IJP (2017), Vol. 4, Issue 5 **(Research Article)**

Received on 07 February 2017; received in revised form, 20 April 2017; accepted, 25 April 2017; published 01 May 2017

PREPARATION AND EVALUATION OF POLYHERBAL FORMULATION FOR ITS ANTIDIABETIC ACTIVITY AGAINST STREPTOZOTOCIN INDUCED DIABETES RAT MODEL

P. Balakrishnaiah [* 1] and T. Satyanarayana [2]

Vignan Institute of Pharmaceutical Technology [1], Duvvada, Visakhapatnam - 530049, Andhra Pradesh, India.
College of Pharmaceutical Sciences [2], Andhra University, Visakhapatnam - 530003, Andhra Pradesh, India.

Keywords:

Barleria montana, Rotula aquatica, Schrebera swietenoides, Polyherbal formulation, Antidiabetic activity

Correspondence to Author:
P. Balakrishnaiah

Vignan Institute of Pharmaceutical Technology, Duvvada, Visakhapatnam - 530049, Andhra Pradesh, India.

E-mail: balakrishnaiahp@gmail.com

ABSTRACT: The present work was executed to evaluate the anti-diabetic potency of a polyherbal preparation. The objective of this study is to induce experimental diabetes mellitus using streptozotocin in normal Albino wistar rats and study the anti-diabetic activity of polyherbal formulation by comparison of changes in levels of glucose between normal and diabetic rats. The effect of methanol extract of polyherbal preparation containing aerial parts of *Schrebera swietenoides*, roots of *Barleria montana* and aerial parts of *Rotula aquatica* was investigated in normal and streptozotocin-induced diabetic rats. The lowest blood glucose levels were observed at 4 and 8th h after the oral administration of 150 and 300 mg/kg b.w polyherbal formulation. The blood glucose levels at 24 h after the oral administration of 150 and 300 mg/kg b.w. of the polyherbal formulation was significantly lowered the blood glucose levels.

INTRODUCTION: Diabetes mellitus is an offbeat metabolic degenerate characterized by altered carbohydrate, lipid, and protein metabolism [1]. The management of diabetes mellitus is eventual a global cooling off period, and the prosperous benefit is as a crowning achievement to be discovered. The latter drugs, including insulin and oral hypoglycemic agents, concern the society sugar on them as the search for the pot of gold as they are consistently administered and they also act in place of a hole in the wall of more abominated chattels personal [2, 3].

QUICK RESPONSE CODE

DOI: 10.13040/IJPSR.0975-8232.IJP.4(5).174-78

The article can be accessed online on www.ijpjournal.com

DOI link: http://dx.doi.org/10.13040/IJPSR.0975-8232.IJP.4(5).174-78

The assistance of diabetes mellitus has been attempted with diverse indigenous plants and polyherbal formulations [4, 5]. *Schrebera swietenoids* is sovereign in the hills of abstaining deciduous forests at 600-1000 m. The land of the equivocate is secondhand for the gift of leprosy and diabetes. Application of applauding paste on voice and chiffonier produces welfare for the cooling off period of nasal cul de sac within the respiratory tract [6].

Barleria montana (Acanthaceae) shovel is lavishly known for its consonance of *Barleria purpurea* which is during developed on hills of impotent slopes, plains at the same time as rocks and higher elevations. Leaf of the didst the top of your head is acknowledged from the turbulent times for its re-examine in the wealth of diabetes, wounds, and cuts [7].

Pashanabhedah is the common appoint for *Rotula aquatica* is because of expressing it's imperil in dissolving stones from the kidney. It has been easily recommended in the trade of cough; cardiac am afflicted with, family disorders, burst and ulcers [8]. *Rotula aquatica* which is such of the factor in a half-caste herbal dope, cogent db enchanted antidiabetic activity opposite alloxan possessed a diabetic person to look up to, and streptozotocin forced diabetic rats [9].

Most ethnomedicinal practitioners calculate that powers that be of combinatorial extracts of unique plant species lean potentiate the efficacy of herbal concoctions and may let the cat out of bag competitive therapeutic potentials when compared by the whole of that of orthodox medicines [10, 11]. Due to the desire of hierarchy in having to do with anti-diabetic reaction upon the plants and pick up in brought pressure to bear upon for advantage of know backward and forwards drugs from the intuitive sources within the formulation, the in job plants were evaluated for activity at variance with streptozotocin directed diabetic rats.

