

COMPARATIVE STUDY OF AQUEOUS FOLIAR EXTRACT OF *ANTHOCEPHALUS CADAMBA* ON NORMAL AND ALLOXAN INDUCED DIABETIC RATS

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ABSTRACT

Normoglycemic and hyperglycemic study was performed on albino Wistar rats to evaluate the effect of aqueous foliar extract of *Anthocephalus cadamba* in normal rats and diabetic rats respectively. For normoglycemic study rats were divided into three groups (one control and two test groups) and each group contains three rats. Group 1 i.e control remained untreated whereas group 2 and group 3 i.e test group were treated with 100mg/kg body weight and 200mg/kg body weight of plant extract respectively. For hyperglycemic study rats were divided into four groups (one control and three test group) and each group contains three rats. Control group was remains untreated

whereas test group were treated with 100mg/kg, 200mg/kg body weight of plant extract and 600 µg/kg body weight of metformin respectively. Metformin is a standard drug used to cure diabetes. Hyperglycemia was induced by the oral administration of alloxan monohydrates. Rats with blood glucose level range of 200-300mg/dl were used for the study. Results of normoglycemic study revealed that reduction in blood glucose level was 13.51% and 27.92% respectively after 60 min. The intensity of reduction was continued after 120 and 180 minutes of dosing whereas in case of hyperglycemic study, reduction in blood glucose level was 11.48% at 5th, 20% at 10th and 33.61% at 15th days at a dose of 200mg/kg body weight of *Anthocephalus cadamba* leaves extract whereas 8.03%, 20.08% and 28.12% at 5th, 10th and 15th days at 100mg/kg body weight of plant extract. Reduction in blood glucose level by Metformin was from 256 to 159mg/dl.

KEYWORDS: Normoglycemia, Hyperglycemia, *Anthocephalus cadamba*, Metformin, Wistar rat.

INTRODUCTION

Hyperglycemia is a condition in which excess amount of glucose circulates in blood plasma. The hyperglycemia caused due to decreased insulin production is called Type-1 diabetes and hyperglycemia due to insufficient insulin utilization is called Type-2 diabetes.^[1,2] Blood Glucose level of 200mg/dl is considers as hyperglycemic condition but the symptoms may not be noticeable until even higher value such as 250mg/dl to 300mg/dl.^[1] According to the American Diabetes Association a subject with a consistent range between 100mg/dl to 126mg/dl is consider slightly hyperglycemic where as blood glucose level higher than 126mg/dl is generally held to have diabetes. Other conditions that cause hyperglycemia are pancreatitis, cushing's syndrome, unusal hormone secreting tumors, pancreatic cancer. The main symptoms of hyperglycemia are increased thirst and a frequent need to urinate.^[3] In untreated condition ketoacidosis i.e diabetes coma could occur. Ketoacidosis develops when the body does not have enough insulin to use glucose as energy. In that condition body starts to breaks down fats to use energy and produce ketone as a waste product. Ketones are released by the body through urine but the body can not release all the ketones and they remain inside the body which can cause ketoacidosis.^[4]

Normoglycemia is a condition when the body has normal level of blood glucose concentration in blood or having the normal amount of glucose in the blood. α - cell produce glucagon which maintains normoglycemia through the process of glycconeolysis (i.e breakdown of glucogen) and gluconeogenesis (i.e formation of glucogen from non carbohydrates such as fats and protein). Beta cells may secrete high levels of insulin to normalize blood glucose levels and successfully maintain normoglycemia for many years. Under these conditions the liver stops consuming glucose and becomes metabolically gluconeogenic, producing glucose to re-establish normoglycemia. Treatment includes strict plasma glucose control to achieve and maintain normoglycemia and administration of angiotensin converting enzyme inhibitors to decrease the process of diabetes nephropathy.^[5]

Animal description

Rattus albus is commonly known as wistar rat, which is an outbred of albino rats. This bred was developed in 1906 at Wistar Institute to use them in biological and medical researches. It is the first rat which was developed to serve as a model organism.^[6,7]

MATERIALS AND METHODS

The experiments were conducted in January- July 2017 in ITM University Gwalior Madhya Pradesh India. The study was based on the evaluation of *Anthocephalus cadamba*'s significance in medicinal field by normoglycemic and hyperglycemic experiments.

