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Research Article

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## Preventive Effect of *Premna Latifolia* against High Fructose Diet Induced Insulin Resistance, Hyperlipidemia and Obesity in Male Wister Rats

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### ABSTRACT

The aim of this study was to investigate ant diabetic effect of *premnalatifolia* on the increased levels of glucose, cholesterol. The ethanolic seed extract of *premnalatifolia* (250,500 mg/kg. p.o.) were studied for their ant diabetic effect on streptozocin induced diabetes in rats. The decreased glucose levels were noted. The ethanolic seed extract of *premnalatifolia* significantly decreased the blood glucose level. The 500mg/kg dose more significantly ( $p < 0.001$ ) protected the animals from induced diabetes. The data suggests that the ethanolic seed extracts of *premnalatifolia* may produce its antidiabetic effects via non-specific mechanisms since it abolished the diabetes induced by STZ method.

**Keywords:** *premnalatifolia*, streptozocin, Ethanolic extract, anti-diabetic.

### ARTICLE INFO

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### 1. Introduction

Insulin resistance is a metabolic disorder whose prevalence is increasing alarmingly in populations worldwide. It is a condition wherein the body tissues become resistant to International Journal of Chemistry and Pharmaceutical Sciences

insulin, resulting in a marked decrease of glucose metabolism in response to insulin. Recent studies suggest that insulin resistance results from complex interactions

between genetic and environmental factors and is associated with common diseases such as type 2 diabetes, hypertension, obesity, and coronary heart disease (Grundy, 2007). It has been demonstrated that the use of pharmacological intervention in combination with lifestyle modifications that include diet and moderate exercise is particularly useful in the management of obesity and cardiovascular diseases as well as prevention of insulin resistance and type 2 diabetes mellitus (Hu et al., 2006). Thiazolidinediones (TZD), agonists of the peroxisome proliferator-activated receptor, are a class of oral antidiabetic agents that enhance insulin sensitivity and improve metabolic control in patients with type 2 diabetes (Gervois et al., 2007). Despite their proven efficacy, a number of deleterious side effects such as weight gain and the documented aggravation of advanced heart failure through fluid retention have been noted with the use of TZDs, including rosiglitazone and pioglitazone (Granberry et al., 2007). Accordingly, a significant research effort in laboratories worldwide is being directed towards generating modulators that retain the beneficial clinical effects of TZDs while avoiding their adverse side effects. It seems, therefore, that developing new agents without side effects would definitely be helpful in the therapy of diabetic patients with insulin resistance.

## 2. Experimental

### Experimental Animals and Housing of Animals:-

Albino Wister rats of male sex (150-250g) were procured from National Institute of Nutrition (Hyderabad). They are maintained under standard conditions (temperature 25 °C) at least 2 weeks prior to the study, so that animals could acclimatize to the new environment. The animals were housed in sanitized polypropylene cages (32x24x16) with stainless steel grill top, bedded with rice husk containing sterile conditions. They had free access to high fructose diet and water was provided *ad libitum*.

### Plant material

Fresh leaves of *Premna Latifolia* was obtained from chittoor dist (tirumala hills), and authenticated by Dr. K. Madhava Chetty, Asst. Professor, Department of Botany, S.V. University, Tirupathi.

### Extraction

After 10 days of drying under shed, the leaves were powdered using a mixer. The methanolic extract was prepared by soxhlet extraction method (Hot method). 100gm of dried powder of leaves was extracted with 1500 ml methanol. The extract was concentrated and dried and suspension is made using acacia.

### Preliminary phytochemical studies

A portion residue from extract was subjected for phytochemical analysis in order to see the presence of glycosides, polyphenols, saponines, flavonoids, tanins and steroids.

### Study design as follows:

**Group I:** Animals given normal diet and water for 42days, followed by water 15min before diet for 28days (15-42).

**Group II:** Animals given high fructose diet (P.O) for 42days at dose 10mg/kg, followed by water 15min before diet for 28days(15-42).

**Group III:** Animals given high fructose diet (P.O) for 42days at dose 10mg/kg, followed by leaf extract at 250mg/kg 15min before diet for 28days(15-42).

