

## Anti-diabetic, Haematinic and Anti-cholesterolic Effects of Wheat (*Triticum aestivum* Linn.) Grass Juice Metabolites to Cure Alloxan Monohydrate induced type-1 Diabetes in Albino Rats

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### ABSTRACT

**Introduction:** From time immemorial therapeutic potential of *Triticum aestivum* grass is known. In present study an effort has been made to assess the hypoglycemic, anti-cholesterolic and haematinic activity of *Triticum aestivum* grass 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 (120 mg/kg body weight). After alloxan monohydrate injection rats were separated and treatment started with *Triticum aestivum* grass juice and insulin. Blood glucose level monitored with the help of glucometer.

**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 *Triticum aestivum* grass juice administered rats on 7<sup>th</sup>, 14<sup>th</sup>, 21<sup>st</sup> and 28<sup>th</sup> 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 anti-diabetic, haematinic and anti-cholesterolic effects in experimental animal models. The results are (<0.05) statistically significant.

**Keywords:** *Triticum aestivum*; Diabetes; Blood glucose; Insulin

### INTRODUCTION

Diabetes mellitus is a metabolic alteration of multiple etiologies (like cardiomyopathy, nephropathy, retinopathy, neuropathy, angiopathy etc.) caused by hyperglycemia. Increased blood glucose causes disturbances of biochemical process of carbohydrate, protein and lipid 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 and food habit of people. Most urban people lead a sedentary life, consume tobacco and take high calorie diet [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 of holistic approaches. Incidence of type-2 as well as type-1 diabetes is increasing globally. During the year 2000, India had 31.7 million people suffering from diabetes mellitus (IDDM and NIDDM) and after eleven years total number of diabetes has double to 62.4million. Several oral and injectable anti-diabetic drugs are used in treatment of diabetes. The existing group of oral hypoglycemic drugs includes Sulphonylureas, Biguanidealpha-glucosidase inhibitor, glucagon like peptide analogs, Dipeptidyl peptidase-4 inhibitors, PPAR-γ agonist etc. are in use. Recently SGLT 2

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Received date: February 17, 2020; Accepted date: March 06, 2020; Published date: March 13, 2020

**Citation:** Sanjeev K, Shachi K, Prasad NK, Dubey NK, Dubey U (2020) Anti-Diabetic, Haematinic and Anti-Cholesterolic Effects of Wheat (*Triticum Aestivum* Linn.) Grass Juice Metabolites to Cure Alloxan Monohydrate Induced Type-1 Diabetes in Albino Rats. J Diab Metab. 11:842. doi: 10.35248/2155-6156.20.11.842

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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 [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 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 [1]. 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 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. 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 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. An example of such is wheat grass (*Triticum aestivum* Linn.). *T. aestivum* belongs to family Poaceae. *T. aestivum* was found to reduce the problems of arthritis [5], ulcerative colitis [6], thalassemia, Present investigation was conducted to evaluate the anti-diabetic, anti-cholesteromic and haematinic properties in alloxan monohydrate administered animals model.

## MATERIALS AND METHODS

### Plant materials

The wheat grass (*T. aestivum* Linn.) grass juice used for present investigation. It was obtained from the local crop field of Darbhanga, India. Juice of *T. aestivum*: Firstly, *T. aestivum* 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 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" [7]. Alloxan monohydrate was obtained from Explicit Chemicals Pvt. Ltd, Pune, India.

