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Determination of Hypoglycaemic Activity from Various Plant Extracts in Normal and Alloxan Induced Diabetic Rats

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ABSTRACT

The present study is undertaken to explore the effects of aqueous, alcoholic, chloroform and Petroleum ether extracts of *Hibiscus rosa sinensis*(HS), *Aegle marmelos*(AM), and *Jatropha curcas*(JC) on blood glucose level in both normal and alloxan induced diabetic rats. In this single dose study, extracts are prepared by Maceration process with different solvents. Extracts of HS, AM, JC was given once orally in different doses. The effect of extract was studied in normal rats, alloxan (150mg/kg, i.p.) induced diabetic rats and glucose fed normal rats by measuring fasting blood glucose level at different intervals. The extracts exhibited significant ($p < 0.01$) antidiabetic activity in normal fasted rats and alloxan induced diabetic rats. The present study showed that aqueous extract of HS, AM, JC has potent antidiabetic effect in alloxan induced rats and Development and evaluation of tablet formulations showing significant activity and to compare these effects with Glibenclamide Standard Marketed product.

Keywords: Diabetes mellitus, *Hibiscus rosa sinensis*(HS), *Aegle marmelos*(AM), *Jatropha curcas*(JC), Antidiabetic, Alloxan, chloroform, petroleum ether, Alcohol.

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INTRODUCTION

Diabetes mellitus is a syndrome characterized by chronic hyperglycemia and disturbances of carbohydrate, fat, and protein metabolism associated with absolute or relative deficiencies in insulin secretion and/or insulin action. Diabetes mellitus may be suspected or recognized clinically by the presence of characteristic symptoms such as excessive thirst, polyuria, pruritus, otherwise unexplained weight loss or one or more of the many complications associated with or attributable to the disease. DM is a chronic metabolic disorder affecting approximately 5% of the world's population. According to World Health Organization Projections, the diabetic population is likely to increase to 300 millions or more by the year 2025.

Plant materials which are being used as traditional medicine for the treatment of Diabetes Mellitus are considered as source for a new drug or a lead to make new drug. Plant extract preparations are being prescribed by the traditional practitioners for Diabetes in many countries. Therefore a proper scientific evaluation of plant extracts by pharmacological tests is necessary.¹

Wood of *Jatropha curcas* Linn. belongs to the Euphorbiaceae family, flowers of *Hibiscus rosa sinensis* belonging to family Malvaceae, a household plant throughout the world, Dried fruit pulp of *Aegle marmelos* (Linn), family Rutaceae are taken and extract is prepared by extraction process by different solvents (Aqueous, alcohol, petroleum ether) .

MATERIALS AND METHOD

Hibiscus rosa sinensis(HS), *Aegle marmelos*(AM), *Jatropha curcas*(JC), Ethanol, Chloroform, Petroleum ether, Tween 80, Female wistar rats, Microcrystalline cellulose, Poly vinyl pyrrolidone, Talc, Magnesium stearate.

Preparation of plant extract:

Extraction Method:

The drugs were cleaned and dried at room temperature in the shade. They were then powdered and used for extraction. The extracts were obtained from Maceration process. The powder was put into 5 liter conical flask with different solvents viz. petroleum ether, chloroform, benzene, ethanol and distilled water. Vessel is closed and kept for seven days with occasional stirring. After effective extraction the liquids were strained and marcs were pressed, adding the expressed liquids to the strained liquids. The combined liquids were clarified by decantation or filtration. The solvents were concentrated on water bath and finally reduced to dryness. The dried extracts were stored carefully used for antidiabetic activity of polyherbal formulation.

Animals:

Female wistar rats weighing between 140-180g were acclimatized for a period of 9 days. They were housed in a standard cage and maintained under standard environmental conditions 12:12 light: dark cycle and with free access to food and water *ad libitum*. All the procedures were performed in accordance to institutional Animal Ethics Committee. (Registration no.1185/a/08/CPCSEA)

Acute and short term toxicity study:

The extract was tested for its acute and short term toxicity in rats. To determine acute toxicity of the drug, healthy wistar rats were starved overnight. They were orally fed with extract in increasing dose levels of 300mg/kg body weight and continued up to 5000-mg/kg-body weight. The mortality and general behaviour of the animals were observed periodically for 24h. The animals were observed continuously for initial 4h and intermittely for next 6h and then again at 24h following drug administration. The parameters observed were grooming, hyperactivity, sedation, loss of righting reflex and convulsions.