**Group IV:** Animals given high fructose diet (P.O) for 42days at dose 10mg/kg, followed by leaf extract at 500mg/kg 15min before diet for 28days(15-42).

**Group V:** Animals given high fructose diet (P.O) for 42days at dose 10mg/kg, followed by Pioglitazone at 10mg/kg 15min before diet for 28days(15-42).

## 3. Results and Discussion

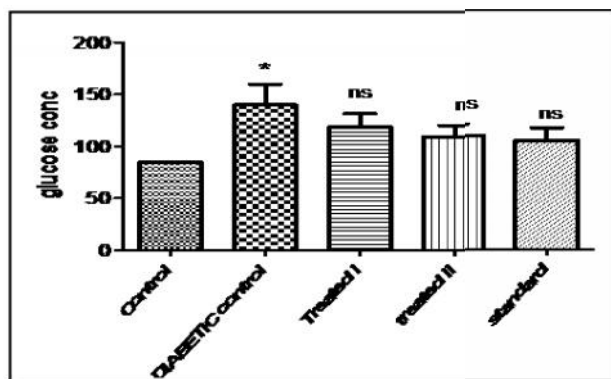
### Results:

The present study results shows the increased level of blood glucose, in diabetic control group when compared to control, all other groups treated with *P.latifolia* and Pioglitazone reduced the blood glucose level when compare with diabetic control as shown in fig 11 and tab 1. Insulin resistance index was increased in diabetic control group when compared to control, all other groups treated with *P.latifolia* and Pioglitazone reduced the Insulin resistance index when compare with diabetic control as shown in and tab 2. Lipid profile was increased in diabetic control group when compared to control, all other groups treated with *P.latifolia* and Pioglitazone reduced the Lipid profile when compare with diabetic control as shown in and tab 3. The body weight was also increased in all the groups when compared with the initial weight, but the increase is very high in the diabetic control group when compared to all other groups as shown in tab 5.

### Discussion:

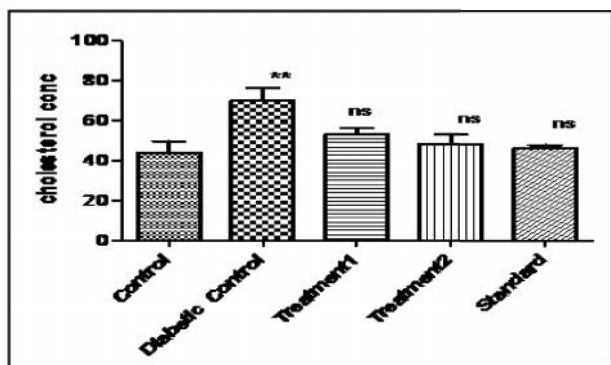
The present study results shows the elevated level of blood glucose, cholesterol, triglyceride, LDL, and reduced HDL level in the diabetic control. When compared with normal control. These find outs are supporting to ghule et al., 2009 reported that when the free fatty acid supply exceeds utilization, non – adipose tissues start accumulating TG, which is aggravated by the simultaneous presence of hyperglycemia. Subsequently the formation of reactive long – chain fatty acyl – COAs and toxic metabolites such as ceramide, the activation of proteins kinase C, an increase of oxidative stress, may all contribute to apoptosis and the decline of cells Poirout and Robertson,2002; Tushuizen et al.2007. The fructose diet induces the elevated levels of glucose it is evidence for for further research of shaefer et.al. 2009. Reported that dietary fructose a monosaccharide which can induce metabolic disorders including glucose intolerance and dyslipidemia which is of pathophysiologic importance for the development of diabetes and atherosclerosis shaefer et.al. 2009. There are many reports in the literature describing an increase in body weight and glycemia with the consumption of high- fructose diets in both humans and animals models Rizkalla et al., 1993; Tordoff and alleva, 1990. Aguilera et al 2004; Xi et al., 2007; Suwannaphet et al., 2010 which found that consumption of high – fructose diets markedly induces an increase in glycemia associated with dyslipidemia and, consequently, a reduction of insulin sensitivity. This study find outs increased oxidative pre radicals in diabetic control, there is now much emerging evidence that chronic consumption of high – fructose diets contributes to

excessive formation or reactive Oxygen species (ROS). This leads to induced oxidative stress and mediated insulin resistance (Houstis et al 2006).



