WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 5.045
Volume 3, Issue 10, 673-680. Research Article ISSN 2277– 7105

PILOT STUDY ON POLYHERBAL EXTRACT FOR ANTIDIABETIC ACTIVITY IN ALLOXAN - DIABETIC RATS

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Article Received on
18 September 2014,

Revised on 12 Oct 2014,
Accepted on 06 Nov 2014

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ABSTRACT

The metabolic disorder which has become more common in world population is Diabetes mellitus. A number of medicines are available but still this disorder search for a drug with fewer side effects. This gained interest for complementary therapies. In this regard, a pilot study on methanol polyherbal extract (AChCaT is Acacia, Chloroxylon, Casearia, Terminalia extract) extracted from Acacia ferruginia (bark & fruit), Chloroxylon swietenia (bark, leaf, root), Casearia elliptica (bark), Terminalia alata (root, leaf) was evaluated for antidiabetic activity in Alloxan induced diabetic rats. Rats of body weight 180-200gms were administered with alloxan dose 120mg/kg body weight to induce diabetes. Animals are grouped as Group I (Normal rats), Group II (Diabetic control - Alloxan treated), Group III (Diabetic+ Glibenclamide (10mg/kg)), Group IV (Diabetic + Polyherbal extract). The polyherbal extract were administered with dose of 400mg/kg using CMC solution (5%) as the vehicle. Blood glucose in Group I, II, III, IV on 14th day are 108±1.14, 369.4 ±10.25, 161.6 ±3.41, 170.4 ±2.13 respectively .Data shows that Group IV is near to standard in giving hypoglycemic effect. Body weights of Group I, II, III and IV on 14th day are 187.2±0.96, 165.8±1.2, 179±0.77, 184.6±0.67 and no toxic effects were observed in the Test Group (Group IV). Body weights and blood glucose levels were compared with Group II.

KEYWORDS: Antidiabetic activity, Acacia ferruginia, Chloroxylon swietenia, Casearia elliptica, Terminalia alata, Poly herbal extract, Alloxan.

INTRODUCTION

Diabetes is a heterogeneous metabolic disorder characterized by altered carbohydrate, lipid

and protein metabolism which causes hyperglycemia resulting from insufficient insulin secretion, insulin action or both. [1] According to the International Diabetes Federation, there are 246 million people with diabetes on the globe and this figure will rise to 380 million by the year 2025. [2] Alloxan-induced diabetes is one of the widely used model to induce Type I diabetes mellitus in the the experimental animals. Alloxan has been found to be selectively toxic to pancreatic beta cells as it preferentially accumulates in the beta cells as glucose analogues. [3] The plants selected for antidiabetic activity was taken from the traditional literature [4]

Acacia ferruginia (bark & fruit) [5] Mimosaceae The activities registered are hepatoprotective agent,[6] itching, leucoderma, gastric ulcers, stomatitis and diseases of the blood.[7] The preliminary phytochemical screening of different extracts revealed presence of alkaloids, steroids, triterpenoids, saponins, flavonoids, tannins and phenolic compounds, carbohydrates, gums and mucilages, proteins and amino acids respectively in the bark.[8] Chloroxylon swietenia(bark, leaf, root) [9] family Rutaceae . Preliminary phytochemical screening of the extracts revealed that the presence of terpenoids, flavonoids, alkaloids, tannins, saponins and steroids ,[10] Casearia elliptica (bark) belongs to the family flacourtiaceae [11] used in bleeding, Terminalia alata (root, leaf) combretaceae.[12] Bark contains pyrogallol and catechols and used in diarrhoea. [5]

Animals

Male Rats of body weights 180-200gm were taken and grouped into four groups where each group contain five rats. The rats were housed in polypropylene cages bottomed with husk maintained at temperature conditions of 25±2ºC with 12/12 light and dark hours. Standard pellet diet and water was provided for the animals ad libitum for a period of 7days as acclimatization period. The study was conducted according to ethics of IAEC (with 557/02C/CPCSEA) OGEC guidelines and approval.

MATERIALS AND METHODS

Plant Material

The plant material required for the antidiabetic activity is authentificated by the Botanist Dr.K. Madhava Chetty, Department of Botany, Sri Venkateswara University, Tirupati, Andhra Pradesh, India. Acacia ferruginia (bark & fruit), Chloroxylon swietenia (bark, leaf, root), Casearia elliptica (bark), Terminalia alata (root, leaf) were collected dried and powdered.