Determination of test dose:

During preliminary toxicity study, no adverse effects or mortality was observed in experimental animals with oral administration of seed extract up to a high dose of 5000mg/kg body weight observed for 24h. So we have chosen single dose, 500mg/kg body weight for all the extracts of HS, JC, chloroform and petroleum ether extracts of AM. and 250mg/kg body weight for aqueous and alcoholic extracts of AM were selected as a test dose for this study.

EXPERIMENTAL DESIGN:**Induction of diabetes in experimental animals:**

The rats were injected with alloxan in saline (0.9% NaCl) at a dose of 150mg/kg body weight intraperitonally. Normal control rats were injected with saline only. Prior to this, the rats were fasted for 16h. After one hour of alloxan administration the animals were given feed *ad libitum*. A 5% dextrose solution was given in feeding bottle for a day to over come the early hypoglycemic Phase. After 72 hours blood glucose was measured by glucometer. The diabetic rats (glucose level > 300 mg/dl) were separated and divided into different groups for experimental study, each group contain six animals.

FORMULATION OF TABLETS:

Tablet formulations were prepared by direct compression method. The compositions of tablet formulations are shown in table 3.

Table 1: LD₅₀ Cut off mg/kg body weight of various extracts

S. No.	Name of Extract	LD ₅₀ Cut off mg/kg body weight	Vehicle
1.	Aqueous extract of AM	250 mg	Tween 80
2	Alcohol extract of AM	250 mg	Tween 80
3	Chloroform extract of AM	500 mg	Tween 80
4	Petroleum ether of AM	500mg	Tween 80
5	Aqueous extract of HS	500 mg	Tween 80
6	Alcohol extract of HS	500 mg	Tween 80
7	Chloroform extract of HS	500 mg	Tween 80
8	Petroleum ether of HS	500 mg	Tween 80
9	Aqueous extract of JC	500 mg	Tween 80
10	Alcohol extract of JC	500 mg	Tween 80
11	Chloroform extract of JC	500 mg	Tween 80

Table 2 Experimental Design

Groups	Diabetic animals	Non diabetic animals	OGTT animals
1.	Normal control (NC)(vehicle only)	Normal control (NC) (vehicle only)	Normal control (NC) + Glucose (2g/kg)
2.	Diabetic control (DC)	---	---
3.	Aqueous extract 500mg (AE-AM)	Aqueous extract 500mg (AE-AM)	Aqueous extract 500mg (AE-AM)+ Glucose (2g/kg)
4.	Ethanollic extract 500mg (EE-AM)	Ethanollic extract 500mg (EE-AM)	Ethanollic extract 500mg (EE-AM) + Glucose (2g/kg)
5.	Chloroform extract 500 (CE-AM)	Chloroform extract 500 (CE-AM)	Chloroform extract 500 (CE-AM) + Glucose (2g/kg)
6.	Petroleum ether extract 500 (PE-AM)	Petroleum ether extract 500 (PE-AM)	Petroleum ether extract 500 (PE-AM)
7.	Aqueous extract 500mg (AE-JC)	Aqueous extract 500mg (AE-JC)	Aqueous extract 500mg (AE-JC)+ Glucose(2g/kg)
8.	Ethanollic extract 500mg (EE-JC)	Ethanollic extract 500mg (EE-JC)	Ethanollic extract 500mg (EE-JC) + Glucose (2g/kg)
9.	Chloroform extract 500 (CE-JC)	Chloroform extract 500 (CE-JC)	Chloroform extract 500 (CE-JC)+ Glucose (2g/kg)
10	Petroleum ether extract 500 (PE-JC)	Petroleum ether extract 500 (PE-JC)	Petroleum ether extract 500 (PE-JC)+ Glucose (2g/kg)
11.	Aqueous extract 500mg (AE-HS)	Aqueous extract 500mg (AE-HS)	Aqueous extract 500mg (AE-HS)+Glucose (2g/kg)
12.	Ethanollic extract 500mg (EE-HS)	Ethanollic extract 500mg (EE-HS)	Ethanollic extract 500mg (EE-HS)+ Glucose (2g/kg)

(AM-*Aegele marmelos*; JC-*Jatropha curcas*; HS-*Hibiscus rosa sinensis*)

Table 3: Formulation of Polyherbal Tablet (F1)

S. No.	Ingredients	For single Tablet
1.	Aqueous extract of <i>Aegle marmelos</i>	8.33 mg
2.	Ethanollic extract of <i>Aegle marmelos</i>	8.33 mg
3.	Chloroformic extract <i>Aegle marmelos</i>	8.33 mg
4.	Petroleum ether extract of <i>Aegle marmelos</i>	8.33 mg
5.	Aqueous extract of <i>Jatropha curcas</i>	8.33 mg

