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EVALUATION OF INVIVO METHOD OF ANTI DIABETIC ACTIVITY OF ETHANOLIC LEAF EXTRACT OF PTEROCARPUS SANTALINUSS IN RATS

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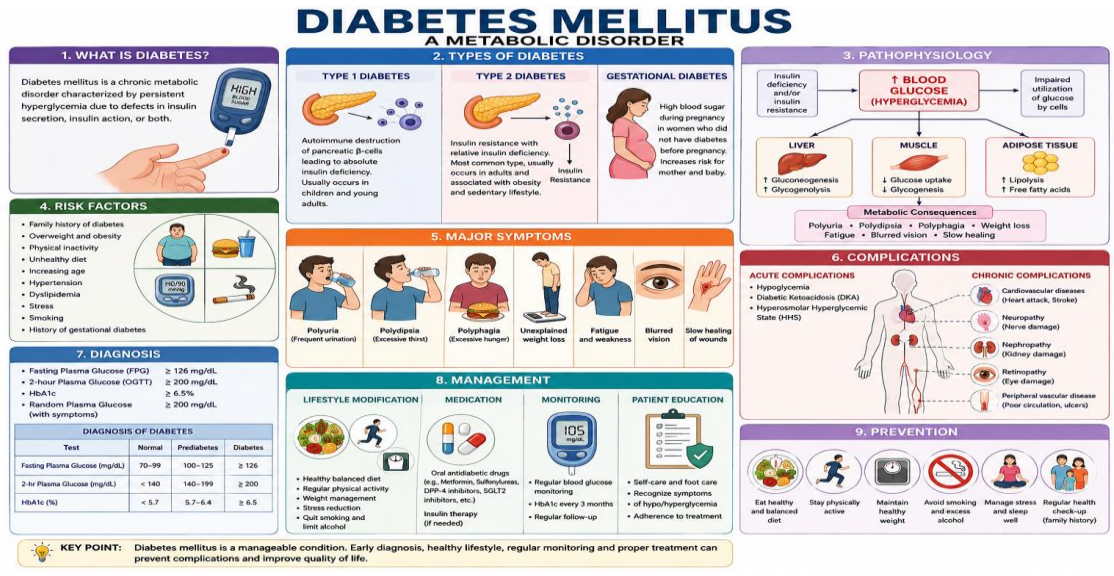
ABSTRACT

Background: Diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia resulting from defects in insulin secretion, insulin action, or both. It is associated with disturbances in carbohydrate, lipid, and protein metabolism and can lead to serious complications involving the cardiovascular system, kidneys, nerves, eyes, and liver. The global prevalence of diabetes continues to increase at an alarming rate. According to the International Diabetes Federation (IDF), approximately 366 million people were living with diabetes in 2011, and this number is expected to rise to 552 million by 2030. In India, nearly 40 million people were affected in 2007, with the number projected to increase to almost 70 million by 2025. The growing burden of diabetes has stimulated interest in the search for safer and more effective antidiabetic agents from medicinal plants. **Aim:** To evaluate the **in vivo** antidiabetic activity of the ethanolic leaf extract of *Pterocarpus santalinus* (EEPSL) in alloxan-induced and dexamethasone-induced diabetic rat models. **Materials and Methods:** Acute oral toxicity studies of the ethanolic leaf extract of *Pterocarpus santalinus* were carried out in albino rats according to OECD Guideline No. 425. The extract was found to be safe up to an oral dose of 2000 mg/kg. Based on the toxicity study, doses of 200 mg/kg and 400 mg/kg body weight were selected for evaluation. Diabetes was induced using alloxan

monohydrate (150 mg/kg, i.p.) and dexamethasone (10 mg/kg, i.p.). EEPSL was administered orally at doses of 200 mg/kg and 400 mg/kg for 21 days in the alloxan model and 11 days in the dexamethasone model. At the end of the experimental period, fasting blood glucose, serum lipid profile (total cholesterol, triglycerides, HDL, LDL, and VLDL), and hepatic marker enzymes (SGPT, SGOT, and ALP) were estimated using a semi-automatic biochemical analyzer. **Results:** EEPSL produced significant dose-dependent antidiabetic activity in both experimental models. The 400 mg/kg dose showed greater efficacy than the 200 mg/kg dose. Treatment with EEPSL significantly reduced fasting blood glucose, total cholesterol, triglycerides, LDL, VLDL, SGPT, SGOT, and ALP levels while significantly increasing HDL cholesterol compared with diabetic control rats. These findings indicate that the extract effectively improved hyperglycemia, dyslipidemia, and diabetes-associated hepatic dysfunction. **Conclusion:** The present study demonstrates that the ethanolic leaf extract of *Pterocarpus santalinus* possesses significant antidiabetic activity in experimental diabetic rats. The extract effectively ameliorated hyperglycemia, improved lipid abnormalities, and normalized hepatic biochemical markers. The increase in HDL cholesterol also suggests a potential cardioprotective effect. Therefore, *Pterocarpus santalinus* leaf extract may serve as a promising natural therapeutic agent for the management of diabetes mellitus. However, further phytochemical investigations, mechanistic studies, and clinical trials are required to establish its therapeutic potential.

KEYWORDS: *Pterocarpus santalinus*, Diabetes mellitus, Antidiabetic activity, Alloxan, Dexamethasone, Ethanolic leaf extract, Lipid profile, Hepatic enzymes.

DIABETES MELLITUS



AIM: To evaluate the antidiabetic potential of the ethanolic extract of *Pterocarpus santalinus* leaves in experimental diabetic animal models and to assess its effects on blood glucose levels, body weight, biochemical parameters, and oxidative stress markers.

OBJECTIVES

1. To prepare the ethanolic extract of *Pterocarpus santalinus* leaves using a suitable extraction method.
2. To perform preliminary phytochemical screening of the ethanolic extract for the identification of major phytoconstituents.
3. To evaluate the acute oral toxicity of the extract according to OECD Guideline 425.
4. To induce experimental diabetes in Wistar albino rats using appropriate diabetic models.
5. To assess the antidiabetic activity of the ethanolic extract at different dose levels by monitoring fasting blood glucose levels.
6. To evaluate the effect of the extract on body weight changes in diabetic rats.
7. To estimate serum biochemical parameters, including lipid profile (total cholesterol, triglycerides, HDL, LDL, and VLDL) and liver function markers (SGOT, SGPT, and ALP).
8. To evaluate the antioxidant status by estimating oxidative stress markers in experimental animals.
9. To compare the antidiabetic efficacy of the extract with that of the standard antidiabetic drug.
10. To statistically analyze the experimental data and determine the significance of the observed effects.

TABLE 1: PRELIMINARY PHYTOCHEMICAL SCREENING OF ETHANOLIC LEAF EXTRACT OF *Pterocarpus santalinus*

S. No.	PHYTOCHEMICAL CONSTITUENTS	INFERENCE
1.	Saponins	Present
2.	Flavonoids	Present
3.	Triterpenoids	Present
4.	Tannins	Present
5.	Proteins	Present
6.	Alkaloids	Present
7.	Carbohydrates	Present
8.	Glycosides	Present

Inference: The ethanolic leaf extract of *Pterocarpus santalinus* contains various phytochemical constituents which may contribute to its pharmacological activities.

ACUTE TOXICITY STUDY

Toxicological studies were carried out according to the guidelines of OECD Guideline No. 425 (Up-and-Down Procedure). Initially, the test dose was administered to a single male rat and observed for 48 h with close surveillance during the first 4 h. After 48 h, the same dose was administered to 2 more male rats and observed for 48 h with close surveillance during the first 4 h. After another 48 h, the same dose was administered to 2 more male rats and observed similarly. Thereafter, all the rats were observed for 14 days for any signs of toxicity or mortality.

In the present study, the ethanolic leaf extract of *Pterocarpus santalinus* was administered at a limit test dose of 2000 mg/kg body weight and did not produce any mortality or toxic signs. Therefore, 1/5th (400 mg/kg) and 1/10th (200 mg/kg) of the limit dose were selected for the pharmacological study.

Table 2: Acute Oral Toxicity Study of Ethanolic Leaf Extract of *Pterocarpus santalinus*

Stage	Dose (mg/kg b.w.)	No. of Animals	Observations					Mortality (0/No. of Animals)
			0–1 h	1–4 h	24 h	48 h	14 Days	
First Administration (Single Rat)	2000 (Limit dose)	1	No toxic signs observed	No toxic signs observed	No toxic signs observed	No toxic signs observed	No toxic signs observed	0/1
Second Administration (2 Rats)		2	No toxic signs observed	No toxic signs observed	No toxic signs observed	No toxic signs observed	No toxic signs observed	0/2
Third Administration (2 Rats)		2	No toxic signs observed	No toxic signs observed	No toxic signs observed	No toxic signs observed	No toxic signs observed	0/2
Total	–	**5**	No mortality or toxic signs observed in any rat during 14 days					**0/5**

Interpretation of Results:

The ethanolic leaf extract of *Pterocarpus santalinus* was found to be safe up to the limit dose of 2000 mg/kg body weight as none of the animals showed any signs of toxicity or mortality. Therefore, 200 mg/kg (1/10th) and 400 mg/kg (1/5th) of the limit dose were selected for the pharmacological evaluation.

Conclusion: The ethanolic leaf extract of *Pterocarpus santalinus* is safe up to 2000 mg/kg body weight in rats and selected doses 200 mg/kg and 400 mg/kg were used for the present study.

RESULTS

6.3. Effect of ELEPS on Alloxan hydrate induced diabetes in rats

A. Biochemical parameters, liver enzymes in normal control rats

In normal control rats biochemical parameters are recorded, those are Glucose levels are found to be from range of 75.83±0.94 mg/dL, and TC-70.89±2.14 mg/dl, TG-62.20±1.34 mg/dl, LDL-27.94±3.02 mg/dl, VLDL-13.47±0.22mg/dl, HDL-29.48±1.92 mg/dl, SGPT-12.85±1.89 U/l, SGOT-13.34±0.90 U/l, ALP-31.11±3.0 U/l are found to be respectively. The results are tabulated in table no 25

B. Effect of Alloxan hydrate (150 mg/kg) on biochemical parameters liver enzymes in rats

When compared to normal control group of animals, the biochemical parameters of toxicant group such as Glucose levels are found to from range of 491.17±27.70 to 522.17±11.76

mg/dL, and TC-294.61±9.71 mg/dl, TG-189.16±2.04 mg/dl, LDL-242.51±8.84 mg/dl and VLDL-37.83±0.40 mg/dl, SGPT-69.50±3.39 U/l, SGOT-51.99±2.41 U/l, ALP-283.48±7.56 U/l are found to be respectively. These are significantly increased to several folds. whereas HDL-14.26±1.01mg/dl are significantly decreased. This is an indication of toxicity produced by Alloxan. The results are tabulated in table no 25.

C. Effect of metformin(50mg/kg) on biochemical parameters liver enzymes of Alloxan hydrate induced diabetes in rats

When compared to toxicant control, metformin treated animals have shown a significant reduction in biochemical parameters such as Glucose levels are reduced (514.00± 1.18 mg/dL, 238.67±16.21 mg/dL, 164.33±6.55 mg/dL, 102.17±5.21 mg/dL) on 0^{th}, 11^{th}, 14^{th} and 21^{st} days of the experiment. And also TC-70.78±1.39 mg/dl, TG (75.71±2.08 mg/dL), LDL (25.98±2.42 mg/dL), VLDL (15.13±0.41 mg/dL), SGPT(23.28±1.89 U/l), SGOT (17.92±2.46 U/l), ALP (78.54±3.90 U/l) are significantly reduced. Whereas HDL levels (29.64±1.48 mg/dL) are significantly increased when compared with toxicant group. The results are tabulated in table no25.

