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Pharmacological Screening of Anti Diabetic Activity of Polyherbal Formulation In Wistar Albino Rats

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ABSTRACT

The aim of the present research is anti diabetic activity of polyherbal formulation comparing with individual plant extractions. The anti diabetic activity of a polyherbal formulation was evaluated in using Alloxan β - cytotoxin induced chemical diabetes in a wide variety of wister rats. Methanolic extract of the poly herbal formulation, prepared from powder of plants Fruits of *Momordica charantia*, stem and root of *Tinospora cordifolia*, aerial parts of *Andrographis peniculeta* and wood of *Pterocarpus marsupium* and leaves of *Gymnema sylvestre* was subjected to phytochemical test and pharmacological screening of Anti diabetic activity at a dose level 400mg/kg. The PHME (400mg/kg) treated diabetic rats show mean (\pm SEM) fasting serum glucose of 253.11 ± 3.41 mg/dl on day 0 which was reduced to 161.43 ± 3.55 mg/dl on day 7, 107.45 ± 4.52 mg/dl on day 14. These changes in fasting serum glucose illustrate that the diabetic rats treated with PHME (400mg/kg) show a progressive and significant ($p \leq 0.05$) reduction in fasting serum glucose during the treatment period in comparison to diabetic group of rats. It was concluded that individual extraction shows the activities but in combination of plants it shows synergistic effect so poly herbal extraction is useful more when compared with given in individual plants.

Keywords: *Momordica charantia*, *Tinospora cordifolia*, *Andrographis peniculeta*, *Pterocarpus marsupium*, *Gymnema sylvestre*

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INTRODUCTION

At present there is an extensive growth in the field of herbal mixtures, and these mixtures are gaining popularity both in developing and developed countries because of their natural origin and less side effects. Many traditional medicines are derived from medicinal plants and minerals which are used for the treatment of different chronic diseases like diabetes, asthma, and so forth¹ Major hindrance in amalgamation of herbal medicine in modern medical practices is lack of scientific and clinical data proving their efficacy and safety. There is a need for conducting clinical research in herbal mixtures, developing simple bioassays for biological standardization, pharmacological and toxicological evaluation, and developing various animal models for toxicity and safety evaluation. It is also important to establish the active components of these herbal extracts² Diabetes mellitus are a offbeat metabolic degenerate characterized by altered carbohydrate, lipid and protein metabolism.³ The management of diabetes mellitus is eventual a global cooling off period and prosperous benefit is as a crowning achievement to be discovered. The latter drugs, including insulin and oral hypoglycemic agents, concern the society sugar on the as search for 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. ^{4, 5} The assistance of diabetes mellitus has been attempted with diverse indigenous plants and polyherbal formulations. ^{6, 7}

The present study has been carried out to determine the hypoglycemic potential of some medicinal plants and the anti-diabetic activity of their polyherbal formulation in diabetic rats.

MATERIALS AND METHOD

Plant Material

The leaves of *Gymnema sylvestere* (fam. *Apocynaceae*), aerial parts of *Andrographis paniculata* (fam. *Acanthaceae*), Fresh fruits of *Momordica charantia* (*Cucurbitaceae*), wood of *Pterocarpus marsupium* (*Fabaceae*), stem and root of *Tinospora cordifolia* (*Fabaceae*) Were collected from Thirupathi in Andhra Pradesh and authenticated from Dr. Madhava shetti, Department of botany, S.V University, Thirupathi.

Preparation of Poly Herbal Extract

The leaves of *Gymnema sylvestere* (fam. *Asclepidaceae*), aerial parts of *Andrographis paniculata* (fam. *Acanthaceae*), Fresh fruits of *Momordica charantia* (*Cucurbitaceae*), wood of *Pterocarpus marsupium* (*Fabaceae*), stem and root of *Tinospora cordifolia* (*Fabaceae*) individually and poly herbal of both plant materials are made into powder and then gone for the Maceration with sufficient quantity of methanol for 7 days. During maceration, it was shaken twice daily. On 7th

day it was filtered and the filtrate was concentrated. The remaining solvent was evaporated by heating on a water bath (50°C) to get methanolic extract and the extract was stored in desiccator.

Phytochemical Screening of Poly Herbal Extract

The poly herbal extract were subjected to qualitative test for the identification of varies active constituents viz. alkaloids, carbohydrates and glycosides, cardiac glycosides, steroids, saponins, tannins and flavonoids using standard test procedures.