6.	Ethanollic extract of <i>Jatropha curcas</i>	8.33 mg
7	Chloroformic extract of <i>Jatropha curcas</i>	8.33 mg
8	Petroleum ether extract of <i>Jatropha curcas</i>	8.33 mg
9	Chloroformic extract of <i>Hibiscus rosa sinensis</i>	8.33 mg
10	Microcrystalline cellulose.	479 mg
11	Poly vinyl pyrrolidone. (Cross linked)	12 mg
12	Talc	30 mg
13	Magnesium stearate	4 mg

RESULTS AND DISCUSSION

Alloxan induced diabetic animals as well as non-diabetic animals were subjected for various treatments as mentioned earlier and different parameters were monitored.

Antidiabetic Activity of Extracts:

Antidiabetic activity were screened in alloxan induced diabetic rat model. To determine the antidiabetic activity of Fruit pulp of *Aegle marmelos*, leaves of *Jatropha curcas* and unripen flower bud of *Hibiscus rosa sinensis*, alloxan induced diabetes was produced in albino wistar rats and parameter like oral glucose tolerance test and Weight variation studies were carried out.

BLOOD GLUCOSE LEVEL (BGL):

Blood Glucose Level (BGL) in Diabetic rats:

The effect of various extracts of *Aegle marmelos*, *Jatropha curcas* and *Hibiscus rosa sinensis* on blood glucose level (BGL) in alloxan (150mg/kgb.w) induced diabetic rats has shown in Tables 05,06 & 07 and Figure. 1.

Table .4: Effective dose for each extract

S. No.	Drug	Extract	Effective dose (in a mg/kg of body weight)
1.	<i>Aegle marmelos</i>	Aqueous	250
2.		Ethanol	250
3		Chloroform	500
4		Petroleum ether	500
5	<i>Jatropha carcus</i>	Aqueous	500
6		Ethanol	500
7		Chloroform	500
8		Petroleum ether	500
9	<i>Hibiscus rosa sinensis</i>	Aqueous	500
10		Ethanol	500
11		Chloroform	500
12		Petroleum ether	500

Table 5: Effect of *Aegle marmelos* on Blood Glucose Level of Alloxan Induced Diabetic Albino Rats After Prolonged Treatment

S No.	Blood Glucose Level mg/100ml											
	Normal Control		Diabetic Control		<i>Aegle marmelos</i>		Alcohol		Chloro-form		Pet ether	
	Basal value	9 th day	Basal value	9 th day	Water Basal value	9 th day	Basal value	9 th day	Basal value	9 th day	Basal value	9 th day
1	73.	80.	333.	347.	332.	151.	316.	140.	327.	153.	314.	131.
2	79.	78.	345.	336.	347.	178.	327.	252.	320.	152.	324.	126.
3	76.	79.	338.	341.	313.	147.	340.	162.	316.	189.	317.	168.
4	76.	81.	326.	335.	352.	163.	326.	185.	319.	216.	316.	201.
5	69.	78.	340.	342.	335.	150.	329.	140.	327.	280.	319.	153.
6	75.	79.	335.	338.	327.	163.	320.	182.	324.	162.	345.	218.
Mean	74.67	79.17	336.2	339.8 ±	334.3	158.7	326.3	176.8	322.2	192.0	322.5	166.2
	±1.382	±0.4773	±2.651 ⁺⁺⁺	1.815 ⁺⁺⁺	±5.73	±4.76 ^{***}	±3.37	±17.01 ^{***}	±1.8	±20.2 ^{***}	±4.710	±15.20 ^{***}
±SD	3.386	1.169	6.494	4.446	14.05	11.67	8.262	41.66	4.535	49.70	11.54	37.22

Table .6: Effect of *Jatropha carcus* on Blood Glucose Level of Alloxan Induced Diabetic Albino Rats After Prolonged Treatment

