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Effect Of Momordica Charantia Seed On Blood Glucose Levels In Normal And Alloxan-Diabetic Mice (Mus Musculus)

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Abstract
Background: *Momordica charantia, sometimes known as bitter melon, is a tropical fruit with long-recognized potential therapeutic effects on a variety of metabolic illnesses, including diabetes.*
Aim*: The purpose of this study was to examine the impact of M. charantia seed on blood glucose levels in normal and alloxan-diabetic mice.*
Method: *Male Swiss albino mice were placed into four groups for this experiment: normal control, normal treated, diabetic control, and diabetic treatment. Alloxan administration caused diabetes in the mice. The treated groups received an oral dose of 100 mg/kg body weight of M. charantia seed extract for 21 consecutive days, whereas the control groups received an equivalent volume of vehicle. Blood glucose levels were measured at regular intervals throughout the study using o-toluidine method and glucometer. Statistical analysis was done by SPSS 16.0.*
Result: *This study indicated that treatment with M. charantia seed extract effectively decreased blood glucose levels and regains the loss of body weight in alloxan-diabetic mice groups. There is significant decrease of glucose of diabetic control from 230.17 ± 10.41 to 111 ± 12.91.*
Conclusion: *These results imply that the seed extract of M. charantia has antihyperglycemic properties and could be a possible treatment for diabetes.*
Keywords: *Momordica charantia**,** alloxan, glucose, diabetic, Swiss albino mice*

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I. Introduction

M. charantia, commonly known as bitter melon or bitter gourd, is a tropical and subtropical vine that is widely cultivated for its edible fruit and medicinal properties. This unique fruit is known for its bitter taste and has been used in traditional medicine across various cultures and regions around the world. Some traditional uses of *M. charantia*: Ayurveda (India): In Ayurvedic medicine, bitter melon has been used for centuries to treat various conditions (Kwatra et al., 2016) .It is believed to have a cooling effect on the body and is used to promote digestion, relieve constipation, and manage diabetes. Bitter melon juice or extracts are also used topically to treat skin conditions such as eczema and psoriasis(Grover & Yadav, 2004) . Bitter melon is valued in Traditional Chinese Medicine for its cleaning and purifying properties. It aids digestion, clears heat, and reduces fevers and skin eruptions. Bitter melon aids digestion and liver function. Bitter melon is a traditional Caribbean and South American medicine. Its tea or juice balances blood sugar, decreases stomach-aches, promotes digestion, and purifies blood. African traditional medicine uses bitter melon. Lowering blood sugar controls diabetes. It soothes pain, fever, and gastrointestinal disorders. Southeast Asian countries cure diabetes with bitter melon. It may control insulin and blood sugar. Bitter melon is antimicrobial and promotes immunity. Bitter melon has been used traditionally, but scientists are studying its medical and traditional purposes.

Bitter melon contains antioxidants, flavonoids, and phenolic substances (Kumari et al., 2017). Antioxidant and anti-inflammatory properties may protect against oxidative stress and inflammation. Bitter melon contains vitamins, minerals, and antioxidants that boost the immune system. It may boost immunological function and infection defence. Alam et al. (2015) show that bitter melon may help regulate weight. It may help reduce body weight, body fat formation, and improve lipid profiles. Bitter melon chemicals affect metabolism and fat absorption. Bitter melon helps digestion. It aids digestion, appetite, and digestive issues like indigestion, constipation, and stomach-aches (Sampath Kumar & Bhowmik, 2010). Bioactive substances that assist digestion and laxation may cause these effects.Diabetes mellitus is a chronic metabolic disorder characterized by hyperglycemia resulting from insulin deficiency or resistance. Momordica charantia is a plant with reported

hypoglycemic properties and is widely used as a traditional remedy for diabetes in many countries. However, there is a need for scientific evidence to support its efficacy.

II. Materials And Methods:

Experimental animals: Three-month-old male Swiss Albino mice (Body weight: 25 ± 5 g) were obtained from animal house of University Dept. of Zoology, Bhagalpur, Bihar. They were separated and kept in stainless steel cages in a temperature and humidity controlled with 12 h light/dark cycle. Food and water were given to the animal according to their need.

Preparation of *Momordica charantia* seed extract:

The seeds of *Momordica charantia* were collected, dried, and ground into a fine powder. 10 g of the pulverised samples were separately soaked for 24 hours in 50 ml of 70% ethanol to produce organic seed extract. After 24 hours, the three seed extracts were filtered through standard Watman filter paper and centrifuged at 10,000 rpm for 10 minutes at 4 degrees Celsius. The supernatants were collected and dehydrated at 30°C in a rotary evaporator. The granules obtained were dissolved in water and stored at 4 degrees Celsius until further use.

