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Antidiabetic activity of Methanolic extracts of Leaves of *Anogeissus acuminata Roxburgh ex candolle* and *Solanum pubescens Willd* by Alloxan induced model in Rats

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ABSTRACT

The Antidiabetic activity of Anogeissus acuminata Roxburgh ex candolle (Family:Combretaceae) and Solanum pubescens Willd (Family:Solanaceae) were investigated in Alloxan induced diabetic albino rats. A comparison was made between both the plant extracts and a known antidiabetic drug Glibenclamide (5 mg/kg body weight). The dried leaves of Anogeissus acuminata and Solanum pubescens were subjected to extraction by continuous hot percolation using methanol as solvent and were subjected to standardization using pharmacognostical and phytochemical screening. Dose selection was made on the basis of acute oral toxicity study (300 mg/kg body weight) as per OECD and CPCSEA guidelines. Oral administration of extracts of Anogeissus acuminata (300mg/kg) and Solanum pubescens(300mg/kg) for 7 days resulted in a significant reduction in blood glucose levels. Alloxan induced diabetic rat model was used for the evaluation of antidiabetic activity. Activity is more for Solanum pubescens in comparision with Anogeissus acuminata. Solanum pubescens methanolic extract (SPME) and Anogeissus acuminata methanolic extract (AAME) showed significant ($p<0.001$) antidiabetic activity. These extracts also prevented body weight loss in diabetic rats. The drug has the potential to act as an antidiabetic drug.

Key words: Anogeissus acuminata, Solanum pubescens, antidiabetic activity , Alloxan, Acute oral toxicity.

INTRODUCTION

The Antidiabetic activity of Anogeissus acuminata Roxburgh ex candolle (Family:Combretaceae) and Solanum pubescens Willd (Family:Solanaceae) were investigated in Alloxan induced diabetic albino rats. A comparison was made between both the plant extracts and a known antidiabetic drug Glibenclamide (5 mg/kg body weight). The dried leaves of Anogeissus acuminata and Solanum pubescens were subjected to extraction by continuous hot percolation using methanol as solvent and were subjected to standardization using pharmacognostical and phytochemical screening.

MATERIALS AND METHODS

Animals:
Healthy adult albino rats of Wister strain of either sex between the age of 2-3 months and weighing 150-200 grams were used for the present study. The animals were housed individually in polypropylene cages, maintained under standard conditions (12 hours light and12 hours dark cycle, 25 $\pm$5°C and 40-60% humidity). They were fed with standard rat pellet diet (National Institute for Nutrition, Hyderabad) and provided water ad libitum. All the animal

experiments were conducted according to the ethical norms approved by CPCSEA, Ethical committee IAEC reg. no. (1447/PO/a/11/CPCSEA).

Chemicals:
Alloxan monohydrate, Glibenclamide, Dextrose, Tween-80, Auto analyzer (Analytical technological limited) and One-touch (Horizon). All the other chemicals and reagents used were of analytical grade.

Plant Material:
Fresh leaves were collected from Chittoor district, Andhra Pradesh, India and authentified by Dr. K. MadhavaChetty, Professor, Department of Botany S.V. University, Tirupathi, Andhra Pradesh, India.

Preparation of Plant Extraction:
The collected leaves were shade dried and powdered in a grinder mixture to get coarse powder. The powdered leaves were defatted with petroleum ether and later extracted with methanol. The extract was evaporated to dryness, gave a residue of 40 % w/w.

Phytochemical Screening:
A preliminary phytochemical screening of methanolic extracts of *Anogeissus acuminata* and *Solanum pubescens* was carried by using standard procedures [1-3].

Acute Oral Toxicity Studies:
Acute oral toxicity studies[4] of the extracts were carried out as per the OECD guidelines, draft guidelines 423 adopted and received from Committee for the Purpose of Supervision and Control of Experiments on Animals (CPCSEA), Ministry of social justice and empowerment, Government of India. Administration of the stepwise doses of extracts of *Anogeissus acuminata* from 40 mg/kg body weight up to the dose 3000 mg/kg body weight caused no considerable signs of toxicity in the tested animals. One tenth of upper limit dose were selected as the level for examination of anti-diabetic activity.

Experimental model:
Alloxan monohydrate was first weighed individually for each animal according to their weight and then solubilized with 0.2 ml saline just prior to injection. Diabetes was induced by injecting it at a dose of 120 mg/kg body weight intraperitonially[4]. After 1 hour of Alloxan administration, the animals were given feed ad libitum, and 5% dextrose solution was also given in a feeding bottle for a day to overcome the early hypoglycemic phase. The animals were kept under observation and after 72 hours blood glucose was measured by One-touch glucometer. The diabetic rats (glucose level 200-300 mg/dl) were separated and divided into six different groups for experimental study, with each group containing six animals.

Experimental Design:
Different groups of rats were used to study the effects of SPME and AAME. The rats were divided into six groups each consisting of six rats.

Group-I: Normal/control animals received 1% tween80, 1ml per orally.
Group-II: Alloxan (120mg/kg body weight) induced diabetic animals received in 1% tween80, 3ml/kg body weight per orally.
Group-III: Alloxan (120g/kg body weight) induced diabetic animals received Glibenclamide0.5mg/kg body weight perorally.
Group-IV: Alloxan (120mg/kg body weight) induced diabetic animals received SPME 300mg/kg, body weight per orally.
Group-V: Alloxan (120mg/kg body weight) induced diabetic animals received AAME 300mg/kg, body weight per orally.

Significant hyperglycemia was achieved within 48 hrs after Alloxan (120mg/kg b.w. i.p.) injection induced diabetic rats with more than 200mg/dl of blood glucose were identified as to be diabetic and used for the study.

In acute study all the surviving diabetic animals and normal animals were fasted overnight Blood samples were collected from the fasted animals prior to the treatment with above scheduled and after administration, at each day up to 7 days.

Body Weight Measurement:
Body weight was measured totally four times during the course of study period[5] [i.e., before Alloxan induction (initial values), and on the first, fourth, and seventh days of the treatment period], using a weighing scale.

Statistical Analysis:
The results of the study were subjected to one way analysis of variance (ANOVA) followed by Dunnett's *t*-test for multiple comparisons. Values with $P<0.05$ were considered significant.

RESULTS AND DISCUSSION

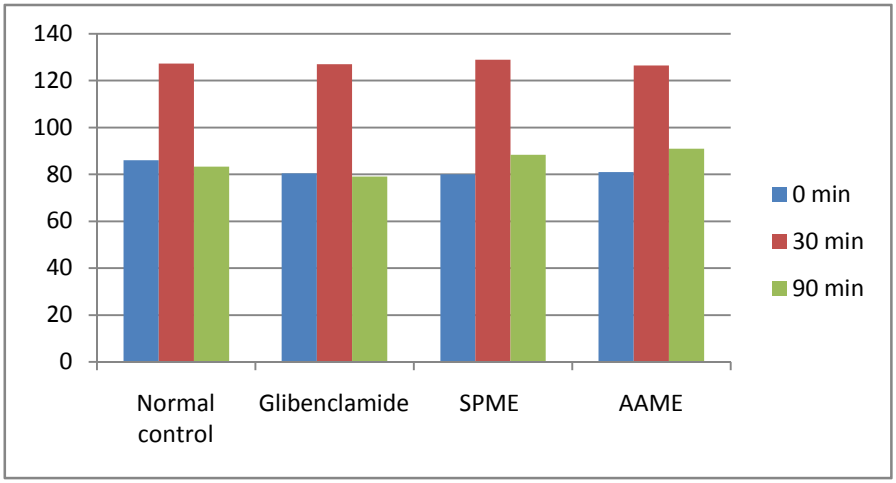
Phytochemical Screening:
Phytochemical screening of the extracts of *Anogeissus acuminata* and *Solanum pubescens* showed the presence of various chemical constituents, mainlyAlkaloids, Tannins, Flavonoids, Carbohydrates, Lignins, Proteins in *Anogeissus acuminata* and Flavonoids in *Solanum pubescence* may be responsible for its Anti-diabetic properties.The results obtained were comparable and satisfied the standard literature.

