behavior, decreased serum insulin level including pancreatic islet cell numbers, increased glycohemoglobin level and enhanced levels of cholesterol and triglyceride. The therapy importantly reduced diabetes-induced abnormalities of pancreas and kidney tissues. Free iron in hemoglobin, iron-mediated free radical reactions and carbonyl formation in hemoglobin were pronounced in diabetes, and were counteracted by glycyrrhizin. Effects of glycyrrhizin and glibenclamide treatments appeared comparable [12].

Solanum anguivi Lam. is a non-tuberous and widely distributed plant that possesses various medicinal properties. Mostly, the plant prefers to grow in humid temperature and commonly found as weed in gardens. It is a rare ethnomedicinal herb belonging to the family Solanaceae. The plant is used as a therapeutic agent for various diseases. The roots are carminative and expectorant which are useful in coughs, catarrhal, dysuria, colic, nasal ulcers, ingredient of dasamula, asthma, difficult parturition, toothache, cardiac disorder, worm complaints, spinal guard disorder, nervous disorder and fever. *S. anguivi* fruit is the most edible source of saponin in the south-western and south-eastern parts of Nigeria because of the traditional belief that it can cure hypertension and diabetes. Saponins have been reported as plant

E-ISSN No: 2456-6713

International Educational Applied Research Journal

Peer-Reviewed Journal-Equivalent to UGC Approved Journal

A Multi-Disciplinary Research Journal

Impact Factor: 5.924

phytochemical having insulin sensitization and antihyperlipidemic effects in diabetic state (13 ,14,15).

2. Materials and Methods:

2.1 Chemicals:

All the chemicals and enzymes were purchased from Sigma-Aldrich Pvt. Ltd., USA except 2-thiobarbituric acid, which was purchased from Hi-Media Laboratories, Pvt. Ltd., Mumbai. Kits for the estimation of glucose, lipid profile, α-amylase activity were purchased from Span diagnostics Pvt. Ltd., Surat, India. *Glycyrhizza glabra* and *Solanum anguivi are them.*

2.2 Preparation of Extracts:

2.2.1 Plant root Collection & Identification:

The roots of *Glycyrhizza glabra* and *Solanum anguivi* were purchased from local ayuredic store, Udupi and its authenticity confirmed by the Dr. Jagrati, Assistant professor, Department of Biotechnology, Holkar Science College, DAVV University.

2.2.2 Plant root extract preparation:

Samples were washed, dried and crushed to powder. Fifty gm sample were soaked in 1:1 ratio of water and 90% ethanol (to obtain extract) for 02 days at room temperature with occasional shaking. Mixture was filtered through filter paper. Ethanolic solution was evaporated in water bath at 30 to 40ºC till complete evaporation of ethanol and yield was in the form of thick paste. Water extract solution was freeze dried at (-15 to -20 ºC) under vacuum, the yield was hydroscopic powder. A known amount of powder is suspended in distilled water and 0.5 ml of this was orally administered to group II animals, while the animals orally administered with the solvent (water) served as control.

2.3 Experimental Animals:

The experimental protocol was approved by the Institutional Animals Ethics Committee (IAEC), DAVV University and Supervision on Experiments on Animals (CPCSEA; registration No. 729), Ministry of Environment and Forests, Government of India and Institutional Ethical Committee for Handling and Maintenance for Experimental Animals were followed.

E-ISSN No: 2456-6713

International Educational Applied Research Journal

Peer-Reviewed Journal-Equivalent to UGC Approved Journal

A Multi-Disciplinary Research Journal

Impact Factor: 5.924

Healthy colony bred Wistar albino male and female rats (*Ratus narvegicus*) (120 to 200 g) were maintained in polypropylene cages (43 x 27 x 25 cm with floor area of 165.85 cm^2 / animal). Seven animals were placed in each cage and were maintained under constant temperature (23 ± 2^0C) and (14h light: 10h dark).

2.4 Experimental Design:

Rats were randomly divided into two groups.

Group 1 was the normal control,

Group 2 was administered 10mg/kg of extract (positive control) and

Groups 3 was administered per-kg body weight of aqueous extracts of Glycyrhizza glabra and Solanum anguivi respectively.

2.5 Experimental procedures:

2.5.1 Biochemical estimations test*:*

Estimations of serum glucose, total cholesterol, HDL-C, triglycerides (TG), and α-amylase activity were measured using diagnostic kits of Span diagnostics by following the instructions provided by the manufacturer. However, concentration of LDL was calculated using the formula provided by Friedwald et al. [13].