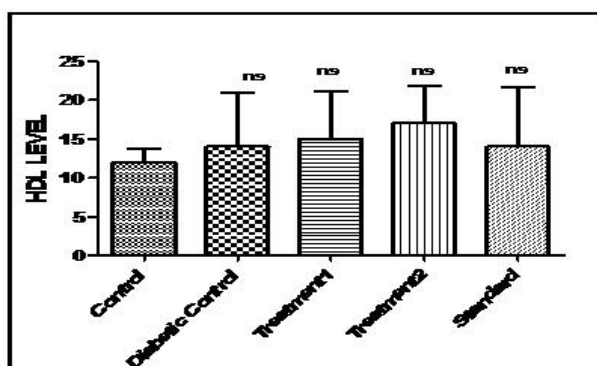
**Figure 11:** Blood glucose level in control, diabetic and *Premna latifolia* treated groups

*Premna latifolia* significantly decreases glucose level in treated groups when compare to diabetic control group. The data was expressed as mean  $\pm$  SD, (n=6) and evaluated by ANOVA followed by Dunnett test \* $p < 0.05$  (vs. DC).



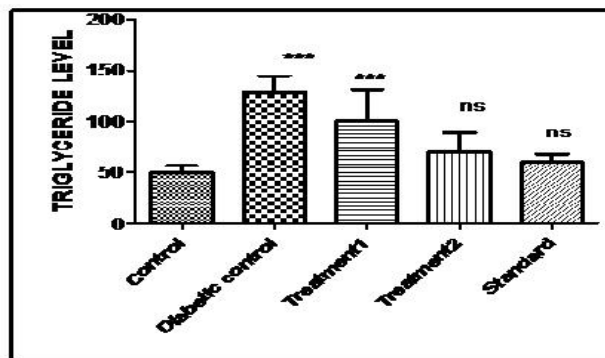
**Figure 12:** Cholesterol level in control, diabetic and *Premna latifolia* treated groups

*Premna latifolia* significantly decreases cholesterol level in treated groups when compare to diabetic control group. The data was expressed as mean  $\pm$  SD, (n=6) and evaluated by ANOVA followed by Dunnett test \*\* $p < 0.01$  (vs. DC).



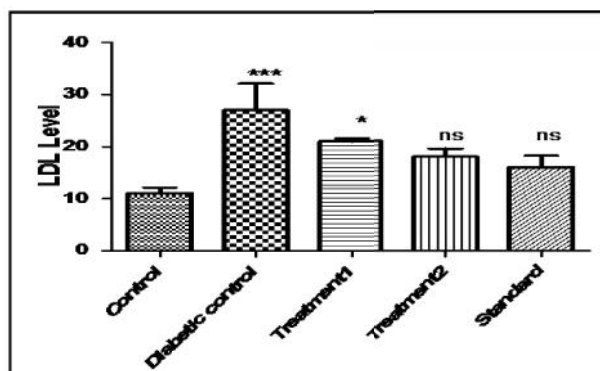
**Fig 13:** HDL level in control, diabetic and *Premna latifolia* treated groups

*Premna latifolia* significantly increases HDL level in treated groups when compare to diabetic control group. The data was expressed as mean  $\pm$  SD, (n=6) and evaluated by ANOVA followed by Dunnett test.



