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Research Article

# Comparative Hypoglycemic Study of *Aloe vera*, *Murraya koenigii* and *Azadirachta indica*

Neeraja Kamakshi U[1]*, Srinivasa Rao D[1], Yamini Suvarchala K[1], Anusha K[1], Venkateswara Rao B[2]

[1]*Dept. of Pharmacognosy, K.C.Reddy Institute of pharmacy, Guntur, Andhra Pradesh-522 348, India*
[2]*Chebrolu Hanumaiah Institute of Pharmaceutical Sciences, Guntur, Andhra Pradesh-522 019*

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**ABSTRACT**

The influence of single drug and multiple drug effect of the selected drugs on hypoglycaemic activity were studied in Wistar rats. Rats were selected as suitable animal models for the study of the above parameters since adequate quantities of blood samples can be collected at the desired intervals of time. Healthy Wistar rats were selected for set of experiment. These studies were conducted in the same group of rats in same group of animals. The experimental conditions and protocols were same for all sets of selected drugs. The experiments were designed to get Serum glucose level data from the study, by estimating the blood glucose. Diabetes mellitus is a chronic disease, Insulin is used in the treatment of diabetes and to improve the therapeutic effect extracts of *Aloe vera* (Aloe) and *Murraya koenigii* (Curry leaves), *Azadirachta indica* (Neem) can be used. Here we maintained same group of animals with appropriate wash out periods. In this study we perform about the hypoglycemic effect of the Aloe, Neem and Curry leaves individually and in combination on Wistar rats.

**Keywords:** *Aloe vera*, *Murraya koenigii*, *Azadirachta indica*, Wistar rats, Hypoglycaemic effect

## INTRODUCTION

Diabetes mellitus[15,16] often simply referred to as Diabetes—is a group of metabolic diseases in which a person has high blood sugar, either because the body does not produce enough Insulin, or because cells do not respond to the Insulin that is produced. This high blood sugar produces the classical symptoms of Polyuria (frequent urination), Polydipsia (increased thirst) and Polyphagia (increased hunger)[2]. There are three main types of diabetes:

Type 1 diabetes mellitus is characterized by loss of the Insulin-producing β-cells of the islets of Langerhans in the pancreas leading to Insulin deficiency. This type of diabetes can be further classified as immune-mediated or idiopathic. The majority of type 1 diabetes is of the immune-mediated nature, where beta cell loss is a T-cell mediated autoimmune attack[1]. There is no known preventive measure against type 1 diabetes, which causes approximately 5%-10% of diabetes mellitus cases. Type 2 diabetes mellitus is characterized by Insulin resistance which may be combined with relatively reduced Insulin secretion. The defective responsiveness of body tissues to Insulin is believed to involve the Insulin receptor. However, the specific defects are not known.

Gestational Diabetes Mellitus (GDM) resembles Type 2 Diabetes in several respects, involving a combination of relatively inadequate Insulin secretion and responsiveness. It occurs in about 2%–5% of all pregnancies and may improve or disappear after delivery.

Insulin is the principal hormone that regulates uptake of glucose from the blood into most cells (primarily muscle and fat cells, but not central nervous system cells). Therefore deficiency of Insulin or the insensitivity of its receptors plays a central role in all forms of diabetes mellitus.

Humans are capable of digesting some Carbohydrates, in particular those most common in food; starch, and some disaccharides such as sucrose, are converted within a few hours to simpler forms most notably the Monosaccharide glucose, the principal carbohydrate energy source used by the body. The rest are passed on for processing by gut flora largely in the colon. Insulin is released into the blood by beta cells (β-cells), found in the Islets of Langerhans in the Pancreas, in response to rising levels of blood glucose, typically after eating. Insulin[3,6] is used by about two-thirds of the body's cells to absorb glucose from the blood for use as fuel, for conversion to other needed molecules or for storage.

Aloe is a succulent perennial and a species of plant dried juice obtained from leaves of various species of Aloe known as *Aloe Vera, Aloe ferox, Aloe spicata, Aloe Africana, Aloe barbedensis, Aloe perryibaker* belonging to the family Liliaceae containing Anthraquinone glycosides. It has Purgative and Laxative property, Anti inflammatory activity. Aloe gel by mouth can reduce blood sugar levels with Type 2 diabetes.