Preparation of the extract

Extraction was done by hot extraction method- Soxhlet extraction in which all the herbs were taken in equal proportions to make up to 300grams and extracted with required quantity of methanol for 6hr. The extract was concentrated and dried product is obtained by using rotavapourator. Dried extract (AChCaT) is stored till the usage in air tight container.

Induction of diabetes

Rats were administered with 120mg/kg alloxan intraperitonially to induce Type I diabetes. [13] Diabetic condition was registered after 2days of alloxan administration.

Methodology

Wistar rats of weight ranging from 180-200gms were taken and grouped into five groups by randomization (n=5). Group I (Normal rats), Group II (Diabetic control Alloxan treated), Group III (Diabetic+ Glibenclamide), Group IV (Diabetic +PH5).The rats were Fed with standard pellet diet and drinking water for a week as acclimation period. The rats were fasted overnight before experimentation. Then rats were administered with diabetic inducer drug alloxan of the dose 120mg/kg intra peritonially. The blood was withdrawn to record the hyperglycemia after administration of alloxan. Control group were given standard pellet diet without any medication, Group II is positive control with induced hyperglycemia left untreated, Group III is treated with standard drug Glibenclamide (Ant hyperglycemic). Group IV is treated with polyherbal extract (Acacia ferruginia (bark & fruit), Chloroxylon swietenia (bark, leaf, root), Casearia elliptica (bark), Terminalia alata (root, leaf) represented as - AChCaT). The rats were treated with treatment groups for 14days.The blood samples were collected on 1^{st} day, 5^{th} day, 14^{th} day from orbital plexes and the blood glucose levels were recorded in Table 1. No signs of toxicity were found .The data from table 1 is analyzed by statistical method of Anova test t test. Body weights for 1^{st}, 5^{th}, 14^{th} day were recorded.

Phytochemistry

The preliminary phytochemical screening of different extracts revealed presence of alkaloids, steroids, triterpenoids, saponins, flavonoids, tannins and phenolic compounds, carbohydrates, gums and mucilages, proteins and amino acids, tannins.

RESULTS

Statistical analysis: The results were expressed by Mean ±SEM. The significance of the data was done by p value using one way ANOVA unpaired t- test.

Table 1 shows the glucose levels of four groups of rats recorded on 1st, 5th, 14th day of the study. The diabetic rats treated with Glibenclamide and AChCaT extract showed significant decrease in blood glucose when compared with diabetic control. Table 2 gives the summary of variation in the body weights during the study.

Table 1: Blood Glucose Levels.

Groups	Day 1	Day 5	Day 14
Group I Control	93.8±3.64***	103.6±1.75 ***	108±1.14***
Group II (Diabetic control -Alloxan treated)	329.2±5.44	348.2±8.5	369.4 ±10.25
Group III (Diabetic+ Glibenclamide)	207 ±1.70***	189 ±4.39***	161.6 ±3.41***
Group IV (Diabetic +Poly herbal extract)	287.6±1.03***	243.8 ±10.45***	170.4 ±2.13***

***P<0.0001 is statistically significant when compared with Group II

Results are presented as mean ± standard error of mean (SEM). The statistical analysis involving two groups was evaluated by means of Student's unpaired t-test, whereas one way analysis of variance (ANOVA) followed by statistical comparison between diabetic control and various treated groups.