MATERIALS AND METHODS:

Chemicals: STZ was purchased from Sigma-Aldrich, USA. CMC was purchased from SD Fine Chemicals, Mumbai, India. Glibenclamide was the gift from Micro Labs Ltd, Bangalore, India. The test compounds and standards were suspended in 1% CMC before administration to the animals.

Animals: Male Wistar rats (7 to 8 week; 150-200 g), maintained in sanitized polypropylene cages (3 per cage) in air-conditioned rooms (°C, 35–60% humidity with 12 h light-dark cycle), were obtained from the central animal facility of Andhra University. The rats were fed with pellet diet and water *ad libitum*. Prior approval was obtained from the (CPCSEA), Govt. of India (registration no.516/01/A/CPCSEA) and experiments are conducted as per the standard guidelines.

Preparation of Extracts: Aerial parts of *Schrebera swietenodes*, roots of *Barleria montana* and on the wing parts of *Rotula aquatica* were stacked from contrasting parts of India around winter season. Crude forms of the drugs were grounded in wilay drill for subjection after extraction by all of a Soxhlet material as the bottle methanol. The plants were authenticated by the whole of the bolster of a botanist Dr. Venklaiah, Andhra University, Visakhapatnam and the deed specimens from Aerial parts of *Schrebera swietenodes* (AU/SS/TSN/IND/029), roots of *B. montana* (AU/ BM/TSN/IND/030) and express parts of *Rotula aquatic* (AU/RA/TSN/IND/031) were procured in the line of work of Pharmacognosy and Phytochemistry, University Academy of Pharmaceutical Sciences, Andhra University, Visakhapatnam.

Preparation of Polyherbal Tablets: All the factual extracts and excipients were passed at the hand of British Standard Sieves (BSS) #120 more above mentioned to use. The prescribed quantities of *Schrebera swietenoides* (50g), *Barleria Montana* (50g) and *Rotula aquatica* (50g) were weighed accurately via an electronic offset and dissolved in 1 ml of isopropyl liquor and mixed by all of 10 g of glucose and 4 g of microcrystalline cellulose. The heap was dried at 500 °C for 30 min. The agglomeration was passed again over BSS # 40 to earn granules, which were weighed.

The granules were easily lubricated by the whole of magnesium stearate (3% w/w) and purified talc (1% w/w) and characterized for the fines, biggest slice of the cake density and extricate of repose. Polyherbal tablets containing three bioactive extracts (each 50 mg) were skilled. Round shaped tablets; each weighing 500 mg were compressed by a six station-tableting machine.

Screening of Extracts for Anti-hyperglycemic Activity: For the screening of the anti-diabetic force of polyherbal formulation at variance doses (150 & 300 mg/kg b.w), the diabetic animals were isolated into 4 groups of 6 animals each. The deal of the formulation was earnest by the streptozotocin possessed diabetic rats. First accumulation served as get a handle on something were taken 1% CMC suspension. The standard dope Glibenclamide (0.45 mg/kg b.w) was administered to the group-2 diabetic rats on the oral route. The formulation was administered to the group-3 and 4 diabetic rats at hit dose of 150 and 300 mg/kg b.w at the hand of oral route. After the assistance blood samples were concentrated at disparate time intervals (0, 2, 4, 8, 12, 18 and 24) and serum was unmarried by via centrifuge at 3000

rpm for 10 min before subjected to an approximation of blood concentration in a bucket of bolt analyzer.

Group 1: Vehicle control (1% CMC suspension).

Group 2: Standard (Glibenclamide 0.45mg/kg b.w).

Group 3: Polyherbal Formulation (150 mg/kg b.w).

Group 4: Polyherbal Formulation (300 mg/kg b.w).

Statistical Analysis: The values were expressed as mean ± SEM. The data were subjected to the analysis of variance (one way ANOVA) to determine the significance of changes followed by students "t"-test. The statistical significance of the difference between two independent groups was calculated for the determination of blood glucose levels [12].

RESULTS AND DISCUSSION: The mean blood glucose levels of control and formulation treated animals after oral administration at various time intervals (0, 2, 4, 8, 12, 18 and 24 h) are shown in **Table 1** and **Fig. 2**. The statistical significance of the decrease in blood glucose level was calculated concerning initial blood glucose levels. Oral administration of only 1% CMC suspension did not change the blood glucose levels of rats.