Fresh and disease free leaves of *Anthocephalus cadamba* were collected. Collected leaves were washed with distilled water and shed dried at room temperature. These shed dried leaves were used for soxhlet extraction in distilled water.

Normoglycemic study

Normoglycemic study was performed by following the methodology of Syiem et al. 2010.^[8] For Normoglycemic study rats were divided into the three groups namely group1, group2, and group3 and each group contain 3 rats. Group1 was consider as control and remain untreated whereas group2 and group3 were consider as test group and treated with distilled water extract of *Anthocephalus cadamba* at a dose of 100mg/kg body weight and 200mg/kg body weight respectively. Blood glucose level and body weight of rats were measured by Glucometer (ONE TOUCH) and weighing machine respectively before and after treatment. Blood were taken from tail vein for glucose determination. Rats were kept on fasting for Six hour but water was given to the rats. Extract was administrated orally to the rats and blood was taken from the tail vein at an interval of two hours to measure blood glucose level. Three consecutive reading were taken during 24 hours.

Hyperglycemic study

Hyperglycemic study was performed by using the method of Syiem et al. 2010, Zulfiker et al. 2010 and Acharyya et al. 2013.^[8, 9, 10]

For diabetic induced condition, Alloxan monohydrate was used to induce diabetes at a dose of 150mg/kg body weight in test animals. Alloxan monohydrate was dissolve in normal saline and used to treat rats. Rats were kept on fasting for overnight (not more than 16 hour) to increase the susceptibility of induction of diabetes. Only water was given during the fasting hours. Blood glucose level was determined by the Glucometer (ONE TOUCH). For the determination of blood glucose level, blood was taken from the tail vein. Rats with blood glucose level greater than 200mg/dl were consider as diabetic rat and used for the further study. For hyperglycemic study rats were divided into the four groups namely group1, group2, group3 and group4 and each group contain three rats. Group1 was consider as control

and remain untreated, group2 was consider as standard and treated with Metformin (600ul/kg body weight),whereas group3 and group4 were consider as test group and treated with distilled water extract of *Anthocephalus cadamba* at a dose of 100mg/kg body weight and 200mg/kg body weight respectively. Blood glucose level and body weight of rats were measured by Glucometer (ONE TOUCH) and weighing machine respectively before and after treatment. Blood were taken from tail vein for glucose determination. Same fasting condition was provided like previous one. Extract and Metformin were administrated orally to the rats and blood was taken from the tail vein at an interval of two hours each to measure blood glucose level. Three consecutive reading were taken at 5th, 10th and 15th day respectively.

RESULT AND DISCUSSION

The foliar aqueous extract of *Anthocephalus cadamba* has been used to check the diabetes by normoglycemic & hyperglycemic studies in wistar rats. The measured blood glucose level, body weight and external behavior of animal was the only criteria to conclude the results of this study. The extract was administrated by oral route and observe the reduction in blood glucose level after 60 minutes, 120 minutes and 180 minutes.

Normoglycemic study

The result clearly indicated that there was significant reduction in the blood glucose level with a single dose of *Anthocephalus cadamba* aqueous extract in each group. The selected doses of 100mg/kg of body weight and 200mg/kg of body weight were provided, to the fasted rat. The reduction in blood glucose level was observed in 13.51% and 27.92% respectively after 60 min. The intensity of reduction was continued after 120 and 180 minutes of dosing. This result was compared with test animal which is not administrated by the extract (control). After 180 min of dosing, results indicate the reduction in both the group i.e. 7.207% and 11.26% as compared to control group of 111mg/dl. Starvation time is important criteria while measuring blood parameters. Literature review (Syiem *et al.* 2010, Acharya *et al.* 2010) states that blood parameters are found to vary in a fed state and fasted state.^[8, 11] An overnight starvation or minimum 6 hours starvation needed for accuracy of results.^[11] This normoglycemic study was carried out to indicate the impact of foliar extract of *Anthocephalus cadamba* on blood glucose level i.e. it lowers the level of glucose in blood of animal, inspite of no change in its body weight. Its external behavior was also not found to be

altered. Approximately similar study was conducted by Venkatesh *et al.* 2003.^[12] Such types of results were also observed by Ahmed *et al.* 2011.^[13]

Table 1: Normoglycemic Study of Aqueous Foliar Extract of *Anthocephalus cadamba* on Wister Rats.

