

Anti-diabetic and Anti-cholesterolic Effects of Bitter gourd (*Momordica charantia* Linn) Fresh Fruit Juice Metabolites to Cure Alloxan Monohydrate Induced Type-1 Diabetes in Albino Rats

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ABSTRACT

In the present study an effort has been made to assess the hypoglycemic and anti-cholesterolic activity of bitter gourd 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 (120 mg/kg body weight). After alloxan monohydrate injection rats were separated and treatment started with fresh bitter gourd juice and insulin. A marked rise in fasting blood glucose as well as serum cholesterol level were observed in diabetic control rats when compared to normal control rats. Anti-hyperglycemic and anti-cholesterolic activity observed in bitter gourd juice administered rats on 7th, 14th, 21st and 28th days post treatment. Anti-hyperglycemic and anti-cholesterolic activity was found more effective than that of insulin treatment group. It is hope that present investigation will be helpful in establishing a scientific basis for anti-diabetic and Anticholesterolic effects.

KEYWORDS: Diabetes; *Momordica Charantia*; Insulin; Blood Glucose

INTRODUCTION

As per King et al. [1] incidence of diabetes in India will increase by 195% in 2025. This affecting both rural and urban populations at alarming rate [2]. Diabetes is a potentially devastating disease with high morbidity and mortality. The central identifying feature of diabetes is chronic and substantial elevation of the circulating glucose level and underlying goal of all diabetes management are to maintain an optimum blood glucose level. Progress in understanding the diabetes over the past few years has led to significant advances in regimen for treatment of this devastating disease [3]. In recent years, several plant extracts have been examined for their anti-diabetic properties in an effort to identify alternative treatment strategies [4]. Although various types of hypoglycemic agents are available like Sulphonylureas, Biguanide alpha-glucosidase inhibitor, glucagon like peptide analogs, Dipeptidyl peptidase-4 inhibitors, PPAR- γ 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 agent during or after treatment have been reported [5,6]. There has been increasing demand of plant products with medicinal activity due to low cost, easy availability and lesser side effects [7]. Bitter gourd (*Momordica charantia* Linn) member of cucurbitacea family. Bitter gourd have been reported to antidote for

diabetes, stomach pain, wounds, tumors, colic, inflammation, malaria, rheumatism, malaria and fevers [8,9]. It decrease the blood glucose levels [10,11] as well as cholesterol levels [12]. Present investigation was conducted to evaluate the anti-diabetic and anti-cholesterolic properties in alloxan monohydrate induced diabetes in albino rats.

AIM OF THE STUDY

The aim of the present study was to investigate the effect of *Momordica charantia* fresh fruit juice on blood glucose levels in experimental rats given after successful establishment of type 1 diabetes to examine its role as therapeutic efficacy and to see its influence, if any prevention of type 1 diabetes.

MATERIAL AND METHODS

Plant Materials: The bitter gourd fruit used for present investigation. It was obtained from the vegetable market of Darbhanga, India.

Momordica charantia Fruit Juice:-

Firstly, bitter gourd was cleaned and extracted the juice.

Male albino rats (200–230g and 10–12 weeks) were used as experimental animals. Animals were procured from local supplier of Darbhanga,

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India. The rats were acclimatized for 7 days. All the animals were fed with rodent pellet diet. Water was allowed ad-libitum under strict hygienic condition. Juice was administered orally with the help of intubation tube.

INDUCTION OF DIABETES

Alloxan Monohydrate is a toxic glucose analogue which selectively destroys insulin producing cell in pancreas. This causes insulin dependent diabetes mellitus called "Alloxan Diabetes" [13]. Alloxan monohydrate was obtained from Explicit Chemicals Pvt.Ltd,Pune, India. Blood glucose levels were monitored regularly with the help of digital glucometer (Dr. Morepen gluco one) 72 hours of alloxan monohydrate injection the diabetic rats (blood glucose levels greater than 280 mg/dl) were separated. Treatment was started except normal control and diabetic control rats. During experimental periods, animals in all group were given to standard water and pellet diet. Blood glucose was monitored by digital glucometer.