D. Effect of EEPSL (200 mg/kg) on biochemical parameters liver enzymes of Alloxan hydrate induced diabetes in rats

When compared to toxicant control, EEPSL 200 mg/kg treated animals have shown a significant reduction in biochemical parameters such as Glucose levels are reduced and these are found to be 513.67±1.28 mg/dL, 320.83±30.44 mg/dL, 137.67±6.76 mg/dL and 108.83±4.75 mg/dL on 0^{th}, 11^{th}, 14^{th} and 21^{st} days of the experiment. TC (109.86±3.11mg/dL), TG (97.95±1.16mg/dL), LDL (60.43±3.82mg/dL), and VLDL (19.58±0.23mg/dL), SGPT(23.16±1.34U/l), SGOT(20.85±1.28U/l), ALP(82.597±4.36U/l) are significantly reduced. Whereas HDL levels (29.84±1.37 IU/l) are significantly increased when compared with toxicant group. The results are tabulated in table no 25.

E. Effect of EEPSL (400 mg/kg) on biochemical parameters liver enzymes of Alloxan hydrate induced diabetes in rats

When compared to toxicant control, EEPSL (400 mg/kg) treated animals have shown a significant reduction in biochemical parameters such as Glucose levels are reduced (522.67±0.88 mg/dL, 248.00±13.90 mg/dL, 99.00±10.22 mg/dL, 79.66±6.14 mg/dL) on 0^{th}, 11^{th}, 14^{th} and 21^{st} days of the experiment.TC (69.42±0.79mg/dL), TG (65.90±0.88mg/dL), LDL (20.98±1.54 mg/dL), VLDL (13.17±0.1mg/dL), SGPT(11.45±1.22 U/l),

SGOT(11.29±1.06 U/l), ALP (29.107±4.003 U/l) are significantly reduced. Whereas HDL levels (35.25±1.41mg/dL) are significantly increased when compared with toxicant group. The results are tabulated in table no25.

F. BODY WEIGHT

The Table no 26, 27 and Fig nos. 29 shows the body weight of the normal and treated groups minor difference from the diabetic control on 21st day. The treated groups animal body weight maintained throughout the experiment compare to diabetic control.

Table 15: Effect of EEPSL on Glucose in alloxan induced diabetes rats, n=6.

Blood glucose levels (mg/dL) (0th DAY) NORMAL 70-120, PATHOLOGICAL RANGE >120					
Animals	**Normal control**	**Diabetic control**	**metformin 50 mg/kg**	**ELEFPS 200 mg/kg**	**ELEFPS 400 mg/kg**
R 1	74	512	510	516	521
R 2	78	513	512	513	524
R 3	73	514	518	514	520
R 4	79	518	515	518	523
R 5	75	515	513	512	526
R 6	76	517	516	509	522
Mean ± SEM	75.83±0.94**	514.84±0.94**	514±1.18*	513.67±1.28**	522.67±0.08***
Blood glucose levels (mg/dL) (7thDAY), NORMAL 70-120, PATHOLOGICAL RANGE >120					
R 1	86	563	215	300	215
R 2	75	530	254	267	225
R 3	79	458	230	339	268
R 4	85	551	312	463	305
R 5	78	456	215	267	225
R 6	81	389	206	289	250
Mean ±SEM	80.67±1.73**	491.17±27.70*	238.67±16.20**	320.83±30.44*	248.00±13.90*
Blood glucose levels (mg/dL) (14th DAY) NORMAL 70-120, PATHOLOGICAL RANGE >120					
R 1	76	625	150	148	135
R 2	71	558	146	112	100
R 3	75	498	189	124	86
R 4	81	581	168	138	121
R 5	74	495	159	150	84
R 6	78	511	174	154	68
Mean± SEM	75.83±1.40**	544.67±21.39**	164.33±6.55*	137.67±6.76**	99.00±10.22*
Blood glucose levels (mg/dL) (21st DAY), NORMAL 70-120, PATHOLOGICAL RANGE >120					
R 1	71	535	100	112	96
R 2	69	568	98	98	78
R 3	70	522	121	93	74
R 4	79	492	114	115	96

R 5	72	525	91	125	78
R 6	65	491	89	110	56
Mean± SEM	71.00±1.88***	522.17±11.76***	102.17±5.21***	108.83±4.75***	79.66±6.141***

Significant at $p<0.05$*, $p<0.01$**, $p<0.001$***, ns = no significant EEPSL = Ethanolic extract of *pterocarpus santalinus*.leaves.

Table 16: Anti Diabetic activity of EEPSL on glucose inAlloxan induced diabetic rats.

BLOOD GLUCOSE LEVELS mg/dl NORMAL-70-120mg/dl, PATHOLOGICAL CONDITION->120mg/dl					
DAYS	**Normal control**	**Diabetic control Alloxan (150mg/kg)**	**metformin 50 mg/kg**	**EEPSL 200 mg/kg**	**EEPSL 400 mg/kg**
0th	75.83±0.94**	514.84±0.94**	514±1.18*	513.67±1.28**	522.67±0.08***
7th	80.67±1.73**	491.17±27.70*	238.67±16.20**	320.83±30.44*	248.00±13.90*
14th	75.83±1.40**	544.67±21.39**	164.33±6.55*	137.67±6.76**	99.00±10.22*
21st	71.00±1.88***	522.17±11.76***	102.17±5.21***	108.83±4.75***	79.66±6.141***

All values are shown as mean ± SEM and n=6.

ns = no significant * indicates $p<0.05$, ** indicates $p<0.01$, *** indicates $p<0.001$, ns = no significant

EEPSL= Ethanolic extract of *pterocarpus santalinus* leaves.

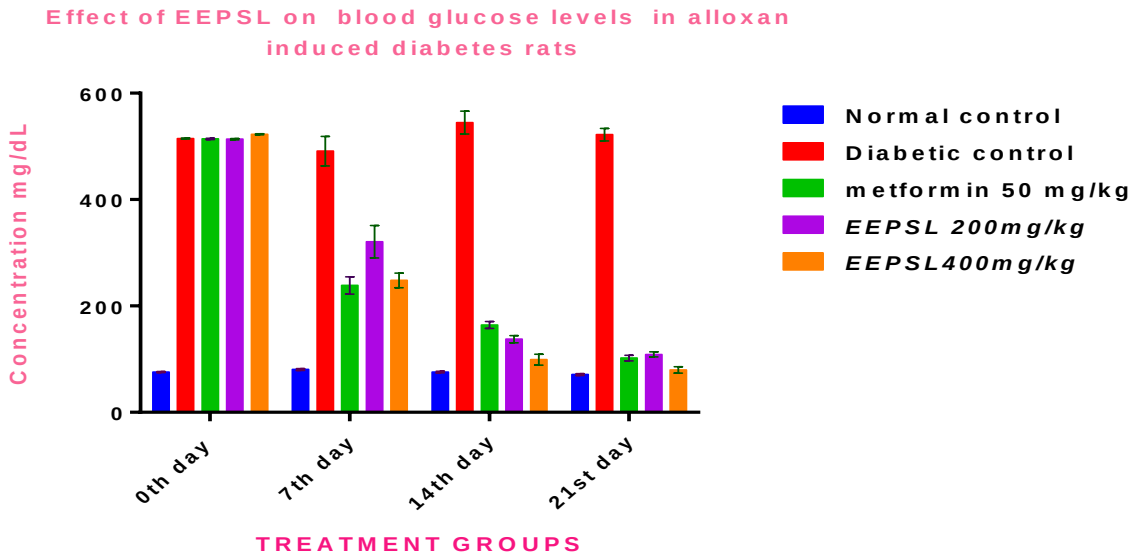


Figure 20: Effect of EEPSL on blood glucose levels in alloxan induced diabetes.

Table 17: Effect of EEPSL on TC in Alloxan induced diabetic rats.

TOTAL CHOLESTEROL (mg/dl) NORMAL - <200, PATHOLOGICAL RANGE- >240					
Animals	**Normal**	**Diabetic control alloxan (150mg/kg)**	**Standard(metformin 50mg/kg)**	**EEPSL 200mg/kg**	**EEPSL 400mg/kg**
R1	**69.50**	**288.68**	**71.22**	**112.11**	**66.66**
R2	**71.61**	**301.14**	**70.56**	**115.23**	**69.21**
R3	**66.54**	**321.25**	**75.21**	**101.22**	**71.09**
R4	**64.25**	**286.15**	**73.21**	**116.24**	**67.55**
R5	**75.22**	**255.26**	**69.22**	**99.20**	**71.04**
R6	**78.24**	**315.15**	**65.28**	**115.21**	**70.98**
Mean ±SEM	**70.89±2.14*** **	**294.61±9.71*** **	**70.78±1.39*** **	**109.86±3.11*** **	**69.42±0.79*** **

All values are shown as mean ± SEM and n=6.

ns = no significant* Indicates $p<0.05$, ** indicates $p<0.01$, *** indicates $p<0.001$, ns = no significant,

EEPSL: Ethanolic extract *pterocarpus santalinus* leaf

TC: total cholesterol

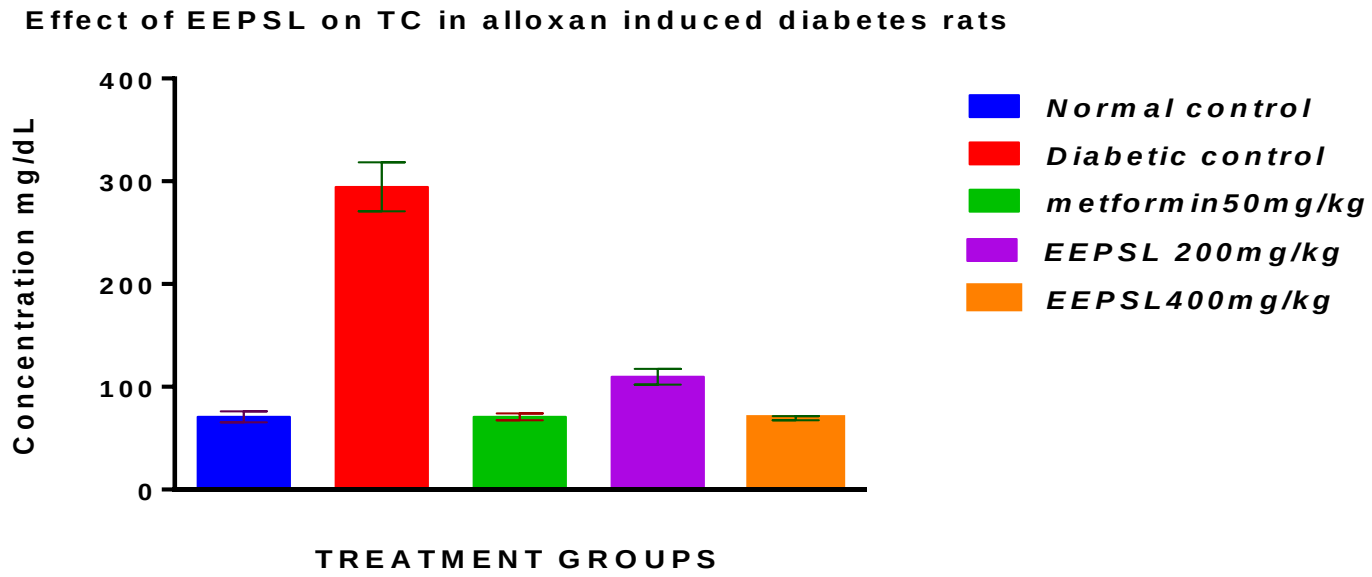


Figure 21: Effect of EEPSL on TC in alloxan induced diabetes.

