

Anti-Diabetic and Haematinic Effects of Beet Root Juice (*Beta vulgaris* L.) in Alloxan Induced Type-1 Diabetic Albino Rats

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Abstract

Introduction: Diabetes is the common endocrine disorder that impairs glucose homeostasis. From time immemorial therapeutic potential of beet root (*Beta vulgaris*) is known. In the present study an effort has been made to assess the anti-diabetic and haematinic properties of *Beta vulgaris* juice in alloxan induced experimental animal model.

Materials and Methods: Rats were acclimatized for 10 days in lab temperature. All animals were given standard water and pellet diet. Diabetes induced in rats with the help of alloxan monohydrate (120 mg/kg body weight). After Alloxan injection diabetic rats were separated and treatment started with *Beta vulgaris* juice and insulin. Juice administered with the help of intubation tube.

Results and Discussion: A marked rise in fasting blood glucose level was observed in diabetic control when compared to control normal rats. Anti-diabetic and haematinic activity was observed in *Beta vulgaris* juice treated rats on 7th, 14th, 21th and 28th days post treatment. Anti-diabetic effect of *Beta vulgaris* juice was found slightly less effective than that of the insulin treatment group. Result are statistically ($p < 0.001$) significant.

Conclusion: It is hoped that the present study will be helpful in the establishing a scientific basis for anti-diabetic and haematinic uses of the plant, *Beta vulgaris*.

Keywords: *Beta vulgaris*; Diabetes; Anti-diabetic; Haematinic; Blood glucose; Insulin

Introduction

Diabetes mellitus is a metabolic alteration of multiple etiologies caused by hyperglycemia. Increased blood glucose 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 (junk food). In spite 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. Incidence of type-2 diabetes increasing globally. 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 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 [1,2]. But no any side effect associated with the use of herbal drugs [3]. There is growing interest in herbal remedies for diabetes, due to their availability and lesser side effects. Gradually increasing order of this disease effect the society, for that medical science is busy to search some positive technology by which this abnormality can be deleted [4]. 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). Plants are being used as food, vegetables, cosmetic and medicinal purposes. Medicinal plants have a great role in treatment of various diseases. An example of such plant is beet root (*Beta vulgaris* L.). *Beta vulgaris* belongs to family Chenopodiaceae [5]. Beet root have been reported to possess anti-depressant [6], haepato-protective [7], anti-hypertensive [8], anti-oxidant [9,10], anti-hyperlipidemic, radio-protective and immunostimulatory [11] effect. It also possess the anti-cancer, immunomodulatory, anti-inflammatory, anti-mutagenic, anti-microbial and anti-fungal activities and is used in

expectorants and carminative [5]. *Beta vulgaris* specially used in salad in all over world. Present investigation was conducted to evaluate the anti-diabetic and haematonic properties in alloxan monohydrate induced diabetes in albino rats.

Materials and Methods

Plant materials

The beet root (*Beta vulgaris* L.) whole root juice used for present investigation. It was obtained from the local vegetable market of Darbhanga, India.

Juice of *Beta vulgaris*

Firstly, *Beta vulgaris* was cleaned and cut in slices and extracts the juice. Albino rats (200-220) were used as experimental animals. Animals were procured from local supplier of Darbhanga, India. The rats were acclimatized for 10 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 selectively destroys insulin producing cell in pancreas. This causes insulin dependent diabetes mellitus called "Alloxan Diabetes" [12]. Alloxan monohydrate was obtained from Explicit Chemicals Pvt. Ltd, Pune, India. Blood glucose monitored with the help of glucometers.

Experimental design

- Group A-Normal Control
- Group B-Normal Control+*Beta vulgaris* juice treatment
- Group C-Diabetic Control
- Group D-Alloxan+Insulin treatment group
- Group E-Alloxan+*Beta vulgaris* Juice treatment

The diabetes was induced in 12 hours fasted animal by a single intraperitoneal injection of freshly prepared solution of Alloxan monohydrate (120 mg/kg body weight) in 0.5 ml normal saline water. After 72 hours of Alloxan monohydrate injection, the diabetic rats (blood glucose levels < 260 mg/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.