Acute Oral Toxicity Studies:
In acute toxicity study, none of the studied methanolic extracts of leaves showed any significant toxicity sign when observed for the parameters during the first 4 hours and followed by daily observations for 14 days and mortality was also not observed. The drug was found to be safe at the tested dose level of 3000 mg/kg b. w. One-tenth of this dose level was taken as effective dose. All the extracts were experimented at the same dose of 300 mg/kg b. w. In order to ascertain a scientific base for the usefulness of this plant in the treatment of diabetes. It was decided to evaluate experimental design of antidiabetic activity by Alloxan-induced model.

Table 1 Oral Glucose Tolerance test in normal rats
Oral glucose tolerance test

Sample	Dose	Blood Glucose Levels (mg/dl)		
		0 min	30 min	90 min
Normal control	2ml/kg	86 ± 1.065	127.2 ± 4.23	83.17 ± 1.24
Glibenclamide	5mg/kg	80.50 ± 1.335***	127 ± 4.203***	79.1±0.94***
MESP	300mg/kg	80 ±0.730***	129 ± 3.945***	88.33±2.044***
MEAA	300mg/kg	81 ±0.477***	126.5 ± 2.997***	91±1.167***

*The values are expressed as mean ± SEM. n=6 animals in each group Statistical significant test for comparison was done by ANOVA, followed by Dunnett's t-test. The blood glucose values of groups are compared with normal control animals, values ***p<0.001, **p<0.01, *p<0.05.*



At 30 min after glucose administration, the peak of blood glucose level increased rapidly from fasting value and then subsequently decreased. The methanolic extracts of *Solanum pubescence* and *Anogeissus acuminata* exhibited remarkable blood glucose lowering effect at 90 min.

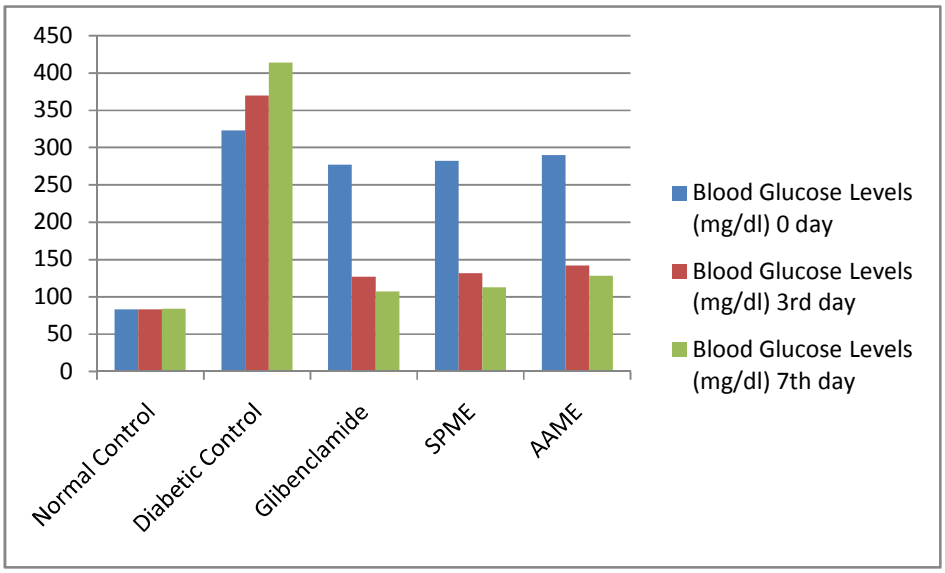
Blood glucose level

Table showed time dependent effect of Methanolic extract of *Solanum pubescens* and *Anogeissus acuminata* (300mg/kg) on plasma glucose level in Alloxan treated rats. The fasting blood sugar levels of each of the rats were checked every day with an autoanlyzer (Glucometer, Bioland G-423 S)glucose kit[6]. Statistical analysis by one-way ANOVA revealed that there was no significant difference among the groups at 0 day. Further, at 7 day showed that there was no significant difference among the groups. Post-hoc test revealed that methanolic extract of *Solanum pubescence* and *Anogeissus acuminata* (300mg/kg) showed significant decrease in the blood glucose level compared to Diabetic control.

Effect of Methanolic extract of *Anogeissus acuminata* and *Solanum pubescens* on blood glucose level in Alloxan induced Diabetic rats.

Group	Treatment	Dose	Blood Glucose Levels (mg/dl)		
			0 day	3rd day	7th day
I	Normal Control	2ml/kg	83.67 ± 2.48	83.5 ± 1.83	84.17 ± 2.15
II	Diabetic Control	125mg/kg	323.3 ± 12.92	369.7 ± 7.06	414.2 ± 5.03
III	Glibenclamide	5mg/kg	277.3 ± 5.22*	127 ± 4.2***	107.2±4.11***
IV	MESP	300mg/kg	282.3± 2.61*	131.8 ±3.36**	112.5±3.79***
V	MEAA	300mg/kg	290.3±2.30*	142 ±1.73**	128±2.43***

The values are expressed as mean ± SEM. n=6 animals in each group Statistical significant test for comparison was done by ANOVA, followed by Dunnett's *t*-test. The blood glucose values of groups III, IV and V are compared with control animals, values ***p<0.001, **p<0.01, *p<0.05



Effect of MEAA and MESP extract and Glibenclamide on blood glucose level in Alloxan induced Diabetic rats.

As expected in the diabetic control, there was severe hyperglycemia as compared to the normal animals. Compared to the diabetic control, the methanolic extract of *Solanum pubescence* and *Anogeissus acuminata* lowered the elevated blood glucose levels only in subacute treatment. It was observed that the standard drug Glibenclamide lowered the blood glucose level significantly, bringing it nearly back to normal, whereas methanolic extract of *Solanum pubescence* and *Anogeissus acuminata* significantly ($p<0.01$) decreased fasting blood serum glucose in diabetic rats on 3rd and 7th days as compared to initial (0hr) blood serum glucose levels. When methanolic extract of *Solanum pubescence* and *Anogeissus acuminata* were compared for their antidiabetic activity in comparison to active control, particularly Glibenclamide, the results showed that their potential was lesser but significant (**$p<0.01$) than the standard drug at subacute level.

