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# Blood Sugar Lowering Effect of Moringa Oleifera Lam in Albino Rats

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## ABSTRACT

Medicinal plants constitute an important source of potential therapeutic agents for diabetes. In the study, we investigate the effects of Moringa oleifera (MO) lam on blood sugar of albino rats. Hyperglycemia was induced in rats using alloxan (120 mg/kg body weight, intraperitioneally,). Normoglycemia and hyperglycemic rats were treated with three different doses of the aqueous extracts, tolbutamide (positive control) and normal saline (negative control). The glucose level of the withdrawn blood samples was determined by 0-toluidine spectrophotometric method. The classes of chemical components of the aqueous extract of the plant were determined. Proteins, fixed oils and fats and carbohydrates were found to be present. The aqueous extract produced a dose—dependent reduction (P<0. 05) in blood sugar levels of normoglycemic and hyperglycemic rats. In normoglycemic rats, the aqueous extract of MO (100,200 and 300 mg/kg) exhibited 23.14, 27.05 and 33.18 % reduction respectively of the blood glucose levels within 6 hours of administration, while tolbutamide (200 mg/kg) showed 33.29% (P<0. 05) reduction. In alloxan induced diabetic rats, the aqueous extract (100, 200, 300 mg/kg) exhibited 33.29%, 40.69% and 44.06% reduction respectively of blood glucose concentration within 6 hours of administration, while tolbutamide (200 mg/kg,) caused 46. 75% reduction. The studies showed that the aqueous extract of Moringa oleifera leaves do posses a significant, dose-dependent hypoglycemic activity in normoglvcemic and alloxan-induced diabetic rats and almost as effective as the standard drug ( tolbutamid.). This also supports its use in folkloric management of diabetes.

**Keywords:** *Moringa oleifera, Diabetes, antidiabetic activity, Rattus norvegicus.*

## 1. INTRODUCTION

Diabetes is a chronic metabolic disorder with impaired glucose tolerance and high risk of cardiovascular disease[1]. Many oral synthetic antidiabetic agents have been developed[2]. Hyperglycemia can be handled initially with oral agents and insulin therapy, which sometimes required achieving targeted glycemic levels. However, these synthetic agents produce some serious side effects and relatively expensive for developing countries[3].

Therefore, searching for effective, low cost and less side effect hvpoglvcemic agents is important. Herbal remedies for diabetes are known since ancient times in different societies. Scientific data supported the antidiabetic effects of some medicinal plant[4].

*Trigonella foenum-graecum* seeds have been shown to possess hypoglycemic properties in experimental animals[5] and in diabetic patients[6]. *Allium sativum*[7], *Vernomonia amydalina*[8] and *Anacardium occidentale*[9] extracts decreases the blood sugar levels in alloxan diabetic rats and rabbits.

*Moringa oleifera* (MO) Lam (drumstick tree and horse radish tree) belongs to *Moringacea* family which accounts 14 species. MO has anti-cancer[10] anti-inflammatory[11] and thyroid status regulator[12] efficacies and researchers reported its hypoglycemic potential[13].

## 2. MATERIALS AND METHODS

**Plants Extract:** The *Moringa oleifera* leaves were harvested from Nsukka. The leaves were dried in shade and pounded to yield a powder. The resulting powder was dispersed in 1% solution of sodium metabisulphate for 24 hours. The viscous mixture was sieved with a muslin cloth. Acetone was then added to the viscous extract until precipitation was complete. The whitish precipitate was recovered and dried in a desiccator containing calcium chloride. Standard solution of the extracts was made in Tween 80 solution.

**Reagents:** The reagents were sourced commercially. Glucose, tolbutamide. sodium ethlyenediaminetetracetate, ortho-toluidine were products of May and Baker while glacial acetic acid, trichioroacetic acid, alloxan monohydrate, thiourea were products of Sigma, St. Lious, MO, USA.

**Animals:** Albino rats of both sexes weighing 80-170g were used. They were housed in white metal cages and were kept under standard conditions for 14 days with free access to water and feed before the experiment commenced. They were bred in the animal house of Department of Zoology, University of Nigeria, Nsukka, Nigeria.

**Induction of Experimental Diabetics:** Diabetes was induced by slow intraperitioneal injection of 1% solution of alloxan (120 mg/kg body weight) dissolved in distilled water and administered within few minutes of its preparation. The diabetic state was confirmed on the seventh day by the blood glucose determination[14].