Curry leaves have several herbal remedial qualities and is mainly derived from an aromatic and deciduous shrub

**Author for Correspondence*

Figure: 1 *Aloe Vera* [7]

Figure: 2 *Murraya koenigii* [8]

Figure: 3 *Azadirachta indica* [9, 10, 11]

Table 1: Standard Insulin

| S.No. | Drug | Initial Blood Glucose levels (mg/dl) | Final Blood Glucose levels (mg/dl) | Difference [Final-Initial] |
|---|---|---|---|---|
| 1 | Insulin | 87 | 52 | 35 |
| 2 | Insulin | 81 | 46 | 35 |
| 3 | Insulin | 110 | 84 | 26 |
| 4 | Insulin | 106 | 79 | 27 |

Mean = 30.75

Table 2: *Aloe vera* leaf juice

| S.No. | Drug | Initial blood Glucose levels (mg/dl) | Final Blood Glucose levels (mg/dl) | Difference [Final-Initial] |
|---|---|---|---|---|
| 1 | Aloe vera juice | 130 | 126 | 4 |
| 2 | Aloe vera juice | 131 | 122 | 9 |
| 3 | Aloe vera juice | 114 | 106 | 10 |
| 4 | Aloe vera juice | 97 | 95 | 2 |

Mean = 6.25

Table 3: *Murraya koenigii* leaf juice

| S.No. | Drug | Initial Blood Glucose levels (mg/dl) | Final blood Glucose levels (mg/dl) | Difference [Final-Initial] |
|---|---|---|---|---|
| 1 | *Murraya koenigii* leaf juice | 119 | 101 | 18 |
| 2 | *Murraya koenigii* leaf juice | 129 | 105 | 24 |
| 3 | *Murraya koenigii* leaf juice | 104 | 89 | 15 |
| 4 | *Murraya koenigii* leaf juice | 113 | 88 | 25 |

Mean = 20.5

consist of dried areal parts of plant *Murraya koenigii* belonging to family Rutaceae containing Carbazole alkaloids. Used in the treatment of Digestive disorders, Kidney disorders, Premature Greying of Hair, Diabetes and Eye Disorders.

Neem is an attractive broad-leaved, evergreen tree which consists of all areal parts of plant known as *Azadirachta indica* belonging to family Meliaceae containing Diterpenes, Triterpenes, Limonoids and Flavonol glycosides Useful in the treatment of Skin ulcers, Diabetes, Elimination of intestine worms and as Diuretic.

## MATERIALS AND METHODS

*Aloe Vera, Murraya koenigii, Azadirachta indica* leaves were collected from the surroundings of K.C.Reddy Institute of Pharmaceutical Sciences, Guntur. All the plants were authenticated by botanist Dr. M. Raghu ram, Assistant Professor, Department of Botany & Microbiology, Acharya Nagarjuna University, Guntur.

*Preparation of Plant Juice*

All the juices were prepared by grinding the leaves with adequate amount of water and are then filtered. Insulin, Batch no. B-50448 was purchased from Torrent Pharmaceuticals Ltd, Indrad plant, Mehsana, Gijarat, India. Blood Glucose Diagnoising kit - ONETOUCH Blood glucometer was purchased from pharmacy.

Wistar rats of either sex weighing between 125-140gms

Table 4: *Azadirachta indica* leaf juice

| S.No. | Drug | Initial Blood Glucose Levels (mg/dl) | Final Blood Glucose Levels (mg/dl) | Difference [Final-Initial] |
|---|---|---|---|---|
| 1 | *Azadirachta indica* leaf juice | 168 | 162 | 6 |
| 2 | *Azadirachta indica* leaf juice | 100 | 96 | 4 |
| 3 | *Azadirachta indica* leaf juice | 113 | 108 | 5 |
| 4 | *Azadirachta indica* leaf juice | 142 | 138 | 4 |

