



ANTI-DIABETIC EFFECT OF *MORUS ALBA* ON RABBIT AS ANIMAL MODEL

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ABSTRACT

A study of ancient literature indicates that diabetes was fairly well known and well conceived as an entity in India. The nature has provided abundant plant wealth for all the living creatures, which possess medicinal virtues. Therefore, there is a necessity to explore their uses and to conduct Pharmacognostic and pharmacological studies to ascertain their therapeutic properties. In fact, nowadays diabetes is a global problem. Hence, the present study aims to open new avenues for the improvement of medicinal uses of *Morus alba*. for the area for diabetes. Another important objective of such study is to bring the anti-diabetic medicinal plants sector on a firm scientific footing, raise awareness and add value to the resource. Dried petroleum ether (60-80°C) extracts of leaves of *Morus alba*. were subjected for hypoglycemic activity in New Zealand rabbits (1.5-3.5 kg). Blood sugar level was determined using digital glucometer. The oral administration of leaf extracts at doses of 200 mg/ kg– lead to a significant blood glucose reduction. This laid the foundation to study the active compounds of such anti-diabetic plants that are responsible for the hypoglycemic activities. It also proves the traditional claim of Kachh region with regard to *Morus Alba* for its anti-diabetic activity.

Keywords: Hypoglycemic activity, *Morus alba*., Alloxan-induced diabetes

INTRODUCTION

A study of ancient literature indicates that diabetes (madhumeha) was fairly well known and well conceived as an entity in India. The knowledge of the system of diabetes mellitus, as the history reveals, existed with the Indians since prehistoric age. 'Madhumeha' is a disease in which a patient passes sweet urine and exhibits sweetness all over the body, i.e. in sweat, mucus, breathe, blood, etc. The practical usage of juices of various plants achieved the lowering of blood glucose by 10-20%¹. Diabetes mellitus, a chronic metabolic disorder, has now become an epidemic, with a worldwide incidence of 5% in the general population. The number of people suffering from diabetes has soared to 246 million and the disease now kills more people than AIDS². Decreased physical activity, increasing obesity, stress and changes in food consumption have been implicated in this increasing prevalence in the past two decades³. In conventional therapy, Type 1 diabetes is treated with exogenous insulin and Type 2 with oral hypoglycemic agents (sulphonylureas, biguanides etc)⁴. Though different types of oral hypoglycemic agents are available along with insulin for the treatment of diabetes, there is an increased demand by patients to use natural products with antidiabetic activity⁵. Since time immemorial, patients with non-insulin dependent diabetes have been treated orally in folk medicine, with a variety of plant extracts. In India, a number of plants are mentioned in ancient literature (Ayurveda) for the treatment of diabetic conditions. *Morus alba* belongs to family sterculiaceae. The plant is commonly known as Vagadu in Hindi. The plant is distributed through out the plains and Africa, tropical Asia and Australia.⁶ In folk medicine, the plant is reportedly used in treating epileptic convulsions, mental illnesses and hemiparalysis⁷. As per Ayurveda, all parts of the plant are medicinally important⁸. It is used to treat vitiated conditions asthma, rheumatism, and anti-inflammatory. It contains tannins, steroids, mucilage alkaloid¹⁰. The present study aims

at studying the antidiabetic activity of leaves extract of *Morus alba* in the model of alloxan-induced diabetes in rabbits.

MATERIALS AND METHODS

Collection and identification *Morus alba* leaves were collected from kachh region, Gujarat. The leaves were shed dried, powered mechanically and sieved. It was extracted with ethanol; by cold maceration method.

Experimental animal

New Zealand Rabbits weighing 1.5-3.5kg. Were given by department of Pharmacology, n. r. vekaria institute of pharmacy, Junagadh. After the approval of institutional animal ethical committee. Animals of either sex housed in groups five under standard laboratory conditions of temperature (25±2) or 12hrs/12hrs-light/dark cycles. They had free access to standard Pellet Chow and water ad libitum. The animals were allowed to acclimatize to laboratory conditions for not less than 10 days after their arrival.