S No.	Blood Glucose Level mg/100ml											
	Normal Control		Diabetic Control		<i>Aegle marmelos</i>		Alcohol		Chloro-form		Pet ether	
	Basal value	9 th day	Basal value	9 th day	Water Basal value	9 th day	Basal value	9 th day	Basal value	9 th day	Basal value	9 th day
1	73.	80.	333.	347.	336.	303.	401.	300.	318.	238.	329.	117.
2	79.	78.	345.	336.	328.	200.	371.	332.	371.	300.	342.	322.
3	76.	79.	338.	341.	304.	198.	314.	186.	327.	168.	357.	201.
4	76.	81.	326.	335.	319.	162.	323.	152.	383.	296.	313.	186.
5	69.	78.	340.	342.	327.	200.	309.	138.	337.	152.	305.	148.
6	75.	79.	335.	338.	321.	148.	317.	143.	351.	170.	360.	152.
Mean	74.67	79.17	336.2	339.8	322.5	201.8	339.2	208.5	347.8	220.7	334.3	187.7
	±1.382	±0.477	±2.651 ⁺⁺⁺	±1.81 ⁺⁺⁺	±4.43	±22.1 ^{***}	±15.42	±34.9 ^{***}	±10.37	±27.2 ^{***}	±9.265	±29.4 ^{***}
±SD	3.386	1.169	6.494	4.446	10.86	54.30	37.77	85.54	25.40	66.82	22.70	72.20

Table 7: Effect of *Hibiscus rosa sinensis* Extracts on Blood Glucose Level of Alloxan Induced Diabetic Albino Rats After Prolonged Treatment

S.No.	Blood Glucose Level mg/100ml											
	Normal Control		Diabetic Control		<i>Aegle marmelos</i> Water		Alcohol		Chloro-form		Pet ether	
	Basal value	9 th day	Basal value	9 th day	Basal value	9 th day	Basal value	9 th day	Basal value	9 th day	Basal value	9 th day
1	73.	80.	333.	347.	302.	320.	390.	412.	375.	154.	341.	386.
2	79.	78.	345.	336.	303.	346.	354.	369.	367.	128.	329.	370.
3	76.	79.	338.	341.	353.	392.	305.	323.	329.	162.	316.	310.
4	76.	81.	326.	335.	317.	296.	361.	370.	343.	250.	310.	363.
5	69.	78.	340.	342.	321.	330.	373.	500.	354.	201.	340.	359.
6	75.	79.	335.	338.	324.	339.	329.	346.	350.	192.	328.	340.
Mean	74.67	79.17	336.2	339.8	320.0	337.2	352.0	386.7	353.0	181.2	327.3	354.7
	±1.382	±0.4773	±2.651 ⁺⁺⁺	±1.815 ⁺⁺⁺	±7.589	±13.08	±12.53	±25.68	±6.74	±17.49 ^{***}	±5.097	±10.82
±SD	3.386	1.169	6.494	4.446	18.59	32.03	30.69	62.90	16.53	42.85	12.48	26.52

Table 8: Effect of *Aegle marmelos* Extracts on Blood Glucose Level of Non- Diabetic (Normal Rats) Albino Rats After Prolonged Treatment

S.No.	Blood Glucose Level mg/100ml									
	Normal Control		<i>Aegle marmelos</i> Water		Alcohol		Chloro-form		Pet ether	
	Basal value	9 th day	Basal value	9 th day	Basal value	9 th day	Basal value	9 th day	Basal value	9 th day
1	73.	81.	70.	70.	73.	65.	75.	59.	63.	64.
2	79.	83.	83.	76.	72.	68.	83.	68.	63.	72.
3	70.	71.	87.	63.	69.	73.	68.	73.	63.	73.
4	82.	73.	78.	60.	83.	70.	63.	70.	63.	82.
5	74.	63.	70.	79.	63.	61.	74.	65.	63.	65.
6	69.	74.	63.	73.	80.	75.	85.	74.	63.	68.
Mean	74.50	74.17	75.17	70.17	73.33	68.67	74.67	68.17	72.33	70.67
	±2.078	±2.949	±3.701	±3.027	±2.974	±2.108	±3.451	±2.272	±3.283	±2.704
±SD	5.089	7.223	9.065	7.414	7.285	5.164	8.454	5.565	8.042	6.623