Mean = 4.75

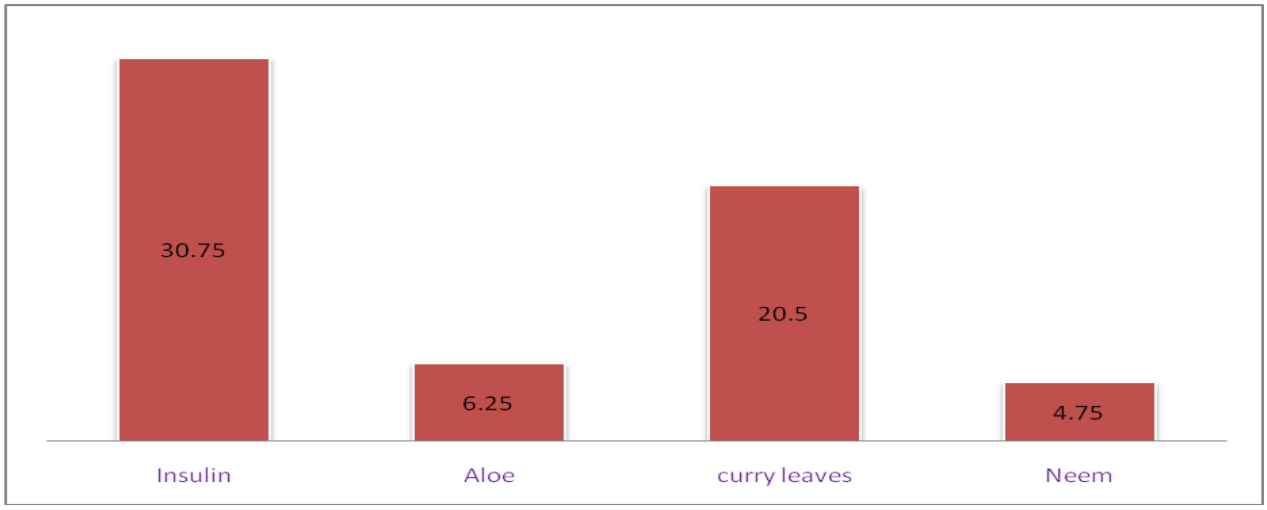


Figure 3: Mean of Reduced blood glucose levels of test & standard preparations

Synergistic Study

Table: 5 *Aloe vera* + Insulin

| S.No. | Drug | Initial Blood Glucose levels (mg/dl) | Final Blood Glucose Levels (mg/dl) | Difference [Final-Initial] |
|---|---|---|---|---|
| 1 | *Aloe vera* + Insulin | 120 | 36 | 84 |
| 2 | *Aloe vera* + Insulin | 175 | 101 | 74 |
| 3 | *Aloe vera* + Insulin | 160 | 89 | 71 |
| 4 | *Aloe vera* + Insulin | 117 | 48 | 69 |

Mean = 74.5

Table 6: *Murraya koenigii* + Insulin

| S.No. | Drug | Initial Blood Glucose levels (mg/dl) | Final Blood Glucose Levels (mg/dl) | Difference [Final-Initial] |
|---|---|---|---|---|
| 1 | *Murraya koenigii* + Insulin | 138 | 58 | 80 |
| 2 | *Murraya koenigii* + Insulin | 164 | 89 | 75 |
| 3 | *Murraya koenigii* + Insulin | 142 | 78 | 64 |
| 4 | *Murraya koenigii* + Insulin | 153 | 83 | 70 |

Mean = 72.25

obtained from the animal house were used in the study. All the rats were maintained on uniform weight of raw chow diet and water. The animals were maintained at 25±1 $^0$C in 12h/12h light/dark cycle. All the animals were fasted for 18 h before the experiment and water was withdrawn during the experiment.

*Blood Glucose Testing Meter*

The blood glucose testing strip is to be used with the blood Glucose meter to test glucose levels in the whole blood. When the blood sample is in contact with blood sample inlet of the test strip, it will flow in to the reaction area automatically and start the test. Only small amount of blood is needed (3µ/ one test). The testing range of blood glucose is 30-600mg/dl.

*Experimental design*

*Dosages*

Insulin =0.1 UNIT/KG

*Aloe vera* juice =10mg/kg Body weight i.e., 1.2ml for each rat weighing about 120gms approximately

(1mg = 1ml since it is an aqueous juice)

*Murraya koenigii* leaf juice = 10mg/kg B.W. i.e., 1.2ml for each rat weighing about 120gms approximately

*Azadirachta indica* leaf juice =10mg/kg B.W. i.e., 1.2 ml for each rat weighing about 120gms approximately.

Table 7: *Azadirachta indica* + Insulin

| S.No | Drug | Initial Glucose (mg/dl) | Blood levels | Final Glucose (mg/dl) | Blood Levels | Difference [Final-Initial] |
|---|---|---|---|---|---|---|
| 1 | *Azadirachta indica* + Insulin | 145 | | 69 | | 76 |
| 2 | *Azadirachta indica* + Insulin | 138 | | 67 | | 71 |
| 3 | *Azadirachta indica* + Insulin | 154 | | 89 | | 65 |
| 4 | *Azadirachta indica* + Insulin | 129 | | 61 | | 68 |

