Hypoglycemic Effects of Turmeric (Curcuma longa Linn.) On Bio-chemical Profile in Alloxan Monohydrate induced type-1 diabetes in albino rats

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Citation: Sanjeev Kumar, Kumari Shachi (2020) Hypoglycemic Effects of Turmeric (Curcuma longa Linn.) On Bio-chemical Profile in Alloxan Monohydrate induced type-1 diabetes in albino rats. Inter jou Daib endo: IJDE: 101

Received Date: 26 February, 2020; Accepted Date: 9 March, 2020; Published Date: 16 March, 2020

Abstract

From time immemorial therapeutic potential of Curcuma longa is known. In present study an effort has been made to assess the hypoglycemic, anti-cholesterolmic, anti-ureatic, anti-creatinic and Oral Glucose Tolerance Test (OGTT) activity of Curcuma longa juice in alloxan monohydrate induced experimental animal model. Rats were acclimatized for 7 days in lab temperature. All animals were given standard water and pellet diet. Diabetes was induced in rats with the help of alloxan monohydrate (130mg/kg body weight). After alloxan monohydrate injection rats were separated and treatment started with Curcuma longa juice and insulin. A marked rise in fasting blood glucose, serum cholesterol, serum creatinine, serum urea level were observed in diabetic control rats when compared to normal control rats. Anti- hyperglycemic, anti-cholesterolmic, anti-creatinic, anti-ureatic activity observed in Curcuma longa fresh root juice administered rats on 10st, 20th, 30th and 40th days post treatment. Anti-hyperglycemic, anti-cholesterolmic, anti-ureatic, anti-creatinic activity was found almost similar effective like insulin treatment group. It is hope that present investigation will be helpful in establishing a scientific basis for anti-diabetic, anti-cholesterolmic, anti-creatinic, anti-ureatic effects in experimental animal models. The results are (<0.05) statistically significant.

Keywords- Diabetes, blood glucose, Insulin, Curcuma longa, serum, urea, creatinine

Introduction

Diabetes Mellitus (DM) is a life style associated disease that create homeostatic chos [1]. DM is a metabolic alteration of multiple etiologies caused by hyperglycemia. Hyperglycemia causes disturbances of carbohydrate, protein and lipid metabolism resulting from defects in insulin secretion or insulin action or both. Recently India has undergone rapid urbanization and industrialization resulting into remarkable changes in the life style of people. Most urban people lead a sedentary life, consume tobacco and take high calorie diet. Inspite of tremendous advancement in the field of medical sciences, incidence of diabetes mellitus is continuously increasing due to consuming high calorie diet with lack of physical activity and excess stress. During the year 2000, India had 31.7 million people suffering from diabetes and after eleven years total number of diabetes has double to 62.4 million. Several oral and injectable anti-diabetic drugs are used in treatment of diabetes. The existing group of oral hypoglycemic drugs includes Sulphonylures, Biguanide alpha-glucosidase inhibitor, glucagon like peptide analogs, Dipeptidyl peptidase -4 inhibitors, PPAR-y agonist etc are in use. Recently SGLT 2 inhibitors (in kidney) Aldolase reductase inhibitors, agonists of Fibroblast Growth Factors -21 (FGF-21) are being explored. Several side effects associated with the use of such oral or injectable hypoglycemic medicine during or after treatment have been reported [2, 3]. But no any side effect associated with the use of herbal drugs [4]. There is growing interest in herbal remedies for diabetes, due to their availability and lesser side effects. Gradually increasing ratio of this disease affect the society. So, that medical sciences is busy to search some positive technology by which this abnormality can be deleted [5]. IDDM and NIDDM both form of diabetes have very serious effect on the health. In addition consequence of abnormal metabolism (eg:lipogenesis, glycosylation of protein). In last few years there has been an exponential growth in the field of herbal medicine. These drugs are gaining popularity both in developing and developed countries because of their natural origin and less side effects. Many traditional medicines in use are derived from medicinal
A number of medicinal plants traditionally used for over 1000 years named rasayana and present in herbal preparations of Indian traditional health care system. In Indian system of medicine most practiced formulate their own treatment. The WHO has listed 21,000 plants, which are used for medicinal purposes around the world. Among these 2500 species are in India, out of which 150 species are used commercially on fairly large scale. India is the largest producer of medicinal herbs. A number of clinical studies have been carried out in recent years that shows potential links between herbal therapies and improved blood glucose levels. Medicinal plant based industries in developing countries has been lack of information on the social and economic benefits that could be derived from industrialization utilization of medicinal plants. Plants are being used as food, vegetables, cosmetic and medicinal purposes. Medicinal plants have a great role in treatment of various diseases. Dietary agents such as spices have been used extensively in the Eastern world for a variety of ailments for millennia and five centuries ago they took a golden journey to the Western world. Various spice-derived neutraceuticals including 1-acetoxychavicol acetate, anethole, capsaicin, cardamonin, curcumin, dibenzoylethane, diosgenine, eugenol, gambogiacid, gingerol, thymoquinone, ursolic acid, xanthohumol and zerumbone derived from galangal, anise, red chili, black cardamom, turmeric, licorice, fenugreek, clove, kokum, ginger, black cumin, rosemary, hop and panecone ginger have been investigated. Although, they always been used to improve to taste and color and as a preservative, they are also used in the treatment of diabetes, but none of them could be developed as a drug for diabetes. Curcuma longa L. (Zingiberaceae), commonly known as turmeric, is native to Southwest India. Curcuma longa generally used in treatment of indigestion, cough, arthritis, diabetes, blood purification, menstrual irregularities and anti-oxidant [6]. Present investigation was conducted to evaluate the anti-diabetic, anti-cholesterolemic, anti-ureatic and anti-creatinic properties in alloxan monohydrate administered animals model.