Biochemical Estimations

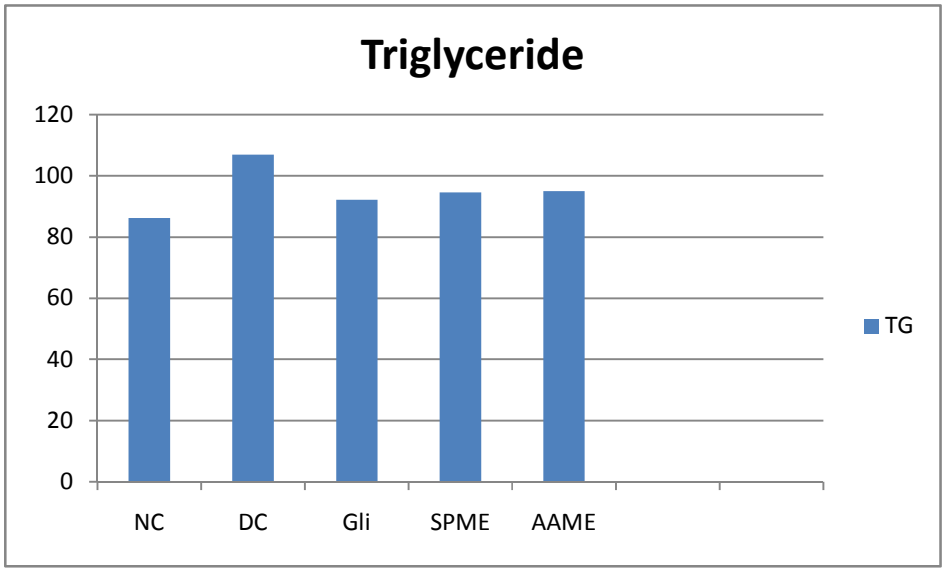
Biochemical Estimations showed significant reduction in serum parameters of Triglycerides, Total Protein, Lactate dehydrogenase, Total Cholesterol, Creatinine, Alkaline Phosphatase, Aspartate aminotransferase, Alanine aminotransferase, Albumin, Blood urea nitrogen, High density lipoprotein, Low density lipoprotein in methanolic extract of *Solanum pubescence* and *Anogeissus acuminata* treated rats shown in the Tables and Histograms below.

Triglycerides

Effect of Methanolic extract of *Anogeissus acuminata* and *Solanum pubescens* on Triglycerides level in Alloxan Induced Diabetic Rats

Group	Treatment	Dose	Triglycerides
I	Normal Control	2ml/kg	86.17 ± 1.88
II	Diabetic Control	125mg/kg	107.0 ± 2.68
III	Glibenclamide	5mg/kg	92.17 ± 1.70***
IV	MESP	300mg/kg	94.67± 1.52***
V	MEAA	300mg/kg	95 ± 3.12***

*#Values are expressed as mean ± SEM, n=6. Statistical significance test for comparison was done by one-way ANOVA, followed by Dunnett's t-test. ***p<0.001, **p<0.01, *p<0.05*



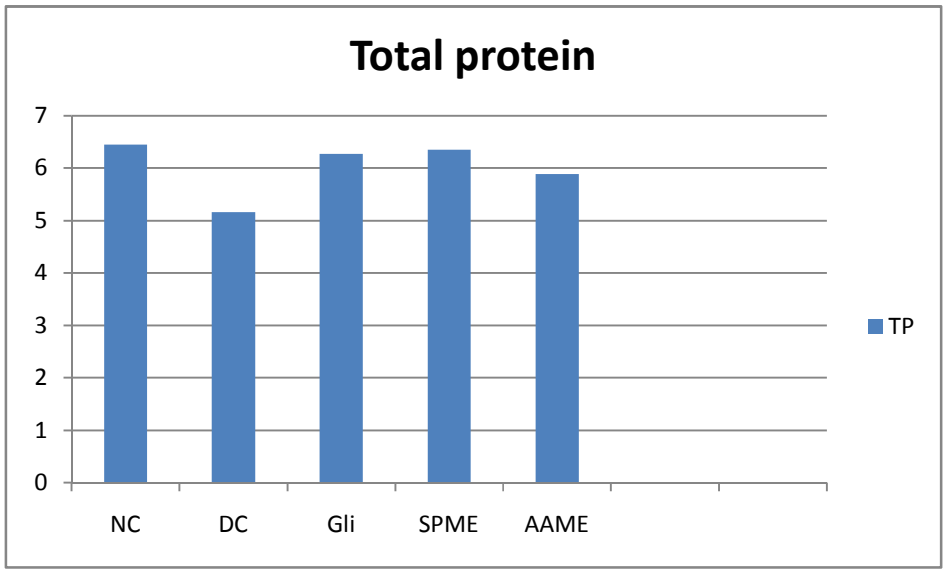
Effect of MEAA and MESP on Triglyceride level in Alloxan induced Diabetic rats.

Total Protein

Effect of Methanolic extract of *Anogeissus acuminata* and *Solanum pubescens* on Total Protein level in Alloxan Induced Diabetic Rats

Group	Treatment	Dose	Total Protein
I	Normal Control	2ml/kg	6.45 ± 0.16
II	Diabetic Control	125mg/kg	5.16 ± 0.14
III	Glibenclamide	5mg/kg	6.27 ± 0.08***
IV	MESP	300mg/kg	6.35±0.13***
V	MEAA	300mg/kg	5.89± 0.10***

*#Values are expressed as mean ± SEM, n=6. Statistical significance test for comparison was done by one-way ANOVA, followed by Dunnett's t-test. ***p<0.001, **p<0.01, *p<0.05.*



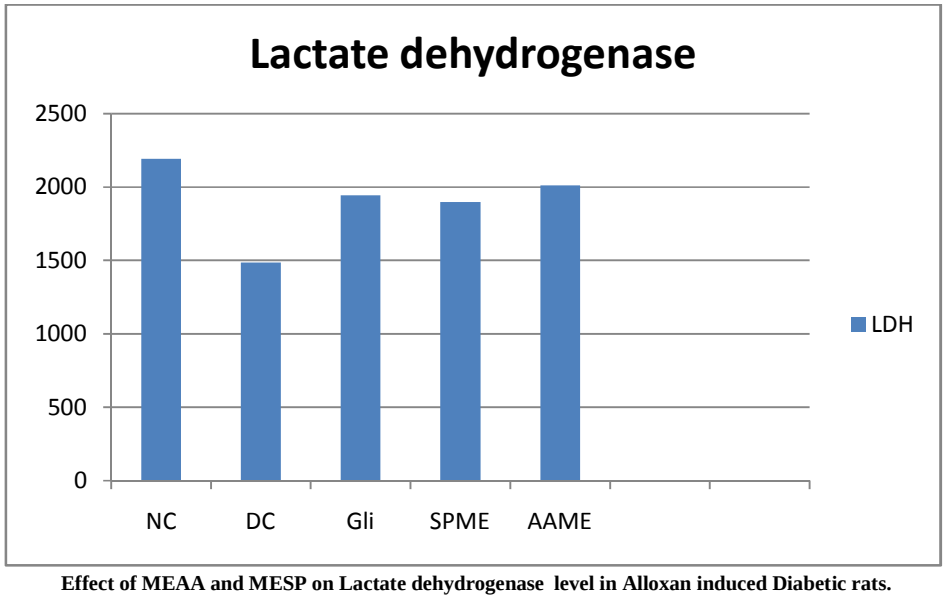
Effect of MEAA and MESP on Total protein level in Alloxan induced Diabetic rats.