Experimental Design

Diabetes was induced using alloxan monohydrate (80 mg/kg). Only alloxanised hyperglycemic and glycosuria animals were used for further studies. Animals were fasted for 18h before the experiment and divided into 5 groups (5 animals in each group). The first group (Group I) served as control which received normal saline and the second group (Group II) served as diabetic control received alloxan monohydrate alone. The third group (Group III) received standard drug metformin 0.5 mg/kg. Group IV- animals treated with extract alone (ethnolic). Group V - animals treated with extract alone (ethnolic) All the animals were regularly observed for their general behavior Effects on blood glucose levels dried petroleum ether (60-80°C) extracts of Leaves of *Morus alba* (50, 100, and 200 mg/kg) were suspended in 1% tween 80 and subjected for hypoglycemic activity in New Zealand rabbits (1.5-3.5 kg). Diabetes was induced by the intravenous administration of alloxan (80 mg/kg)¹² after anesthesia with diethyl ether. Forty-eight hours later, the blood (1 mL) was collected from the orbital

sinus into tubes and immediately used for the determination of blood glucose. Only animals that presented with glycemic levels equal to or above 200 mg/dL were submitted to treatments, which consisted of a single oral administration (by gavages) of extracts of leaves of *Polyalthia longifolia*. The blood was collected after 0.5h, 1h, 2h, 4h, 6h, 8h, 10h, 12h and 24h of a single oral treatment of extract for blood glucose measurements using a glucometer.

Phytochemical screening

Preliminary Phytochemical screening of ethanolic extract was performed for the presence of alkaloids, flavonoids, tannins, and glycosides, steroids.

Statistical analysis

The data was statistically analyzed by one-way ANOVA followed by Dunnett multiple comparison test with equal sample size. The difference was considered significant when $p < 0.001$. All the values were expressed as mean \pm standard deviation (S.D.).

TREATMENT OF DIABETIC RATS

Five groups of five rabbits were used in the experiment. Group 1 served as normal healthy control group and group 2 as diabetic untreated control. Group 3 as standard drug. Group 4 and 5 was treated with a intervened dose extract for 10 days.

At the beginning and end of the experiment, FBG was estimated. Blood glucose level (PPG) was estimated daily during the treatment period.

ANTI-DIABETIC ACTIVITY

The diabetogenic rabbits, having blood glucose level more than 250mg/dl they were selected for the study. The rabbits were deprived for food 18 hours before the experiment and water is allowed, but on the day of experiment water is withdrawn. Animals were divided into five groups, contained six rabbits in each group. The blood samples were withdrawn at interval of initial 0 (zero hours), 0.5, 1, 2, 4, 8, 10, 12 and 24 hours of administration of single dose and blood sugar levels were measured by glucometer.

RESULTS

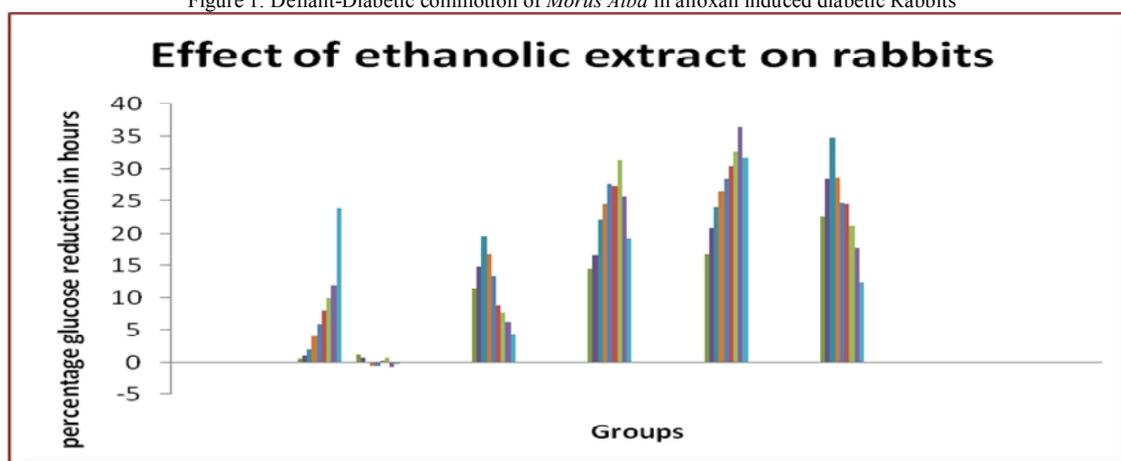
The effect of single oral administration of petroleum ether extracts of *Polyalthia longifolia* leaves are shown in [Table 1 and Figure 1. Experimental studies reveals that the petroleum ether extracts from *Morus alba* leaves (50, 100, and 200 mg/kg) orally administered produced a significant decrease in the blood glucose level in the model of alloxan-induced diabetes in rabbits. Maximum reduction in blood glucose level was seen at dose of 200 mg/kg of ethanolic extracts of *Morus alba* leaves.