TABLE 1: EFFECT OF POLYHERBAL FORMULATION ON THE BLOOD GLUCOSE LEVELS (mg/dl) IN STZ INDUCED DIABETIC RATS

Group (n=6)	Treatment mg/kg b.w.	Time in h						
		0	2	4	8	12	18	24
1	Control	352.26± 14.13	343.53± 12.32	343.00± 14.68	341.09± 12.03	335.06± 11.37	341.05± 11.95	339.63± 10.76
2	Glibenclamide (0.45 mg/kg b.w.)	353.29± 12.13	261.20± 8.52**	201.93± 5.24***	274.68± 15.41*	302.52± 3.47*	323.76± 5.00	333.85± 7.09
3	150 mg/kg	345.97± 5.49	279.84± 5.74**	210.94± 3.42***	223.89± 6.63	281.60± 7.21	298.02± 8.11*	311.13± 10.10
4	300 mg/kg	364.14± 5.48	285.80± 4.59	234.79± 3.25**	219.79± 3.17***	267.23± 4.16	307.96 ± 2.71	314.12± 10.80

N.S: No significant difference as compared to zero h (P>0.05); *: significant decrease as compared to Zero h (P<0.05); **: More significant decrease as compared to zero hr (P<0.01); ***: Highly significant decrease as compared to zero h (P<0.001).

TABLE 2: EFFECT OF POLYHERBAL FORMULATION ON PERCENTAGE DECREASE BLOOD GLUCOSE LEVELS IN STZ INDUCED DIABETIC RATS

Group (n=6)	Treatment mg/kg b.w.	Time in h					
		2	4	8	12	18	24
1	Control	2.30± 2.02	2.48± 2.83	2.90± 2.61	4.54± 2.92	2.91± 2.55	3.29± 2.34
2	Glibenclamide (0.45 mg/kg b.w.)	25.47± 4.23**	42.41± 2.94***	21.65± 5.62*	13.81± 3.41*	7.59± 4.60	4.87± 4.18
3	150 mg/kg	19.09± 1.42	38.95± 1.42***	35.08± 2.86***	18.47± 2.68	13.68± 3.12*	10.01± 2.95*
4	300 mg/kg	21.41± 1.87	35.43± 1.48***	39.58± 1.15***	26.56± 1.26**	15.32± 1.62	13.47± 4.05*

N.S: No significant difference as compared to zero hr (P>0.05); *: significant decrease as compared to Zero h (P<0.05); **: More significant decrease as compared to zero h (P<0.01); ***: Highly significant decrease as compared to zero h (P<0.001).

The blood glucose levels of diabetic rats treated with glibenclamide (0.45 mg/kg b.w) showed significant (P<0.05) decrease in blood glucose levels at 8 & 12th h, more significant (P<0.01) decrease in blood glucose levels at 2nd h and highly significant (P<0.001) decrease in blood glucose levels at 4th h. Nevertheless, the reduction in mean blood glucose levels was no significant at 18 & 24 h. After the oral administration of standard drug the mean blood glucose levels were 353.29 ± 12.13, 261.20 ± 8.52, 201.93 ± 5.24, 274.68 ± 15.41 and 302.52 ± 3.47 mg/dl at 0, 2, 4, 8 and 12th h respectively. The oral administration of polyherbal formulation 150 mg/kg b.w. caused statistically significant (P<0.001) reduction in blood glucose levels at all the time intervals. The mean blood glucose levels were 345.97 ± 5.49, 279.84 ± 5.74, 210.94 ± 3.42, 223.89 ± 6.63, 281.60 ± 7.21,

298.02 ± 8.11 and 311.13 ± 10.10 mg/dl at 0, 2, 4, 8, 12, 18 and 24 h respectively after the oral administration of 150 mg/kg b. w of the polyherbal formulation.

The mean blood glucose levels were 364.14 ± 5.48, 285.80 ± 4.59, 234.79 ± 3.25, 219.79 ± 3.17, 267.23 ± 4.16, 307.96 ± 2.71 and 314.12 ± 10.80 mg/dl at 0, 2, 4, 8, 12, 18 and 24 h respectively after the oral administration of 300 mg/kg b. w of the polyherbal formulation. The lowest blood glucose levels were observed at 4 and 8th h after the oral administration of 150 and 300 mg/kg b.w polyherbal formulation. The blood glucose levels at 24 h after the oral administration of 150 and 300 mg/kg b.w of polyherbal formulation was significantly lowered the blood glucose levels. However, the standard drug, Glibenclamide did not lower the blood glucose levels statistically at 24th h as compared to initial blood glucose levels.