Lactate dehydrogenase

Effect of Methanolic extract of *Anogeissus acuminata* and *Solanum pubescens* on Lactate dehydrogenase level in Alloxan Induced Diabetic Rats

Group	Treatment	Dose	LDH
I	Normal Control	2ml/kg	2192 ± 80
II	Diabetic Control	125mg/kg	1485 ± 15.0
III	Glibenclamide	5mg/kg	1944 ± 26.15***
IV	MESP	300mg/kg	1898± 24.31***
V	MEAA	300mg/kg	2011±18.36***

*#Values are expressed as mean ± SEM, n=6. Statistical significance test for comparison was done by one-way ANOVA, followed by Dunnett's t-test. ***p<0.001, **p<0.01, *p<0.05.*



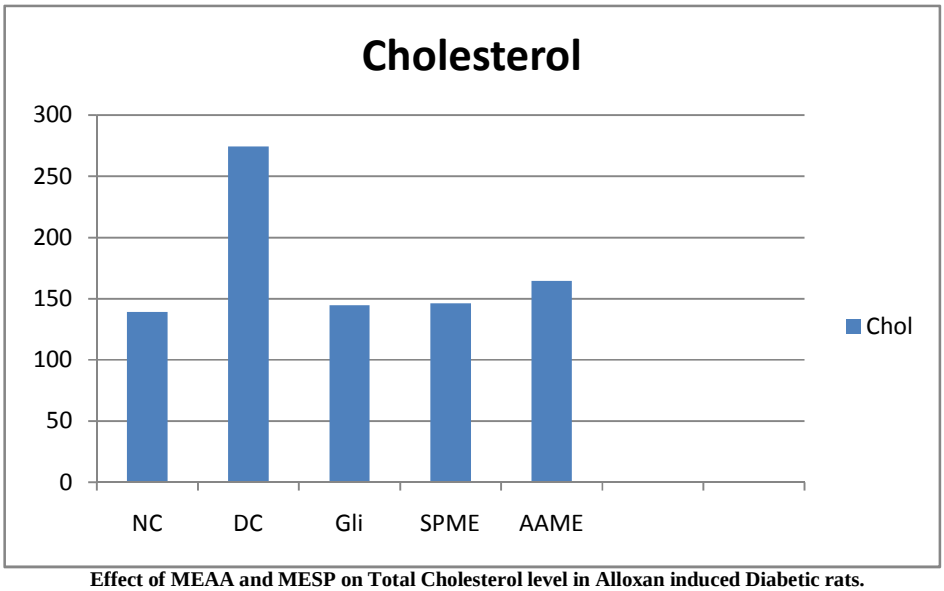
Effect of MEAA and MESP on Lactate dehydrogenase level in Alloxan induced Diabetic rats.

Total Cholesterol

Effect of Methanolic extract of *Anogeissus acuminata* and *Solanum pubescens* on Total Cholesterol level in Alloxan Induced Diabetic Rats

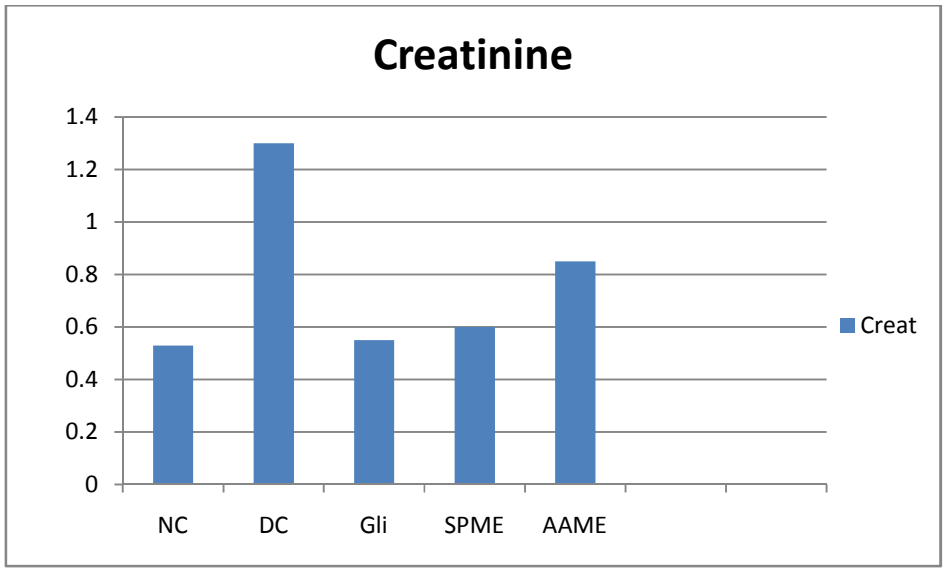
Group	Treatment	Dose	Total Cholesterol
I	Normal Control	2ml/kg	139.3 ± 2.98
II	Diabetic Control	125mg/kg	274.5± 1.94
III	Glibenclamide	5mg/kg	144.7 ± 3.21***
IV	MESP	300mg/kg	146.2±1.79***
V	MEAA	300mg/kg	164.5±5.74***

*#Values are expressed as mean ± SEM, n=6. Statistical significance test for comparison was done by one-way ANOVA, followed by Dunnett's t-test. ***p<0.001, **p<0.01, *p<0.05.*



Effect of MEAA and MESP on Total Cholesterol level in Alloxan induced Diabetic rats.

Creatinine



Effect of MEAA and MESP on Creatinine level in Alloxan induced Diabetic rats.

Effect of Methanolic extract of *Anogeissus acuminata* and *Solanum pubescens* on Creatinine level in Alloxan Induced Diabetic Rats

Group	Treatment	Dose	Creatinine
I	Normal Control	2ml/kg	0.53 ± 0.03
II	Diabetic Control	125mg/kg	1.30 ± 0.11
III	Glibenclamide	5mg/kg	0.55 ± 0.03***
IV	MESP	300mg/kg	0.60± 0.02***
V	MEAA	300mg/kg	0.85± 0.03***

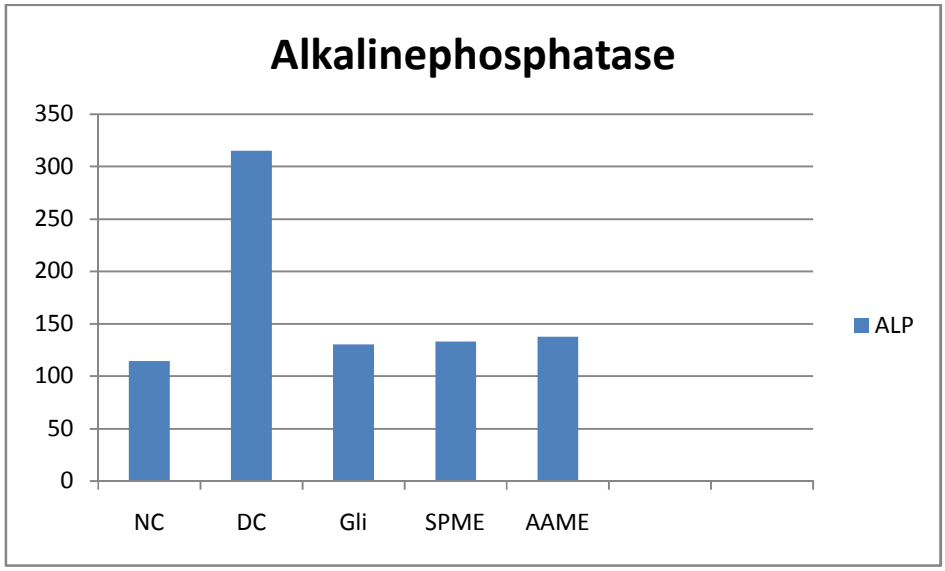
*#Values are expressed as mean ± SEM, n=6. Statistical significance test for comparison was done by one-way ANOVA, followed by Dunnett's t-test. ***p<0.001, **p<0.01, *p<0.05.*

Alkaline Phosphatase

Effect of Methanolic extract of *Anogeissus acuminata* and *Solanum pubescens* on Alkaline Phosphatase level in Alloxan Induced Diabetic Rats

Group	Treatment	Dose	ALP
I	Normal Control	2ml/kg	114.7 ± 1.61
II	Diabetic Control	125mg/kg	315.3 ± 8.83
III	Glibenclamide	5mg/kg	130.3 ± 3.99***
IV	MESP	300mg/kg	133.2± 1.64***
V	MEAA	300mg/kg	137.8±2.28***

*#Values are expressed as mean ± SEM, n=6. Statistical significance test for comparison was done by ANOVA, followed by Dunnett's t-test. ***p<0.001, **p<0.01, *p<0.05.*