Animals

Adult healthy Wistar rats of either sex of about 6-8 weeks of age, weighing 180 - 220g, Female and male animals were separately kept in polypropylene cages in groups of six. The animals were given free access to water and food and were fed with standard rat pellet diet. The protocol of the experiment was approved by the Institutional Animal Ethics Committee (**IAEC NO: P37/VCP/2015/10/DBP/AE12/RATS**) and experiments were conducted according to the guidelines of the Committee for the Purpose of Control and Supervision of Experiments on Animals (CPCSEA).

Toxicity Studies

Wistar rats (200-250gm) of either sex were selected and segregated in to 8 groups of 6 animals each. Single dose of methanolic extract of polyherbal formulation, starting from the minimal dose of 50mg/kg up to 3000mg/kg administered orally. The drug treated animals were observed carefully for its toxicity signs and mortality. From the maximum dose, 1/5th and 1/10th of the concentration was considered as therapeutic dose for further study.

Anti diabetic activity^{8,9}

Activity in Alloxon Induced Hyperglycaemic Rats¹⁰

1. Single dose study
2. Multiple dose study (14 days treatment)

Single Dose Study

Induction of Diabetes:

The animals were allowed to fast for 24hrs and rendered diabetic by injecting a single dose of alloxon at 150mg/kg body weight administered as a 5% w/v in distilled water by i.p. route. It produces diabetes by selected necrosis of β - cells of islets of Langerhans of pancreas.

After 48 hrs of injecting alloxon, diabetes was confirmed by testing blood sugar with *Erba CHEM 5 Plus* Auto analyzer. The animals with sugar level more than 250mg/dl were selected. Animals were maintained for four days in diabetic condition for well establishment of diabetes.

Standard: Glipizide at the dose of (5mg/kg) was used as a standard drug.

Experimental Design:

Animals were divided into eight groups of six each. The animals (Wister rats) were fasted for 18h but were allowed free access to water before and throughout the duration of experiment.

Group-I: Administered with vehicle (distilled water) and served as Normal control.

Group-II: Administered with standard drug Glipizide (5mg/kg).

Group III: Administered (MEGS) methanolic extraction of *Gymnema sylvestere* (400mg/kg).

Group IV: Administered (MEPM) methanolic extraction of *Pterocarpus marsupium* (400mg/kg).

Group V: Administered (MEMC) methanolic extraction of *Momordica charantia* (400mg/kg).

Group VI: Administered (MEAP) methanolic extraction of *Andrographis paniculata* (400mg/kg).

Group VII: Administered (METC) methanolic extraction of *Tinospora cordifolia* (400mg/kg).

Group VIII: Administered (PHME) Poly herbal methanolic extraction (400mg/kg).

Multiple dose treatment (14 days treatment)

The animals used for this study are the same animals used for single dose study, had free access to feed and water during this period

The chronic study involved repeated administration of extracts of MEGS, MEPM, MEMC, MEAP, METC, PHME and Glipizide for 14days (once a day) to the groups used for single dose study at a prefixed times and blood glucose levels were estimated in samples withdrawn after 2h on day 0, 7th and 14th day.

RESULTS AND DISCUSSION**Body Weight:**

The changes in body weight of the different groups of animals during the period of study was given in **Table 1** and represented in **Figure 1** which shows an increase in the mean body weight (\pm SEM) of normal rats from 230.33 ± 1.47 g on day 0 to 240.00 ± 1.06 g on day 7, 249.2 ± 0.94 g on day 14. This shows that the group of normal rats gained body weight during the treatment period of 14 days.

During the same period of treatment, the diabetic group of rats has shown a change in body weight from a mean (\pm SEM) value of 190.5 ± 1.2 g on day 0, $160. \pm 1.28$ g. on day 7 and which decreased further to 132.8 ± 1.07 g on day 14. These changes in the body weight illustrate that the diabetic rats show a progressive loss of body weight, which was found to be significant ($p \leq 0.05$) during the 14 days of treatment period as against the gain in body weight seen in normal group of rats.

The glipizide (5 mg/kg) treated group of diabetic rats shows a mean (\pm SEM) body weight of 189.73 ± 1.4 g on day 0, however this was found to have been increased to 204.6 ± 1.08 g on day

7, and 212.5 ± 1.6 g, on day 14. The body weight gain in this group of rats from day 0 through day 7 to day 14 was relatively less when compared with the normal group. This shows that glipizide treatment has protected the diabetic rats from losing the body weight in a significant ($p < 0.01$) manner when compared with the diabetic control group of rats.