Table 1:- percent blood glucose reduction in hours by *Morus alba* ethanolic extract

Group (n= 6)	Initial Blood glucose (mg/dl)	Percent blood glucose reduction in Hours								
		0.5	1	2	4	6	8	10	12	24
Control	324.7	1.2 \pm 0.3	0.7 \pm 0.3	0.1 \pm 0.3	-0.5 \pm 0.4	-0.5 \pm 0.2	0.2 \pm 0.5	-0.6 \pm 1.9	-0.7 \pm 0.1	-0.2 \pm 0.3
<i>Morus alba</i> 50 mg/kg	316.0	11.5 \pm 1.9**	14.9 \pm 0.8***	19.6 \pm 0.5***	16.85 \pm 0.8 ***	13.4 \pm 4.9 **	8.9 \pm 1.9**	7.7 \pm 2.4*	6.3 \pm 1.3** *	4.4 \pm 1.6*
<i>Morus alba</i> 100 mg/kg	304.9	14.6 \pm 4.5*	16.7 \pm 2.5***	22.2 \pm 3.8***	24.5 \pm 7.4**	27.8 \pm 6.5**	27.4 \pm 3.5***	31.4 \pm 5.6***	25.8 \pm 5.1***	19.4 \pm 6.4*
<i>Morus alba</i> 200mg/kg	319.2	16.8 \pm 5.8*	20.9 \pm 5.5**	24.1 \pm 2.9***	26.6 \pm 4.9***	28.5 \pm 9.2*	30.4 \pm 6.9*	32.7 \pm 6.0***	36.5 \pm 4.8***	31.8 \pm 8.5 **
Metformin 0.5mg/kg	323.9	22.6 \pm 3.6***	28.5 \pm 5.5***	34.9 \pm 4.6***	28.7 \pm 6.5**	24.8 \pm 5.7**	24.6 \pm 4.1***	21.3 \pm 5.6**	17.7 \pm 9.8	12.5 \pm 5.9*

Values are mean percent blood glucose reduction (\pm S.E.M.) of five animals. Significant difference from control at corresponding intervals: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure 1. Defiant-Diabetic commotion of *Morus Alba* in alloxan induced diabetic Rabbits



DISCUSSION

Alloxan causes diabetes through its ability to destroy the insulin-producing beta cells of the pancreas^{15, 16}. In vitro studies have shown that alloxan is selectively toxic to pancreatic beta cells, leading to the induction of cell necrosis. The cytotoxic action of alloxan is mediated by reactive oxygen species, with a simultaneous massive increase in

cytosolic calcium concentration, leading to a rapid destruction of beta cells. Experimental studies reveals that the ethanolic extract from *Morus alba* leaves (50, 100, 200 and 300 mg/kg) orally administered produced a significant decrease in the blood glucose level in the model of alloxan-induced diabetes in rabbits. It also proves the traditional claim with regard to *Morus alba* and its antidiabetic activity.

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