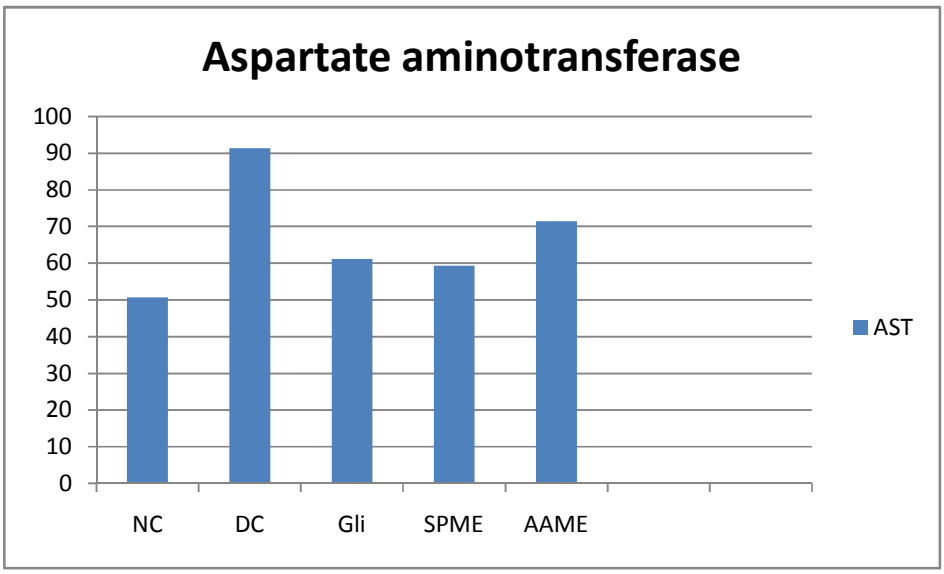
Effect of MEAA and MESP on Alkaline phosphatase level in Alloxan induced Diabetic rats.

Aspartate Aminotransferase

Effect of Methanolic extract of *Anogeissus acuminata* and *Solanum pubescens* on Aspartate Aminotransferase level in Alloxan Induced Diabetic Rats

Group	Treatment	Dose	AST
I	Normal Control	2ml/kg	50.67 ± 2.04
II	Diabetic Control	125mg/kg	91.33 ± 1.70
III	Glibenclamide	5mg/kg	61.17 ± 1.53***
IV	MESP	300mg/kg	59.33 ± 1.85***
V	MEAA	300mg/kg	71.5± 1.85***

*#Values are expressed as mean ± SEM, n=6. Statistical significance test for comparison was done by one-way ANOVA, followed by Dunnett's t-test. ***p<0.001, **p<0.01, *p<0.05.*



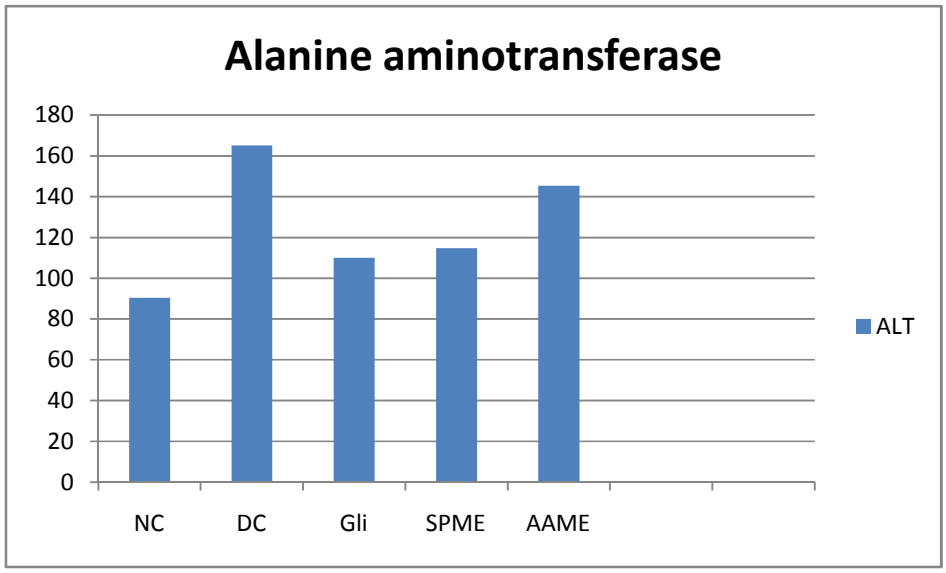
Effect of MEAA and MESP on Aspartate aminotransferase level in Alloxan induced Diabetic rats.

Alanine Aminotransferase

Effect of Methanolic extract of *Anogeissus acuminata* and *Solanum pubescens* on Alanine Aminotransferase level in Alloxan Induced Diabetic Rats

Group	Treatment	Dose	ALT
I	Normal Control	2ml/kg	90.5 ± 0.99
II	Diabetic Control	125mg/kg	165.2 ± 4.67
III	Glibenclamide	5mg/kg	110.0 ± 4.96***
IV	MESP	300mg/kg	114.7 ± 2.89***
V	MEAA	300mg/kg	145.3± 1.52***

*#Values are expressed as mean ± SEM, n=6. Statistical significance test for comparison was done by one-way ANOVA, followed by Dunnett's t-test. ***p<0.001, **p<0.01, *p<0.05.*



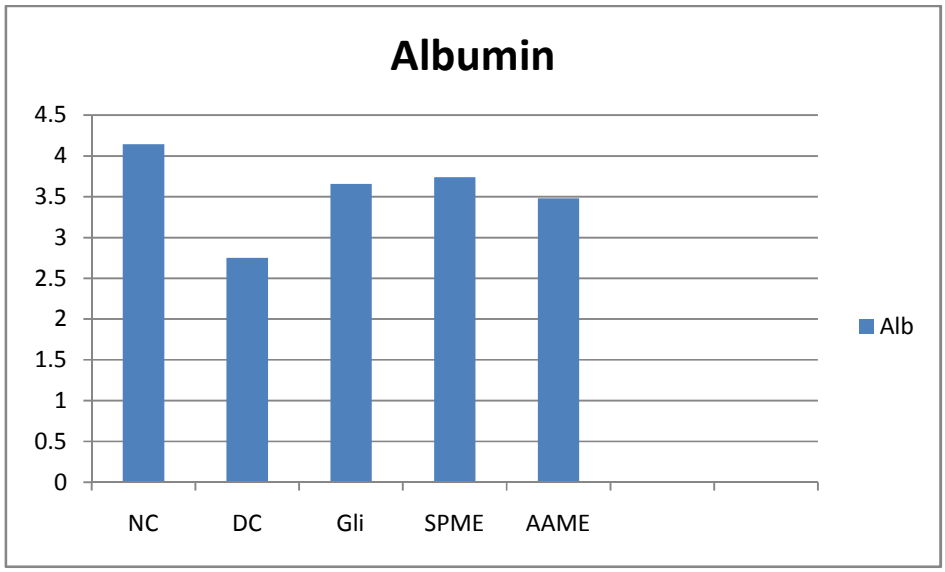
Effect of MEAA and MESP on Alanine aminotransferase level in Alloxan induced Diabetic rats.