Table 18: Effect of EEPSL on TG in Alloxan induced diabetic rats.

TRIGLYCERIDES (mg/dl) NORMAL- <150, PATHOLOGICAL RANGE- >200					
Animals	**Normal**	**Diabetic control alloxan (150mg/kg)**	**Standard (metformin 50mg/kg)**	**EEPSL 200mg/kg**	**EEPSL 400mg/kg**
R1	68.88	188.46	70.68	99.12	66.52
R2	69.25	187.25	75.21	96.25	65.25
R3	64.25	194.23	68.94	98.22	69.58
R4	63.45	183.24	79.14	97.26	64.62
R5	69.26	185.65	78.18	102.65	66.22
R6	62.11	196.11	82.15	94.22	63.23
Mean ±SEM	62.20±1.34***	189.16±2.04***	75.71±2.08***	97.95±1.16***	65.90±0.88***

All values are shown as mean ± SEM and n=6.

ns = no significant* Indicates $p<0.05$, ** indicates $p<0.01$, *** indicates $p<0.001$, ns = no significant,

EEPSL: Ethanolic extract *pterocarpus santalinus* leaf, TG: triglycerides

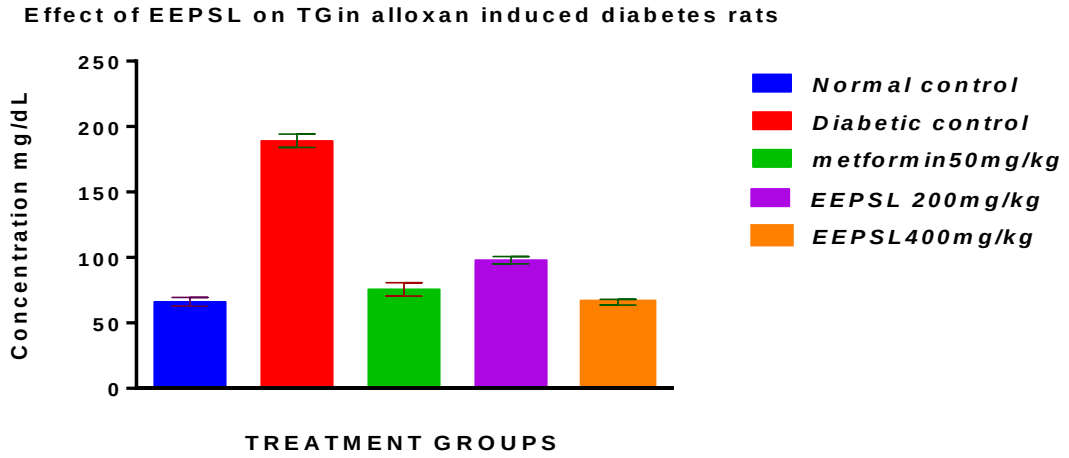


Figure 22: Effect of EEPSL on TG in alloxan induced diabetes.

Table 19: Effect of EEPSL on LDL in alloxan induced rats.

LOW DENSITY LIPOPROTIENS (mg/dl) NORMAL <70, PATHOLOGICAL RANGE >150					
Animals	**Normal**	**Diabetic control alloxan (150mg/kg)**	**Standard(metformin 50mg/kg)**	**EEPSL 200mg/kg**	**EEPSL 400mg/kg**
R1	22.52	236.77	24.88	63.08	20.95
R2	34.62	250.47	30.28	65.88	21.02
R3	25.44	268.25	35.28	45.43	17.89
R4	19.78	232.32	25.25	67.55	18.15
R5	26.16	207.89	19.58	52.38	19.70
R6	39.13	259.37	20.65	68.27	28.21
Mean ±SEM	27.94±3.02***	242.51±8.84**	25.98±2.42***	60.43±3.82***	20.98±1.54***

All values are shown as mean ± SEM and n=6.

ns = no significant* Indicates $p<0.05$, ** indicates $p<0.01$, *** indicates $p<0.001$, ns = no significant,

EEPSL: Ethanolic extract *pterocarpus santalinus* leaf LDL- Low density lipo protiens

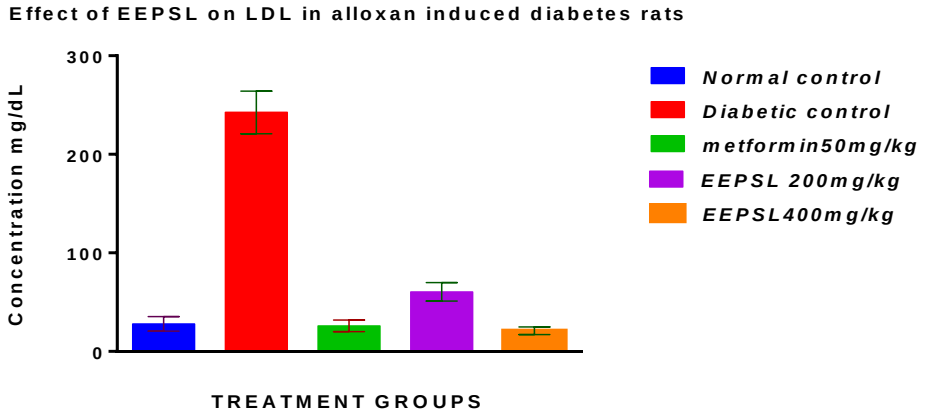


Figure 23: Effect of EEPSL on LDL levels in alloxan induced diabetes.

Table 20: Effect of EEPSL on VLDL in alloxan induced rats.

VERY LOW DENSITY LIPOPROTIENS (mg/dl) NORMAL <32, PATHOLOGICAL RANGE >30					
Animals	**Normal**	**Diabetic control alloxan (150mg/kg)**	**Standard (metformin 50mg/kg)**	**EEPSL 200mg/kg**	**EEPSL 400mg/kg**
R1	13.77	37.69	14.13	19.82	13.30
R2	13.85	37.45	15.04	19.25	13.05
R3	12.85	38.84	13.78	19.64	13.91
R4	12.69	36.64	15.82	19.45	12.92
R5	13.85	37.13	15.63	20.53	13.24
R6	13.82	39.22	16.43	18.84	12.64
Mean ±SEM	13.47±0.22**	37.83±0.40^{ns}	15.13±0.41***	19.58±0.23***	13.17±0.1***

All values are shown as mean ± SEM and n=6.

ns = no significant* Indicates p<0.05, ** indicates p<0.01, *** indicates p<0.001, ns = no significant,

EEPSL: Ethanolic extract *pterocarpus santalinus* leaf, VLDL: Very low density lipo protiens

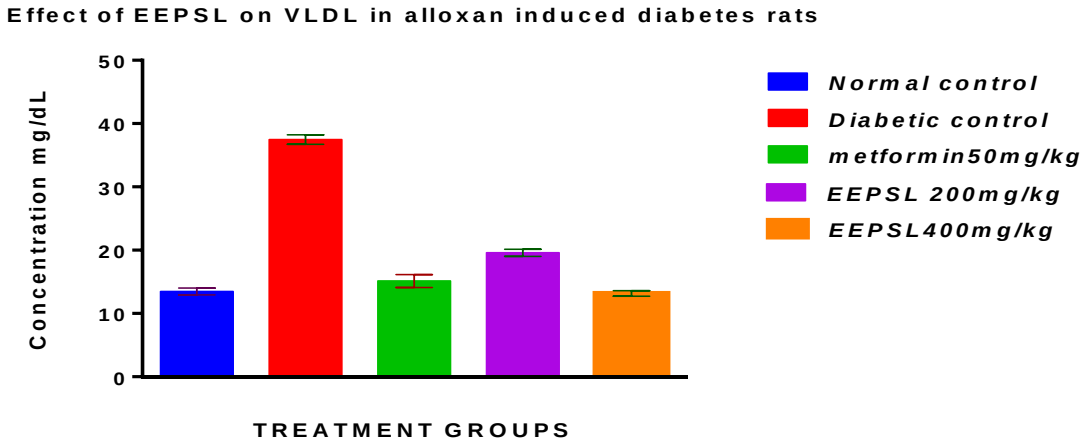


Figure 24: Effect of EEPSL on VLDL levels in alloxan induced diabetes.

Table 21: Effect of EEPSL on HDL in alloxan induced rats.

HIGH DENSITY LIPO PROTIENS (mg/dl) NORMAL >40 , PATHOLOGICAL RANGE <30					
Animals	**Normal**	**Diabetic control alloxan (150mg/kg)**	**Standard (metformin 50mg/kg)**	**EEPSL 200mg/kg**	**EEPSL 400mg/kg**
R1	33.21	14.214	32.21	29.21	32.41
R2	23.14	13.215	25.14	30.10	35.14
R3	28.25	14.15	26.15	36.15	39.29
R4	31.78	17.18	32.14	29.24	36.48
R5	35.21	10.24	34.01	26.29	38.10
R6	25.29	16.56	28.20	28.10	30.13
Mean ±SEM	29.48±1.92***	14.26±1.01***	29.64±1.48***	29.84±1.37***	35.25±1.41**

All values are shown as mean ± SEM and n=6.

ns = no significant* Indicates $p<0.05$, ** indicates $p<0.01$, *** indicates $p<0.001$, ns = no significant,

EEPSL: Ethanolic extract *pterocarpus santalinus* leaf, HDL: High density lipo protiens

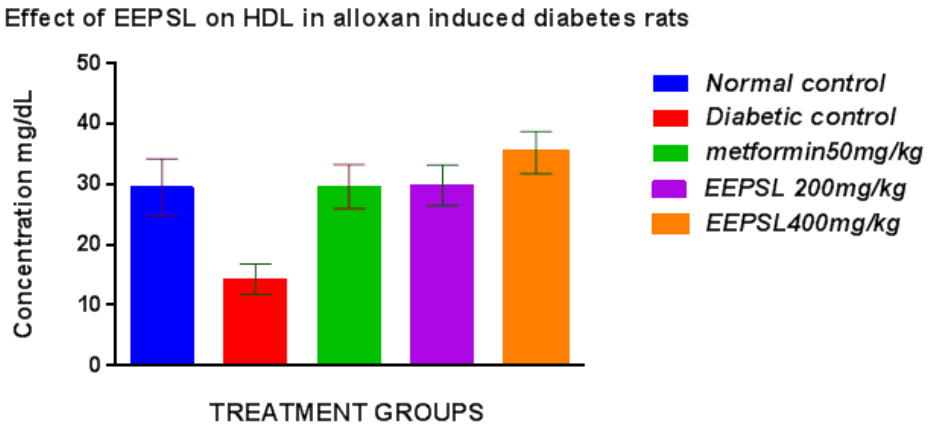


Figure 25: Effect of EEPSL on HDL levels in alloxan induced diabetes.

Table 22: Effect of EEPSL on SGPT in alloxan induced rats.

