

Anti-diabetic, haematinic and anti-cholesterolic effects of carrot (*Daucus carota* Linn.) juice metabolites to cure alloxan monohydrate induced type-I diabetes in albino rats

Abstract

Introduction: In present study an effort has been made to assess the hypoglycemic, Anti-cholesterolic and haematinic activity of carrot juice in alloxan monohydrate induced experimental animal model.

Materials and methods: 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 (140mg/kg body weight). After alloxan monohydrate injection rats were separated and treatment started with carrot juice and insulin.

Results and discussion: A marked rise in fasting blood glucose as well as serum cholesterol level was observed in diabetic control rats when compared to normal control rats. Anti-hyperglycemic, Anti-cholesterolic and haematinic activity observed in carrot juice administered rats on 7th,14th,21st and 28th days post treatment. Anti-hyperglycemic and anti-cholesterolic activity was found less effective than that of insulin treatment group.

Conclusion: It is hope that present investigation will be helpful in establishing a scientific basis for antidiabetic, haematinic and Anti-cholesterolic effects in experimental animal model. The results are (<0.001) statistically significant.

Keywords: *daucus carota*, diabetes, blood glucose, insulin, anti-cholesterolic

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Introduction

Diabetes mellitus is an endocrine alteration of multiple pathologies (like cardiomyopathy, nephropathy, retinopathy, neuropathy, angiopathy etc.) caused by elevated blood glucose. Increased blood glucose causes defects of carbohydrate, protein and lipid metabolism. Recently India has undergone rapid urbanization and industrialization resulting into remarkable changes in the life style and food habit. Most urban people lead a static life, consume tobacco and take high calorie diet Kumar S et al.,¹ In spite of tremendous advancement in the field of allopathic medical sciences, incidence of diabetes mellitus is continuously increasing due to consuming high calorie diet with lack holistic life style approaches. Incidence of type-2 as well as type-1 diabetes increasing globally at war foot levels. During the year 2020, India had 31.7 million people suffering from diabetes mellitus (IDDM and NIDDM) 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 agents during or after treatment have been reported Samantha et al.,² Monami et al.,³ But no any side effect associated with the use of herbal drugs Sarvanan & Leelavinothan.⁴ 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 those medical sciences is busy to search some positive technology by which this abnormality can be deleted Kumar et al.,⁵ IDDM and NIDDM both form of diabetes have very serious effect on the health. 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 plants, minerals and organic matter.

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.⁶ A number of clinical studies have been carried out in recent years that show potential links between herbal therapies and improved blood glucose levels. Medicinal plant based industries in developing countries lack information on the social and economic benefits that could be derived from industrializing 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. An example of such plant is carrot (*Daucus carota* Linn.) that belongs to umbellifer family Apiaceae. Carrot reduce the blood glucose and cholesterol Abbey et al.,⁷ Majumdar et al.,⁸ Nicolle et al.,⁹ Wisker et al.,¹⁰ and anti-oxidant, appetizer, removing gall

bladder stone, spectorant and bronchodilator Abbey et al.,⁷ Present investigation was conducted to evaluate the anti-diabetic, anti-cholesteromic and haematonic properties in alloxan monohydrate administered animal model.

Materials and methods

Plant materials: The carrot juice used for present investigation. It was obtained from the vegetable market of Darbhanga, India.

Juice of carrot: Firstly, Carrot was cleaned and the juice was extracted. Male albino rats (200-220gm and 10-12 weeks) were used as experimental animals. Animals were procured from local supplier of Darbhanga, 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.

Induction of diabetes: Alloxan Monohydrate is a toxic glucose analogue which selectively destroys insulin producing cell in pancreas. This cause's insulin dependent diabetes mellitus called "Alloxan Diabetes" Lenzen.¹¹ Alloxan monohydrate was obtained from Explicit Chemicals Pvt.Ltd, Pune, India.

Experimental design:

1. Normal Control
2. Diabetic control
3. Alloxan+Carrot Juice treatment
4. Alloxan+Insulin treatment

The diabetes was induced in 12 hours fasted animal by a single intraperitoneal injection of freshly prepared solution of Alloxan monohydrate (140mg/kg body weight) in 0.5ml normal saline water. After 72 hours of Alloxan monohydrate injection, the diabetic rats (blood glucose levels <280mg/dl) (>280 not <280) were separated. Treatment was started except in normal control and diabetic control