Albumin

Effect of Methanolic extract of *Anogeissus acuminata* and *Solanum pubescens* on Albumin level in Alloxan Induced Diabetic Rats

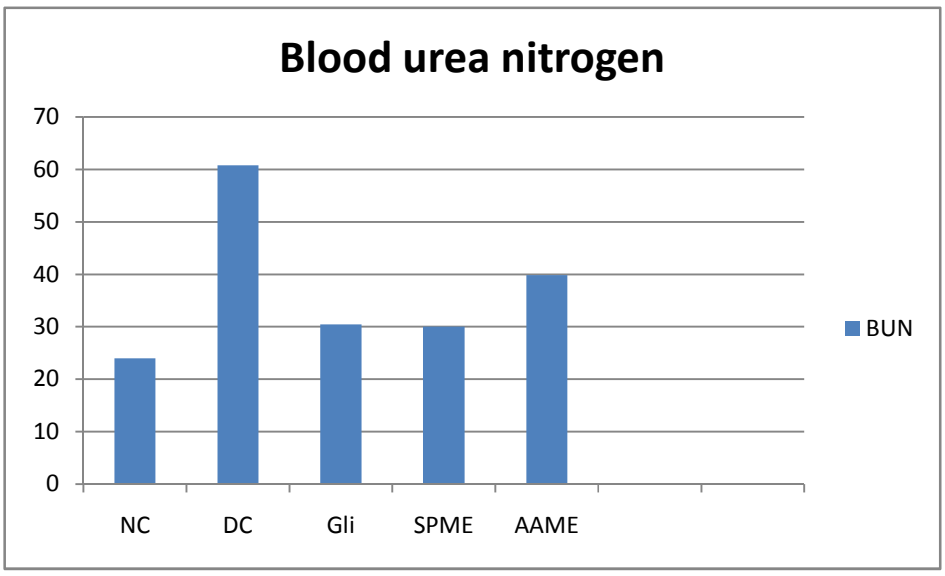
Group	Treatment	Dose	Albumin
I	Normal Control	2ml/kg	4.145 ± 0.11
II	Diabetic Control	125mg/kg	2.75 ± 0.29
III	Glibenclamide	5mg/kg	3.66 ± 0.15***
IV	MESP	300mg/kg	3.74 ± 0.07***
V	MEAA	300mg/kg	3.48± 0.18***

*#Values are expressed as mean ± SEM, n=6. Statistical significance test for comparison was done by one-way ANOVA, followed by Dunnett's t-test. ***p<0.001, **p<0.01, *p<0.05.*



Effect of MEAA and MESP on Albumin level in Alloxan induced Diabetic rats.

Blood urea nitrogen



Effect of MEAA and MESP on Bloodurea nitrogen level in Alloxan induced Diabetic rats.

Effect of Methanolic extract of *Anogeissus acuminata* and *Solanum pubescens* on Bloodurea nitrogen in Alloxan Induced Diabetic Rats

Group	Treatment	Dose	BUN
I	Normal Control	2ml/kg	24 ± 1.5
II	Diabetic Control	125mg/kg	60.80 ± 0.89
III	Glibenclamide	5mg/kg	30.46 ± 1.33***
IV	MESP	300mg/kg	30±0.84***
V	MEAA	300mg/kg	39.86± 0.32***

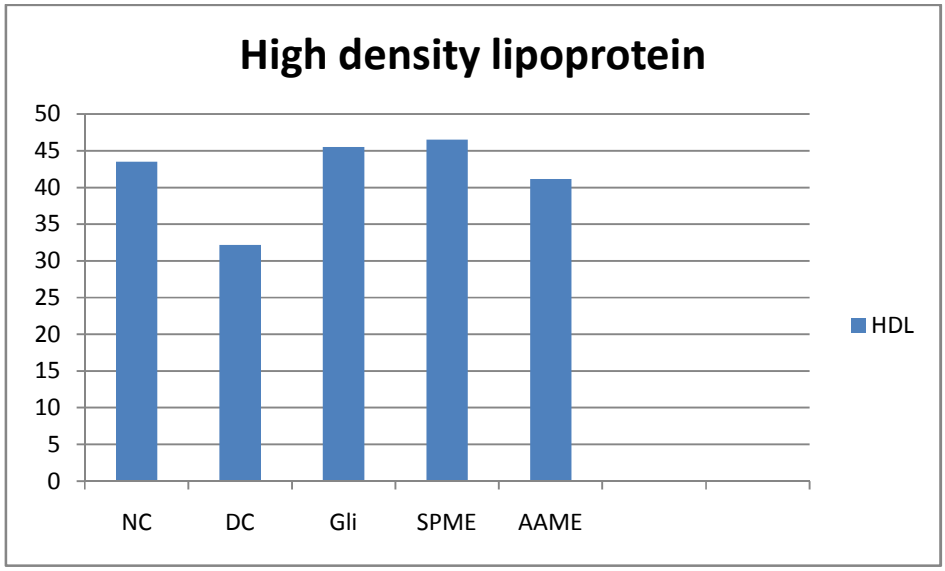
*#Values are expressed as mean ± SEM, n=6. Statistical significance test for comparison was done by one-way ANOVA, followed by Dunnett's t-test. ***p<0.001, **p<0.01, *p<0.05.*

High density lipoprotein

Effect of Methanolic extract of *Anogeissus acuminata* and *Solanum pubescens* on High density lipoprotein level in Alloxan Induced Diabetic Rats

Group	Treatment	Dose	HDL
I	Normal Control	2ml/kg	43.5 ± 0.763
II	Diabetic Control	125mg/kg	32.17 ± 0.6
III	Glibenclamide	5mg/kg	45.5 ± 1.118***
IV	MESP	300mg/kg	46.50± 0.76***
V	MEAA	300mg/kg	41.17± 0.703***

*#Values are expressed as mean ± SEM, n=6. Statistical significance test for comparison was done by one-way ANOVA, followed by Dunnett's t-test. ***p<0.001, **p<0.01, *p<0.05.*



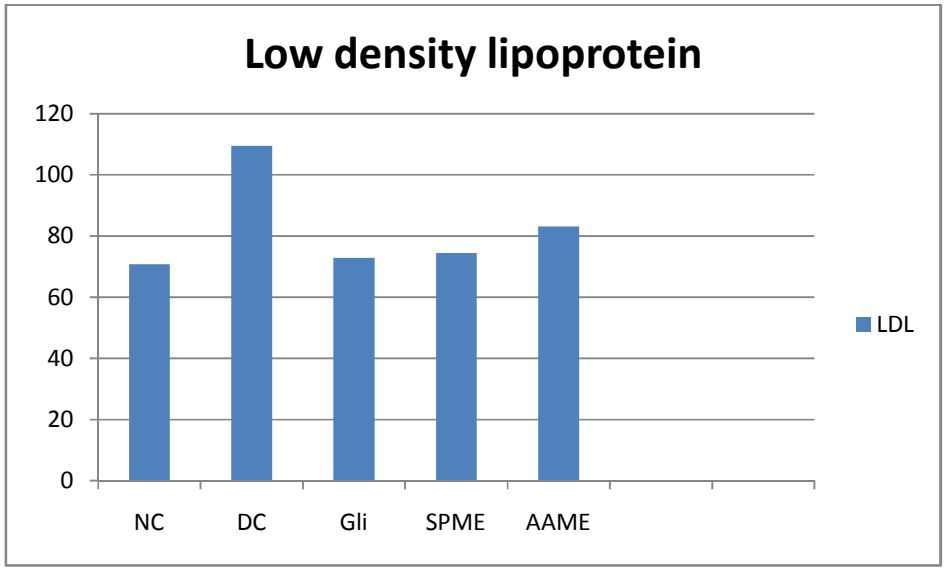
Effect of MEAA and MESP on High density lipoprotein level in Alloxan induced Diabetic rats.