The MEGS (400 mg/ kg) treated group of diabetic rats were found to have mean body weight (\pm SEM) of 174.3 ± 2.30 g on day 0, 178.00 ± 1.4 g on day 7, 202.3 ± 0.9 g on day 14. These values show that the body weight was maintained in a significant manner ($p \leq 0.05$) throughout the study period in this group when compared with diabetic animals.

The MEPM (400 mg/kg) treated group of diabetic rats show mean (\pm SEM) body weight of 164 ± 1.25 g on day 0, 172.80 ± 1.9 g on day 7, 195.80 ± 1.13 g. on day 14 and these values show that the body weight was maintained in a significant manner ($p \leq 0.05$) throughout the study period in this group when compared with diabetic animals.

The MEMC (400 mg/kg) treated group of diabetic rats show mean (\pm SEM) body weight of 161 ± 1.12 g on day 0, 168 ± 2.21 g on day 7, 194 ± 2.11 g. On day 14 and these values show that the body weight was maintained in a significant manner ($p \leq 0.05$) throughout the study period in this group when compared with diabetic animals.

The MEAP (400 mg/kg) treated group of diabetic rats show mean (\pm SEM) body weight of 161 ± 1.21 g on day 0, 169 ± 2.21 g on day 7, 193 ± 2.11 g. On day 14 and these values show that the body weight was maintained in a significant manner ($p \leq 0.05$) throughout the study period in this group when compared with diabetic animals.

The METC (400 mg/kg) treated group of diabetic rats show mean (\pm SEM) body weight of 160 ± 1.21 g on day 0, 167 ± 2.21 g on day 7, 194 ± 2.11 g. on day 14 and these values show that the body weight was maintained in a significant manner ($p \leq 0.05$) throughout the study period in this group when compared with diabetic animals.

The PHME (400 mg/kg) treated group of diabetic rats show mean (\pm SEM) body weight of 158 ± 1.23 g on day 0, 165 ± 1.43 g on day 7, 192 ± 1.44 , on day 14 and these values show that the body weight was maintained in a significant manner ($p \leq 0.05$) throughout the study period in this group when compared with diabetic animals.

Table 1: Effect of MEGS, MEPM, MEMC, MEAP, METC and PHME on body weight of rats

Groups	Dose Administered	Body Weight (Mean \pm S.E.M) in 'gm'		
		0 Day	7 th Day	14 th Day
Group-I	Distilled water	230.33 ± 1.47	240.00 ± 1.06	249.2 ± 0.94
Group-II	Alloxan, 150mg/kg	190.5 ± 1.2^a	160.6 ± 1.28^a	132.8 ± 1.07^a

Group-III	Glipizide 5mg/kg	189.73±2.4*	204.6±1.08*	212.5±1.6*
Group-IV	MEGS 400mg/kg	174.3±2.3*	178.00±1.4*	202.3±0.9*
Group-V	MEPM 400 mg/kg	164±1.25*	172.8±1.9*	195.8±1.13*
Group-VI	MEMC 400mg/kg	161±1.12*	169±2.21*	194±2.11*
Group-VII	MEAP 400mg/kg	161±1.21*	168±2.21*	193±2.11*
Group-VIII	METC400mg/kg	160±1.21*	167±2.21*	194±2.11*
Group-XI	PHME 400mg/kg	158±1.23*	165±1.43*	192±1.44*

Values are expressed as mean ± SEM; n=6

^a p≤0.01 Diabetes control Vs G-I

* p≤0.05, Glipizide/ MEGS/ MEPM/ MEMC/MEAP/ METC /PHME Vs Diabetic Control.