Drugs and chemicals: The drug alloxan monohydrate (Loba chemical, Mumbai) was purchased from commercial sources. All other chemicals were analytical grade and used as such without further testing.

Induction of diabetes: Before diabetes induction, experimental animals will fast for 18 hours. Alloxan monohydrate intraperitoneally induces diabetes (Wilson et al., 1972.). Alloxan monohydrate (450mg/kg/BW) will be injected three times at 48-hour intervals at 150mg/kg/BW each. The entire experimental group will utilise diabetic animals with blood glucose levels of 200 mg/dl (Lensen, 2008). Monitoring blood glucose levels: Blood samples were collected from the tail vein of each mouse at regular intervals (e.g., 0, 7, 14, and 28 days) during the study period. Blood glucose levels were measured using a glucometer.

Experimental Design:

Twenty-four healthy male mice were randomly divided into four groups (n=6 each):

a. Control group (C): Received a standard diet and water.

b. Normal + *Momordica charantia* group (NM): Received a standard diet, water, and Momordica charantia seed extract orally.

c. Diabetic control group (DC): Induced with alloxan to develop diabetes and received a standard diet and water.

d. Diabetic + *Momordica charantia group (DM*): Induced with alloxan and received a standard diet along with *Momordica charantia* seed extract orally.

Body Weight Determination: The body weight of all groups of mice was measured before treatment (day 0) and during the treatment period (on days 7, 14 and 21). The body weight of the experimental mice was measured using an adequately adjusted electronic balance.

Statistical Analysis of the Results

The SPSS Version 16.0 programme was used to analyze the study's results. The findings were then presented as the mean standard error of the mean (SEM). ANOVA was used to compare the means of all parameters. Statistically, a $p<0.05$ value was regarded as statistically significant.

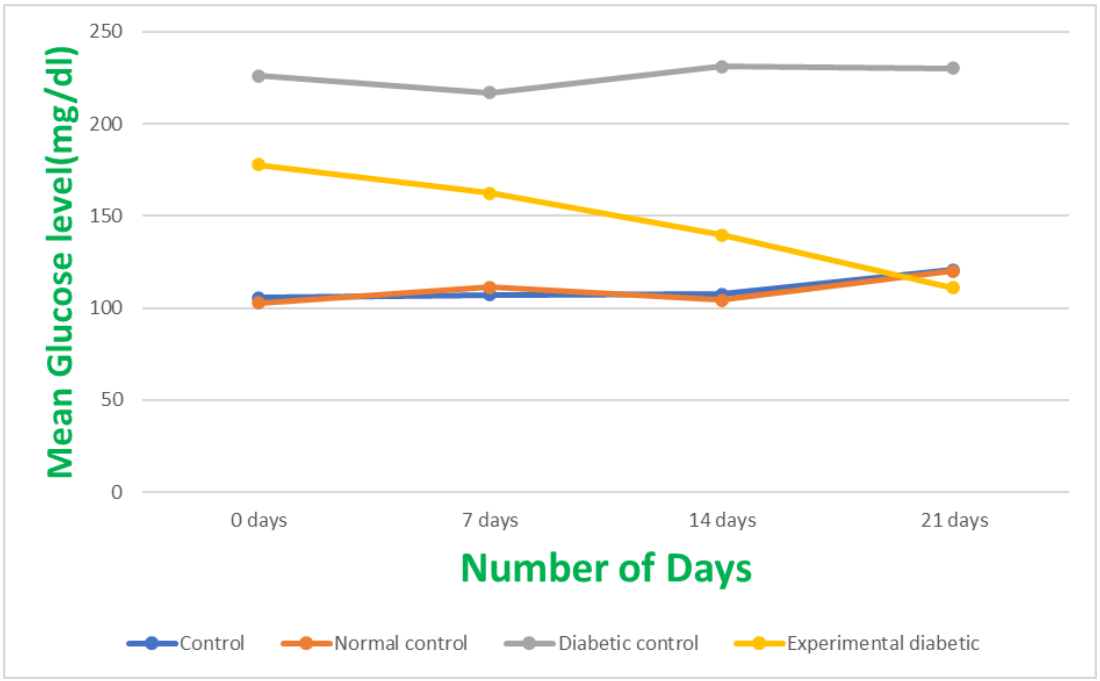
Result (Effect) of Extract of *M. charantia* on BGL in Diabetic Mice After Prolonged Treatment

A noticeable increase in blood glucose level (BGL) was obtained in chemically (alloxan)-induced diabetic mice compared with the normal control group. According to one-way ANOVA analysis, there no significant mean difference between (C) and (NM) (Taye et al., 2020).There is a significant mean difference between diabetic control and experimental group on 21 day, which suggest that there is decrease in blood glucose level.