Low density lipoprotein

Effect of Methanolic extract of *Anogeissus acuminata* and *Solanum pubescens* on Low density lipoprotein in Alloxan Induced Diabetic Rats

Group	Treatment	Dose	LDL
I	Normal Control	2ml/kg	70.83 ± 0.98
II	Diabetic Control	125mg/kg	109.5 ± 1.765
III	Glibenclamide	5mg/kg	72.83 ± 1.376***
IV	MESP	300mg/kg	74.50± 1.668***
V	MEAA	300mg/kg	83.17± 1.38***

*#Values are expressed as mean ± SEM, n=6. Statistical significance test for comparison was done by one-way ANOVA, followed by Dunnett's t-test. ***p<0.001, **p<0.01, *p<0.05.*



Effect of MEAA and MESP on Low density lipoprotein level in Alloxan induced Diabetic rats.

Medicinal plants could be consider as potential sources for providing a reasonable amount of the required elements other than diet to the patients of diabetes mellitus. Several controlled clinical trials of trace element supplements for glycemic control revealed the beneficial role for supplementation for the control and management of diabetes. In diabetics rats there was a significant increase in lipids, total cholesterol, triglycerides ($P<0.01$) in methanolic extract of *Solanum pubescence* and *Anogeissus acuminata* treated rats there was a reduction in cholesterol, triglycerides, lipids which shows the hypolipidemic effect of these plants. The hypolipidimic effect may be due to inhibition of fatty acids synthesis. In normal metabolisim insulin activates the enzyme lipoprotein lipases and hydrolysis triglycrides and the deficience in insulin results in inactivation of these enzymes thereby causing hypertriglyceridemia. The significant reduction of serum lipid levels in diabetic rats after methanolic extract of *Solanum pubescence* and *Anogeissus acuminata* treatment may be directly attributed to improvements in insulin levels.

The test group also lowered serum SGOT, SGPT levels which show the protective effect and normal functioning of liver in reversing the organ damage due to diabetes which is clearly observed by high levels of SGOT and SGPT in diabetic control.

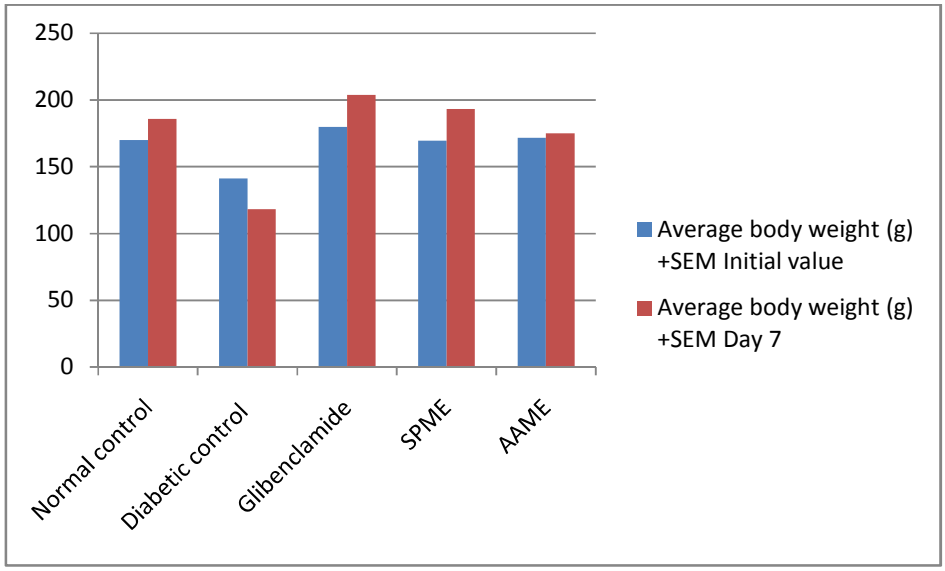
Body Weight Measurement

Below Table shows the body weight changes in the normal and experimental animals in each group. The mean body weight of the diabetic rats decreased when compared to extract treated rats. There was a significant reduction in body weight of the diabetic rats compared with normal and extract treated diabetic rats. After methanol extract of *Solanum pubescence* and *Anogeissus acuminata* suplimentation for 7 days there was a significant increase in diabetic rats($p<0.001$).

Table Body Weight Measurement

Group	Treatment	Dose	Average body weight (g) ±SEM	
			Initial value	Day 7
I	Normal control	2ml/kg	170 ± 1.36	185.8 ± 2.15
II	Diabetic control	125mg/kg	141.3 + 1.99	118.3 + 2.09
III	Glibenclamide	5mg/kg	180 ± 4.5***	203.8 ± 3.18***
IV	MESP	300mg/kg	169.5± 3.85***	193.3 ± 2.96***
V	MEAA	300mg/kg	171.7±2.40***	175±4.08***

*#The values are expressed as mean ± SEM. n=6 animals in each group Statistical significant test for comparison was done by one-way ANOVA, followed by Dunnett's t-test. The Average body weight values of groups are compared with normal control animals, values ***p<0.001, **p<0.01, *p<0.05.*

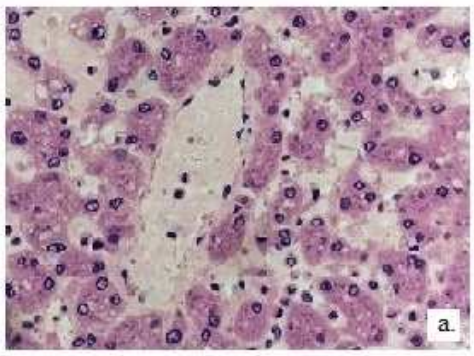


Effect of MEAA and MESP on Body Weight in Alloxan induced Diabetic rats.

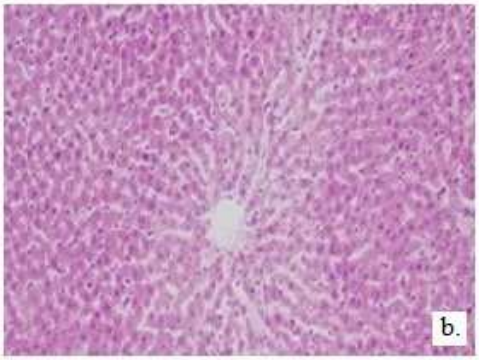
In the present study, diabetic rats had lower body weights and high blood glucose level as compared to normal rats. In spite of increased food consumption, loss of body weight due to defect in glucose metabolism and excessive breakdown of tissue protein is a characteristic condition in diabetics. Treatment with methanolic extract of *Solanum pubescence* and *Anogeissus acuminata* improved the average body weights of rats, which indicates that control over polyphagia and muscle wasting resulted due to hyperglycemic condition.

Histopathology:

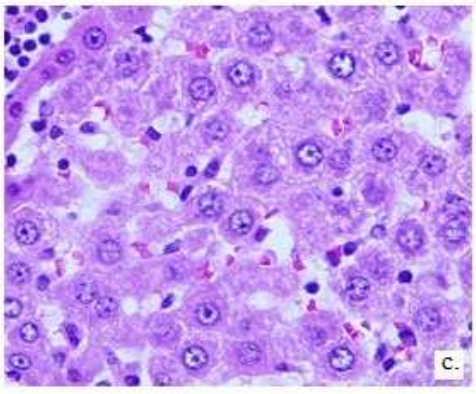
Figure No.	Report
Normal control	Hepatocytes are normal
Diabetic control	Hepatocytes are with shrunken nuclei, granular cytoplasmand dilated sinusoids
Glibenclamide	Normal hepatocytes, dilated central veins are seen
methanolic extract of *Solanum pubescence*	Hepatocytes are normal, multiple focal areas of necrosis are seen. Occasional portal tracts show lymphocytic infiltration.
methanolic extract of *Anogeissus acuminata*	Hepatocytes are normal. Few portal tracts show inflammation with lymphocytes. Occasional dilated central veins seen.
Normal control	Normal islets with acni
Diabetic control	Islet cells with fatty infiltration shows damaged and atrophic islet with acni.
Glibenclamide	Pancreas show small Islet cells.
methanolic extract of *Solanum pubescence*	Islets with normal round and elongated.
methanolic extract of *Anogeissus acuminata*	Islets with normal structural intactness with their nucleus.



