STUDIES OF ANTI-DIABETIC ACTIVITY OF MOMORDICA CHARANTIA ON ALLOXAN INDUCED DIABETIC MICE

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ABSTRACT

Aims: To study the antidiabetic activity (DM) of bitter melon (Momordica charantia) on alloxan induced diabetic mice. Place and Duration of Study: The study was carried out between October 2020 and February 2021 in the Biochemistry Laboratory of Department of Biochemistry, Bharat Technology, West Bengal, India.

Methodology: After making 4 groups of mice- Group I: normal control (A), Group II: diabetic control (B) (alloxan 120 mg/kg body weight), Group III: diabetic control (C) (alloxan 120mg/kg body weight) + (Momordica charantia fruit extract at the dose of 200 mg/kg body weight); after the induction of the diabetes the effect of the Momordica charantia was closely observed for 3 weeks by measuring the blood glucose level of the diabetic mice.

Result: After inducing alloxan at 120 mg/kg body-wt. rate the blood glucose level of the albino mice rises up to a range of (195-265) after administration of the drug (Momordica charantia) at a rate of 200mg/kg body-wt. the blood glucose level significantly drops on (120-190).

Keywords: Momordica charantia, Antidiabetic activity, Alloxan induced diabetes mellitus, Glucose level.

I. INTRODUCTION

Nowadays diabetes is a serious issue in human life, the death rate from diabetes mellitus is also increasing simultaneously. There are several treatment for diabetes in the form of synthetic medicines which has lots of side effects due to this scientists are trying to extend their knowledge and experiments about the use of some herbal products for the treatment of diabetes.¹

In our general life whatever we eat that produces glucose which is the main source of energy in human body. The increase of glucose amount in blood is called diabetes. The two main hormones that regulates the blood glucose level are glucagon and insulin. Insulin secrets from the β-cells of pancreas that breaks down the carbohydrates into glucose and store it inside the cells.

There are basically two types of diabetes; in case of the type-1 diabetes body doesn’t produces enough insulin as a result of it blood glucose level increases, it is generally caused by the immune system of the body which helps in destroying foreign viruses and bacteria. In case of the type-2 diabetes someone’s body does not respond to the secreted insulin as a result of it insulin secretion started to decrease still the cause of this type is unknown².

Insulin injections were invented in 1920³ before that of time people used to treat diabetes by some medicinal plants. There are more than 400 plants in those plants bitter melon plays a major roll. The scientific name of it is Momordica charantia. The family of bitter melon is ‘cucurbitaceae’. It is mainly green in colour, covered with teeth shape ridges and bitter in taste. It contains minerals such as iron, magnesium, potassium and vitamins such as A and C and also some phenolic compounds and alkaloids. The chemical constituents of bitter melon are 2,5- stigmataadien-3β-ol-glucoside and β sitosterol-glucoside. These chemicals are responsible for reducing the blood sugar level it helps in transferring the sugar to the muscles and liver⁴⁵. That’s why bitter melon extract or medicines can be useful in the treatment of diabetes as a substitute of synthetic insulin injections⁶.

The alloxan(C₄H₇N₂O₃) is a kind of glucose analogue it destroys the β-cells of pancreas as a result of it insulin production gets raptured.

II. MATERIALS AND METHOD

Plant material and drug collection

The Alloxan was collected from the laboratory of BHARAT TECHNOLOGY, Howrah, Uluberia, West Bengal under the supervision of prof. M. Rahman and the Momordica charantia was obtained from the local market of Uluberia on January 2021. It was identified by prof. B. Biswal department of pharmacognoc.
Preparation of extract

The fruits were kept in cool place after that they were dried in the sunlight. The dried bitter melon was powdered by the help of a grinder. The powdered contain was stored in an airtight container. After that, the amount of distilled water is measured and added in a conical flask with continuous stirring at room temperature. Then the mixture was filtered through a filter paper and poured in another conical flask where few drops of ethyl alcohol is added after that it was stored in a fridge. Before using the mixture ethyl alcohol was evaporated by placing it on water bath for 15 minutes.

Experimental animal

6-12 months old with an average weight of 90-250gm albino mice were used for the study. They were kept inside a clean cage where the air conditioning is maintained. The animals introduced to laboratory condition for 3 days before of the experiment. The animals were given purified water and a basal diet was maintained by following the CPCSEA (The committee for the purpose of control and supervision on experiments on animals) guidelines for laboratory animal’s facility. Before starting of the experiment every animals are separated from each other, they are marked and 3 groups are made which will help in the clean identification of animals. The institution animal ethics committee, Bharat Technology, Uluberia, Howrah, West Bengal, India approved the experimental protocol and following the guidelines and procedures of the “Principle of laboratory animal care”.

Dose selection and mode of administration

All the animal were fed by oral route by using the feeding tube. The extract, which was prepared given orally. Alloxan was given by intravenous injection by dissolving it in distilled water. The albino rats were divided into 3 groups where each group contains 6 albino mice individually. For the first three days, their basal diet is maintained and water is given frequently. After induction of diabetes, each group is observed for 3 weeks in 6 hours interval for 72 hours. The grouping is done in the following way-

Group I: normal control (A), Group II: diabetic control (B) (alloxan 120 mg/kg body weight), Group III: diabetic control (C) (alloxan 120mg/kg body weight) + (Momordica charantia fruit extract at the dose of 200 mg/kg body weight).