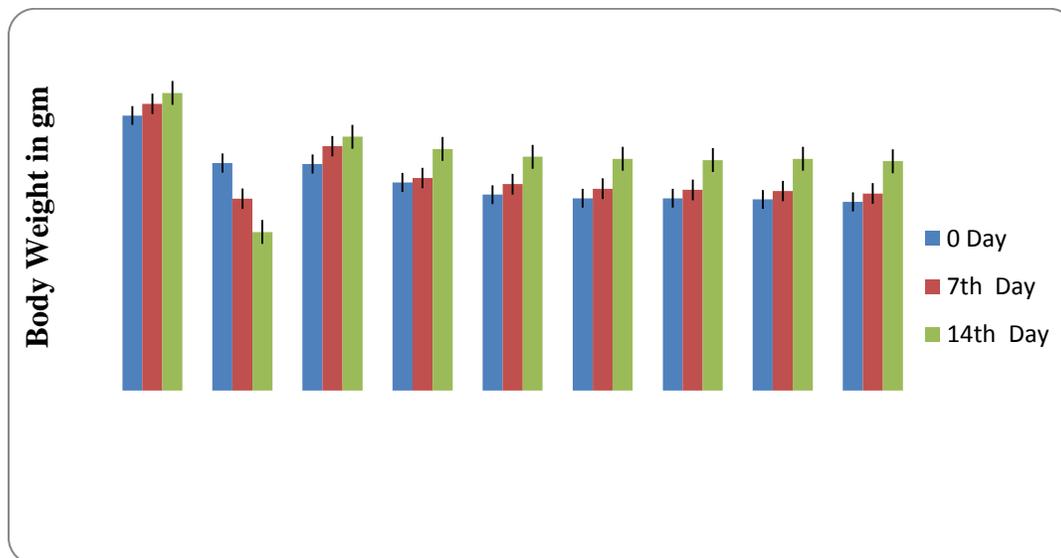


Figure 1: Effect of MEGS, MEPM, MEMC,MEAP, METC and PHME on body weight in rats.

Effect on alloxon induced hyperglycaemic rats:

The fasting serum glucose of the different groups of animals during the single dose treatment period of study is given in **Table 2**. and presented in **figure 2**, which shows that the mean (\pm SEM) fasting serum glucose values of the normal group of rats was 95.76 ± 0.248 , 96.2 ± 0.21 , 96.86 ± 0.47 , 97.3 ± 0.26 , 97.96 ± 0.29 , 98.65 ± 0.15 and 97.68 ± 0.44 mg/dl, on 0, 1, 2, 4, 8, 12 and 24 hr respectively. The above values show that the fasting serum glucose in the normal group of rats was maintained within the normal range throughout the period of study.

The mean fasting serum glucose (\pm SEM) in the diabetic control group of rats was found to be 262.16 ± 07.96 , 266.5 ± 7.39 , 275.5 ± 7.20 , 285 ± 7.42 , 296.16 ± 6.84 , 316.5 ± 4.61 and 326.16 ± 4.76 mg/dl on 0, 1, 2, 4, 8, 12 and 24 hr respectively, which was found to be significantly ($p \leq 0.01$) higher when compared with the normal rats.

The glipizide (5 mg/kg) treated diabetic rats show a mean (\pm SEM) fasting serum glucose of 253.00 \pm 3.36 mg/dl on 0 hr which was reduced to 237.83 \pm 5.36 mg/dl on 1 hr, which reduced further to 168.16 \pm 2.79, 83 \pm 4.09, 87.5 \pm 3.48, 95 \pm 2.06 and 98.35 \pm 1.75 mg/dl on 2, 4, 8, 12 and 24 hr respectively.

These changes in fasting serum glucose values illustrate that the diabetic rats treated with glipizide show a progressive and significant ($p \leq 0.05$) including on the 4 hr, it shows highly significant ($p \leq 0.01$) in reduction of fasting serum glucose, during the treatment period in comparison to the diabetic group of rats. This indicates that the glipizide treatment of diabetic rats is able to bring back the fasting serum glucose levels nearer to normal range throughout the study period.

The MEGS (400mg/kg) treated hyperglycaemic rats show mean (\pm SEM) fasting serum glucose of 265.83 \pm 5.19 mg/dl on 0hr which was found to have been reduced 238.83 \pm 3.67mg/dl on 1hr which reduced further to 195.33 \pm 2.29, 138.33 \pm 1.92, 98.16 \pm 1.85, 123.91 \pm 2.25 and 140.65 \pm 1.80mg/dl on 2, 4, 8, 12 and 24hr respectively.

These changes in fasting serum glucose values illustrate that the diabetic rats treated with MEGS (400mg/kg) show a progressive and significant ($p \leq 0.05$) including on the 8 hr, it shows highly significant ($p \leq 0.01$) values in reduction of fasting serum glucose during the single dose of treatment period in comparison to the normal group of rats.