Mean = 70

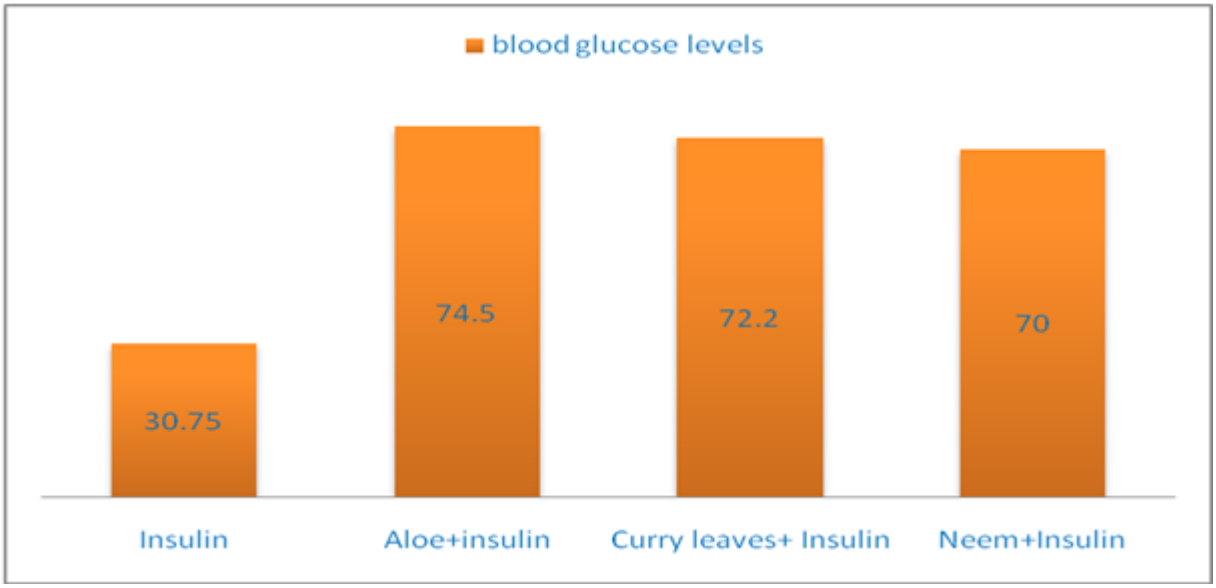


Figure: 4 Mean Of Reduced Blood Glucose levels Of Test with Standard

*Administration of Drugs*

The drugs were administered by oral route with the help of oral feeding tube as described below. The rat was gently handled and then a mouth gag was introduced in between the two jaws and held in position by holding the upper jaw and lower jaw with left hand. Infant feeding tube dipped in glycerin was introduced into the mouth through the central hole of the mouth gag. The tube was pushed slowly such that it enters the Oesophagus and reaches the stomach. To the other end of the tube a syringe was attached. After administering 1 ml of distilled water to ensure free flow into the stomach, the required quantity of the drug solution was administered through the syringe and feeding tube. The tube was removed gently.

*First Part of Experiment*[12,14]

16 rats were divided into four groups four rats to the each group and initial blood glucose levels were found. First group was administered with Standard drug Insulin (0.1 UNIT/KG) subcutaneously. Second group was administered with *Aloe vera* leaf juice (1.2ml/kg) orally. Third group was administered with *Murraya koenigii* leaf juice (1.2ml/kg) orally and the fourth group was administered with *Azadirachta indica* (1.2ml/kg) leaf juice orally. After 1 hour the blood samples were withdrawn by cutting the terminal edge of tail and final blood glucose levels were estimated with Glucose meter.

*Second Part of Experiment*

12 rats were divided into three groups each containing four rats and initial blood glucose levels were determined. First group was administered with Insulin Subcutaneously and *Aloe vera* juice orally. Second group was administered with Insulin Subcutaneously and *Murraya koenigii* leaf juice orally. Third group was administered with Insulin Subcutaneously and *Azadirachta indica* leaf juice orally. After 1 hour the final blood glucose levels were found by cutting the terminal edge of tail and single blood drop showed the blood glucose level in Glucose meter.

*Testing Procedure*

The test strip was inserted into the test slot of the blood glucose meter. The meter will start automatically and shows the current strip code. Slightly the tail of rats was cut with scissors and the first blood drop was removed. The second blood drop was applied to the strip from the red sample inlet. Through the capillary action, the sample compartment was filled with 3µl of blood and covered the reaction area; a beep sound will let you know that the test has begun. In 10 seconds, the blood glucose value will appear on the blood glucose meter and automatically stores in the memory. After removing the strip the machine will turn off automatically.