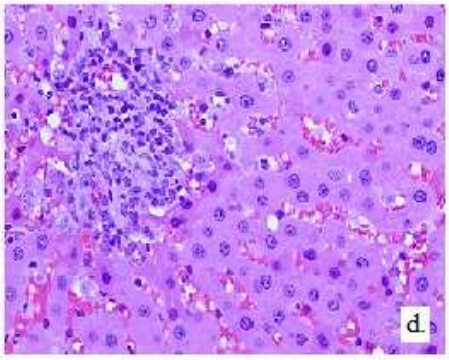
Normal Control Liver



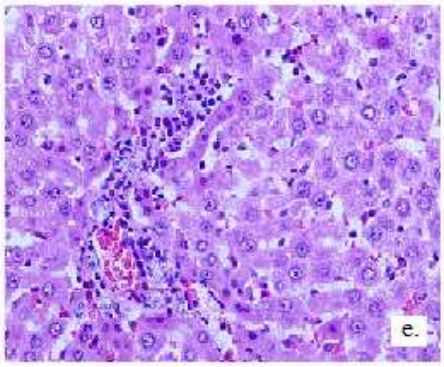
Diabetic Control Liver



Glibenclamide Treated Liver

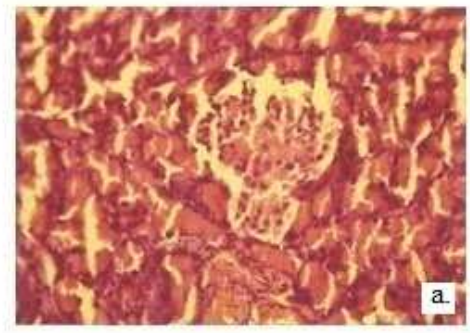


AAME Treated Liver

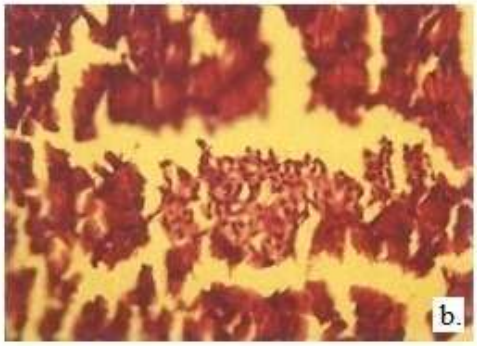


SPME Treated Liver

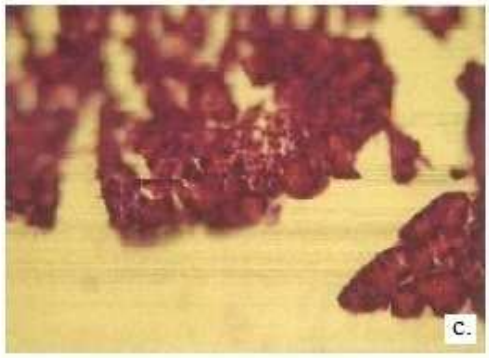
Photomicrograph of liver stained with haemotoxylin and Eosin (magnification x 400). a) Group-I (Normal control) Hepatocytes are normal, b) Group-II (Diabetic control) with shrunken nuclei, granular cytoplasm and dilated sinusoids, c) Group-III (Glibenclamide) Normal hepatocytes, dilated central veins are seen, d) Group-V (AAME) Focal areas of necrosis are seen and hepatocytes are normal. Perivascular round cell collection (PVRCC) and portal tract infiltration with lymphocytes are also seen, e)Group-IV (SPME) hepatocytes are normal. Occasional dilated central veins are seen along with occasional focal areas of necrosis.



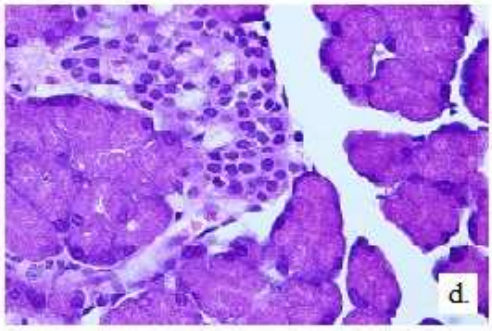
Normal Control Pancreas



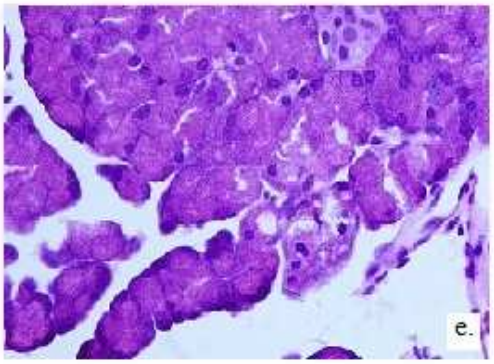
Diabetic Control Pancreas



Glibenclamide Treated Pancreas



AAME Treated Pancreas



SPME Treated Pancreas

Photomicrograph of Pancreas stained with haemotoxylin and Eosin (magnification x 400). a) Group-I (Normal control) Normal islets with acni, b) Group-II (Diabetic control) islet cells with fatty infiltration shows damaged and atrophic islet with acni, c) Group-III (Glibenclamide) islet cells are small, d) Group-V (AAME) islets with normal structural intactness with their nucleus, e) Group-IV (SPME) islets with normal round and elongated.

In the recent times many traditionally used medicinally important plants were tested for their antihyperglycemic potential by various investigators in experimental animals. I have undertaken a study on *Anogeissus acuminata* and *Solanum pubescens* for their antidiabetic activity.

The present experiment was continuous post treatment for 7 days with the SPME and AAME where SPME showed more potential hypoglycemic activity than in AAME in OGTT and normoglycemic rats and alloxan induced diabetogenic rats.

Preliminary phytochemical screening revealed that AAME showed positive response to Alkaloids, Tannins, Flavonoids, Carbohydrates, Lignins, Proteins and in SPME, the response was positive to Flavonoids. The increased level of glycosylated haemoglobin (HbA1c) is directly proportional to the decreased level of haemoglobin in diabetic control experimental rats. HbA1c is used as most reliable marker and standard diagnosis practices for estimating the degree of protein glycation during diabetes mellitus[8]. Proglycation is a non-enzymatic reaction between excess glucose present in the blood and free amino groups on the globin component of haemoglobin. Measurement of HbA1c level provides information of long term glycemic status and to correlate with various complications related to Diabetes mellitus. On oral administration of SPME and AAME, the SPME, is more significantly decreased the Hb1c level possibly due to normoglycemic control mechanisms in experimental rats which also reflect the decreased protein glycation condensation reactions and the reports obtained is concordant with the previous result.

A marked increase in serum concentration of TC, TG, LDL and decreased HDL was observed[7] with diabetic rats than normal control group which is often linked with hyperlipidaemia. Hyperlipidaemia certainly contributes to major risk factor for cardio vascular diseases[8,9]. During diabetic state, insulin deficiency contributes to derangements of various metabolic and regulatory mechanisms in body. At normal state insulin activates the lipolytic hormones action on the peripheral fat depots which hydrolyses triglycerides and prevents mobilization of free fatty acids [10-11]. However, insulin deficiency inactivates the lipoprotein lipase which promotes liver conversion of free fatty acids into phospholipids and cholesterol and finally discharged into blood which resulted into elevated serum phospholipids level [12-13]. My result of this study reveals that the administration of SPME and AAME not only lowered TC, TG and LDL, but also enhanced the cardio protective lipid HDL.

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