Results and Discussion

A significant rise in fasting blood glucose levels was recorded in diabetic control when compared to normal control rats. Anti-diabetic activity was recorded in *Beta vulgaris* juice treated rats on 7th, 14th, 21st and 28th day post treatment. The haemoglobin concentration of untreated diabetic rat was also lower than that of the other groups. It was also lower than that of the diabetic animals treated with *Beta vulgaris* juice and those treated with standard drugs like insulin. The results are shown in tables 1 and 2. *Beta vulgaris* juice was found less effective than that of the insulin treatment group. The result of the present investigation indicates that *Beta vulgaris* juice has the property to lowers the blood glucose 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 *Beta vulgaris* juice might have tissue repairable and restorative capacities.

Kumar S, et al. [4] has also reported that *Azadirachta indica* leaves fed rat shows reduction of blood glucose in alloxan monohydrate induced diabetic rats. Finding in this regard with *Beta vulgaris* juice and *Azadirachta indica* leaves were also no different. Kumar PS, et al. [13] has also observed that reduction in blood glucose levels when administration of ethnolic extract of *Beta vulgaris*. Findings in the present study too are in accord with the findings discussed above; *Beta vulgaris* has been widely used for curing various maladies. Present investigation will be helpful in establishing a scientific basis for anti-

Table 1: Anti-diabetic effect of *Beta vulgaris* juice and insulin in experimental animals.

Experimental Group	Fasting Blood Glucose (mg/dl)			
	7 th day	14 th day	21 st day	28 th day
Group A Normal Control	96.44 ± 2.75	95.22 ± 1.70	3.23 ± 3.40	93.23 ± 2.44
Group B Normal Control+ <i>Beta vulgaris</i> Juice	95.43 ± 1.75	92.44 ± 2.30	91.40 ± 2.30	88.43 ± 1.70
Group C Diabetic Control	265.45 ± 2.27	270.91 ± 2.05	275.85 ± 2.25	274.43 ± 2.70
Group D Alloxan+Insulin Treatment	260.40 ± 2.75 P<0.001	190.40 ± 3.50 P<0.001	170.80 ± 2.50 P<0.001	1300.40 ± 2.60 P<0.001
Group E Alloxan+ <i>Beta vulgaris</i> Juice Treatment	260.80 ± 2.65 P<0.001	195.40 ± 2.70 P<0.001	178.70 ± 2.10 P<0.001	136.35 ± 2.70 P<0.001

Value are mean ± SEM; n=6; p<0.001 vs. diabetic control

Table 2: Haematonic effect of *Beta Vulgaris* Juice in experimental animals.

Experimental Group	Blood Haemoglobin (g/dl)			
	7 th day	14 th day	21 st day	28 th day
Group A Normal Control	17.8 ± 1.52	15.00 ± 0.02	5.20 ± 0.40	15.09 ± 0.42
Group B Normal Control+ <i>Beta vulgaris</i> Juice	16.4 ± 0.60	16.7 ± 0.45	16.8 ± 0.20	17.02 ± 0.20
Group C Diabetic Control	14.7 ± 0.72	14.3 ± 0.78	15.02 ± 0.20	14.08 ± 0.20
Group D Alloxan+Insulin Treatment	14.07 ± 0.72	14.09 ± 0.82	15.07 ± 0.78	15.02 ± 0.70
Group E Alloxan+ <i>Beta vulgaris</i> Juice Treatment	16.5 ± 0.45	16.8 ± 0.42	16.7 ± 0.20	17.3 ± 0.20

Value are mean ± SEM; n=6; p<0.001 vs. diabetic control

diabetic and haematinic uses of *Beta vulgaris* juice. However, much more studies are still required to explore the other potential of this root.

Conclusion

This research appears that *Beta vulgaris* juice works as anti-diabetic and haematinic agent. So this plant root will be helpful in treating the diabetes in ruler India due to low cost, easily availability and lesser side effects associated with the use of this plant root.

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