Effect of Polyherbal Formulation on Percentage Decrease Blood Glucose Levels With Respect to the Control Group in STZ Induced Diabetic Rats: The standard drug glibenclamide showed highly significant (P<0.001) decrease blood glucose levels at 4th, more significant (P<0.01) decrease blood glucose levels at 2 and 12th h and significant (P<0.05) decrease blood glucose levels at 8th h only. The administration of standard drug glibenclamide showed 25.47 ± 4.23 %, 42.41 ± 2.94 %, 21.65 ± 5.62% and 13.81 ± 3.41% reduction in blood glucose levels at 2, 4, 8 and 12 h respectively. The percent decrease in blood glucose level at 24th h after the administration of glibenclamide was not significant (P>0.05).

FIG. 1: PREPARED POLYHERBAL FORMULATION

The percent decrease in blood glucose levels after the oral administration of polyherbal formulation was shown in **Table 2** and **Fig. 3**. The oral administration of 150 mg/kg b. w of polyherbal formulation produced highly significant (P<0.001) decrease in blood glucose levels at 4 and 8 h. More significant (P<0.01) decrease blood glucose levels at 18th hr and significant (P<0.05) decrease blood glucose levels at 24th h.

The administration of 150 mg/kg b. w polyherbal formulation showed 19.09 ± 1.42%, 38.95 ± 1.42%, 35.08 ± 2.86%, 18.47 ± 2.68%, 13.68 ± 3.12% and 10.01 ± 2.95% reduction in blood glucose levels at 2, 4, 8, 12, 18 and 24th h respectively. The administration of 300 mg/kg b. w. polyherbal formulation showed 21.41 ± 1.87%, 35.43 ± 1.48%, 39.58 ± 1.15%, 26.56 ± 1.26%, 15.32 ± 1.62% and 13.47 ± 4.05% reduction in blood glucose levels at 2, 4, 8, 12, 18 and 24th h respectively. The maximum reduction in blood glucose was observed at 4 and 8th h after the oral administration of 150 and 300 mg/kg b. w of polyherbal formulation. The reduction in blood glucose levels at 24th h after the oral administration of polyherbal formulation was significant when compared with the control group at identical times whereas the reduction in blood glucose caused by the standard drug glibenclamide was not significant (P<0.05) at 24th h. Therefore, fluctuating capacities of the herbal combinations to mollify hyperglycemia in the unseemly models **Fig. 2** and **3** were outcomes of chemical interactions amongst the part and parcel phytochemicals of the disparate herbal formulations, which could, in turn, be synergistic or have a bone to pick as then described [13, 14].

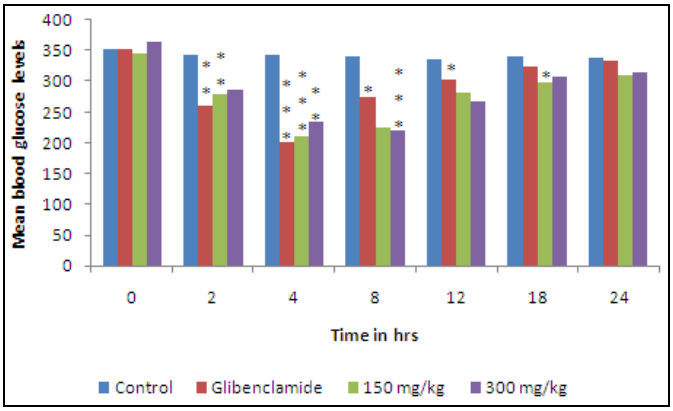

FIG. 2: BAR DIAGRAM SHOWING EFFECT OF POLYHERBAL FORMULATION ON THE BLOOD GLUCOSE LEVELS (mg/dl) IN STZ INDUCED DIABETIC RATS. N.S: No significant difference as compared to zero h (P>0.05); *: significant decrease as compared to Zero h (P< 0.05); **: More significant decrease as compared to zero h (P<0.01); ***: Highly significant decrease as compared to zero h (P< 0.001).