**Investigation of the hypoglycemic effect of the extract:** The animals were fasted for 12 hours but were allowed access to water before and during the experiment. The blood glucose level was monitored before and after alloxanization by withdrawing blood from the tail tipping method[15]. At the end of the fasting, taken as the zero time (0 hr). blood was withdrawn from the animals tail vein and the sugar level

determined by 0- toluidine method[16]. Only animals with blood glucose levels above 100 mg/dl were used. Normal rats were then divided into 5 groups (I-V) of six animals in each group. Group I received normal saline (2m1/kg body weight) while group II received 200mg/kg body weight of tolbutamide. Group III-V received 100, 200 and 300 mg/kg body weight of the extract respectively. The diabetic rats were also divided into 5 groups on the same pattern and the experiment was repeated with them. Blood samples were drawn from the tail vein at 0, 1, 3 and 6 hours after the administration of the extract.

**Statistical analysis:** Data obtained were reported as mean ± SEM. The statistical significance of the change in blood glucose level was determined by the students't-test. The probability value of less than 0.05 was considered as the level of significance.

## 3. RESULTS AND DISCUSSION

The extract showed a dose dependent effect since more pronounced hypoglycemic effect was produced when the dose was increased as shown in table 1 and 2. In alloxan induced diabetic rats, the extract produced significant hypoglycemic effect, giving a percentage ($p<0.05$) reduction in blood sugar levels of 31.22, 40.69 and 44.96% for 100, 200 and 300 mg/kg dosed of the extract at 6 hrs of administration while tolbutamide exibited 46.75% ($P<0.05$) reduction of the blood sugar levels at the same time interva1s as shown in table 1. In the normoglycemic rats, the extract showed a significant ($P<0.05$) decrease (table 2), which was dose dependent.

From the obtained results, we can conclude that *Moringa olejfera* is comparable with the reference drug tolbutamide. The comparable effect of MO with tolbutamide on both normoglycemic and hyperglycemic animals may suggest similar modes of action. Alloxan monohydrate destroys the pancreatic B- cells[15] and the extract lowered blood sugar levels in alloxanized rats, an indication that the extract has extra pancreatic effects.

This resultant effect of *Moringa oleifera* extract was due to its active constituents, which has neither been known nor the extract mode of action of the hypoglycemic effect determined. Further studies can be done to identify the active principles responsible for the hypoglycemic effect.

**Table 1. Effect of Moringa oleifera extract on blood glucose levels of Alloxan-diabetic rats.**

| Dose of Drug (Mg/Kg) | Blood Glucose Level (Mg/Kg) | | | | Maximum Reduction % |
|---|---|---|---|---|---|
| | 0h | 1h | 3h | 6h | |
| 100 | 105.05 ± 6.90 | 98 ± 5.80 | 81 ± 5.6 | 72.25 ± 3.4 | 31.22 |
| 200 | 101.67 ± 1.40 | 90.3 ± 1.82 | 78.67 ± 1.70 | 60.34 ± 1.14 | 40.69 |
| 300 | 103.70 ± 0.84 | 93.3 ± 1.17 | 82 ± 1.53 | 57.08 ± 1.11 | 44.96 |
| 200 Tolbutamide | 106.30 ± 3.01 | 83 ± 3.01 | 64.69 ± 6.72 | 56.60 ± 6.90 | 46.75 |
| 2 (Ml/Kg) Normal Saline | 117.67 ± 6.20 | 117 ± 5.90 | 115.3 ± 7.21 | 115.01 ± 6.13 | 2.26 |

**Values are expressed as Mean ± SEM; P<0.05; n=5**

**Table 2: Effect of Moringa oleifera extract on blood glucose levels of normal rats**

| Dose of Drug (Mg/Kg) | Blood Glucose Level (Mg/Kg) | | | | Maximum Reduction % |
|---|---|---|---|---|---|
| | 0h | 1h | 3h | 6h | |
| 100 | 88.67 ± 4.20 | 85.35 ± 2.50 | 79.09 ± 2.94 | 68.15 ± 4.31 | 23.14 |
| 200 | 84.00 ± 1.10 | 81.30 ± 3.08 | 77.15 ± 4.36 | 61.28 ± 2.32 | 27.05 |
| 300 | 90.07 ± 3.31 | 78.25 ± 1.35 | 63.59 ± 1.49 | 57.08 ± 1.38 | 33.18 |
| 200 Tolbutamide | 90.05 ± 1.10 | 75.20 ± 1.63 | 72.67 ± 2.81 | 60.07 ± 3.05 | 33.29 |
| 2 (Ml/Kg) Normal Saline | 82.91 ± 1.61 | 82.63 ± 2.50 | 81.35 ± 1.42 | 81.25 ± 2.23 | 2.00 |

**Values are expressed as Mean ± SEM; P<0.05; n=5**

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