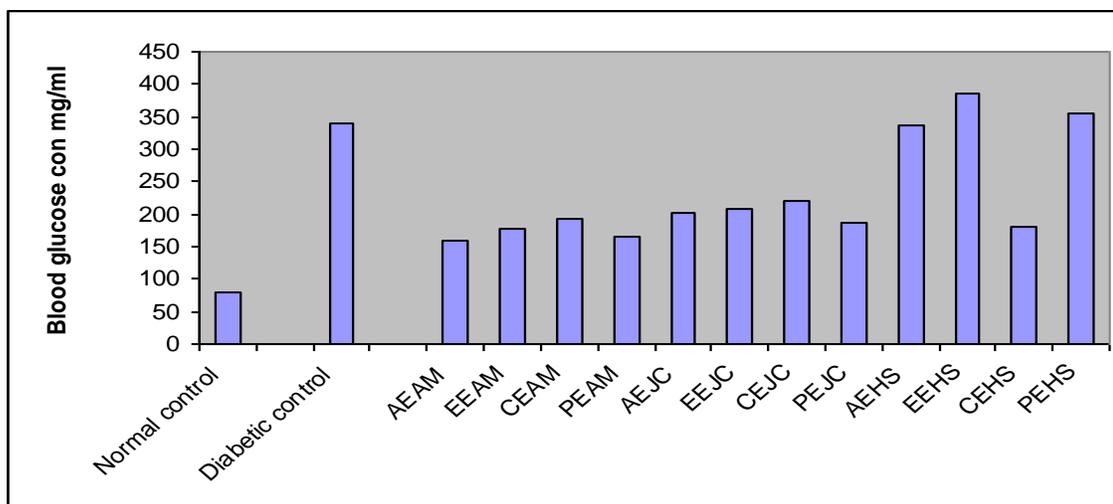


Figure 1: Effect of Various Extracts on Blood Glucose Level in Diabetic Rats

There was a significant elevation in BGL in alloxan induced diabetic control ($p < 0.001$) rats when compare with normal control. Oral treatments with 250mg/kg body weight of aqueous and ethanolic extracts of *Aegle marmelos* and 500mg/kg body weight of chloroform and petroleum ether extract of *Aegle marmelos*, aqueous, ethanolic, chloroform and petroleum ether extract of *J. curcas* and chloroform extract of *Hibiscus rosa sinensis* groups were able to reduce blood glucose level significantly as compare to diabetic control. The aqueous, ethanolic and petroleum ether extracts of *Hibiscus rosa sinensis* groups were unable to reduce blood glucose level significantly as compare to diabetic control. The aqueous extract of *Aegle marmelos* shown more significant reduction in blood glucose level compared with the extracts of same plant.

The petroleum ether extracts of *Jatropha curcas* and Chloroform extract of *Hibiscus rosa sinensis* has shown more significant reduction in blood glucose level compared with the extracts of same plants.

One-way ANOVA followed by Newmann-Keuls test. Values are expressed as mean \pm SEM. $P > 0.05$ is considered as non-significant. $P < 0.05$ is considered as significant. $^{+++}P < 0.001$ as compared to normal control group. $^{+}P < 0.05$. $^{***}P < 0.001$ as compared to diabetic control group.

Blood Glucose Level (BGL) in Non- Diabetic rats:

The effect of AEAM, EEAM, CEAM, PEAM, AEJC, EEJC, CEJC, PEJC, AEHS, EEHS, CEHS and PEHS on blood glucose level (BGL) in non-diabetic (normal rats) animals has shown in Tables 07, 08 & 09 and Figure.2.

Daily treatment with 500mg/kg body weight of CEAM, PEAM, AEJC, EEJC, CEJC, PEJC and CEHS and 250mg/kg body weight of AEAM, EEAM led to a fall in the BGL. The aqueous extracts

of *Jatropha curcas* was shown maximum effect in reducing the fasting blood sugar level in normal rats as compared to other extracts.

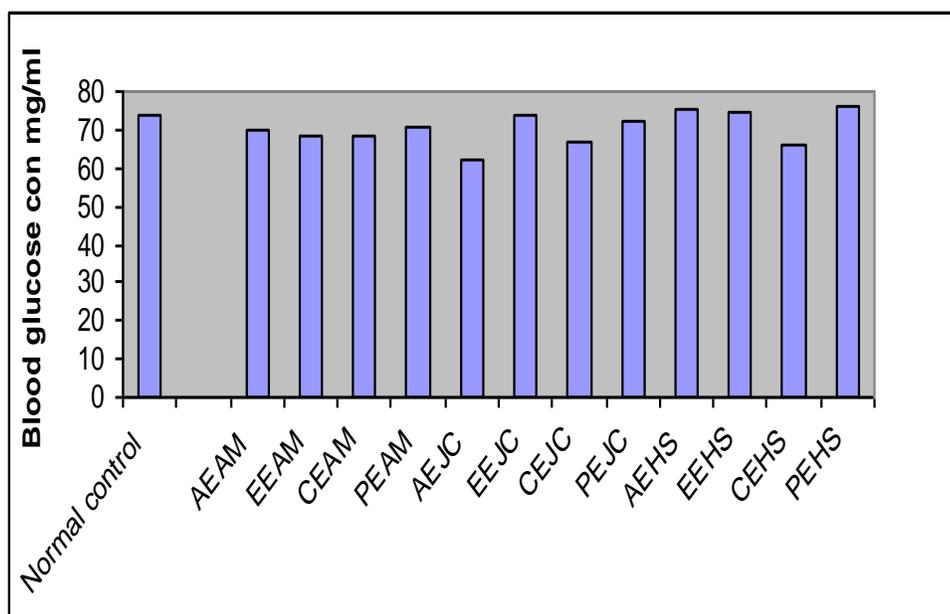


Figure 2: Effect of Various Extracts on Blood Glucose Level in Non Diabetic Rats

Oral Glucose Tolerance Test (OGTT):