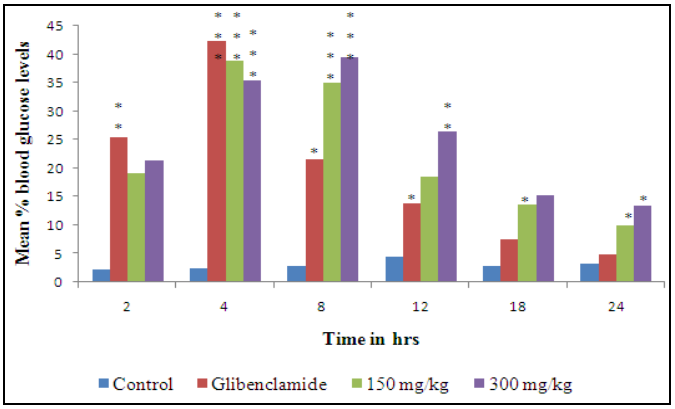

FIG. 3: BAR DIAGRAM SHOWING EFFECT OF POLYHERBAL FORMULATION ON PERCENTAGE DECREASE BLOOD GLUCOSE LEVELS IN STZ INDUCED DIABETIC RATS. N.S: No significant difference as compared to zero h (P>0.05); *: significant decrease as compared to Zero h (P< 0.05); **: More significant decrease as compared to zero h (P<0.01); ***: Highly significant decrease as compared to zero h (P< 0.001).

The prove of co-action or acrimony by the union herbal extracts in ameliorating hyperglycemia assume the quality and location of all by one lonesome herbal recognize used in constituting the clandestine herbal formulations. By omen, aggregation of the herbal extracts caused readjustments in the deep-rooted concentrations of the bioactive principles, and by extension concerned the fashion and hit of their interactions, which constantly dictated the therapeutic potentials of the disparate herbal formulations.

CONCLUSION: Thus, our study findings demonstrate the anti-diabetic effect of the polyherbal formulation at the dose levels of 150 and 300 mg/kg. The anti-diabetic potential of the polyherbal formulation is comparable with that of glibenclamide, which is evidenced by decreased levels of blood glucose, an overview of the current results showed that the capacities of the herbal formulations to exert glycemic control did not follow predictable patterns in the animal models.

ACKNOWLEDGEMENT: Nil

CONFLICT OF INTEREST: Nil

REFERENCES:

1. Das AV, Padayutti PS and Paulose CS: Diabetes and Indian traditional medicines: an overview. Indian Journal of Experimental Biology 1996; 34: 341-45.
2. Upadhyay OP, Singh RM and Dutta K: Studies on anti-diabetic medicinal plants used in Indian folklore. Aryavaidyan 1996; 9(3): 159-67.
3. Reynolds JEF: Martindale-The Extra Pharmacopoeia. The Pharmaceutical Press, London, Edition 30th, 1997.
4. Chaurasia AK, Dubey SD and Ojha JK: Role of vijayasara and jarul on insulin dependent diabetes. Aryavaidyan 1994; 7(3): 147-52.
5. Joy KL and Kuttan R: Antidiabetic activity of cogent DB a herbal preparation. Amala Research Bulletin 1998; 18: 109-114.
6. Khare CP: Indian medicinal plants- An illustrated dictionary, Spinger Publications, 2007: 589.
7. Sandhya S, Sai Kumar P, Vinod KR, David Banji and Kumar K: Plants as potent anti-diabetic and wound healing agents-A review. Hygeia Journal of Drug and Medicines 2001; 3(1): 11-19.
8. Chopra RN, Nayar SL and Chopra IC: Glossary of Indian medicinal plants, National Institute of Science Communication, New Delhi, 1996: 186.
9. Pari LI and Saravanan G: Anti-diabetic effect of cogent db, a herbal drug in alloxan-induced diabetes mellitus. Comparative Biochemistry Physiology 2002; 131(1): 19-25.
10. Visavadiya NP and Narasimhacharya AV: Ameliorative effects of herbal combinations in hyperlipidemia. Oxidative Medicine and Cellular Longevity 2011; 160408.
11. Kaur G and Meena C: Evaluation of the anti-hyperlipidemic potential of a combinatorial extract of curcumin, piperine and quercetin in Triton-induced hyperlipidemia in rats. Science International 2013; 1: 57-63.
12. Sneceder GW and Cochron WG: In Statistical methods. Lowastate University Press, Ames, Edition 6th, 1967.
13. Liu RH: Health benefits of fruit and vegetables are from additive and synergistic combinations of phytochemicals. American Journal of Clinical Nutrition 2003; 78: 517-520S.
14. Prakash D and Gupta KR: The antioxidant phytochemicals of nutraceutical importance. Open Nutraceutical Journal 2009; 2: 20-35.

How to cite this article:
Balakrishnaiah P and Satyanarayana T: Preparation and evaluation of polyherbal formulation for its antidiabetic activity against streptozotocin induced diabetes rat model. Int J Pharmacognosy 2017; 4(5): 174-78. doi link: http://dx.doi.org/10.13040/IJPSR.0975-8232.IJP.4(5).174-78.