EXPERIMENTAL DESIGN

Group A–Normal Control

Group B–Diabetic control

Group C–Alloxan +*Momordica charantia* fruit Juice treatment

Group D–Alloxan+Insulin treatment

RESULTS AND DISCUSSION

A significant rise in fasting blood glucose levels was recorded in diabetic control when compared to normal control rats. Anti–diabetic and anti-cholesteromic activity were recorded in *Momordica charantia* fruit juice treated rats on 7th, 14th, 21st and 28th day post treatment. The serum cholesterol and blood glucose of diabetic control animals were higher than that of other experimental group. Anti-cholesteromic and hyperglycemic effects were recorded in juice and insulin administered animals. The results are shown in Table 1 and 2, *Momordica charantia* juice was found more effective than that of insulin treatment group. The result of the present investigation indicate that *Momordica charantia* fruit juice have the property to lowers the blood gluucose and serum cholesterol 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 *Momordica charantia* fresh fruit juice might have tissue repairable and restorative capacities. Kumar et al. [14] has also reported beet root juice treated rat shows reduction of blood glucose in alloxan monohydrate induced diabetic rats. Finding in this regard with *Momordica charantia* fresh fruit juice and beet root juice were also nodifferent. Insulin secreting activity of Hibiscus rosa leaf extract seen in alloxan induced diabetic rats. Kamala et al. [15,16] has reported that oral administration of fruit juice of *Momordica charantia* fruit juice lead to marked lowering of blood glucose level in streptozotocin induced experimental model. Raji KP et al. [17–19] have also demonstrated that anti-diabetic and anti-cholesteromic effect of edible mashroom (*Pleurotus eous*) in alloxan induced diabetic rats. Findings in the present study too are in accord with the findings discussed above, *Momordica charantia* fresh fruit juice has been widely used for curing various maladies. Present investigation will be helpful in establishing a scientific basis for anti- diabetic and anti- cholesteromic uses of better gourd fresh fruit juice in alloxan induced experimental animal models. However, much more studies are still required to explore the other potential of this fresh fruit juice.

CONCLUSION

Since diabetes is a chronic disorder requiring long term therapy there is need to access the effect and efficacy of some plant fruit juice of medicinal values so that alternative therapies evolved to minimize the circulating blood glucose. Western life style is on the sharp rise in India and so is the rise and prevalence of the disease, diabetes. The cost of treatment is already ruining many families in ruler India. Hence the research of this kind appears to be grate greater importance in evolving some cheap alternative therapies.

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Table 1: Effect of *Momordica charantia* Juice on fasting blood glucose levels in Alloxan Induced diabetic rats and normal rats.

Experimental Group	Fasting blood glucose (mg/dl)			
	7 th Day	14 th Day	21 st Day	28 th Day
Group A- Normal Rats	90.40 ± 1.23	89.02 ± 2.17	95.30± 3.26	92.09 ± 0.34
Group B- Diabetic Control	283.54 ± 2.01	287.20 ± 2.09	285.20 ± 1.37	288.44 ± 1.32
Group C- <i>Momordica charantia</i> juice treatment group	170.02 ± 2.20 P<0.05	168.24 ± 1.67 P<0.05	119.20 ± 2.43 p <0.05	107.43 ± 246 p<0.05
Group D-Alloxan+insulin treatment group	169.10 ± 2.63 P<0.05	150.23 ± 2.63 P<0.05	111.14 ± 1.20 P<0.05	102.02 ± 2.75 P<0.05

Values are Mean ± SEM, n=10, P<0.05 Vs diabetic Control.

Table 2: Effect of *Momordica charantia* Juice on serum cholesterol levels in Alloxan Induced diabetic rats and normal rats.

Experimental Group	Serum cholesterol levels (mg/dl)			
	7 th Day	14 th Day	21 st Day	28 th Day
Group A- Normal Rats	100.32± 1.03	98.02 ± 2.37	99.30± 2.76	100.09 ± 0.74
Group B- Diabetic Control	205.24 ± 2.71	209.30± 2.08	218.20± 1.39	213.44 ± 1.33
Group C- <i>Momordica charantia</i>	105.02± 2.39 P<0.05	98.34 ± 1.23 P<0.05	97.20 ± 2.18 p<0.05	97.42±1.32 p<0.05
Group D-Alloxan+insulin treatment group	107.20± 1.83 P<0.05	106.23± 2.79 P<0.05	99.65 ± 1.30 P<0.05	102.20± 2.05 P<0.05

Values are Mean ± SEM, n=10, P<0.05 vs diabetic Control.