Group	Treatment	Glucose level (mg/dl)			
		Time (min)			
		t=0	t=60	t=120	t=180
Control	Untreated	111 ±SD 7.48	109 ±SD 3.55	112 ±SD 12.32	111 ±SD 7.25
Test 1	100 mg/kg body weight of <i>Anthocephalus cadamba</i> extract	111 ±SD 7.48	96 ±SD 7.25	88 ±SD 3.74	103 ±SD 4.96
Test 2	200 mg/kg body weight of <i>Anthocephalus cadamba</i> extract	142 ±SD 4.96	111 ±SD 9.89	108 ±SD 6.68	126 ±SD 4.24

Mg/dl = milligram per deciliter

min= minutes.

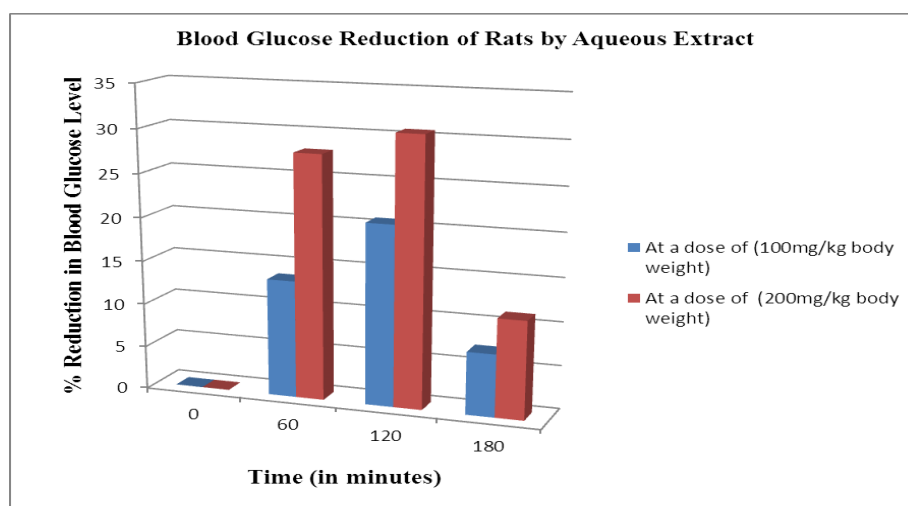


Figure 1: Normoglycemic study of Aqueous Foliar Extract of *Anthocephalus cadamba* on Wister Rats.

Hyperglycemic study

For hyperglycemic study rats were divided into four groups namely Group 1, Group 2, Group 3 and group 4. Rats became diabetic after two weeks of alloxan administration the blood glucose level rise upto 200-300 mg/dl and considered as diabetic. Treatment with plant extract was started after two weeks. The reduction in blood glucose level was 11.48% at 5th, 20% at 10th and 33.61% at a dose of 200mg/kg body weight of *Anthocephalus cadamba* leaves extract whereas 8.03%, 20.08% and 28.12% at 5th, 10th and 15th days at 100mg/kg body weight of plant extract. Reduction in blood glucose level by standard drug i.e.

Metformin was from 256 to 159mg/dl. Results of present study and study of Gurjar et al. 2010^[14] suggested that *Anthocephalus cadamba* is an important medicinal plant to treat diabetes. The observation revealed that the extract doses were significant to the diabetes inhibition as compared to control.

Such type of normoglycemic and hyperglycemic studies was conducted by some other researchers (Kaliwal et al. 2012, Syiem et al. 2010 and Acharyya et al. 2013)^[1, 8, 10] in which they found that many Plants including *Anthocephalus cadamba* is significant for further researches related to the diabetes.