The MEPM (400mg/kg) treated hyperglycaemic rats show mean (\pm SEM) fasting serum glucose of 268.36 \pm 6.75mg/dl on 0hr which was reduced to 249.8 \pm 5.14mg/dl on 1hr, which reduced further to 207 \pm 3.00, 156.58 \pm 6.56, 112.26 \pm 3.76, 131.05 \pm 3.47 and 177.51 \pm 7.35 mg/dl on 2, 4, 8, 12 and 24 hr respectively. These changes in fasting serum glucose illustrate that the diabetic rats treated with MEPM (400 mg/kg) show a progressive and significant ($p \leq 0.05$) including on the 8 hr, it shows highly significant ($p \leq 0.01$) reduction in fasting serum glucose during the treatment period in comparison to diabetic group of rats.

The MEMC (400mg/kg) treated hyperglycaemic rats show mean (\pm SEM) fasting serum glucose of 258.11 \pm 2.33mg/dl on 0hr which was reduced to 242.21 \pm 1.32mg/dl on 1hr, which reduced further to 174.23 \pm 2.21, 88.22 \pm 2.32, 95.11 \pm 2.16, 101.21 \pm 2.22 and 106.13 \pm 2.32 mg/dl on 2, 4, 8, 12 and 24 hr respectively. These changes in fasting serum glucose illustrate that the diabetic rats treated with MEMC (400mg/kg) show a progressive and significant ($p \leq 0.05$) including on the 8 hr, it shows highly significant ($p \leq 0.01$) reduction in fasting serum glucose during the treatment period in comparison to diabetic group of rats.

The MEAP (400mg/kg) treated hyperglycaemic rats show mean (\pm SEM) fasting serum glucose of 259.11 \pm 2.33mg/dl on 0hr which was reduced to 241.21 \pm 1.22mg/dl on 1hr, which reduced further

to 174.13±2.11, 88.22±2.32, 95.12±1.16** a, 101.21±2.32 and 106.14±2.12 mg/dl on 2, 4, 8, 12 and 24h respectively. These changes in fasting serum glucose illustrate that the diabetic rats treated with MEAP (400mg/kg) show a progressive and significant (p≤0.05) including on the 8h, it shows highly significant (p≤0.01) reduction in fasting serum glucose during the treatment period in comparison to diabetic group of rats.

The METC (400mg/kg) treated hyperglycaemic rats show mean (±SEM) fasting serum glucose of 261.11±2.33mg/dl on 0hr which was reduced to 241.31±1.22mg/dl on 1hr, which reduced further to 173.23±2.21, 88.21±2.32, 95.12±2.16, 101.23±2.22 and 106.13±2.32 mg/dl on 2, 4, 8, 12 and 24 hr respectively. These changes in fasting serum glucose illustrate that the diabetic rats treated with METC (400mg/kg) show a progressive and significant (p≤0.05) including on the 8 hr, it shows highly significant (p≤0.01) reduction in fasting serum glucose during the treatment period in comparison to diabetic group of rats.

The PHME (400mg/kg) treated hyperglycaemic rats show mean (±SEM) fasting serum glucose of 255.11±1.45mg/dl on 0hr which was reduced to 239.21±1.61mg/dl on 1hr, which reduced further to 171.21±1.23, 86.31±1.14, 89.11±1.32, 97.23±2.34and 101.11±1.33mg/dl on 2, 4, 8, 12 and 24 hr respectively.

Table 2: Effect of MEGS, MEPM, MEMC, MEAP, METC and PHME on serum glucose levels in alloxan induced diabetes rats (Single dose study)

Gro up	Dose (mg/kg)	Serum glucose levels in mg/dl (Mean ± S.E.M)						
		0 hr	1 hr	2hr	4hr	8hr	12hr	24hr
I	water	95.76 ± 0.24	96.2 ±0.21	96.86 ±0.47	97.3 ±0.26	97.96 ±0.29	98.65 ±0.15	97.68 ±0.44
		II	alloxan150 mg/kg	262.16 ±7.96 b	266.5±7.39 b	275.5±7.2 b	285±7.42 b	296.16±6.84 b
III	Glipizide 5 mg/kg	253±3.36	237.83±5.36** a	168.16±2.79** a	83±4.09* a	87.5±3.48** a	95.00±2.06** a	98.35±1.75** a
IV	MEGS 400mg/kg	265.83 ± 5.19	238.83±3.67** a	195.33±2.29** a	138.33±1.92** a	98.16±1.85** a	123.91±2.25* a	140.65±1.80** a
V	MEPM 400 mg/kg	268.36 ± 6.75	249.8±5.14	207.25±3.0** a	156.58±6.56** a	112.26±3.76* a	131.05±3.47** a	177.51±7.35** a
VI	MEMC 400mg/kg	258.11 ±2.33	242.21±1.32	174.23±2.21	88.22±2.32	95.11±2.16** a	101.21±2.22	106.13±2.32** a
VII	MEAP 400mg/kg	259.11 ±2.33	241.21±1.22	174.13±2.11	88.22±2.32	95.12±1.16** a	101.31±2.32	106.14±2.12** a
VIII	METC400 mg/kg	261.11 ±2.33	241.31±1.22	173.23±2.21	88.21±2.32	95.12±2.16** a	101.23±2.22	106.13±2.32** a
XI	PHME 400mg/kg	255.11 ±1.45	239.21±1.61	171.21±1.23	86.31±1.14	89.11±1.32	97.23±2.34	101.11±1.33** a