SERUM ALANINE TRANSAMINASE (U/l) NORMAL- 5 – 50(U/l) PATHOLOGICAL RANGE <50					
Animals	**Normal**	**Diabetic control alloxan (150mg/kg)**	**Standard (metformin 50mg/kg)**	**EEPSL 200mg/kg**	**EEPSL 400mg/kg**
R1	10.70	75.56	19.07	25.56	13.09
R2	15.81	79.80	17.08	20.56	15.56
R3	15.60	71.18	22.01	22.80	10.55
R4	09.55	65.90	25.86	24.86	12.64
R5	18.86	55.86	28.77	29.90	06.89
R6	06.61	68.71	26.90	27.32	09.99
Mean ±SEM	12.85±1.89^{ns}	69.50±3.39**	23.28±1.89*	23.16±1.34***	11.45±1.22**

All values are shown as mean ± SEM and n=6.

ns = no significant* Indicates p<0.05, ** indicates p<0.01, *** indicates p<0.001, ns = no significant,

EEPSL: Ethanolic extract *pterocarpus santalinus* leaf, SGPT: serum alanine transaminase.

Fig.15:Effect of EEPSL on SGPT in Alloxan induced diabetes rats

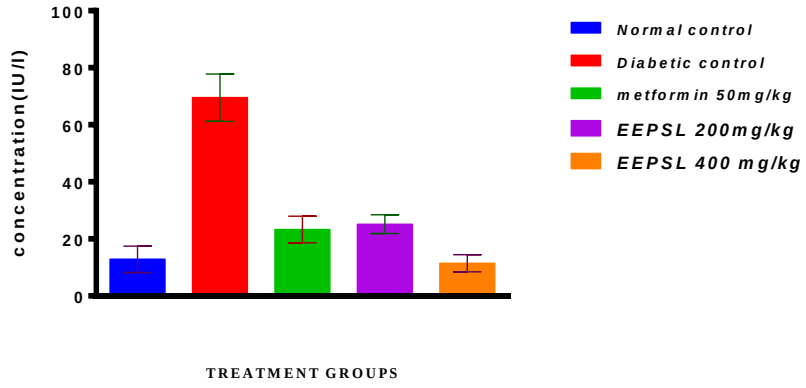


Figure 26: Effect of EEPSL on SGPT levels in alloxan induced diabetes.

Table 23: Effect of EEPSL on SGOT in alloxan induced rats.

SERUM ASPARTATE TRANSAMINASE U/l) NORMAL 7-40 U/l PATHOLOGICAL RANGE <40					
Animals	**Normal**	**Diabeticcontrol alloxan(150mg/kg)**	**Standard(metformin 50mg/kg)**	**EEPSL 200mg/kg**	**EEPSL 400mg/kg**
R1	13.046	48.86	15.081	22.27	13.05
R2	16.291	59.90	11.10	25.046	12.04
R3	11.581	45.82	12.55	16.081	10.06
R4	15.64	55.96	18.99	18.56	09.32
R5	12.81	45.98	25.56	22.081	08.15
R6	10.71	55.44	24.24	21.07	15.14
Mean ±SEM	13.34±0.90**	51.99±2.41*	17.92±2.46**	20.85±1.28***	11.29±1.06***

All values are shown as mean ± SEM and n=6.

ns = no significant* Indicates $p<0.05$, ** indicates $p<0.01$, *** indicates $p<0.001$, ns = no significant,

EEPSL: Ethanolic extract *pterocarpus santalinus* leaf SGOT: Serum aspartate transaminase

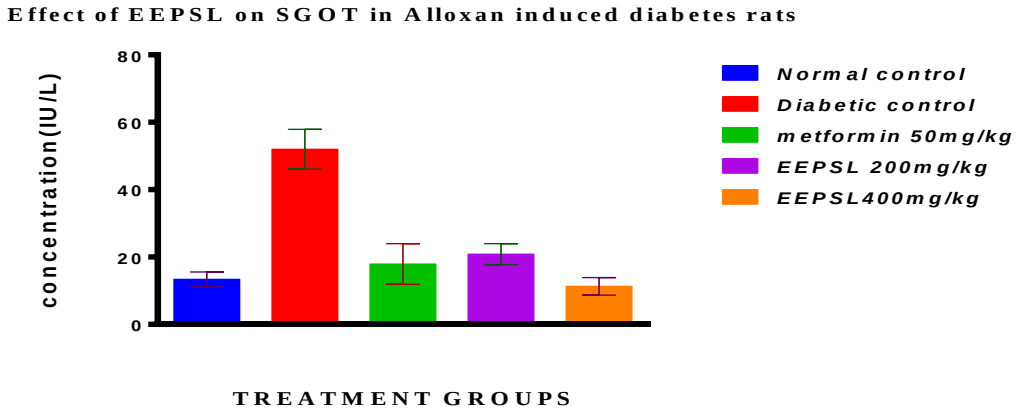


Figure 27: Effect of EEPSL on SGOT levels in alloxan induced diabetes.

Table 24: Effect of EEPSL on ALP in alloxan induced rats.

ALKALINE PHOSPHATE (U/l) NORMAL 20-60 (U/l) PATHOLOGICAL RANGE >60					
Animals	**Normal**	**Diabeticcontrol alloxan(150mg/kg)**	**Standard(metformin 50mg/kg)**	**EEPSL 200mg/kg**	**EEPSL 400mg/kg**
R1	24.68	298.50	67.67	86.60	32.55
R2	41.24	277.01	75.56	77.60	24.68
R3	38.09	299.56	89.60	86.08	38.09
R4	32.55	300.04	69.70	100.01	22.08
R5	28.02	268.77	78.86	69.79	15.99
R6	22.08	256.99	89.90	75.50	41.24
Mean ±SEM	31.11±3.0***	283.48±7.56**	78.54±3.90**	82.597±4.36***	29.107±4.003***

All values are shown as mean ± SEM and n=6.

ns = no significant* Indicates $p<0.05$, ** indicates $p<0.01$, *** indicates $p<0.001$, ns = no significant,

EEPSL: Ethanolic extract *pterocarpus santalinus* leaf, ALP: alkaline phosphate

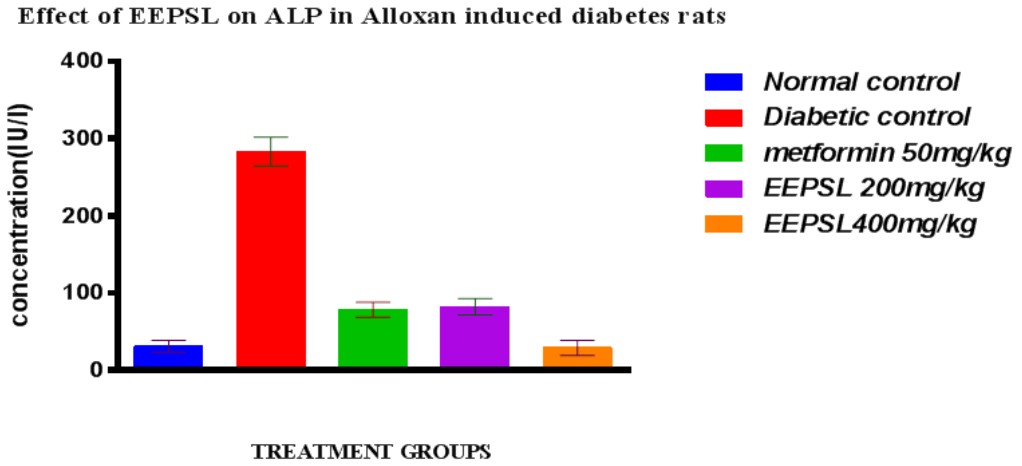


Figure 28: Effect of EEPSL on ALP in alloxan induced diabetes.

Table 25: Effect of EEPSL on biochemical parameters in alloxan induced diabetic rats.

BIOCHEMICAL PARAMETERS & LIVER ENZYMES						
S.NO	**PARAMETERS**	**Normal control**	**Diabeticcontrol alloxan(150mg/kg)**	**metformin 50 mg/kg**	**EEPSL 200 mg/kg**	**EEPSL 400 mg/kg**
1	TC (mg/dL)	70.89±2.14***	294.61±9.71***	70.78±1.39***	109.86±3.11***	69.42±0.79***
2	TG (mg/dL)	62.20±1.34***	189.16±2.04***	75.71±2.08***	97.95±1.16***	65.90±0.88***
3	LDL (mg/dL)	27.94±3.02***	242.51±8.84**	25.98±2.42***	60.43±3.82***	20.98±1.54***
4	VLDL (mg/dL)	13.47±0.22**	37.83±0.40ns	15.13±0.41***	19.58±0.23***	13.17±0.1***
5	HDL (mg/dL)	29.48±1.92***	14.26±1.01***	29.64±1.48***	29.84±1.37***	35.25±1.41**
6	SGPT (IU/l)	12.85±1.89ns	69.50±3.39**	23.28±1.89*	23.16±1.34***	11.45±1.22**
7	SGOT (IU/l)	13.34±0.90**	51.99±2.41*	17.92±2.46**	20.85±1.28***	11.29±1.06***
8	ALP (IU/l)	31.11±3.0***	283.48±7.56**	78.54±3.90**	82.597±4.36***	29.107±4.003***

n=6. Significant at $p<0.05$*, $p<0.01$**, $p<0.001$***, ns = no significant,EEPSL = Ethanolic extract of *pterocarpus santalinus* leaf,TC: Total cholesterol, TG: Triglycerides, LDL: Low density lipoproteins, VLDL: Very low density lipoproteins, HDL: High density lipoproteins., SGPT: spartate aminotransferase, SGOT :Alanine aminotransferase, ALP: alkaline phosphate

Table 26: Effect of EEPSL on body weight in alloxan induced diabetic rats.

BODY WEIGHT (gm) (0 th DAY)					
Animals	**Normal control**	**Diabetic control alloxan(150mg/kg)**	**metformin 50 mg/kg**	**EEPSL200 mg/kg**	**EEPSL 400 mg/kg**
R 1	**200**	**275**	**275**	**250**	**290**
R 2	**250**	**275**	**250**	**280**	**275**
R 3	**200**	**300**	**250**	**275**	**300**
R 4	**275**	**250**	**250**	**275**	**250**
R 5	**250**	**300**	**275**	**250**	**275**
R 6	**200**	**275**	**280**	**275**	**275**
Mean ± SEM	**229.17±13.56*** **	**279.17±7.68** **	**263.33±6.00*** **	**267.50±5.59ns**	**277.50±6.92** **
BODY WEIGHT (gm) (11th DAY)					
Animals	**Normal control**	**Diabetic control alloxan(150mg/kg)**	**metformin 50 mg/kg**	**EEPSL 200 mg/kg**	**EEPSL 400 mg/kg**
R 1	**200**	**190**	**279**	**259**	**300**

R 2	**250**	**185**	**254**	**290**	**285**
R 3	**275**	**170**	**255**	**280**	**310**
R 4	**200**	**155**	**254**	**280**	**260**
R 5	**250**	**180**	**273**	**255**	**285**
R 6	**200**	**160**	**283**	**280**	**284**
Mean ± SEM	**229.17±13.56*** **	**173.33±5.72** **	**266.33±5.52*** **	**274±5.62^{ns}**	**287.33±6.33****

All values are shown as mean ± SEM and n=6, n=6. Significant at $p<0.05$*, $p<0.01$**, $p<0.001$***, ns = no significant

Table 27: Effect of EEPSL on body weight in alloxan induced diabetic rats.