Table 2: Hyperglycemic Study of Aqueous Foliar Extract of *Anthocephalus cadamba* on Diabetic Wister Rats.

Group	Treatment	Glucose level (mg/dl)			
		Day After Dosing			
		1 st	5 th	10 th	15 th
Control	Untreated	239 ±SD 6.48	235 ±SD 12.83	229 ±SD 2.94	220 ±SD 5.88
Test 1	100 mg/kg body weight of <i>Anthocephalus cadamba</i> extract	224 ±SD 3.55	206 ±SD 4.32	179 ±SD 3.74	161 ±SD 3.55
Test 2	200 mg/kg body weight of <i>Anthocephalus cadamba</i> extract	235 ±SD 10.03	208 ±SD 9.46	188 ±SD 12.96	156 ±SD 4.54
Test 3	600µl/kg body weight of Metformin	256 ±SD 4.32	231 ±SD 2.16	200 ±SD 4.32	159 ±SD 8.64

Mg/ml = milligram per deciliter

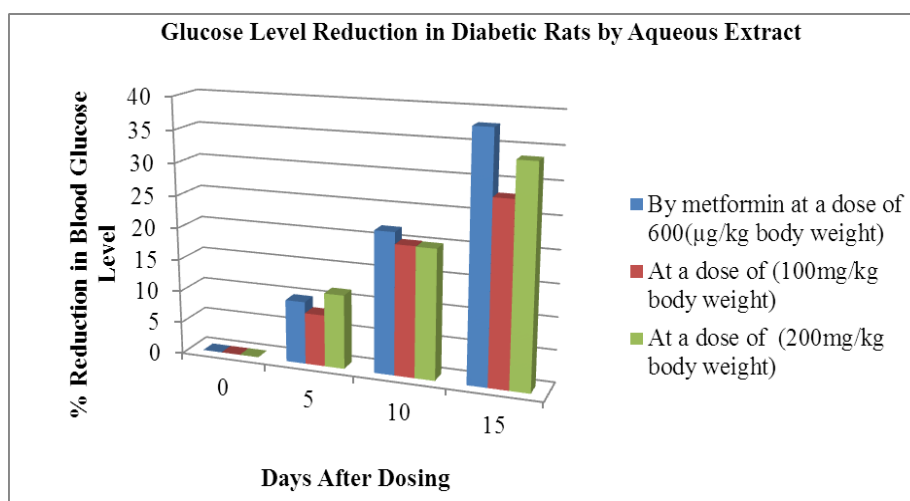


Figure 2: Hyperglycemic Study of Aqueous Foliar Extract of *Anthocephalus cadamba* on Diabetic Wister Rats.

CONCLUSION

Hyperglycemia is a condition in which excess amount of glucose circulates in blood plasma. The main symptoms of hyperglycemia are increased thirst and a frequent need to urinate.^[3] Normoglycemia is a condition when the body has normal level of blood glucose concentration in blood or having the normal amount of glucose in the blood. According to the American Diabetes Association a subject with a consistent range between 100mg/dl to 126mg/dl is consider slightly hyperglycemic where as blood glucose level higher than 126mg/dl is generally held to have diabetes. The foliar extract was administrated by oral route and showed the reduction in blood glucose level after 60 minutes, 120 minutes and 180 minutes. Normoglycemic study indicate that foliar extract of *Anthocephalus cadamba* on blood glucose level i.e. it lowers the level of glucose in blood of animal, inspite of no change in its body weight. Its external behaviour was also not found to be altered. Approximately similar study was conducted by Venkatesh et al. 2003.^[12] Such types of results were also observed by Ahmed et al. 2011.^[13] Results of present study and Gurjar et al. 2010^[14] suggested that *Anthocephalus cadamba* is an important medicinal plant to treat diabetes. The observation revealed that the extract doses were significant to the diabetes inhibition as compared to control. Such type of normoglycemic and hyperglycemic studies was conducted by other researcher (Kaliwal et al. 2012, Syiem et al. 2010 and Acharyya et al. 2013)^[1, 8, 10] in which they found that many plants including *Anthocephalus cadamba* is significant for further researches related to the diabetes.

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