Values are expressed as mean \pm SEM; $n=6$ * $P<0.05$, ** $P<0.01$,

‘a’ indicates comparison of G-III,IV and G-V with Diabetic control ** $P<0.01$ ‘b’ indicates comparison of G-II with G-I

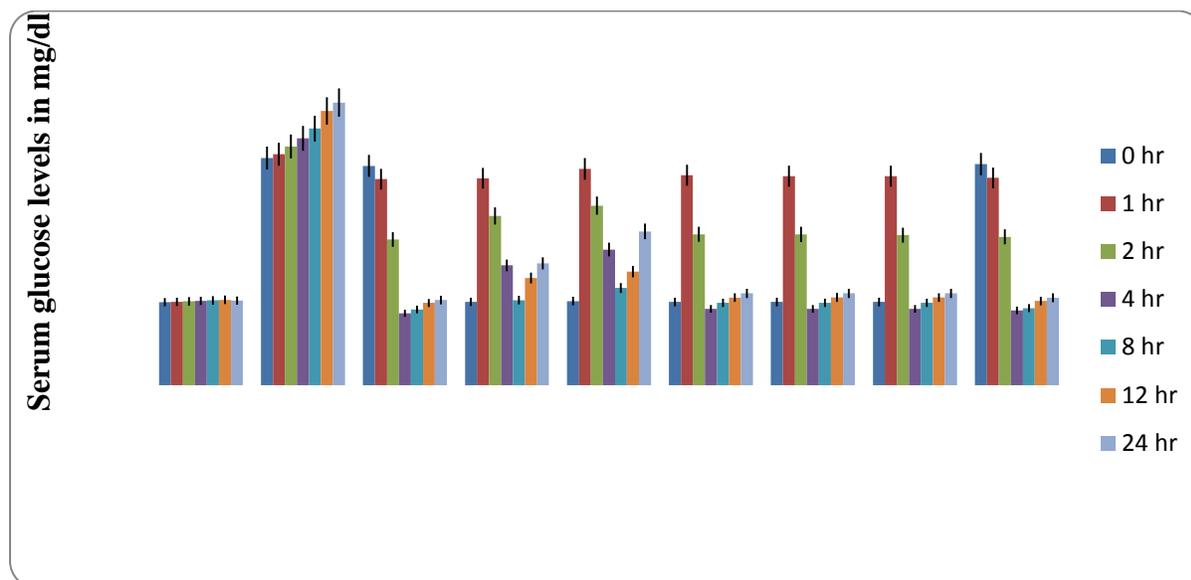


Figure 2: Effect of MEGS, MEPM, MEMC, MEAP, METC and PHME on serum glucose levels in alloxan induced diabetes rats (Single dose study)

Multiple dose study:

The fasting serum glucose of the different groups of animals during the chronic study is given in Table 3 and presented in figure 3. which shows that the mean (\pm SEM) fasting serum glucose values of the normal group of rats was 94.63 ± 0.54 , 96.27 ± 0.60 , 97.29 ± 1.09 mg/dl on day 0, day 7, and day 14 respectively. The above values show that the fasting serum glucose in the normal group of rats was maintained within the normal range throughout the period of study.

The mean fasting serum glucose (\pm SEM) in the diabetic control group of rats was found to be 269.64 ± 2.89 , 337.73 ± 9.899 , 386.5 ± 17.92 and mg/dl, on 0, day 7, day 14 respectively, which was found to be significantly ($p \leq 0.01$) higher when compared with the normal rats. These elevated fasting serum glucose levels were found to have been maintained throughout the 14 days of treatment period indicating that the rats are rendered diabetic.