## RESULTS AND DISCUSSION

Diabetes Mellitus is a chronic disorder demands lifelong medication to maintain the body's glucose Homeostasis

with the aid of single/multiple drug therapy. It is well known that the allopathic medications on long run usage tend to cause side effects and even in some cases they proved to worsen the condition. Hence there is growing interest and demand for the herbal drugs as supplements to the therapy because of their no or less side effects even in chronic administration. Apart from their fewer side effects they usually posses multiple beneficiary effects such as Antioxidant and Anti-inflammatory etc. Hence in many parts of the rural areas of India it has become practice to use the herbal drugs in combination with allopathic drug with or without the consultation of the physicians for many other ailing conditions. The present study focused to give sufficient scientific evidence in the usage of *Azadirachta indica*, *Aloe vera* and *Murraya koenigii* juice for hypoglycemic effect. When the leaf juice of *Azadirachta indica*, *Aloe vera* and *Murraya koenigii*e are given in combination with Insulin it has showed synergistic action of insulin by increasing the uptake of glucose in liver, muscles and adipose tissue.

## CONCLUSION

The present study in Wistar rats reveals that the fresh juice of *Aloe vera*, *Azadirachta indica* and *Murraya koenigii* have shown normal effect on blood glucose level on its own, and when given in combination with insulin they tend to enhance its effect and even extended its therapeutic value. It is proved that *Murraya koenigii* (20.5 Units) will reduce more glucose levels than *Azadirachta indica* (4.75 Units) and *Aloe vera* (6.25 Units). When used along with Insulin, *Aloe vera* (74.5 Units) will reduce glucose levels than *Murraya koenigii* and *Azadirachta indica.* So from the present preliminary study we can conclude that, the leaf juice of *Aloe vera*, *Azadirachta indica* and *Murraya koenigii* are useful in combination with Insulin in chronic therapy like Diabetes mellitus by which one can reduce the dose of Insulin required to maintain glucose homeostasis alone or in combination with other Anti hyperglycemic agents. To validate its beneficiary effect in combination with Insulin in diabetic animal models may prove its worthy to be used in long run.

## REFERENCES


1. Rother KI. Diabetes treatment-bridging the divide. The New England journal of medicine 2007, 356.
2. Cooke DW, Plotnik L. Type 1 diabetes mellitus in pediatrics. Pediatric Review2008, 29 (11); 347-384.
3. National diabetes statistics, National Diabetes Information Clearing house Web site. http://diabetes.niddk.nih.gov/dm/pubs/statistics/index.htm#allages (2007); Accessed (August 22, 2010).
4. UK Prospective Diabetes Study Group. U.K. prospective diabetes study 16. Overview of 6 years' therapy of type II diabetes: a progressive disease. *Diabetes* 1995, 44:1249-1258.
5. Saydah SH, Fradkin J, Cowie CC. Poor control of risk factors for vascular disease among adults with previously diagnosed diabetes. Journal of American Medical Association 2004, 291:335-342.
6. DeWitt DE, Dugdale C. Using new insulin strategies in the outpatient treatment of diabetes: clinical applications. JAMA 2003, 289:2265-2269.
7. Bolkent S, Akev N, Ozsoy N, Sengezer-Inceli M, Can A, Alper O, Yanadaq R. Effect of *Aloe vera* (L.) Burm fil. Leaf gel and pulp extracts on kidney in type II diabetic rat model Indian Journal of Experimental Biology 2004, 42 (2); 48–52.
8. Fajans SS, Cloutier MC, Crowther RL. Clinical and etiological heterogeneity of idiopathic diabetes mellitus (Banting Memoral Lecture) Diabetes 1997, 7:1112–25.
9. Khosla P, Bhanwra S, Singh J, Seth S, Srivastava RK. A study of hypoglycemic effects of *Azadirachta indica* (Neem) in normal and Alloxan diabetic rabbits. Indian Journal of Physiology and Pharmacology 2000, 44:69–74.
10. Pillai NR, Santhakumari G. Hypoglycemic Activty of melia Azadirechta Linn. (Neem) Indian Journal of Medical Research 1981, 74:931–3.
11. Edwin E, Sheeja E, Gupta VB, Jain DC. Fight Diabetes the herbal way. Express Pharma Pulse 2006, 1:41–2.
12. Mahantayya V.Math and Balasubramaniam P. The Hypoglycaemic effect of Curry leaves (*Murraya koenigii spreng).*
13. Saif-Vr. Rehman, Saghir Ahmad Jafri, Sajid Hassan, Ishtiaq Ahmed & Muhammad Naim. Study of Antidiabetic effect of *Aloe vera* extract on Alloxan induced diabetic rats.
14. Shravan kumar Dholi, Ramakrishna Raparla, Santosh kumar Mankala, Kannappan Nagappan. Invivo Antidiabetic evaluation of Neem leaf extracts in Alloxan induced rats.
15. Diabetes Mellitus, World Health Organization Fact Sheet 1999, 138.
16. Diabetes Mellitus, American Diabetes Association - General Fact Sheet 1999.