The effect of AEAM, EEAM, CEAM, PEAM, AEJC, EEJC, CEJC, PEJC, AEHS, EEHS, CEHS and PEHS on glucose tolerance is shown in Table 11, 12 & 13 and Figure.3.

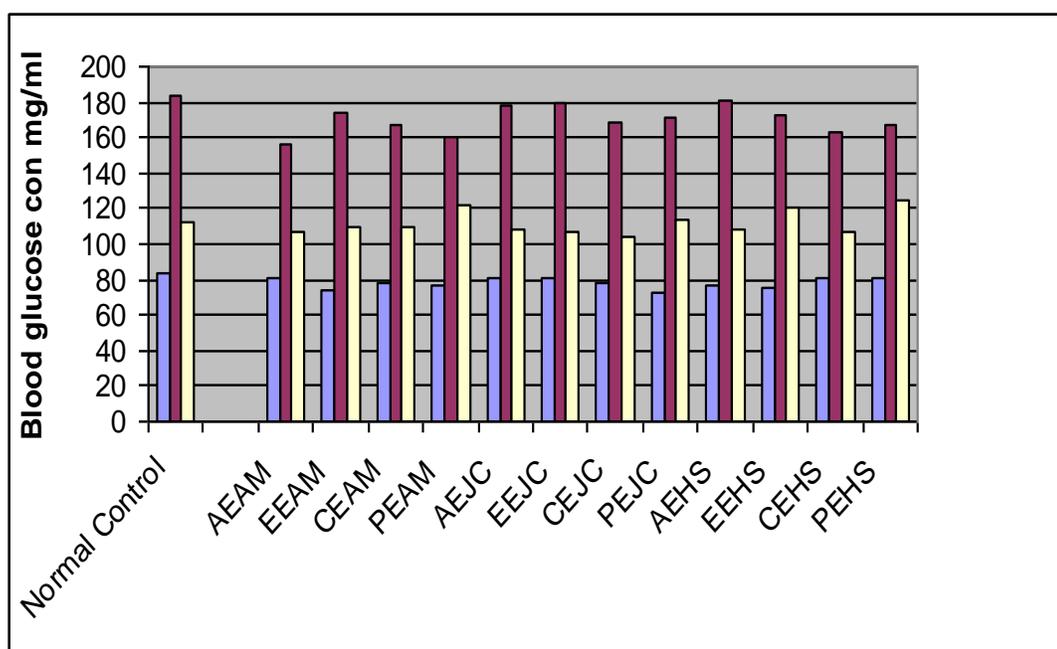


Figure 3 : Effect of various Extracts on Oral Glucose tolerance test (OGTT) in Normal rats

Table 9: Effect of *Jatropha carcus* Bark on Blood Glucose Level of Non- Diabetic (Normal Rats) Albino Rats After Prolonged treatment

S.No.	Blood Glucose Level mg/100ml									
	Normal Control		<i>Aegle marmelos</i>		Alcohol		Chloro-form		Pet ether	
	Basal value	9 th day	Water Basal value	9 th day	Basal value	9 th day	Basal value	9 th day	Basal value	9 th day
1	73.	81.	73.	53.	71.	73.	71.	74.	82.	57.
2	79.	83.	82.	64.	79.	70.	73.	70.	64.	69.
3	70.	71.	80.	72.	83.	82.	63.	70.	63.	81.
4	82.	73.	65.	60.	64.	60.	63.	62.	72.	82.
5	74.	63.	67.	63.	85.	86.	64.	60.	74.	70.
6	69.	74.	69.	59.	70.	72.	80.	64.	78.	73.
Mean	74.50	74.17	72.67	61.83	75.33	73.83	69.00	66.67	72.17	72.00
	±2.078	±2.949	±2.860	±2.574**	±3.373	±3.763	±2.817	±2.231	±3.081	±3.742
±SD	5.089	7.223	7.005	6.306	8.262	9.218	6.899	5.465	7.548	9.165

Table 10: Effect of *Hibiscus rosa sinensis* on Blood Glucose Level of Non- Diabetic (Normal Rats) Albino Rats After Prolonged Treatment