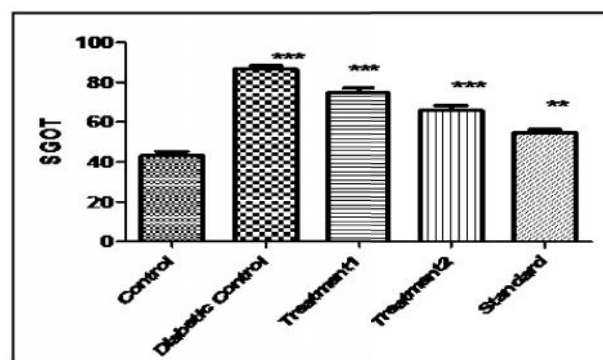
**Fig 14:-** Triglyceride level in control, diabetic and *Premna latifolia* treated groups

*Premna latifolia* significantly decreases Triglyceride level in treated groups when compare to diabetic control group. The data was expressed as mean  $\pm$  SD, (n=6) and evaluated by ANOVA followed by Dunnett test \*\*\* $P < 0.001$  (vs. DC), \*\*\* $P < 0.001$  (vs. T1).



**Fig 15:** LDL level in control, diabetic and *Premna latifolia* treated groups

*Premna latifolia* significantly decreases LDL level in treated groups when compare to diabetic control group. The data was expressed as mean  $\pm$  SD, (n=6) and evaluated by ANOVA followed by Dunnett test \*\*\* $P < 0.001$  (vs. DC), \* $P < 0.05$  (vs. T1).



**Fig 16:** SGOT level in control, diabetic and *Premna latifolia* treated groups

*Premna latifolia* significantly decreases SGOT Value in treated groups when compare to diabetic control group. The data was expressed as mean  $\pm$  SD, (n=6) and evaluated by ANOVA followed by Dunnett test \*\*\*P<0.001(vs.DC), \*\*\*P<0.001(vs.T1) \*\*\*P<0.001(vs.T2), \*\*P<0.01(vs.S).

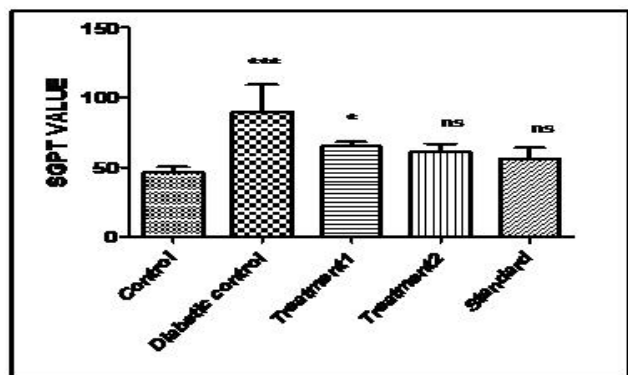


Fig17: SGPT level in control, diabetic and *Premna latifolia* treated groups

*Premna latifolia* significantly decreases SGPT Value in treated groups when compare to diabetic control group. The data was expressed as mean  $\pm$  SD, (n=6) and evaluated by ANOVA followed by Dunnett test \*\*\*P<0.001(VS.DC), \*P<0.05(VS.T1).

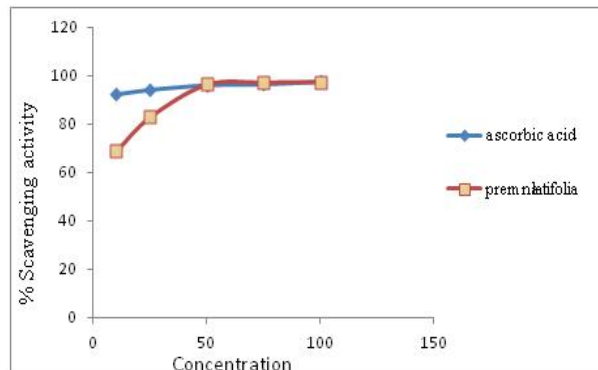


Fig18: *In- vitro* anti oxidant activity of *Premna latifolia* compared with ascorbic acid.

