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EFFECT OF MURVA (*MAERUA OBLONGIFOLIA)* ON ALLOXAN INDUCED DIABETES IN RATS

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ABSTRACT

Diabetes is a chronic metabolic disorder characterized by altered carbohydrates, fat and protein metabolism, and an increased risk of vascular complications. Swiss albino mice weighing 20-25g and albino rats (Wistar strain) weighing 170-190g of either sex were used for the studies. Mice used for toxicity and rats for anti-diabetic study. The aqueous roots extract of Murva was found to be safe at a dose of 2000mg/kg; hence a dose of 800mg/kg was used for anti-diabetic study. Diabetes was induced by alloxan monohydrate 150mg/kg i.p. After three days of injection of alloxan, diabetes was confirmed by monitoring its blood glucose level. Animals with blood glucose level more than 200mg/dl were taken for studies. Glibenclamide 20mg/kg i.p was taken as std. drug. The test possessed significant anti-diabetic activity ($p<0.001$) when compared to positive and negative control. Hence the roots extract of Murva may be value in patients with diabetes mellitus.

INTRODUCTION: Diabetes mellitus is a clinical syndrome characterized by inappropriate hyperglycemia caused by a relative or absolute deficiency of insulin or by a resistance to the action of insulin at the cellular level. It is the most common endocrine disorder which in turn damage many of the body's systems, in particular the blood vessels and nerves [1-2].

Murva is an important ayurvedic drug used as one of the ingredients in many Ayurvedic preparations. *Maerua oblongifolia* (Forsk.) A. Rich. (Capparaceae) is one of the botanical sources of the Ayurvedic drug *Murva.* Ethanomedical survey reveals that *Murva* is used to cure various diseases such as fever, stomach ache, skin infections, urinary calculii, diabetes mellitus, epilepsy, pruritis, rigidity in lower limbs, and abdominal colic. In India, the Ayurvedic systems of medicine has been existing for over three thousand years, *Charaka* and *Sushruta*, two of the earliest Indian scholars had sufficient knowledge of the properties of the Indian medicinal plants. The Vedas are the epic poems, which contain rich material on the herbal medicine of that time [3]. The medicinal treatises like the *Charakasamhita* and *Sushrutasamhita* are esteemed even to this day as the treasures of literature on indigenous medicine [4].

Murva is a controversial drug. Amongst the many synonyms of this plant, one is *'Dha-nurgunopayogya'* meaning 'the plant whose bark is being used for the bow-strings'. These synonyms have also contributes to the existing confusion. The plant which has tough fibers is the *Murva*. There are many such fiber yielding plants are found in the veagetable kingdom. *Murva* is an important controversial drug used in diseases like anaemia (*pandu*); fever (*jwara*); diabetes (*prameha*); stomach disorders (*udara roga*); typhoid (*visama jwara*); urinary infection (*asmari*) and cough (*ksaya*) [5].

MATERIALS AND METHODS: The pharmacological studies were carried out following Kulkarni [6], Ghosh [7], Hajare [8] and Sharada [9]. The Present Pharmacological studies include acute toxicity studies and screening of aqueous extract of roots of *Maerua oblongifolia*. The plant material was collected and authenticated. For the preparation of aqueous extract, the roots were macerated with chloroform water, followed by filtration and concentrating the extract to small volume. It was then evaporated to dryness. The aqueous extract for experimental purpose was prepared in distilled water containing 2% v/v Tween 80 as suspending agent.

Swiss albino mice weighing 20-25g and albino rats (Wistar strain) weighing 170-190g of either sex were used for the studies. The animals were procured and housed in the animal house at least 2 weeks prior to the study, so that animals could adapt to the new environment. Animal house was well maintained under standard hygienic conditions, at a temperature (22 ± 2ºC), room humidity (60 % ± 10%) with 12 hours day and night cycle, with food and water *ad libitum.* Rats were housed in groups of 4 per cage and mice in group of 6 per cage. They were provided with commercial food pellets and purified water. Cleaning and sanitation was done on alternate days. Paddy husk was provided as a bedding material which was changed every day. The cages were maintained clean.

Acute toxicity studies [10, 11]: Acute toxicity studies were conducted to study acute toxic effects and to determine the minimum lethal dose of the drug extracts. Swiss albino mice of either sex weighing between 20-25 g fasted overnight were used for the study. The aqueous extract was initially administered orally to separate groups of mice each, at doses of 30, 100, 300, 1000 and 3000mg/kg of body weight. Further aqueous extract at doses of 2000 and 2500 mg/kg were also given. Symptoms such as difficulty in breathing, sedation and decreased motor activity were not observed upto 7 days after the administration of the different doses of the aqueous extract but at the dose of 3000 mg/kg body weight it showed toxicity. Mortality was observed at this dose after 3days, subsequently doses of 2000mg and 2500mg/kg body weight were found to be safe.