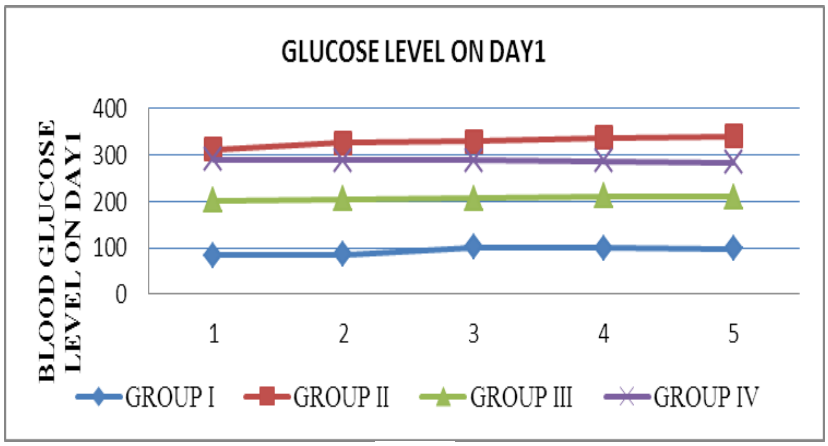
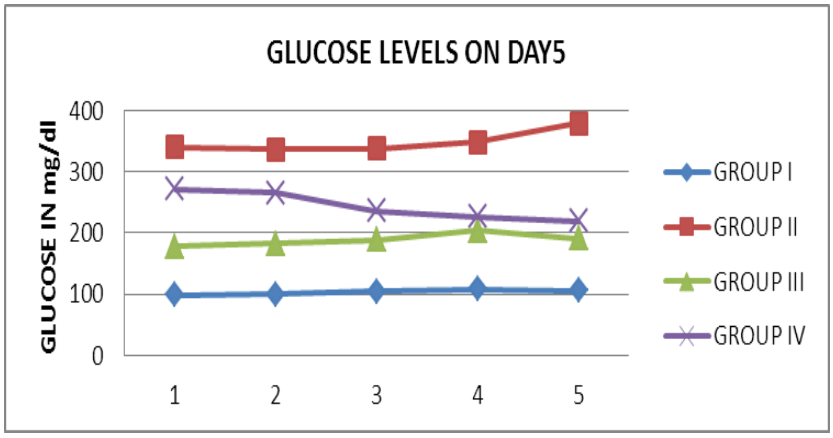


Fig 1:



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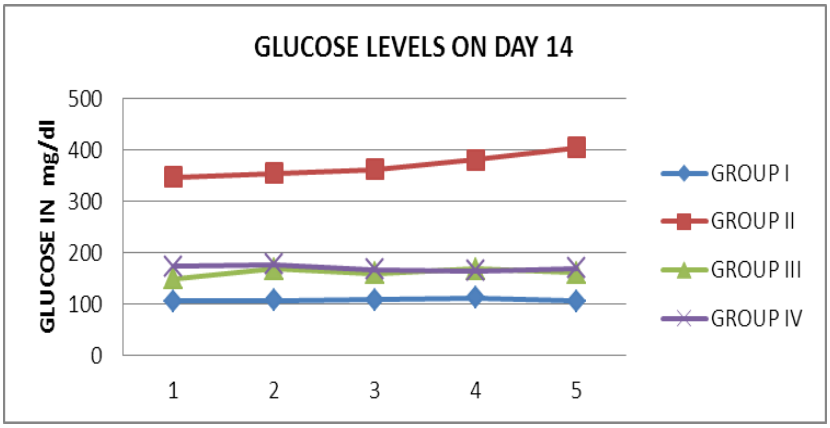

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Table 2: Body weight of the rats.

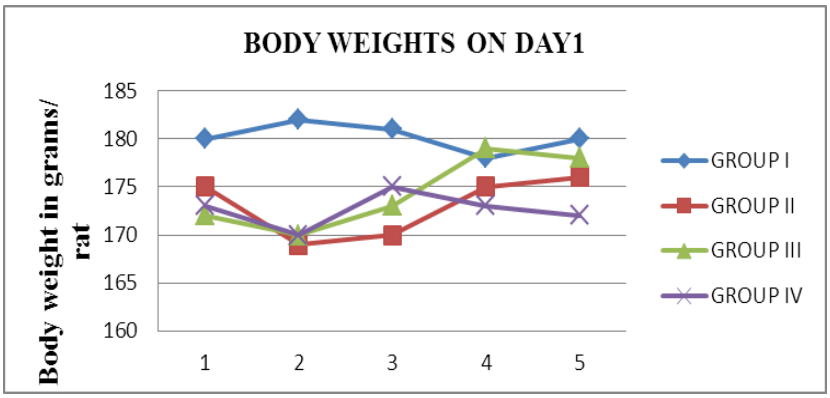
Groups	Day 1	Day 5	Day 14
Group I Control	180.2±0.66***	182.4±0.6***b	187.2±0.96***
Group II (Diabetic control -Alloxan treated)	173±1.44	169.2±0.59	165.8±1.2
Group III (Diabetic+ Glibenclamide)	174.4±1.74[a]	181±0.71***	179±0.77***
Group IV (Diabetic +Poly herbal extract)	172.6±0.81[a]	175.6±0.92***c	184.6±0.67***

***P<0.0001 statistically significant Vs Group II;

a=not statistically significant Vs Group II.

b=p value equal to 0.0001 Vs Group II.

c=p value equals to 0.0002 Vs Group II.