2.5.2 Sub-chronic studies/ Collection and treatment of samples:

The extracts were reconstituted in distilled water, and administered orally on daily basis for 21 days. At the end of 21 days, the animals were anaesthetized using chloroform and bled by cardiac puncture 24 hours after the last treatment. The blood samples were collected in specimen bottles, allowed clotting and the serum separated by centrifugation at 3000rpm for 10 minutes and then subjected to biochemical parameters analysis.

2.6 Statistical analysis:

Statistical significance was ascribed at $P<0.05$ or more. Data are expressed as means ± S.E.M. and were analyzed by ANOVA (non parametric) followed by posthoc Neuman keuls multiple comparison test using trial version of Prism 5 software for windows (GraphPad, San Diego, CA).

E-ISSN No: 2456-6713

International Educational Applied Research Journal

Peer-Reviewed Journal-Equivalent to UGC Approved Journal

A Multi-Disciplinary Research Journal

Impact Factor: 5.924

3. Results and Discussion:

Tables 1 and 2 below present the result of acute toxicity studies showing the exract of *Glycyrhizza glabra* and *Solanum anguivi* is greater than 5000mg/kg body weight.

Table no. 01 Phase I oral of extract of *Glycyrhizza glabra* and *Solanum anguivi*

Group	No. of Animals	Doses (g/Kg)	No. of Death
1	3	10	Nil
2	3	100	Nil
3	3	1000	Nil

Table no. 02 Phase II oral of extract of *Glycyrhizza glabra* and *Solanum anguivi*

Group	No. of Animals	Doses (mg/Kg)	No. of Death
1	1	1600	Nil
2	1	2900	Nil
3	1	5000	Nil

The effect of daily doses of extract of *Glycyrhizza glabra* and *Solanum anguivi* on lipid profile of a wistar albino rats is presented in Table 03. There was no significant ($p<0.05$) changes in the serum level of total cholesterol (TC), trglyceride (TAG), low density lipoprotein cholesterol (LDL-C) and hi density lipoprotein –Cholesterol (HDL-c) for the animals administered with the extract as compared with the control groups. (Table 03).

Table 03 Effects of *Glycyrhizza glabra* and *Solanum anguivi* extract on normoglycemic animals on the parameters in Wistar albino rats.

Parameter	Group II (ctrl)	Group III
Total cholestrol (mg / dl)	43.56 ± .162	38.85 ± 0.128^{a}
HDL - Cholestrol (mg/ dl)	19.86 ± 0.22	22.81 ± 0.23^{c}

E-ISSN No: 2456-6713

International Educational Applied Research Journal

Peer-Reviewed Journal-Equivalent to UGC Approved Journal

A Multi-Disciplinary Research Journal

Impact Factor: 5.924

Tryglyceride (mg/ dl)	102.55 ± 0.95	101.96 ± .98[c]
LDL - Cholestrol (mg/dL)	44.03 ± .127	41.27 ± 0.101[b]

Group 1 Negative control result is satisfactory,

Group II Positive control results is satisfactory with administered 10mg/kg of extract (positive control) and

Group III, HDL cholesterol increased significantly while triglycerides, total cholesterol, LDL and urea levels decreased significantly, as compared to control.

Data are means ± S.E.M. (n=7); [a], $P<0.001$; [b], $P<0.01$ and [c], $P<0.05$ as compared to the respective control values.

In this study, the leaf extracts results of *Glycyrhizza glabra* and *Solanum anguivi showed* significant effect on lipid profile of the experimental animals (Table 03) is similar to Chia Hui Apphia Eu 2010, the extract administration lead to increase in HDL while a significant decrease in LDL, triglycerides, and total cholesterol in group II animals. Administration of extract of glycyrhizza and solanum selectively induce LPL expression in the non-hepatic tissues to promote catabolism of circulating TAG-rich lipoproteins and prevent further uptake of FFA into the liver by down-regulating hepatic LPL expression.

4. Conclusion:

We conclude from the study's data that Glycyrrhizza glabra and Solanum anguivi root extract significantly increase the Lipid Profile levels in Wistar albino rats. This herb can be used well as a replacement to manage diabetes in pancreatic functions.

5. References:

1. Fiore C., Eisenhut M., Ragazzi E., Zanchin G., Armanini D. A history of the therapeutic use of liquorice in Europe. *J. Ethnopharmacology*. 2005; 99:317–324. Doi: 10.1016/j.jep.2005.04.015. [PMC free article] [PubMed] [CrossRef] [Google Scholar].
2. Mamedov N.A., Egamberdieva D. Plant and Human Health. Volume 3. Springer International Publishing; Cham, Switzerland: 2019. Phytochemical Constituents and Pharmacological Effects of Licorice: A Review; pp. 1–21. [Google Scholar].