S. No.	Blood Glucose Level mg/100ml									
	Normal Control		<i>Aegle marmelos</i>		Alcohol		Chloro-form		Pet ether	
	Basal value	9 th day	Water Basal value	9 th day	Basal value	9 th day	Basal value	9 th day	Basal value	9 th day
1	73.	81.	73.	75.	63.	74.	63.	74.	72.	69.
2	79.	83.	87.	80.	68.	56.	68.	66.	76.	78.
3	70.	71.	80.	83.	77.	78.	77.	68.	73.	79.
4	82.	73.	65.	72.	69.	78.	69.	70.	68.	83.
5	74.	63.	64.	64.	83.	87.	83.	59.	61.	76.
6	69.	74.	72.	77.	82.	76.	82.	61.	70.	71.
Mean	74.50	74.17	73.50	75.17	73.67	74.83	73.67	66.33	70.00	76.00 ±2.129
	±2.078	±2.949	±3.603	±2.725	±3.343	±4.183	±3.343	±2.290	±2.113	
±SD	5.089	7.223	8.826	6.676	8.189	10.25	8.189	5.610	5.177	5.215

Table 11: Effects of *Aegle marmelos* Extracts on Oral Glucose Tolereace Test (Ogtt) in Normal Rats

S.No	Blood Glucose Level mg/100ml (Mean±SEM)																
	Normal Control glucose (2g /kg) (NC)			<i>Aegle marmelos</i> -glucose (2g /kg) (NC)			Water			Alcohol			Chloroform			Pet ether	
	Fasting value (FBGL)	30 min	90 min	Fasting value (FBGL)	30 min	90 min	Fasting value (FBGL)	30 min	90 min	Fasting value (FBGL)	30 min	90 min	Fasting value (FBGL)	30 min	90 min		
1.	86.	197.	129.	73.	160.	110.	74.	168.	121.	78.	164.	109.	76.	148.	89.		
2.	84.	186.	139.	79.	158.	107.	72.	172.	110.	76.	149.	119.	88.	184.	158.		
3.	89.	174.	126.	84.	151.	99.	69.	179.	98.	79.	153.	97.	71.	197.	103.		
4.	82.	177.	145.	87.	148.	108.	84.	188.	117.	83.	174.	99.	74.	160.	107.		
5.	79.	176.	135.	80.	155.	113.	82.	165.	114.	85.	187.	116.	73.	132.	132.		
6.	80.	189.	140.	86.	162.	102.	59.	173.	100.	69.	172.	120.	81.	141.	141.		
Mean	83.33	183.2	135.7	81.50	155.7	106.5	73.33	174.2	110.0	78.33	166.5	110.0	77.17	160.3	121.7		
	±1.54	±3.68	±2.917	±2.141	±2.201	±2.1**	±3.721	±3.381	±3.7**	±2.30	±5.778	±4.11**	±2.57	±10.38	±10.6**		
±SD	3.777	9.020	7.146	5.244	5.391	5.167	9.114	8.280	9.274	5.645	14.15	10.08	6.306	25.43	26.20		

Table 12: Effect of *Jatropa carcus* Extracts on Oral Glucose Tolereace Test (Ogtt) in Normal Rats

S.No.	Blood Glucose Level mg/100ml (Mean±SEM)																
	Normal Control glucose (2g /kg) (NC)			<i>Jatropa carcus</i> -glucose (2g /kg) (NC)			Water			Alcohol			Chloroform			Pet ether	
	Fasting value (FBGL)	30 min	90 min	Fasting value (FBGL)	30 min	90 min	Fasting value (FBGL)	30 min	90 min	Fasting value (FBGL)	30 min	90 min	Fasting value (FBGL)	30 min	90 min		
1.	86.	197.	129.	79.	189.	121.	75.	172.	172.	172.	172.	172.	172.	172.	172.		
2.	84.	186.	139.	82.	210.	108.	68.	172.	172.	172.	172.	172.	172.	172.	172.		
3.	89.	174.	126.	85.	172.	103.	73.	172.	172.	172.	172.	172.	172.	172.	172.		
4.	82.	177.	145.	69.	159.	110.	84.	172.	172.	172.	172.	172.	172.	172.	172.		
5.	79.	176.	135.	81.	147.	109.	89.	172.	172.	172.	172.	172.	172.	172.	172.		
6.	80.	189.	140.	86.	191.	100.	92.	172.	172.	172.	172.	172.	172.	172.	172.		
Mean	83.33	183.2	135.7	80.33	178.0	108.5	80.17	179.3	106.5	78.33	168.0	104.3	72.67	171.0	113.2		
	±1.54	±3.6	±2.9	±2.499	±9.43	±2.952**	±3.911	±4.951	±5.54**	±2.70	±6.0	±2.09**	±2.87	±12.9	±6.45**		
±SD	3.777	9.020	7.146	6.121	23.12	7.232	9.579	12.13	13.58	6.623	14.83	5.125	7.033	31.75	15.82		