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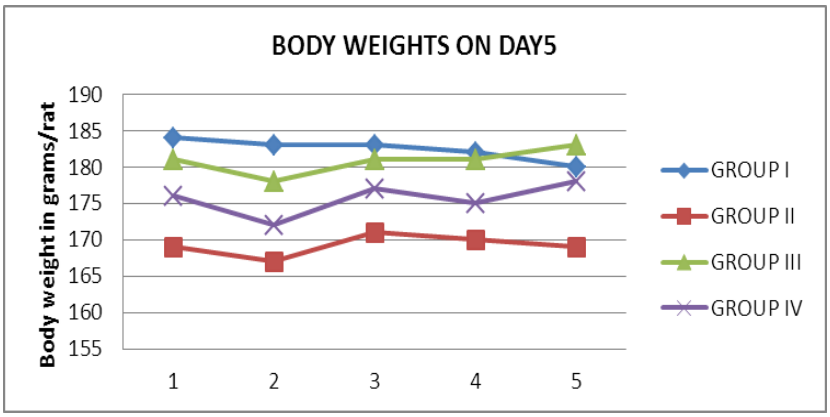

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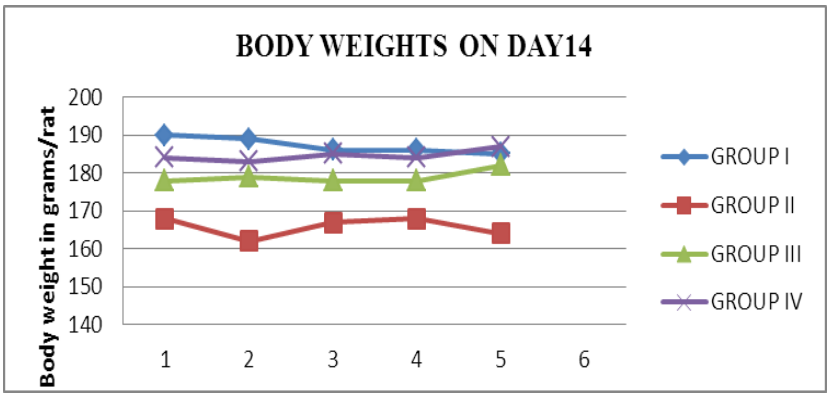

Fig 6:

DISCUSSION

The Present study was done to evaluate the antidiabetic activity of the Polyherbal extract (AChCaT) against diabetic rats. Animals were grouped into four groups (n=5) which were initially administered with alloxan 120mg/kg except Group I. The fasting blood glucose levels of the diabetic rats is >160mg/dl which indicates the hyperglycemia where the normal level of glucose is 50-135 mg/dl. [14] All the Groups were treated with respective test compounds (Group II-No treatment; Group III treated with Glibenclamide orally; Group IV with poly herbal extract orally). The Blood glucose and Body weights levels were recorded on 1st, 5th, 14th day of the study and given in Table 1 & Table 2. Polyherbal extract of dose 400mg/kg was administered to Group IV rats for the period of 14days.The recorded data of body weights , blood glucose was expressed as mean ± SEM .The results showed that the polyherbal extract have got antidiabetic activity which is comparable to the standard drug Glibenclamide and the glucose levels had a fall to 170.4 ±2.13 when compared to standard with blood glucose level 161.6 ±3.41 at the end of 14th day and no signs of toxicity were observed in the animals.

CONCLUSION

The Present study was done to evaluate the antidiabetic activity of the Polyherbal extract (Acacia ferruginia -bark & fruit; Chloroxylon swietenia - bark, leaf, root; Casearia elliptica – bark; Terminalia alata root, leaf against Alloxan induced diabetes in rats. The extract showed significant decrease in Blood glucose levels when compared to diabetic control group (Group II) and body weight of the rats were regained to normal level indicating there may be no signs of toxicity were observed in the animals. Thus this study concludes that the methanolic polyherbal extract has registered good activity against hyperglycemia condition. Further analysis of the Polyherbal extract is being conducted and planned as Ph. D work.

ACKNOWLEDGEMENTS

The authors are thankful to the Nishka labs for providing the drug Alloxan and also to the staff of V.L college of Pharmacy for providing the support to carry on the animal studies.

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