The glipizide (5 mg/kg) treated diabetic rats show a mean (\pm SEM) fasting serum glucose of 251.83 ± 3.07 mg/dl on 0 day which was reduced to 158.30 ± 0.55 mg/dl on 7 which reduced further to 106.6 ± 0.98 mg/dl on day 14 respectively. These changes in fasting serum glucose values illustrate that the diabetic rats treated with glipizide show a progressive and significant ($p \leq 0.05$) including on the day 7 and day 14, they show highly significant ($p \leq 0.01$) in reduction of fasting serum glucose, during the treatment period in comparison to the diabetic group of rats. This

indicates that the glipizide treatment of diabetic rats is able to bring back the fasting serum glucose levels nearer to normal range throughout the study period.

The MEGS (400mg/kg) treated diabetic rats show mean (\pm SEM) fasting serum glucose of 271.26 \pm 3.68 mg/dl on 0 day which was found to have been reduced 185.11 \pm 6.63 mg/dl, 123.19 \pm 02.25 mg/dl on day 7, day 14 and respectively.

These changes in fasting serum glucose values illustrate that the diabetic rats treated with MEGS (400 mg/kg) show a progressive and significant ($p\leq 0.05$) including on the day 7 and day 14, they show highly significant ($p\leq 0.01$) values in reduction of fasting serum glucose during the single dose of treatment period in comparison to the diabetic group of rats.

The MEPM(400mg/kg) treated diabetic rats show mean (\pm SEM) fasting serum glucose of 274.1 \pm 2.481mg/dl on day 0 which was reduced to 189.48 \pm 5.56 mg/dl on day 7, 130.31 \pm 1.79 mg/dl on day 14 a mg/dl. These changes in fasting serum glucose illustrate that the diabetic rats treated with MEPM (400mg/kg) show a progressive and significant ($p\leq 0.05$) reduction in fasting serum glucose during the treatment period in comparison to diabetic group of rats.

The MEMC (400mg/kg) treated diabetic rats show mean (\pm SEM) fasting serum glucose of 254.45 \pm 2.34mg/dl on day 0 which was reduced to 163.11 \pm 2.44mg/dl on day 7, 109.32 \pm 1.34mg/dl on day 14 a mg/dl. These changes in fasting serum glucose illustrate that the diabetic rats treated with MEMC (400mg/kg) show a progressive and significant ($p\leq 0.05$) reduction in fasting serum glucose during the treatment period in comparison to diabetic group of rats.

The MEAP (400mg/kg) treated diabetic rats show mean (\pm SEM) fasting serum glucose of 264.45 \pm 2.34mg/dl on day 0 which was reduced to 163.11 \pm 2.44mg/dl on day 7, 109.22 \pm 1.34mg/dl on day 14 a mg/dl. These changes in fasting serum glucose illustrate that the diabetic rats treated with MEAP (400mg/kg) show a progressive and significant ($p\leq 0.05$) reduction in fasting serum glucose during the treatment period in comparison to diabetic group of rats.

The METC (400mg/kg) treated diabetic rats show mean (\pm SEM) fasting serum glucose of 263.45 \pm 2.34mg/dl on day 0 which was reduced to 163.14 \pm 2.14mg/dl on day 7, 109.34 \pm 1.34mg/dl on day 14 a mg/dl. These changes in fasting serum glucose illustrate that the diabetic rats treated with METC (400mg/kg) show a progressive and significant ($p\leq 0.05$) reduction in fasting serum glucose during the treatment period in comparison to diabetic group of rats.

The PHME (400mg/kg) treated diabetic rats show mean (\pm SEM) fasting serum glucose of 253.11 \pm 3.41mg/dl on day 0 which was reduced to 161.43 \pm 3.55mg/dl on day 7, 107.45 \pm 4.52mg/dl on day 14 . These changes in fasting serum glucose illustrate that the diabetic rats treated with

PHME (400mg/kg) show a progressive and significant ($p \leq 0.05$) reduction in fasting serum glucose during the treatment period in comparison to diabetic group of rats.