REFERENCES

1. King H, Aubert RE, Herman WH. Global burden of diabetes,1995-2025: Prevalence numerical estimates and projections. *Diabetes Care*. 1998;21:1414-1431.
2. Mohan V, Shantirani CS, Mohan D, Raj D, Unnikrishnan RI, Dates M. Mortality rates due to diabetes in the selected urban South Indian population-The Chennai urban population study. *J Ass physicians India*. 2006;54:113-117.
3. Tiwari Ak, Madhusudan Rao. Diabetes mellitus and multiple therapeutic approaches of phytochemicals and future prospects, *Current Sci*.2002; 83:30-38.
4. Sarvanan G, Leelavinothan P. Effect of *Syzygium cumini* Bark on blood glucose, plasma insulin and C-peptide in streptozotocin induced diabetic rats. *Int J Endocrinol Metab*. 2006;4:96-105.
5. Samantha LB, Submit BM, Paul V, Jeffery J. Increased cancer related mortality for patients with Type-2 diabetes who use Sulphonylureas or insulin. *Diabetes Care*.2006;29:254-258.
6. Monami M, Lamanna C, Ralzi D, Marchionni N, Mannucci N, Mannucci E. Sulphonylureas and cancer a case-control study. *Acta Diabetol*. 2009;46:279-284.
7. Vijay P,Vijayvergia R. Biochemical analysis of primary metabolites of some medicinal plants.*Bioscan*.2007;2:2003-2006.
8. Dandawate PR, Subramaniam D, Padhye SB, Anan S. Bitter melon: a panacea for inflammation and cancer. *Chin J Nat Med*. 2016;14:81.
9. Kubola J, Siriamornpun S. Phenolic contents and antioxidant activities of bitter gourd (*momordica charantia* L.) leaf stem and fruit fraction extracts in vitro. *Food Chem*.2008;110:881.
10. Rahman IU, Khan RU, Rahman KU, Bashir M. Lower hypoglycemic but higher antiatherogenic effects of bitter melon than glibenclamide in type 2 diabetic patients. *Nutr J*. 2015;14:13.
11. Tayyab F, Lal SS. Antidiabetic hypolipidemic and antioxidant activity of *Momordica charantia* on type-II diabetic patient in Allahabad India. *Int J Pharma Bio Sci*. 2013;4:932.
12. Tayyab F, Lal SS, Mishra M, Kumar U. A review: medicinal plants and its impact on diabetes. *World J Pharma Res*.2012;1:1019.
13. Lenzen S.The mechanism of alloxan and streptozotocin induced diabetes.*Diabetologia*.2008;51:194-198.
14. Kumar S, Shachi K, Dubey NK, Dubey U. Anti-Diabetic and Haematinic Effects of Beet Root Juice (*Beta vulgaris* L.) in Alloxan Induced Type-1 Diabetic Albino Rats. *J Diab Res Ther*.2020;6:1-4
15. Vimla H, Naik RP, Chandravar R. Insulin secreating activity of *Hibiscus rosa sinensis* Linn. leaf extract in diabetic wister rats. *Bioscan*.2008;3:293-297.
16. Mahmoud MF, Ashry FZE, Maraghy NNE, Fahmy. Studies on the anti-diabetic activities of *Momordica charantia* fruit juice in streptozotocin induced diabetic rats. *Pharm Biol*. 2017;55:758-765.
17. Raji KP, Natarajan P, Kurup GM. Anti-hyperglycemic activity of mushroom on serum glucose levels in alloxan induced diabetic rats. *Bioscan*.2009;4:231-235.
18. Kumar S, Shachi K. Therapeutic Efficacy of *Azadirachta indica* Leaves in Alloxan Monohydrate induced type-1 diabetes in albino rats". *EC Diabet Met Res*. 2020;4:1-4.
19. Hanninen O, Rauma AL, Kaartinen K, Nenonen M.Vegan diet in physiological health promotion. *Acta Physiologica Hungarica*. 1999;86(3):171-180.