BODY WEIGHT(gm)					
Days	**Normal control**	**Diabetic control alloxan(150mg/kg)**	**metformin 50 mg/kg**	**EEPSL200 mg/kg**	**EEPSL 400 mg/kg**
0th day	**229.17±13.56*** **	**279.17±7.68** **	**263.33±6.00*** **	**267.50±5.59^{ns}**	**277.50±6.92** **
21st day	**229.17±13.56*** **	**173.33±5.72** **	**266.33±5.52*** **	**274±5.62^{ns}**	**287.33±6.33****

All values are shown as mean ± SEM and n=6.

n=6. Significant at $p<0.05$*, $p<0.01$**, $p<0.001$***, ns = no significant EEPSL: Ethanolic extract of *pterocarpus santalinus* leaves

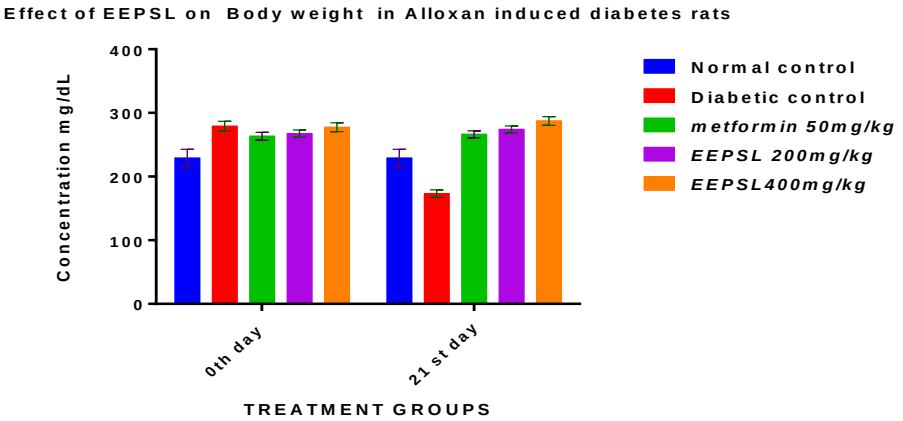


Figure 29: Effect of EEPSL on body weight in alloxan induced diabetes.

6.4. Effect of EEPSL on Dexamethasone induced diabetes in rats

A. Biochemical parameters, liver enzymes in normal control rats

The normal group of rats the blood glucose levels, And lipid profile TC (68.01±1.20 mg/dl), TG(64.94±1.64 mg/dl), LDL(25.55±2.68 mg/dl), VLDL(12.98±0.32 mg/dl), liver enzymes SGPT(12.85±1.89 U/l), SGOT(12.95±1.04 U/l), ALP(13.26±1.05 U/l) are found to be and HDL (29.48±1.92mg/dL) respectively. The results are tabulated in table no.38,28.

B. Effect of Dexamethasone (150 mg/kg) on biochemical parameters, liver enzymes in rats

When compared to normal control group of animals, the biochemical parameters such as Glucose (273.17±10.37 mg/dL), TC (288.75±8.98 mg/dL), TG(194.90±1.64 mg/dl),LDL (235.1±9.39 mg/dl), VLDL (40.33±1.72 mg/dl) & liver enzymes are SGPT(69.50±3.39 U/l), SGOT (73.42±2.68 U/l), ALP (85.54±3.78 U/l) are significantly increased, whereas HDL (14.26±1.018 mg/dL) levels are significantly decreased. The results are tabulated in table nos. 38,28

C. Effect of metformin (50mg/kg) on biochemical parameters liver enzymes of Dexamethasone induced diabetes in rats

When compared to normal control animals the biochemical parameters such as Glucose (239.83±20.76 mg/dL), TC (67.89±2.07 mg/dL), TG(85.41±1.00 mg/dl), LDL(21.18±3.33 mg/dl), VLDL(17.07±0.21mg/dl), SGPT(23.28±1.89U/l), SGOT(10.73±0.95U/l), ALP(12.60±0.92 U/l) are significantly decreased, whereas HDL (29.64±1.49mg/dL) levels are significantly increased when compared to toxicant group. The results are tabulated in table no 38,28.

D. Effect of EEPSL 200 mg/kg on biochemical parameters, liver enzymes of Dexamethasone induced diabetes in rats

When compared to normal control animals the biochemical parameters such as Glucose (78.16±2.35 mg/dL), TC (95.85±0.80mg/dL),TG (93.23±1.15mg/dl), LDL (47.35±1.65mg/dl), VLDL (18.64±0.23mg/dl), SGPT (34.98±1.47U/l), SGOT (34.29±1.47U/l), ALP (23.79±1.00U/l) are significantly decreased, whereas HDL (29.84±1.37mg/dL) levels are significantly increased when compared toxicant group. The results are tabulated in table no 38,28

E. Effect of EEPSL (400 mg/kg) on biochemical parameters, liver enzymes of Dexamethasone induced diabetes in rats

When compared to normal control animals the biochemical parameters such as Glucose (70.83±1.42 mg/dL), TC (65.17±1.13mg/dL),TG (65.14±1.37mg/dl), LDL (16.93±1.34mg/dl), VLDL (13.023±0.27mg/dl),SGPT (11.45±1.22U/l), SGOT (08.50±0.67 U/l), ALP (08.12±0.7U/L) are significantly decreased, whereas HDL (35.25±1.41mg/dL)levels are significantly increased. The results are tabulated in table no 38, 28

PHYSICAL PARAMETERS

F. BODY WEIGHT

The Table nos.39 & 40 and Fig no.39 shows the body weight of the normal and treated groups significantly difference from the diabetic control on 22nd day. The treated groups animal body weight maintained throught the experiment compare to diabetic control.

Table 28: Effect of EEPSL on blood glucose levels in dexamethasone induced diabetes rats.

Blood glucose levels (mg/dL) (0th DAY),NORMAL 70-120mg/dl ,PATHOLOGICAL RANGE >120					
Animals	Normal control	Diabetic control	metformin 50 mg/kg	ELEFPS 200 mg/kg	ELEFPS 400 mg/kg
R 1	**56**	**66**	**72**	**68**	**71**
R 2	**64**	**74**	**75**	**76**	**68**
R 3	**77**	**59**	**65**	**79**	**71**
R 4	**71**	**69**	**71**	**68**	**69**
R 5	**66**	**70**	**69**	**81**	**78**
R 6	**76**	**85**	**75**	**79**	**88**
Mean ± SEM	**68.36±3.25**	**70.50±3.54**	**71.16±1.55**	**75.16±2.35**	**74.16±3.11**
Blood glucose levels (mg/dL) (11th DAY), NORMAL 70-120mg/dl ,PATHOLOGICAL RANGE >120					
R 1	**56**	**258**	**149**	**175**	**269**
R 2	**78**	**235**	**238**	**196**	**271**
R 3	**64.**	**268**	**310**	**289**	**265**
R 4	**68**	**305**	**255**	**255**	**289**
R 5	**75**	**278**	**248**	**295**	**255**
R 6	**95**	**295**	**239**	**205**	**270**

Mean ±SEM	**72.66±5.50*** **	**273.17±21.19** **	**239.83±21.19^{ns}**	**235.83±20.76^{ns}**	**72.667±5.50^{ns}**
Blood glucose levels (mg/dL) (22nd DAY), NORMAL 70-120mg/dl ,PATHOLOGICAL RANGE >120					
R 1	**62**	**295**	**68**	**99.21**	**69**
R 2	**72**	**287**	**60**	**112.12**	**75**
R 3	**59**	**315**	**71**	**102.51**	**73**
R 4	**86**	**298**	**86**	**95.26**	**65**
R 5	**77**	**275**	**74**	**98.85**	**71**
R 6	**68**	**201**	**68**	**93.21**	**72**
Mean± SEM	**70.66±4.06*** **	**278.50±16.40** **	**71.16±3.52** **	**100.19±2.72**	**70.83±1.42** **

All values are shown as mean ± SEM and n=6., n=6. Significant at $p<0.05$*, $p<0.01$**, $p<0.001$***, ns = no significant, EEPSL: Ethanolic extract of *pterocarpus santalinus* leaves

Table 29: Effect of EEPSL on blood glucose levels in dexamethasone induced diabetes rats.

BLOOD GLUCOSE LEVELS (mg/dL) , NORMAL-70-120mg/dl , PATHOLOGICAL CONDITION->120mg/dl					
Animals	**Normal control**	**Diabetic control**	**Metformin 50 mg/kg**	**EESKSE 200 mg/kg**	**EESKSE 400 mg/kg**
0th DAY	68.36±3.25	70.50±3.54	71.16±1.55	75.16±2.35	74.16±3.11
11th DAY	72.66±5.50***	273.17±21.19**	239.83±21.19^{ns}	235.83±20.76^{ns}	72.667±5.50^{ns}
22nd day	70.66±4.06***	278.50±16.40**	71.16±3.52**	100.19±2.72**	70.83±1.42**

All values are shown as mean ± SEM and n=6,

ns = no significant, * indicate $p<0.05$, ** indicate $p<0.01$, *** indicate $p<0.001$,

EEPSL: Ethanolic extract of *Pterocarpus santlinus* leaf

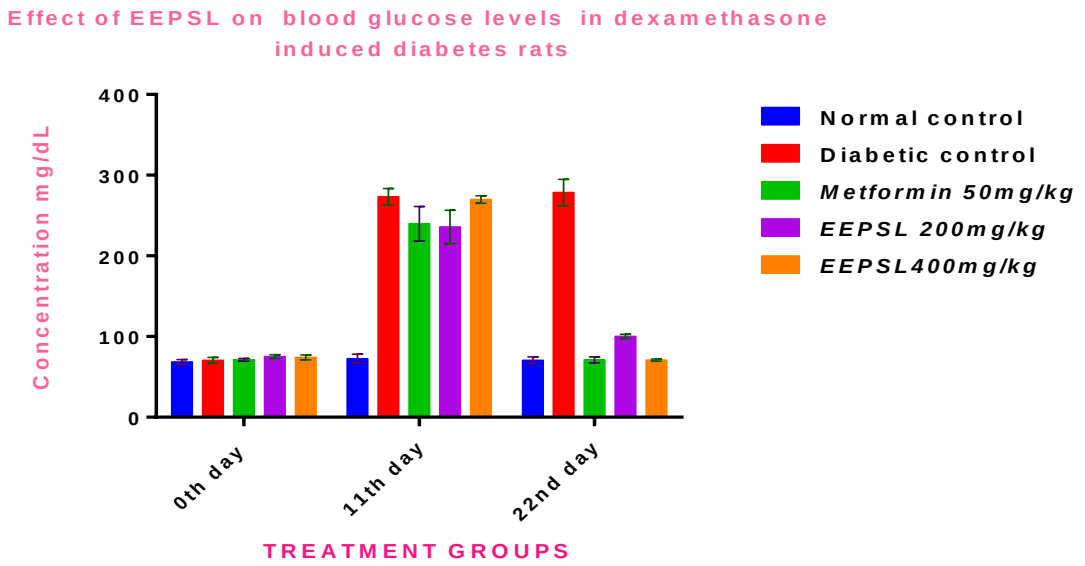


Figure 30: Effect of EEPSL on blood glucose levels in alloxan induced diabetes.

Table 30: Effect of EEPSL on TC in Alloxan induced diabetic rats.