### Materials and Methods

#### Plant Materials:

The Turmeric (Curcuma longa Linn.) juice used for present investigation. Turmeric fresh root was obtain from the local crop field of Darbhanga, India.

#### Juice of Curcuma Longa

Firstly, Curcuma longa root was procured from crop field area and was cleaned and extract the juice. Albino rats (200-250) were used as experimental animals. Animals were procured from local supplier of Darbhanga, India.

The rats were acclimatized for 15 days. All the animals were fed with rodent pellet diet. Water was allowed ad libitum under strict hygienic condition. Induction of Diabetes: Alloxan Monohydrate is a toxic glucose analogue which

#### Experimental Design:

Group A- Normal Control
Group B- Diabetic control
Group D- Alloxan + Curcuma longa Juice treatment
Group E- Alloxan + Insulin treatment

The diabetes was induced in 12 hours fasted animal by a single intraperitoneal injection of freshly prepared solution of Alloxan monohydrate (135mg/kg body weight) in 0.5ml normal saline water.

After 72 hours of Alloxan monohydrate injection, the diabetic rats (blood glucose levels <290mg/dl) were separated. Treatment was started except in normal control and diabetic control animals. During further investigation all experimental group animals were given standard hygienic water and pellet diet.

### Fasting blood glucose level (mg/dl)

<table>
<thead>
<tr>
<th>Experimental Group</th>
<th>10th Day</th>
<th>20th Day</th>
<th>30th Day</th>
<th>40th Day</th>
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</thead>
<tbody>
<tr>
<td>Group A- Normal Rats</td>
<td>87.18 ± 2.83</td>
<td>88.18 ± 1.22</td>
<td>86.12 ± 1.38</td>
<td>85.19 ± 1.02</td>
</tr>
<tr>
<td>Group B- Diabetic Control</td>
<td>298 ± 1.71</td>
<td>305.12 ± 2.12</td>
<td>306.22 ± 3.16</td>
<td>299.14 ± 0.87</td>
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<tr>
<td>(Vehicle)</td>
<td>280.17 ± 0.67</td>
<td>210.72 ± 2.12</td>
<td>180.17 ± 2.18</td>
<td>95.17 ± 2.16</td>
</tr>
<tr>
<td>Group C- Alloxan+ Juice treatment</td>
<td>279.18 ± 1.67</td>
<td>209.18 ± 3.14</td>
<td>182.16 ± 2.19</td>
<td>94.16 ± 0.18</td>
</tr>
<tr>
<td>(1200mg/kg body weight)</td>
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<th>Experimental Group</th>
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</thead>
<tbody>
<tr>
<td>Group D- Alloxan + Insulin (Human mixtard®)</td>
<td>298 ± 1.71</td>
<td>305.12 ± 2.12</td>
<td>306.22 ± 3.16</td>
<td>299.14 ± 0.87</td>
</tr>
</tbody>
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Value are mean ± SEM, N=6 P<0.05 Vs diabetic Control.

Table: 1 Effect of Curcuma longa Juice and Insulin on blood glucose level in experimental animal Model.
The result of the present investigation indicate that was found almost similar effect are shown in table 2 when compared to diabetic control group. Activity were significantly normal in fresh root juice treated groups compared to diabetic control group. Anti-cholesteromic, anti-ureatic, and anti-creatinic activity were recorded in juice and insulin treated groups. Oral Glucose Tolerance Test (OGTT) were significantly normal in juice and insulin treated groups compared to diabetic control group. Turmeric also improves the serum protein count when compared to diabetic control group. The results are shown in table-1,2 and 3. Curcuma longa fresh root juice was found almost similar effect like insulin treatment group. The result of the present investigation indicate that Curcuma longa fresh root juice have the property to lowers the blood glucose, serum creatinine and serum urea levels. Alloxan monohydrate facilitates the production of free radicals and causes the tissue damage. The beta cells of pancreas are susceptible to such damage. It appears from the present investigation that the Curcuma longa fresh root juice might have tissue repairable and restorative capacities [8]. has also reported that beet root juice treated rat shows reduction of blood glucose in alloxan monohydrate induced diabetic rats. Finding in this regard with Curcuma longa fresh root juice and...
beet root juice were also no different [9]. Has reported that oral administration of aqueous extract of Curcuma longa root lead to marked lowering of blood glucose level in alloxan induced experimental model[10]. have also demonstrated that crude aqueous extract of Curcuma longa fresh root possess hypoglycemic properties in alloxan administered animal model. Findings in the present study too are in accord with the findings discussed above, Curcuma longa fresh root juice has been widely used for curing various diseases. Present investigation will be helpful in establishing a scientific basis for anti-diabetic, anti-cholesteromic, anti-ureatic, anti-creatitnic uses of [11] Curcuma longa fresh root juice in alloxan induced experimental animal model. However, much more studies are still required to explore the other potential of this fresh plant root [12].

Conclusion

Western life style is on sharp rise in India and also is the rise and prevalence of diabetes. The cost of treatment is already ruining many families in rural India. So this research appears to be grate importance in evolving cheap treatment for diabetes.

Acknowledgement

The authors are thankful to Head, University Department of Zoology, L.N.Mithila University Darbhanga, India for the lab facilities provided. The authors are also thankful to Mr. Dinesh Munot Explicit Chemical Pvt.Ltd. Pune for providing free sample of Alloxan monohydrate for the present investigation.

References