Acute oral toxicity test

Momordica charantia at the dose range of 200 mg/kg weight were administered orally on 3 group of mice where 6 mice was present in each group. Every mice were kept under close observation for 4 hours after administering for any chance in the general behaviour or physical activities. Acute toxicity made up our minds fixed with the process.

Inducing Diabetes Mellitus

After first 3 days diabetes mellitus was induced in the group II after giving intravenous injection at 120mg/kg body-wt. where group I mice’s are controlled normally and given only water. After this step animals are monitored for 7 days. Animals with blood glucose level more than 120 mg/dL were declared diabetic and were used in entire experimental group. In comparison with the normal group there was rise in blood glucose level of group II animals from (90-120) range to (195-265) range.

Dose administration

*Normal Control A (only water)
Blood glucose level (mg/dl)

*Diabetic Control B (only alloxan)

<table>
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<th>Average</th>
<th>Range</th>
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<tr>
<td>6</td>
<td>149</td>
<td>263</td>
<td>229</td>
<td>195-265</td>
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</tbody>
</table>

Blood glucose level (mg/dl)

*Diabetic control C (charantia extract)

<table>
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<th>Sl no</th>
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<th>After Charantia</th>
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<td>263</td>
<td>186</td>
<td>148.67</td>
<td>120-190</td>
</tr>
</tbody>
</table>

Statistical analysis of data

The data obtained were analysing using graph pad prism, version 9.1.1. All the values were presented in the table and expressed as a mean ± standard error mean (±) of six animals. The significant difference between the mean diabetic index with one-way analysis of variance (ANOVA) followed by p values<0.05 considered significant.

III. RESULTS

Phytochemical screening

The ethanoic extract of *Momordica charantia* contained light green residue. The result of preliminary phytochemical analysis of the ethanoic extract of *Momordica charantia* showed the presence of triterpene, alkaloids, proteid, steroids, carbohydrate, inorganic lipid, phenolic compounds.

Pharmacological study

After inducing diabetes with alloxan at 120 mg/kg body-wt. rate the blood glucose level of the albino mice rises up to a range of (195-265) after administration of the drug (Momordica charantia) at a rate of 200mg/kg body-wt. the blood glucose level significantly drops on (120-190).

Table 1 shows the effect of the Momordica charantia extract on the alloxan induced diabetic mice. The glucose index for group A animal which serve as normal (only water) was 19.49±7.958. The glucose index for group B animal, which serve as diabetic control (only alloxan) was 26.59±10.854 and the group C which serve as diabetic control (alloxan + Momordica charantia extract) was 21.52±8.794. It shows that after inducing diabetes by alloxan in mice Momordica charantia extract significantly decreases the blood glucose level.

Table 1: Glucose parameter of alloxan induced diabetic mice treated with Momordica charantia

<table>
<thead>
<tr>
<th>Group</th>
<th>Treatment</th>
<th>No.of animal</th>
<th>Dose</th>
<th>Glucose index</th>
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<tr>
<td>A</td>
<td>Normal control</td>
<td>6</td>
<td>........................</td>
<td>19.49±7.958</td>
</tr>
<tr>
<td>B</td>
<td>Only alloxan</td>
<td>6</td>
<td>120mg/kg</td>
<td>26.59±10.854</td>
</tr>
<tr>
<td>C</td>
<td>Alloxan + charantia</td>
<td>6</td>
<td>200mg/kg</td>
<td>21.52±8.789</td>
</tr>
</tbody>
</table>

Values are expressed as Mean±SEM; Significance relative to control, p<0.0001
IV. DISCUSSION

Several surveys have proved that medicinal plants have a great potential in case of the treatment of several chronic diseases such as diabetes mellitus. The herbal products are less costly, easily available and also efficient that’s why they have such an impact in the countries like India [10].

To perform this study bitter melon was selected to examine its anti-diabetic activity. And alloxan is used as it inhibits glucose induced insulin by destroying the beta cells of pancreas [11]. After giving alloxan solution to the mice their blood glucose or blood sugar level increases randomly and the animals were considered hyperglycemic. This situation can also cause the cellular damage [12]. In this cellular death of beta cells Reactive Oxygen Species plays a major role.

In this study significant diabetes was achieved after alloxan (120 mg/kg body weight) injection. Alloxan induced diabetic mice within range of 195 - 265 mg/dl of blood sugar level were considered to be diabetic and used for the study. However, administration of the ethanol extract at the dose of 200 mg/kg body weight decreased the sugar level in alloxan induced mice. This have been caused due to increase in the process of glycogenesis [17]. Hence, it is proved treatment by the Momordica charantia extract significantly reduces the blood sugar level.

In previous phytochemical studies it is shown that in the bitter melon extract there is presence of triterpenes, alkaloids, proteid, steroids, carbohydrate, inorganic lipid, phenolic compounds. The triterpene has the ability to prevent the development of insulin resistance.

V. CONCLUSION

By the study, it can be concluded that Momordica charantia has a good dose dependent anti-diabetic activity in alloxan induced diabetic mice.

VI. COMPETING INTERESTS

Authors have declared that no competing interests exist.
ACKNOWLEDGEMENTS

The authors are thankful to management of Bharat Technology for providing the required facilities to carry out the research work.

VII. REFERENCES