TOTAL CHOLESTEROL (mg/dl) NORMAL- <150, PATHOLOGICAL RANGE - >200					
Animals	**Normal**	**Diabetic control Dexamethsone(10mg/kg)**	**Standard(metformin 50mg/kg)**	**EEPSL 200mg/kg**	**EEPSL 400mg/kg**
R1	66.65	278.86	69.66	98.22	68.31
R2	69.27	281.34	77.21	94.25	64.21
R3	71.54	259.26	65.23	95.23	67.85
R4	63.26	298.29	63.58	97.66	66.25
R5	67.28	324.88	64.25	93.21	63.21
R6	70.10	289.87	67.45	96.54	61.24
Mean ±SEM	68.01±1.20***	288.75±8.98***	67.89±2.07***	95.85±0.80***	65.17±1.13***

All values are shown as mean ± SEM and n=6.

ns = no significant* Indicates $p<0.05$, ** indicates $p<0.01$, *** indicates $p<0.001$, ns = no significant,

EEPSL: Ethanolic extract *pterocarpus santalinus* leaf, TC- total cholesterol

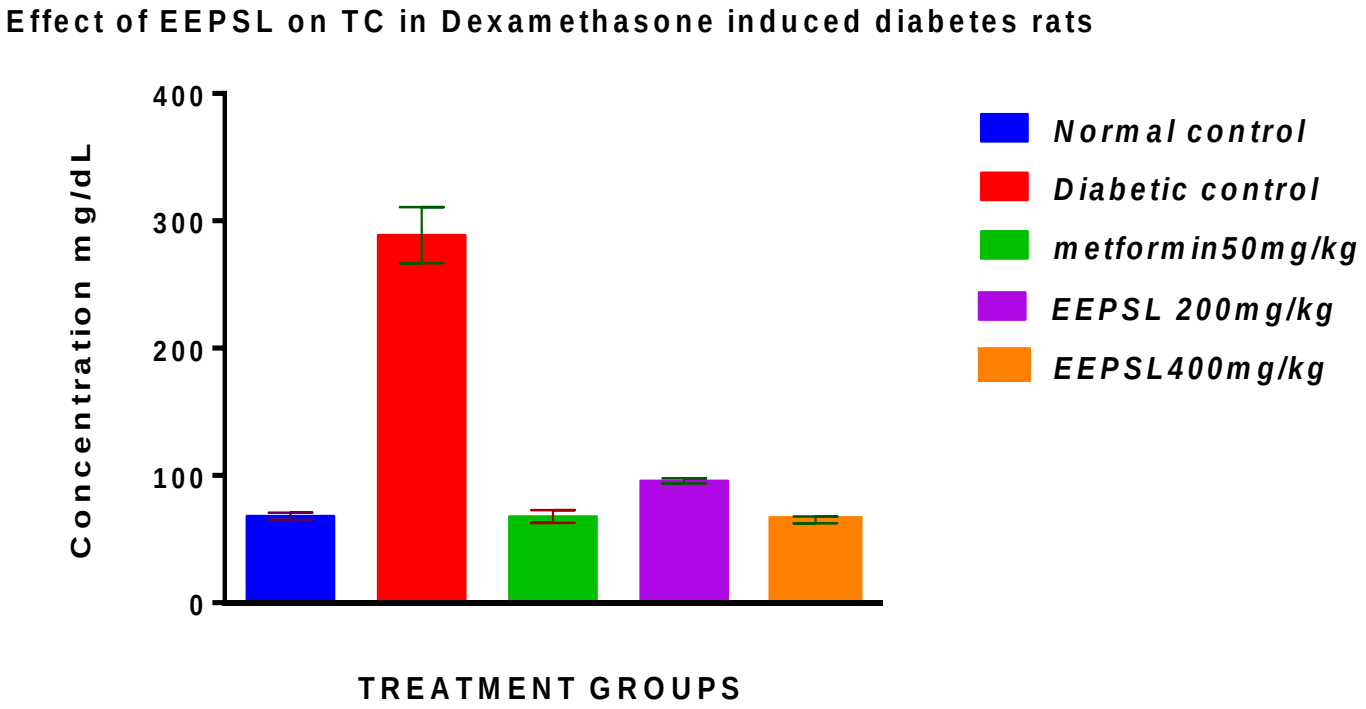


Figure 31: Effect of EEPSL on TC levels in dexamethasone induced diabetes.

Table 31: Effect of EEPSL on TG in alloxan induced rats.

TRIGLYCERIDES (mg/dl) NORMAL- <150, PATHOLOGICAL RANGE - >20					
Animals	**Normal**	**Diabetic control Dexamethsone(10mg/kg)**	**Standard(metformin 50mg/kg)**	**EEPSL 200mg/kg**	**EEPSL 400mg/kg**
R1	69.22	178.22	86.22	92.12	66.45
R2	65.31	184.56	81.21	95.24	69.17
R3	63.24	199.28	87.14	93.45	60.18
R4	61.28	215.68	84.43	90.85	67.83
R5	60.51	196.78	88.22	97.65	62.63
R6	70.11	235.67	85.28	90.12	64.59
Mean ±SEM	64.94±1.64***	194.90±1.64***	85.41±1.00***	93.23±1.15***	65.14±1.37***

All values are shown as mean ± SEM and n=6.

ns = no significant* Indicates $p<0.05$, ** indicates $p<0.01$, *** indicates $p<0.001$, ns = no significant,

EEPSL: Ethanolic extract *pterocarpus santalinus* leaf, TG-triglycerides

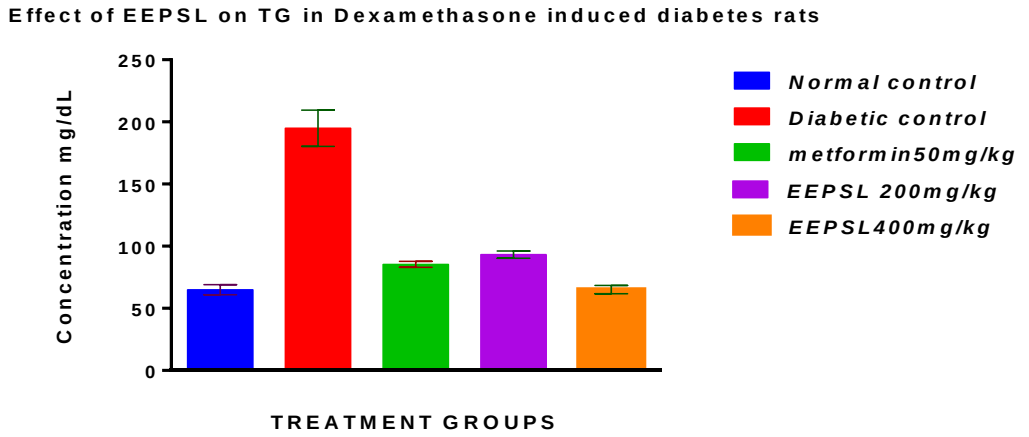


Figure 32: Effect of EEPSL on TG levels in dexamethasone induced diabetes.

Table 32: Effect of EEPSL on LDL in alloxan induced rats.

LOWDENSITY LIPOPROTIENS (mg/dl)) NORMAL <70, PATHOLOGICAL RANGE >150					
Animals	**Normal**	**Diabetic control Dexamethsone(10mg/kg)**	**Standard(metformin 50mg/kg)**	**EEPSL 200mg/kg**	**EEPSL 400mg/kg**
R1	19.6	229.00	20.21	50.59	22.61
R2	33.07	231.15	35.83	45.11	15.24
R3	30.65	205.16	21.66	40.39	16.53
R4	19.23	237.98	14.58	50.25	16.21
R5	19.97	275.29	12.6	47.39	12.79
R6	30.79	226.18	22.2	50.41	18.2
Mean ± SEM	25.55±2.68***	235.1±9.39***	21.18±3.33***	47.35±1.65***	16.93±1.34***

All values are shown as mean ± SEM and n=6.

ns = no significant* Indicates $p<0.05$, ** indicates $p<0.01$, *** indicates $p<0.001$, ns = no significant,

EEPSL: Ethanolic extract *pterocarpus santalinus* leaf, LDL-low density lipo protiens

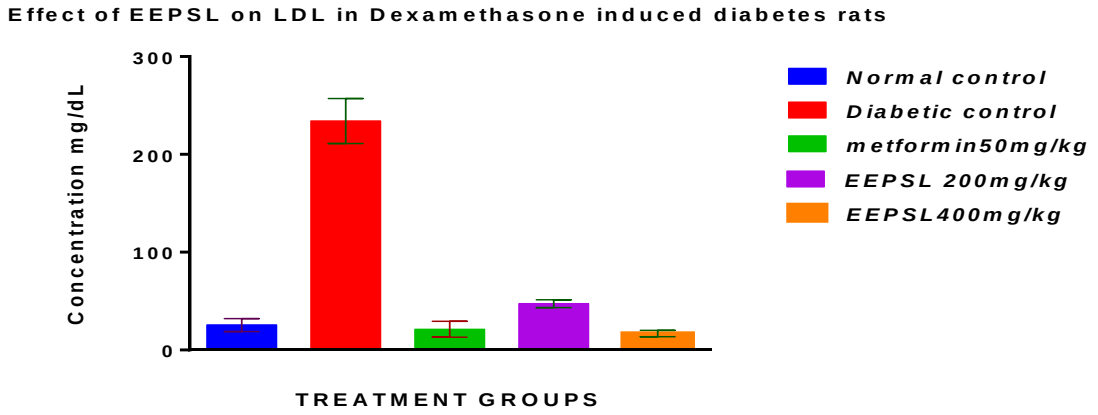


Figure 33: Effect of EEPSL on LDL levels in dexamethasone induced diabetes.

Table 33: Effect of EEPSL on VLDL in alloxan induced rats.

VERY LOW DENSITY LIPOPROTIENS(mg/dl) NORMAL<32,PATHOLOGICAL RANGE >30					
Animals	**Normal**	**Diabetic control Dexamethsone(10mg/kg)**	**Standard(metformin 50mg/kg)**	**EEPSL 200mg/kg**	**EEPSL 400mg/kg**
R1	13.84	35.64	17.24	18.42	13.29
R2	13.06	36.91	16.24	19.04	13.83
R3	12.64	39.85	17.42	18.69	12.03
R4	12.25	43.13	16.86	18.17	13.56
R5	12.10	39.35	17.64	19.53	12.52
R6	14.02	47.13	17.05	18.02	12.91
Mean ± SEM	12.98±0.32***	40.33±1.72***	17.07±0.21***	18.64±0.23***	13.023±0.27***

All values are shown as mean ± SEM and n=6.

ns = no significant* Indicates $p<0.05$, ** indicates $p<0.01$, *** indicates $p<0.001$, ns = no significant,

EEPSL: Ethanolic extract *pterocarpus santalinus* leaf, VLDL-very low density lipo protiens

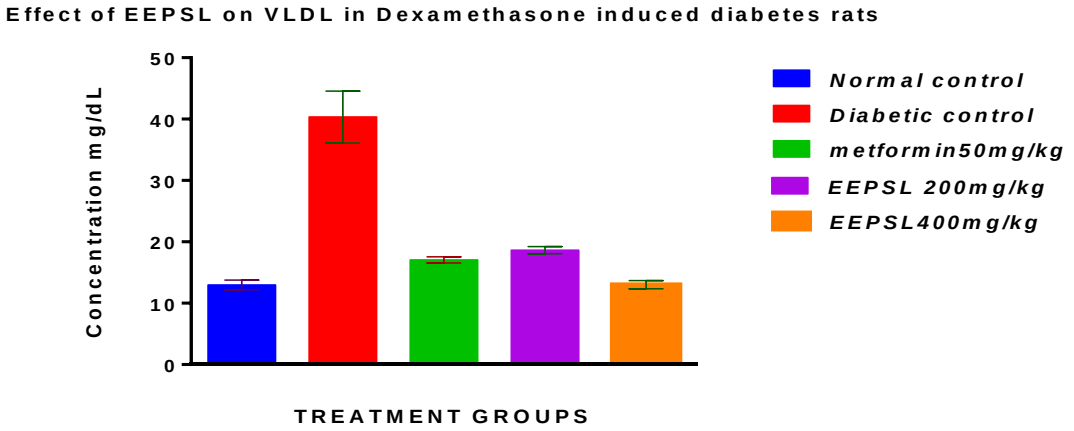


Figure 34: Effect of EEPSL on VLDL levels in dexamethasone induced diabetes.