Table 3: Effect of MEGS, MEPM, MEMC, MEAP, METC and PHME on serum glucose levels of rats after multiple dose treatment

Groups	Dose (mg/kg)	Serum glucose levels in mg/dl (Mean \pm S.E.M)		
		0 Day	7 Day	14 Day
I	Distilled water	94.63 \pm 0.54	96.27 \pm 0.60	97.29 \pm 1.09
II	alloxan 150mg/kg	269.64 \pm 2.89 ^a	337.73 \pm 9.89 ^a	386.51 \pm 17.92 ^a
III	Glipizide 5mg/kg	251.83 \pm 3.07*	158.30 \pm 0.55**	106.6 \pm 0.98**
IV	MEGS 400mg/kg	271.26 \pm 3.68	185.11 \pm 6.63**	123.19 \pm 2.25**
V	MEPM 400 mg/kg	274.11 \pm 2.48*	189.48 \pm 5.56**	130.31 \pm 1.79**
VI	MEMC 400mg/kg	254.45 \pm 2.34	163.11 \pm 2.44**	109.32 \pm 1.34**
VII	MEAP 400mg/kg	264.45 \pm 2.34	163.13 \pm 2.24**	109.22 \pm 1.34**
VIII	METC400mg/kg	263.45 \pm 2.34	163.14 \pm 2.14**	109.34 \pm 1.34**
XI	PHME 400mg/kg	253.11 \pm 3.41	161.43 \pm 3.55**	107.45 \pm 4.52**

Values are expressed as mean \pm SEM; n=6 ^a $p \leq 0.05$ Diabetes control Vs Normal control.

** $p \leq 0.01$, Vs Diabetic Control

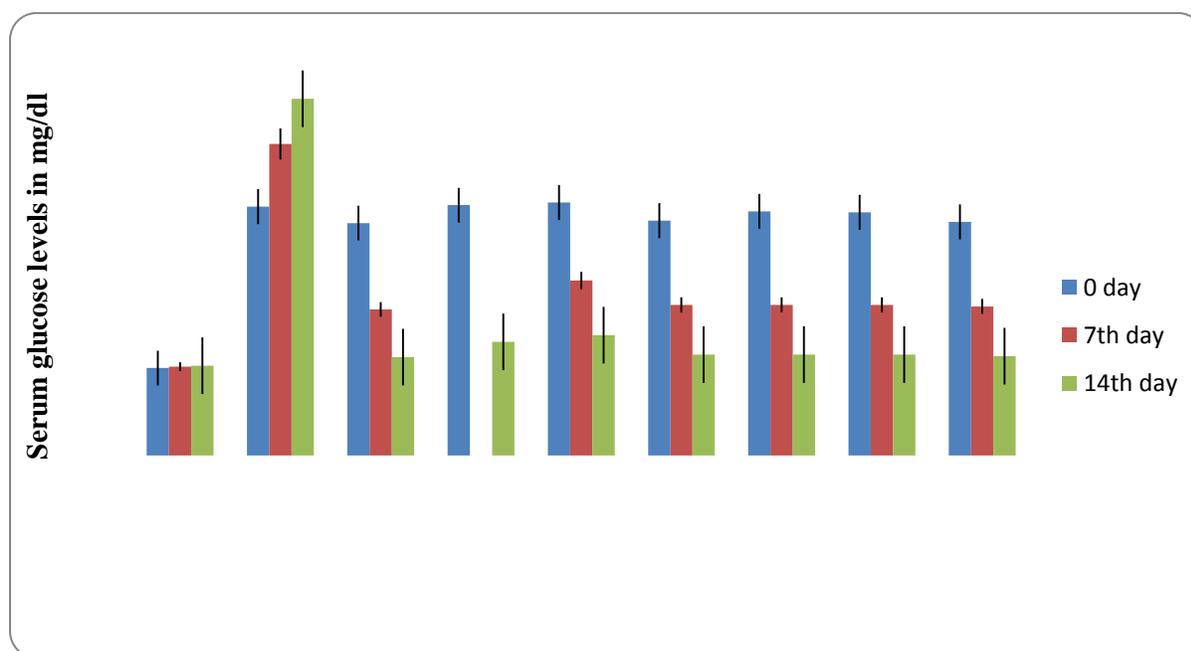


Figure 3: Effect of MEGS, MEPM, MEMC, MEAP, METC and PHME on serum glucose levels of rats after multiple dose treatment

CONCLUSION

Plants have played a significant role in human health care since the ancient times. Traditional plants exerts great role in discovery of new drugs, however, the exact mechanism responsible for activities is currently unclear. Therefore, further investigations need to be carried out to isolate and identify specific compounds present in the plant extract responsible for these activities and exact

mechanism. It was concluded that individual extraction shows the activities but in combination of plants it shows synergistic effect so poly herbal extraction is useful more when compared with given in individual plants.

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