animals. During further investigation all experimental group animals were given standardised 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, anti-cholesteromic and haematonic activity was recorded in carrot 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. The serum cholesterol of diabetic control animals was higher than other experimental group. Anti-cholesteromic activities were recorded in juice and insulin administered animals. Oral glucose tolerance test was significantly improved in juice treated animals compared to diabetic control group. The results are shown in Tables 1–4. Carrot juice was found less effective than that of the insulin treatment group. The result of the present investigation indicate that carrot juice have 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 Kumar et al.,¹ has also reported that beet root juice treated rats showed reduction of blood glucose in alloxan monohydrate induced diabetic rats. Finding in this regard with carrot juice and beet root juice were also no different. Khayatnouri M et al.,¹² have also observed reduction in blood glucose levels and cholesterol with administration of carrot juice in streptozotocin induced diabetic male mice. Findings in the present study too are in accordance with the findings discussed above carrot juice has been widely used for curing various maladies. Present investigation will be helpful in establishing a scientific basis for anti-diabetic, anti-cholesteromic and haematonic uses of Carrot juice in alloxan induced experimental animal model. Carrot juice tolerated the overdose of glucose through oral glucose tolerance test in juice treated experimental animals. However, much more studies are still required to explore the other potential of this root juice.

Table 1 Anti diabetic effect of carrot juice and insulin in experimental animals

Experimental Design	Fasting blood glucose Level (mg/dl)			
	7th day	14th day	21st day	28th day
Normal Control	90.22±1.84	88.72±1.32	90.66±1.23	90.62±1.83
Diabetic Control	290±1.84	288±1.34	298±1.36	290±1.63
Alloxan+Carrot Juice treatment (1000mg/kg body weight)	280± 2.08	250±1.34	229±1.38	136±1.23
	P<0.001	P< 0.001	P< 0.001	P< 0.001
Alloxan+Insulin (Human Mixtard®)	264±7.02	260±2.64	210±1.38	132±3.46
	P<0.001	P<0.001	P<0.001	P<0.001

Value are Mean±S.E.M, n=6, P<0.001 vs diabetic control

Table 2 Haematonic effect of carrot juice and insulin in experimental animals

Experimental Design	Blood Hemoglobin (g/dl)			
	7th day	14th day	21st day	28th day
Normal Control	15.2±0.31	16.6±0.03	14.7±0.23	15.3±0.43
Diabetic Control	14.4±0.30	13.2±0.69	12.00±0.41	13.3±0.23
Alloxan+Carrot Juice treatment (1000mg/kg body weight)	16.02±0.43	16.90±0.43	16.9±0.32	16.5±0.36
Alloxan+Insulin (Human Mixtard®)	15.2 ±0.31	15.02±0.41	15.60±0.62	15.23±0.32

Value are Mean±S.E.M, n=8, P<0.001 vs diabetic control

Table 3 Effect of carrot juice and insulin on biochemical profile in experimental animals

Experimental Design	Biochemical Parameters (mg/dl)							
	7th day		14th day		21st day		28th day	
	SC	SP	SC	SP	SC	SP	SC	SP
Normal Control	107±1.03	1.36±0.6	108±2.09	6.39±0.17	109±1.03	6.23±0.73	106±2.68	1.39±0.37
Diabetic Control	182±2.18	4.69±0.04	180±2.83	4.42±1.09	189±1.09	4.18±1.08	188±1.69	4.43±2.09
Alloxan+Carrot Juice treatment (1000mg/kg body weight)	126±0.46	5.07±0.64	126±0.63	6.02±0.49	122±0.75	5.06±6.69	121±1.18	5.91±6.23
Alloxan+Insulin (Human Mixtard®)	123±0.48	6.06±0.89	122±0.93	6.03±0.83	118±0.23	6.23±0.19	118±2.19	6.23±2.13

SC, serum cholesterol; SP, serum protein

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

Table 4 Effect of oral glucose tolerance test (OGTT) in experimental animals

Experimental Design	Blood glucose levels (mg/dl)			
	30 minutes	60 minutes	90 minutes	120 minutes
Normal Control	180±5.2.01	165±1.08	120.20±4.60	96.40±1.10
Diabetic Control	339±5.2.60	366±2.20	346±1.12	330.40±3.30
Alloxan+Carrot Juice treatment (1000mg/kg body weight)	200.28±214	136.18±6.12	136.18±2.68	140.30±4.60
	P<0.001	P<0.001	P<0.001	P<0.001
Alloxan+Insulin (Human Mixtard®)	250.26±4.12	206.18±3.18	126±2.12	119.7±3.19
	P<0.001	P<0.001	P<0.001	P<0.001

Value are Mean±S.E.M, n=8, P<0.001 vs diabetic control

Conclusion

Western lifestyle is on sharp rise in India and also is the rise and prevalence of diabetes. The cost of treatment is already running many families in ruler India. This research appears that carrot juice works as anti-diabetic as well as haematinic agent. We got the positive effects of carrot juice on experimental diabetic animals. So this 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. The treatment of diabetic patient with carrot juice will be more beneficial than allopathic treatments.

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Conflicts of interest

The authors declare no conflict of interest.

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