Table 34: Effect of EEPSL on HDL in alloxan induced rats.

HIGH DENSITY LIPOPROTIENS(mg/dl) NORMAL >40 , PATHOLOGICAL RANGE <30					
Animals	**Normal**	**Diabetic control Dexamethsone(10mg/kg)**	**Standard(metformin 50mg/kg)**	**EEPSL 200mg/kg**	**EEPSL 400mg/kg**
R1	33.21	14.214	32.21	29.21	32.41
R2	23.14	13.215	25.14	30.10	35.14
R3	28.25	14.15	26.15	36.15	39.29
R4	31.78	17.18	32.14	29.24	36.48
R5	35.21	10.24	34.01	26.29	38.10
R6	25.29	16.56	28.20	28.101	30.13
Mean ± SEM	29.48±1.92**	14.26±1.018***	29.64±1.49**	29.84±1.37***	35.25±1.41**

All values are shown as mean ± SEM and n=6.

ns = no significant* Indicates $p<0.05$, ** indicates $p<0.01$, *** indicates $p<0.001$, ns = no significant,

EEPSL: Ethanolic extract *pterocarpus santalinus* leaf, HDL-high density lipo protiens

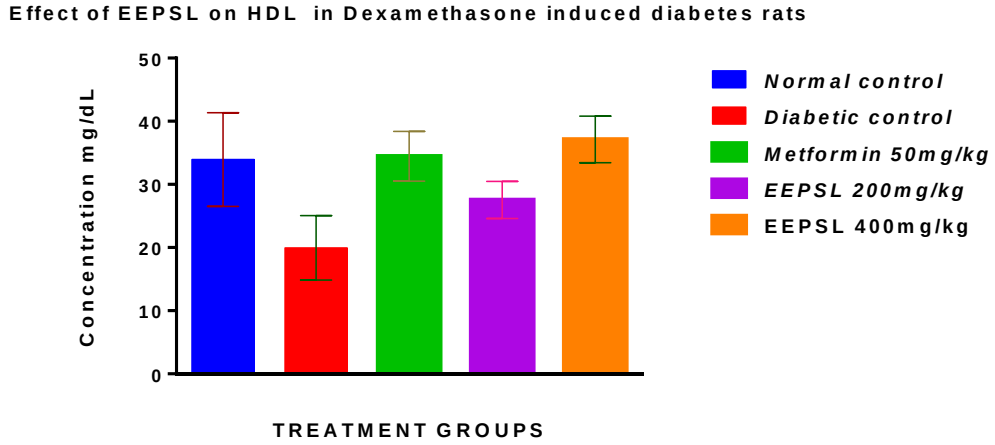


Figure 35: Effect of EEPSL on HDL levels in dexamethasone induced diabetes.

Table 35: Effect of EEPSL on SGPT in alloxan induced rats.

SERUM ALANINE TRANSAMINASE(U/l) NORMAL- 5 – 50(U/l), PATHOLOGICAL RANGE >50					
Animals	**Normal**	**Diabetic control Dexamethsone(10mg/kg)**	**Standard(metformin 50mg/kg)**	**EEPSL 200mg/kg**	**EEPSL 400mg/kg**
R1	10.70	75.56	19.07	30.12	13.09
R2	15.81	79.80	17.08	39.22	15.56
R3	15.60	71.18	22.01	36.25	10.55
R4	09.55	65.90	25.86	37.64	12.64
R5	18.86	55.86	28.77	35.29	06.89
R6	06.61	68.71	26.90	31.17	09.99
Mean ± SEM	12.85±1.89^{ns}	69.50±3.39**	23.28±1.89*	34.98±1.47**	11.45±1.22**

All values are shown as mean ± SEM and n=6.

ns = no significant* Indicates p<0.05, ** indicates p<0.01, *** indicates p<0.001, ns = no significant,

EEPSL: Ethanolic extract *pterocarpus santalinus* leaf, SGPT-serum alanine transaminase.

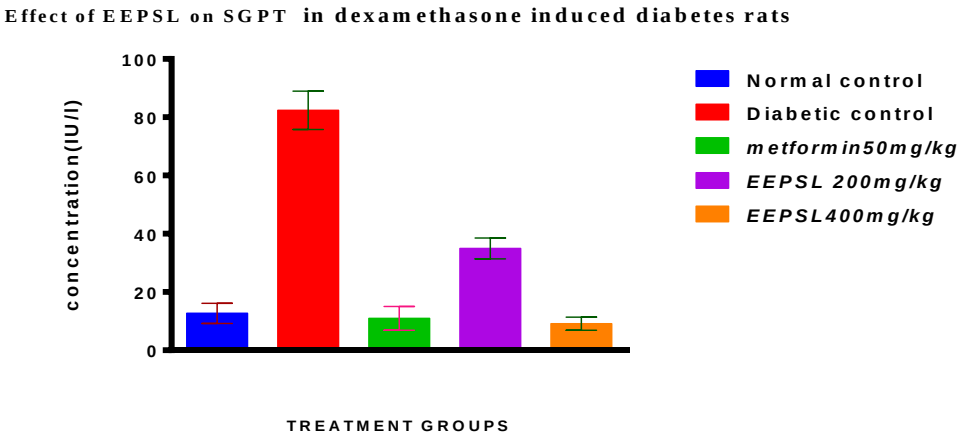


Figure 36: Effect of EEPSL on SGPT levels in dexamethasone induced diabetes.

Table 36: Effect of EEPSL on SGOT in alloxan induced rats.

SERUM ASPARTATE TRANSAMINASE(U/l) NORMAL 7-40 U/l, PATHOLOGICAL RANGE >40					
Animals	**Normal**	**Diabetic control Dexamethsone(10mg/kg)**	**Standard(metformin 50mg/kg)**	**EEPSL 200mg/kg**	**EEPSL 400mg/kg**
R1	12.54	68.86	13.55	29.31	06.64
R2	15.65	71.56	10.24	31.52	08.74
R3	15.78	85.68	09.55	38.54	09.88
R4	13.56	75.96	07.08	36.25	06.54
R5	09.55	68.96	12.86	32.94	08.66
R6	10.64	69.50	11.14	37.22	10.56
Mean ± SEM	12.95±1.04***	73.42±2.68***	10.73±0.95***	34.29±1.47***	08.50±0.67***

All values are shown as mean ± SEM and n=6.

ns = no significant* Indicates $p<0.05$, ** indicates $p<0.01$, *** indicates $p<0.001$, ns = no significant,

EEPSL: Ethanolic extract *pterocarpus santalinus* leaf SGOT- serum aspartate transaminase.

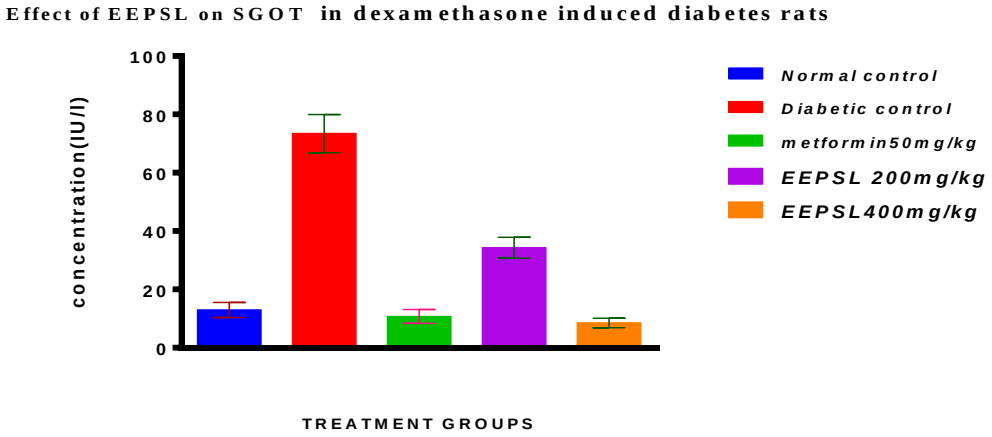


Figure 37: effect of EEPSL on SGOT levels in dexamethasone induced diabetes.

Table 37: Effect of EEPSL on ALP in alloxan induced rats.

ALKALINE PHOSPHATE (U/l) NORMAL 20-60 U/l PATHOLOGICAL RANGE >60					
Animals	**Normal**	**Diabetic control Dexamethsone(10mg/kg)**	**Standard(metformin 50mg/kg)**	**EEPSL 200mg/kg**	**EEPSL 400mg/kg**
R1	**15.54**	**88.61**	**15.64**	**22.21**	**09.65**
R2	**16.74**	**74.54**	**12.24**	**25.15**	**10.66**
R3	**12.54**	**89.14**	**11.15**	**23.35**	**06.24**
R4	**09.55**	**99.22**	**14.26**	**27.19**	**06.56**
R5	**13.25**	**86.22**	**13.11**	**24.69**	**08.22**
R6	**11.95**	**75.55**	**09.25**	**20.15**	**07.41**
Mean ± SEM	**13.26±1.05*** **	**85.54±3.78*** **	**12.60±0.92*** **	**23.79±1.00*** **	**08.12±0.71*** **

All values are shown as mean ± SEM and n=6.

ns = no significant* Indicates $p<0.05$, ** indicates $p<0.01$, *** indicates $p<0.001$, ns = no significant,

EEPSL: Ethanolic extract *pterocarpus santalinus* leaf, ALP- alkaline phosphate.

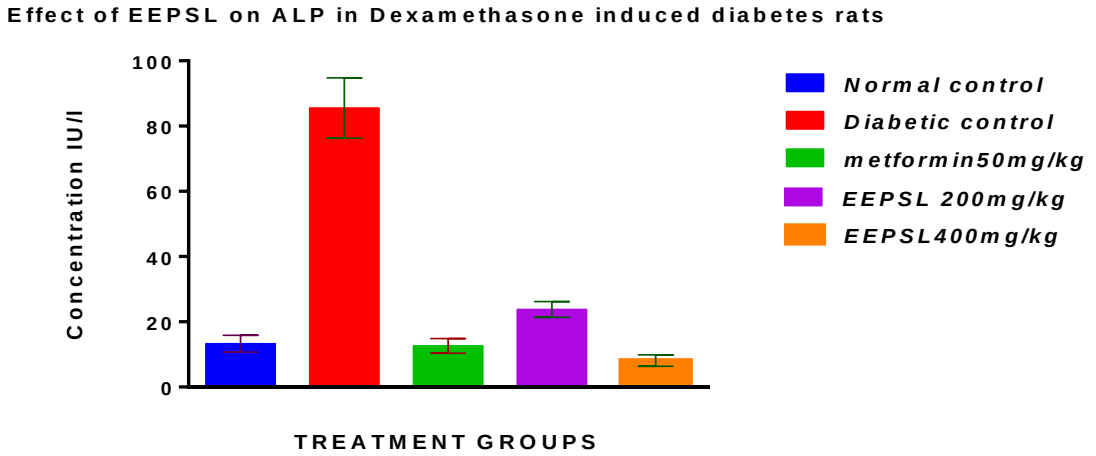


Figure 38: Effect of EEPSL on ALP levels in dexamethasone induced diabetes.