Table 6: % Scavenging activity of ascorbic acid and *Premna latifolia*

conc.	% scavenging activity	
	Ascorbic acid	<i>Premna latifolia</i>
10	92.12	68.79
25	94.09	82.88
50	96.06	96.34
75	96.45	97.2
100	97.63	97.4
IC <sub>50</sub>	75.5	77.14

Table 1: Blood glucose level in control, diabetic and *Premna latifolia* treated groups

Groups	0 <sup>th</sup> day	14 <sup>th</sup> day	24 <sup>th</sup> day	42 <sup>th</sup> day	MEAN $\pm$ SD
Control	83	83.16	85.5	87	85 $\pm$ 1.9
Diabetic control	85	136.66	157.66	179	140 $\pm$ 40*
Treatment I	84	141.66	134.66	113	118 $\pm$ 26 <sup>ns</sup>
Treatment II	83	134.16	118.16	101	109 $\pm$ 22 <sup>ns</sup>
Standard	82	136	110.5	89	104 $\pm$ 24 <sup>ns</sup>

Table 2: Insulin levels and insulin index in control, diabetic and *Premna latifolia* treated groups

parameter	Control	Diabetic control	Treatment I	Treatment II	Standard
Insulin	21 $\pm$ 3.9	65 $\pm$ 12	49 $\pm$ 10	28 $\pm$ 4.8	30 $\pm$ 7.6
Insulin index	4.38	22.24	14.14	7.46	7.6

Table 3: lipid profiles of control, diabetic and *Premna latifolia* treated groups

Parameters	Control	Diabetic control	Treatment I	Treatment II	Standard
Cholesterol	44 $\pm$ 14	70 $\pm$ 16**	53 $\pm$ 8.6 <sup>ns</sup>	48 $\pm$ 12 <sup>ns</sup>	46 $\pm$ 4.3 <sup>ns</sup>
HDL	12 $\pm$ 1.8	14 $\pm$ 6.9 <sup>ns</sup>	15 $\pm$ 6.2 <sup>ns</sup>	17 $\pm$ 4.8 <sup>ns</sup>	14 $\pm$ 7.6 <sup>ns</sup>
LDL	11 $\pm$ 2.8	27 $\pm$ 13***	21 $\pm$ 1.4*	18 $\pm$ 3.9 <sup>ns</sup>	16 $\pm$ 5.4 <sup>ns</sup>
Triglycerides	50 $\pm$ 6.5	129 $\pm$ 16***	100 $\pm$ 32***	70 $\pm$ 19 <sup>ns</sup>	60 $\pm$ 7.9 <sup>ns</sup>

All treatment groups were compared with diabetic control group, data was expressed Mean $\pm$ SD (n=6). The significance between two groups was determined by one way ANOVA, followed by Dunnett multiple comparison \*p<0.05, \*\*p<0.01, \*\*\*p<0.001.

Table 4: SGPT and SGOT values of control, diabetic and *Premna latifolia* treated groups

Parameters	Control	Diabetic control	Treatment I	Treatment II	Standard
SGPT	46 $\pm$ 3.9	90 $\pm$ 19***	65 $\pm$ 3.2*	61 $\pm$ 6 <sup>ns</sup>	56 $\pm$ 7.8 <sup>ns</sup>
SGOT	43 $\pm$ 5.3	87 $\pm$ 4.3***	75 $\pm$ 6.5***	66 $\pm$ 6.1***	55 $\pm$ 4.3**

Table 5: Body weight of control, diabetic and *Premna latifolia* treated groups

Body weight	control	Diabetic control	Treatment I	Treatment II	standard
Initial	219 $\pm$ 10	202 $\pm$ 31	205 $\pm$ 14	210 $\pm$ 7.5	190 $\pm$ 18
Final	220 $\pm$ 16	288 $\pm$ 40	240 $\pm$ 18	232 $\pm$ 15	223 $\pm$ 14

#### 4. Conclusion

These findings investigated that the insulin resistance has been increased in the diabetic control group when compared to the control groups, as insulin resistance index is high in diabetic control group, in all other groups the insulin resistance index is decreased when compared with diabetic control so insulin resistance is decreased. The lipid profile was significantly increased in diabetic control group when compared to the control group and in all others groups the levels were decreased. But the HDL level was decreased in diabetic control group and increased in all others groups. The body weight of the animals was increased in the diabetic control group and the increase was very high. When compared to all other groups. The above study as per literature review and preliminary phytochemical screening we conclude levels were significantly increased in diabetic control group and in the treated groups they were decreased due to the presence of flavonoids, polyphenols, and alkaloids. So further investigation is needed for which chemical constituents were responsible for this activity.

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