	0 days	7 days	14 days	21 days
Control (C)	105.67±7.25	107±12.61	107.50±12.61	120.83±7.35
M.C+ Control (NM)	102.83±6.43	111.33±6.43	104.33±4.67	120.01±7.19**
Diabetic control (DC)	226.17±14.19	217±14.19	231.10±9.61	230.17±10.41
Experimental diabetic (Alloxan+ M.C)	177.83±6.911	162.33±6.6	139.50±7.39	111±12.91**

Table 1

(**Significant at $p<0.05$)

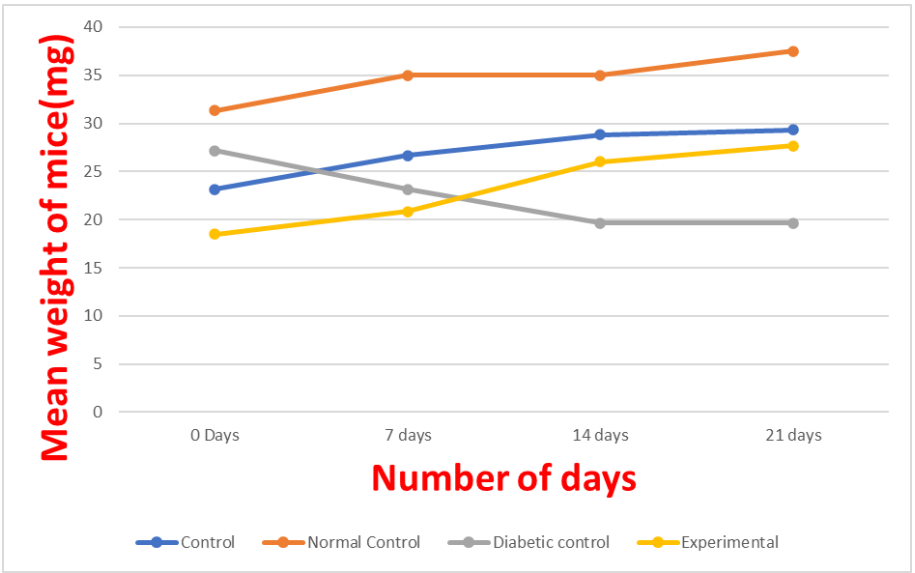


Effect of *M.charantia* on Body Weight in Chemically Induced Diabetic Mice

The body weights of mice in the (NM) group were increased compared to their original body weights while in the diabetic control group (diabetic mice without any treatment intervention) a significant drop in the body weight was observed when their final body weights were compared with their initial body weights. Alloxan-induced diabetic mice displayed significant decline in body weight compared to control mice as shown below in Figure 1. Aqueous extract of *M. charantia* seed of 100mg/kg doses treated groups mice indicated enhancement in body weight when compared to diabetic mice in control group, however, it was still less than in the (NM) group.

	0 Days	7 days	14 days	21 days
Control	23.166±1.94	26.66±0.81	28.83±2.04	29.33±3.66
Normal Control (M.C.+ Control)	31.33±0.81	35.00±2.09	35.00±2.09	37.50±2.5**
Diabetic control	27.15±1.51	23.16±1.47	19.66±0.81	19.66±0.81**
Experimental (Diabetic + M.C.)	18.5±0.83	20.833±0.40	26.00±1.09	27.66±1.96**

(**Significant at p<0.05)



III. Discussion

Akhtar et al. (1981) discovered that oral M.C seed powder caused dose-dependent hypoglycemia in normal and Alloxan-diabetic rats. In clinical trials, bitter melon seed (Momordica charantia) has been used to treat diabetes (Bever and Zahnd, 1979). These data imply that *Momordica charantia's* hypoglycemic potential is partly due to its seed fraction's active components *charatin* (Meir and Yaniv, 1985). *M. charantia* seed reduced serum glucose in alloxan-induced diabetic albino mice. High glucose levels started these mice. In clinical trials, bitter melon seed (Momordica charantia) has been used to treat diabetes (Bever and Zahnd, 1979).

In the result shown above the diabetic mice's weight loss may be due to glucose metabolism disturbance. The non-diabetic group administered *M. charantia* seed powder had no change in blood glucose, with increase in body weight. Therefore, *M. charantia* seed powder can control normal albino mice body weight gain without affecting blood glucose levels. This observation and the decrease in body weight observed in uncontrolled diabetes might be the result of protein wasting due to an unavailability of carbohydrates for utilization as an energy source (Virdi et al. 2003). The treated groups showed increase glucose metabolism and thus enhances body weight in alloxan-induced diabetic rats.

The possible mechanism by which MC seeds lead to a decrease in blood glucose may be by a potentiation of the insulin effect by increasing either the pancreatic secretion of insulin or its responsiveness. A number of other plants have been reported to exert hypoglycemic activity through insulin-release stimulatory effect (Pari and Umamaheswari 2000; Peungvicha et al. 1998).

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