Table 13: Effect of *H. rosa sinensis* Extracts on Oral Glucose Tolerance Test (Oggt) in Normal Rats

S.No	Blood Glucose Level mg/100ml (Mean±SEM)																
	Normal Control glucose (2g /kg) (NC)			<i>H.Rosa sinensis</i> -glucose (2g /kg) (NC)			Water			Alcohol			Chloroform			Pet ether	
	Fasting value (FBGL)	30 min	90 min	Fasting value (FBGL)	30 min	90 min	Fasting value (FBGL)	30 min	90 min	Fasting value (FBGL)	30 min	90 min	Fasting value (FBGL)	30 min	90 min		
1.	86.	197.	129.	89.	169.	103.	72.	167.	121.	83.	175.	102.	84.	168.	132.		
2.	84.	186.	139.	77.	172.	107.	80.	165.	138.	84.	169.	104.	86.	172.	130.		
3.	89.	174.	126.	68.	169.	119.	73.	169.	127.	89.	182.	99.	92.	153.	128.		
4.	82.	177.	145.	79.	184.	116.	70.	173.	113.	75.	154.	117.	78.	174.	114.		
5.	79.	176.	135.	72.	210.	99.	79.	200.	112.	79.	160.	109.	76.	168.	121.		
6.	80.	189.	140.	73.	177.	102.	75.	165.	109.	72.	137.	113.	69.	170.	125.		
Mean	83.33	183.2	135.7	76.33	180.2	107.7	74.83	173.2	120.0	80.33	162.8	107.3	80.83	167.5	125.0		
	±1.54	±3.68	±2.917	±2.985	±6.40	±3.30**	±1.621	±5.504	±4.502**	±2.55	±6.600	±2.813**	±3.331	±3.05	±2.708*		
±SD	3.777	9.020	7.146	7.312	15.69	8.091	3.971	13.48	11.03	6.250	16.17	6.890	8.159	7.477	6.633		

Maximum glucose tolerance was observed in aqueous extract (106.5 ± 2.1) and minimum glucose tolerance was observed in petroleum ether extract of (121.7 ± 10.6) *Aegle marmelos* in 90 minutes compared with the normal control. Maximum glucose tolerance was observed in chloroform extract (104.3 ± 2.09) and minimum glucose tolerance was observed in petroleum ether extract of (113.2 ± 6.45) *Jatropha curcas* in 90 minutes compared with the normal control. Maximum glucose tolerance was observed in chloroform extract (107.3 ± 2.813) and minimum glucose tolerance was observed in petroleum ether extract of (125.0 ± 2.708) *Hibiscus rosa sinensis* in 90 minutes compared with the normal control.

CONCLUSION

The results obtained from the pharmacological screening have led to the conclusion that aqueous extract of *Aegle marmelos*, petroleum ether extract of *Jatropha curcas* and chloroform extract of *Hibiscus rosa sinensis* have shown more prominent antidiabetic activity. Alcohol, chloroform and Petroleum ether extract of *Aegle marmelos*, aqueous ethanol and chloroformic extract of *Jatropha curcas*, exhibited moderate antidiabetic activity while aqueous ethanol and petroleum ether extract of *Hibiscus rosa sinensis* have not shown any activity from parameters studied i.e. Blood glucose level, OGTT and weight variation test. The aqueous extract of *Aegle marmelos*, petroleum ether extract of *Jatropha curcas* and chloroform extract of *Hibiscus rosa sinensis* shown decrease in blood glucose level and increase in body weight supporting the folk information regarding antidiabetic property. Thus antidiabetic action of this drug is likely to be due to its ability to induce regeneration of β -cells of pancreas. The different number of significant extracts are used to prepare polyherbal formulations F1, (which contains aqueous, ethanol, chloroform and petroleum ether extracts of *Aegle marmelos* and *Jatropha curcas*, petroleum chloroform extract of *Hibiscus rosa sinensis*) was found to be significant antidiabetic activity as compared to marketed formulation. From this result it can be concluded that the F1 formulation possesses significant antidiabetic activity might be due to combined effect of all significant extracts.

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