Anti-diabetic study: Male Wistar strain rats with normal blood sugar level weighing between 120-180g were used for investigation. The animals were injected with alloxan monohydrate dissolved in distilled water at a dose of 150mg/kg body weight intraperitoneally to induce diabetes. After three days of injecting alloxan monohydrate, diabetes was confirmed by testing blood glucose sugar level using Abbott glucometer. The animals with blood glucose level more than 200mg/dl were selected for evaluation of anti-diabetic activity.

Experimental Design: The rats were randomly divided into 4 groups (n = 5) as follows:

- Group I: Control animals non-diabetic received normal diet (Saline solution, 0.1ml/10g, i.p.)
- Group II: Animals treated with alloxan (150 mg/ kg, i.p. diabetic control animals). The rats developed diabetes after alloxan injection as evidenced by sustained hyperglycaemia 3 days after the induction
- Group III: Glibenclamide (20mg/kg) i.p., treatment, for 3 days followed by alloxan administration
- Group IV: Test extract (800mg/kg), p.o, treatment for three days followed by alloxan administration

TABLE-1: EFFECT OF *MURVA* ON ALLOXAN INDUCED DIABETES

Group		Blood glucose level mg/dl (mean ± SE)			
		Base	Day after treatment		
			1	2	3
I	Control	102.43±5.34	105.91±3.67	103.43±8.12	106.92±6.52
II	Diabetic	202.02±10.89	204.74±7.34	205.45±8.67	208.76±8.57
III	Diabetic + Glibenclamide (20mg/kg)	205.23±12.54	189.70±11.21	181.54±9.54	174.59±11.37
IV	Diabetic + Test extract (800mg/kg)	203.48±8.46*	188.75±7.72*	170.49±13.94*	165.54±12.63*

*p (<0.001) as compared to normal control

RESULT: Acute toxicity studies were carried out to evaluate acute toxic effects and determine minimum lethal dose of drug extract in Swiss albino mice. It was found that aqueous extract of 2500mg/kg doses did not show any toxic manifestations or death. Glibenclamide (20mg/kg) i.p showed significant hypoglycemic effect as compared with control group after oral load of glucose in mice. The aqueous extract (800mg/kg) p.o exhibited significant reduction in blood glucose as compared to control. Continued administration of roots extract of *Murva* (800mg/kg) p.o and glibenclamide for 3 days in different group of diabetic rats produced significant reduction of blood glucose level. The test extract at a dose of 800mg /kg p.o showed potent anti diabetic activity ($p<0.001$) compared to standard drug Glibenclamide (20mg/kg) i.p, normal control and diabetic control. It reduced blood glucose more than that of standard drug.

DISCUSSION: In our studies, the damage of pancreas is induced by alloxan and causes hyperglycaemia. Alloxan causes destruction of pancreatic beta cells is mediated via generation of oxidative stress [12]. Toxicity of alloxan is elicited through its reduction by glutathione to dialuric acid, in which redox recycling process generates ROS that damages the beta cells [13]. Furthermore, transition metals such as iron and copper, which are potentially involved in the generation of hydroxyl free radical, are also involved in alloxan mediated killing of beta cells [13, 14, 15]. This study suggested that test extract at a dose of 800mg/kg p.o was potent to inhibit the toxicity of alloxan on β-cells of pancreas and prevents hyperglycemia either by increases the metabolism of blood glucose level or by increasing the insulin level by prevents the β cell destruction.

Herbal medicine is a triumph of popular therapeutic diversity. Almost in all the traditional medicine, the medicinal plants play a major role and constitute the backbone for the same. Pharmacological studies are done to evaluate the safety and effectiveness for the proposed use of any crude drug/ plant material. Screening of drugs thus involves scanning and evaluation for its therapeutic use.

In order to make sure the safe use of these medicines, a necessary first step is the establishment of standards of quality, safety and efficacy. Keeping these facts in to consideration, the attempt has been made to carry out antipyretic studies of the root of *Maerua oblongifolia* (Forsk.) A. Rich.

CONCLUSIONS: Aqueous extract of *Maerua oblongifolia roots*t exhibited significant anti-hyperglycemic activities in alloxan-induced diabetic rats. The anti-diabetic activity of murva may be by any one of the above said mechanism or by both this mechanism and so might be of value in diabetes treatment.

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