Table 38: Effect of EEPSL on biochemical parameters in alloxan induced diabetic rats.

BIOCHEMICAL PARAMETERS & LIVER ENZYMES						
S.NO	**PARAMETERS**	**Normal control**	**Diabetic control Dexamethsone(10mg/kg)**	**metformin 50 mg/kg**	**EEPSL 200 mg/kg**	**EEPSL 400 mg/kg**
1	TC (mg/dL)	68.01±1.20***	288.75±8.98***	67.89±2.07***	95.85±0.80***	65.17±1.13***
2	TG (mg/dL)	64.94±1.64***	194.90±1.64***	85.41±1.00***	93.23±1.15***	65.14±1.37***
3	LDL (mg/dL)	25.55±2.68***	235.1±9.39***	21.18±3.33***	47.35±1.65***	16.93±1.34***
4	VLDL (mg/dL)	12.98±0.32***	40.33±1.72***	17.07±0.21***	18.64±0.23***	13.023±0.27***
5	HDL (mg/dL)	29.48±1.92**	14.26±1.018***	29.64±1.49**	29.84±1.37***	35.25±1.41**
6	SGPT(IU/l)	12.85±1.89^{ns}	69.50±3.39**	23.28±1.89*	34.98±1.47**	11.45±1.22**
7	SGOT(IU/l)	12.95±1.04***	73.42±2.68***	10.73±0.95***	34.29±1.47***	08.50±0.67***
8	ALP(IU/l)	13.26±1.05***	85.54±3.78***	12.60±0.92***	23.79±1.00***	08.12±0.71***

EEPSL: Ethanolic extract of *Pterocarpus santalinus*, TC: Total cholesterol, TG: Triglycerides, LDL: Low density lipoproteins, VLDL: Very low density lipoproteins, HDL: High density lipoproteins., SGPT: spartate aminotransferase, SGOT: Alanine aminotransferase, ALP: alkaline phosphate

Table 39: Effect of EEPSL on physical parameters in alloxan induced rats.

Body weight (gm)(0th DAY)					
Animals	**Normal control**	**Diabetic control**	**metformin 50 mg/kg**	**ELEFPS 200 mg/kg**	**ELEFPS 400 mg/kg**
R 1	**200**	**225**	**225**	**225**	**275**
R 2	**180**	**250**	**200**	**220**	**275**
R 3	**225**	**225**	**200**	**250**	**200**
R 4	**225**	**250**	**250**	**200**	**250**
R 5	**225**	**250**	**225**	**275**	**220**
R 6	**200**	**250**	**220**	**275**	**225**
Mean ± SEM	**209.16±7.68****	**241.66±5.27^{ns}**	**220±7.63****	**240.83±12.61****	**240.83±12.61****
Body weight (gm)(11th DAY)					
R 1	**200**	**155**	**185**	**175**	**185**
R 2	**230**	**160**	**155**	**160**	**180**
R 3	**225**	**175**	**165**	**155**	**175**
R 4	**220**	**170**	**180**	**180**	**165**
R 5	**200**	**185**	**195**	**170**	**160**
R 6	**235**	**165**	**160**	**155**	**155**
Mean ±SEM	**218.33±6.14**	**168.33±4.4**	**173.3±6.41**	**165.83±4.3**	**170.00±4.83**
Body weight (gm)(22nd DAY)					
R 1	**200**	**180**	**230**	**230**	**280**
R 2	**225**	**185**	**225**	**225**	**285**
R 3	**180**	**190**	**226**	**275**	**225**
R 4	**225**	**180**	**275**	**225**	**260**
R 5	**200**	**185**	**276**	**280**	**255**
R 6	**225**	**195**	**235**	**285**	**250**
Mean± SEM	**209.16±7.68^{ns}**	**185.83±2.38^{ns}**	**244.50±9.90****	**253.33±12.01****	**259.16±8.89****

All values are shown as mean ± SEM and n=6, * indicates $p<0.05$, ** indicates $p<0.01$, *** indicates $p<0.001$.

Table 40: Effect of EEPSL on physical parameters in alloxan induced rats.

BODY WEIGHT(gm)					
DAYS	**Normal control**	**Diabeticcontrol Dexamethsone(10mg/kg)**	**metformin 50 mg/kg**	**EEPSL 200 mg/kg**	**EEPSL 400 mg/kg**
0th	209.16±7.68**	241.66±5.27^{ns}	220±7.63**	240.83±12.61**	240.83±12.61**
11th day	218.33±6.14**	168.33±4.4**	173.3±6.41**	165.83±4.3**	170.00±4.83***
22nd day	209.16±7.68^{ns}	185.83±2.38^{ns}	244.50±9.90**	253.33±12.01**	259.16±8.89**

All values are shown as mean ± SEM and n=6, , ns = no significant,

* indicate $p<0.05$, ** indicate $p<0.01$, *** indicate $p<0.001$,

EEPSL: Ethanolic extract of *Pterocarpus santlinus* leaf

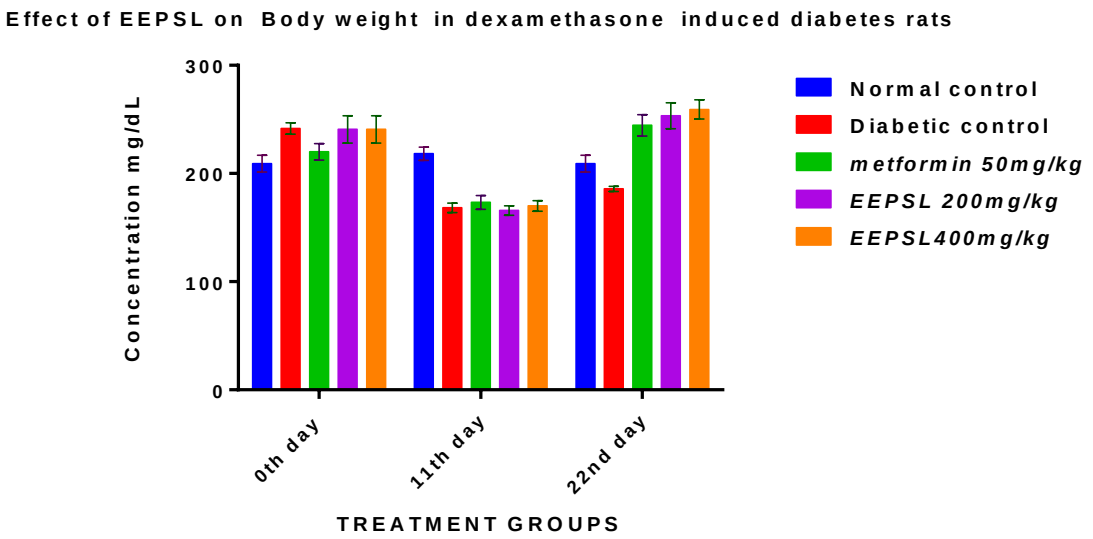


Figure 39: Effect of EEPSL on body weight in dexamethasone induced diabetes.

DISCUSSION

Diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia and is associated with severe complications affecting various vital organs. Despite the availability of several antidiabetic drugs, the search for effective and safer plant-based therapies continues. In the present study, the antidiabetic potential of the ethanolic leaf extract of *Pterocarpus santalinus* (EEPSL) was evaluated using experimental diabetic models.

The ethanolic extract was prepared using 90% ethanol by the continuous maceration method. Acute oral toxicity studies performed according to OECD Guideline No. 425 revealed that the extract was safe up to a dose of 2000 mg/kg body weight, with no mortality or observable signs of toxicity. Based on these findings, doses of 200 mg/kg and 400 mg/kg were selected for the antidiabetic study.

Diabetic control animals exhibited significant hyperglycemia accompanied by alterations in biochemical parameters, including increased total cholesterol (TC), triglycerides (TG), low-density lipoprotein (LDL), very low-density lipoprotein (VLDL), and elevated liver enzymes (SGPT, SGOT, and ALP), along with reduced high-density lipoprotein (HDL) levels. These findings are consistent with the metabolic disturbances associated with diabetes mellitus.

Treatment with EEPSL significantly reduced fasting blood glucose levels and improved the altered lipid profile in a dose-dependent manner. The higher dose (400 mg/kg) produced

results comparable to the standard drug, metformin. The extract also restored HDL levels while reducing TC, TG, LDL, and VLDL concentrations, suggesting an improvement in lipid metabolism.

The improvement in the lipid profile may be attributed to enhanced insulin action. Insulin suppresses lipolysis by inhibiting hormone-sensitive lipase in adipose tissue, thereby reducing the release of free fatty acids into the circulation. In diabetes, insulin deficiency or resistance promotes excessive lipolysis, resulting in elevated free fatty acids, increased β-oxidation, enhanced acetyl-CoA production, and increased cholesterol synthesis. Administration of EEPSL appears to reverse these metabolic abnormalities, thereby reducing dyslipidemia.

Furthermore, EEPSL significantly decreased serum SGPT, SGOT, and ALP levels, indicating protection against diabetes-induced hepatic damage. The beneficial effects observed in this study may be attributed to the presence of bioactive phytoconstituents such as flavonoids, tannins, saponins, alkaloids, glycosides, and phenolic compounds, which possess antioxidant and antihyperglycemic properties.

Overall, the findings of the present study demonstrate that the ethanolic leaf extract of *Pterocarpus santalinus* possesses significant antidiabetic and antihyperlipidemic activities and may serve as a promising natural therapeutic agent for the management of diabetes mellitus and its associated metabolic complications.

CONCLUSION

The present study demonstrated that the ethanolic leaf extract of *Pterocarpus santalinus* possesses significant antidiabetic activity in both alloxan-induced and dexamethasone-induced diabetic rat models. Treatment with the extract produced a significant reduction in fasting blood glucose levels and favorably modulated the altered biochemical parameters by decreasing total cholesterol (TC), triglycerides (TG), low-density lipoprotein (LDL), very low-density lipoprotein (VLDL), and hepatic marker enzymes (SGPT, SGOT, and ALP), while significantly increasing high-density lipoprotein (HDL) levels.

The improvement in the lipid profile suggests that the extract exhibits hypolipidemic activity, whereas the normalization of liver enzyme levels indicates a hepatoprotective effect. The

increase in HDL levels further suggests a potential cardioprotective role by reducing the risk of atherosclerosis and coronary artery disease.

The observed pharmacological effects may be attributed to the presence of bioactive phytoconstituents, including flavonoids, phenolic compounds, tannins, saponins, alkaloids, and glycosides, which possess antioxidant and antihyperglycemic properties.

In conclusion, the findings of the present study support the traditional use of *Pterocarpus santalinus* leaves in the management of diabetes mellitus and indicate that the ethanolic leaf extract has promising therapeutic potential for controlling hyperglycemia and its associated metabolic complications. However, further studies are warranted to isolate and characterize the active phytoconstituents, elucidate their molecular mechanisms of action, and establish their safety and efficacy through clinical investigations before considering their therapeutic application in humans.