E-ISSN No: 2456-6713

International Educational Applied Research Journal

Peer-Reviewed Journal-Equivalent to UGC Approved Journal

A Multi-Disciplinary Research Journal

Impact Factor: 5.924

3. Hayashi H., Yokoshima K., Chiba R., Fujii I., Fattokhov I., Saidov M. Field survey of Glycyrrhiza plants in Central Asia (5). Chemical characterization of G. bucharica Collected in Tajikistan. Chem. Pharm. Bull. 2019; 67:534–539. Doi: 10.1248/cpb.c18-00881. [PubMed] [CrossRef] [Google Scholar].
4. Sokolov S., Zamotayev I. Directory of Medicinal Plants. Medicina; Moscow, Russia: 1985. (In Russian) [Google Scholar].
5. Chevallier A. The encyclopedia of medicinal plants. Choice Rev. Online. 1997; 34:34–3624. doi: 10.5860/choice.34-3624. [CrossRef] [Google Scholar].
6. Fenwick G.R., Lutomski J., Nieman C. Liquorice, Glycyrrhiza glabra L.-Composition, uses and analysis. Food Chem. 1990; 38:119–143. Doi: 10.1016/0308-8146(90)90159-2. [CrossRef] [Google Scholar].
7. Esmaeili H., Karami A., Hadian J., Nejad Ebrahimi S., Otto L.G. Genetic structure and variation in Iranian licorice (Glycyrrhiza glabra L.) populations based on morphological, phytochemical and simple sequence repeats markers. Ind. Crop. Prod. 2020; 145:112140. doi: 10.1016/j.indcrop.2020.112140. [CrossRef] [Google Scholar].
8. Kang M.R., Park K.H., Oh S.J., Yun J., Lee C.W., Lee M.Y., Han S.-B., Kang J.S. Cardiovascular protective effect of glabridin: Implications in LDL oxidation and inflammation. Int.Immunopharmacology. 2015; 29:914–918. Doi: 10.1016/j.intimp.2015.10.020. [PubMed] [CrossRef] [Google Scholar].
9. Hui-Yan G., Li-dong G., Jing-Hua Y. Measurement and comparison of glycyrrhizin acid contents in root of licorice (Glycyrrhiza uralensis Fisch.) from different cultivating areas. J. For. Res. 2002; 13:141–143. Doi: 10.1007/BF02857240. [CrossRef] [Google Scholar].
10. Hayashi H., Hattori S., Inoue K., Khodzhimatov O., Ashurmetov O., Ito M., Honda G. Field Survey of Glycyrrhiza plants in Central Asia (3). Chemical characterization of G. glabra collected in Uzbekistan. Chem. Pharm. Bull. 2003; 51:1338–1340. Doi: 10.1248/cpb.51.1338. [PubMed] [CrossRef] [Google Scholar].
11. Komal Landge, Dr. Hingane L. D. Herbal Drugs Used in the Treatment of Diabetes Mellitus, 2022.
12. Glycyrrhiza glabra: A Potent Herb from Traditional to Modern. Mallick*, Md Nasar. Noida, India: s.n., 2022; 11.
13. S.K. Bhavsar, S. Singh, S. Giri, M.R. Jain, D.D. Santani. Effect of saponins from Helicteres isora on lipid and glucose metabolism regulating genes expression. Journal of Ethnopharmacology, 124 (2009), pp. 426-433.

E-ISSN No: 2456-6713

International Educational Applied Research Journal

Peer-Reviewed Journal-Equivalent to UGC Approved Journal

A Multi-Disciplinary Research Journal

Impact Factor: 5.924

14. C.H. Eu, W.Y. Lim, S.H. Ton, K.A. Kadir. Glycyrrhizic acid improved lipoprotein lipase expression, insulin sensitivity, serum lipid and lipid deposition in high-fat diet induced obese rats. Lipids in Health and Disease, 9 (2010), pp. 1-9.
15. K.T. Lee, T.W. Jung, H.J. Lee, S.G. Kim, Y.S. Shin, W.K. Whang. The antidiabetic effect of genosenoside Rb2 via activation of AMPK. Archives of Pharmaceutical Research, 34 (2011), pp. 1201-1208
16. Chia Hui Apphia Eu, Wai Yen Alfred Lim, So Ha Ton, Khalid bin Abdul Kadir. Glycyrrhizic acid improved lipoprotein lipase expression, insulin sensitivity, serum lipid and lipid deposition in high-fat diet-induced obese rats. Lipids in Health and Disease 2010; 9:81.