### Experimental design

Group A-Normal Control

Group B-Diabetic control

Group D-Alloxan+*T. aestivum* Juice treatment

Group E-Alloxan+Insulin treatment

The diabetes was induced in 12 hours fasted animal by a single intra-peritoneal injection of freshly prepared solution of Alloxan monohydrate (120 mg/kg body weight) in 0.5 ml normal saline water. After 72 h of Alloxan monohydrate injection, the diabetic rats (blood glucose levels < 280 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, anti-cholesteromic and haematinic activity was recorded in *T. aestivum* grass juice treated rats on 7<sup>th</sup>, 14<sup>th</sup>, 21<sup>st</sup> and 28<sup>th</sup> 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 *T. aestivum* grass juice and those treated with standard drugs like insulin. The serum cholesterol of diabetic control animals was higher than other experimental group. Anti-cholesteromic activity was recorded in juice and insulin administered animals. Oral glucose tolerance test were significantly tolerated administered glucose in juice treated animals compared to diabetic control group. The results are shown in Tables 1-4. *T. aestivum* grass juice was found less effective than that of the insulin treatment group. The result of the present investigation indicates that *T. aestivum* 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 *T. aestivum* juice might have tissue repairable and restorative capacities. Kumar et al. [8] has also reported beet root juice treated rat shows reduction of blood glucose in alloxan monohydrate induced diabetic rats. Finding in this regard with *T. aestivum* grass juice and beet root juice were also no different. Mohan et al. [9] have also observed that reduction in blood glucose levels and cholesterol when administration of ethnolic extract of *T. aestivum*. Findings in the present study too are in accord with the findings discussed above; *T. aestivum* grass 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 haematinic uses of *T. aestivum* juice in alloxan induced experimental animal model. *T. aestivum* 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 grass [10].

**Table 1:** Anti diabetic effect of *T. aestivum* grass juice and insulin in experimental animals.

Experimental Design	Fasting blood glucose Level (mg/dl)			
	7th day	14th day	21st day	28th day
Normal Control	91.33 ± 1.84	88.17 ± 3.72	90.66 ± 2.36	90.73 ± 1.66
Diabetic Control	289 ± 1.90	295 ± 2.60	294 ± 1.36	294 ± 2.36
Alloxan + <i>T. aestivum</i> grass Juice treatment (1000 mg/kg body weight)	280 ± 2.64	260 ± 6.23	220 ± 3.43	140 ± 3.40
	p<0.05	p<0.05	p<0.05	p<0.05
Alloxan + Insulin (Human Mixtard®)	263 ± 7.36	250 ± 3.23	205 ± 4.63	130 ± 3.49
	p<0.05	p<0.05	p<0.05	p<0.05

Value are Mean ± S.E.M, n=6, p<0.05 vs diabetic control.

**Table 2:** Haematinic effect of *T. aestivum* juice and insulin in experimental animals.

Experimental Design	Blood Hemoglobin (mg/dl)			
	7th day	14th day	21st day	28th day
Normal Control	15.2 ± 5.2	16.6 ± 0.02	14.9 ± 0.54	15.2 ± 0.43
Diabetic Control	14.0 ± 0.40	14.065 ± 0.23	13.94 ± 0.69	14.6 ± 0.54
Alloxan+ <i>T. aestivum</i> grass Juice treatment (1000 mg/kg body weight)	16.5 ± 0.45	16.60 ± 0.43	16.90 ± 0.63	16.8 ± 0.17
Alloxan + Insulin (Human Mixtard®)	16.3 ± 0.43	16.3 ± 0.43	16.4 ± 0.73	16.5 ± 0.83

Value are Mean ± S.E.M, n=8, p<0.05 vs diabetic Control.

**Table 3:** Effect of *T. aestivum* grass Juice and insulin on biochemical profile in experimental animals.

Experimental Design	Biochemical Parameters							
	7th day		14th day		21st day		28th day	
	SC	SP	SC	SP	SC	SP	SC	SP
Normal Control	108 ± 1.06	1.36 ± 0.45	108 ± 2.06	6.36 ± 0.17	107 ± 3.03	6.38 ± 0.75	106 ± 203	1.39 ± 0.07
Diabetic Control	181 ± 2.19	4.65 ± 0.04	182 ± 3.89	4.43 ± 1.08	184 ± 0.73	4.23 ± 0.08	183 ± 2.16	4.43 ± 0.07
Alloxan+ <i>T. aestivum</i> grass Juice treatment (1000 mg/kg body weight)	126 ± 0.43	5.07 ± 0.2	126 ± 0.43	6.07 ± 0.03	122 ± 0.83	5.03 ± 0.38	120 ± 2.19	5.91 ± 0.23
Alloxan + Insulin (Human Mixtard®)	120 ± 0.47	6.00 ± 0.77	123 ± 0.83	6.23 ± 0.83	121 ± 0.89	6.00 ± 1.23	119 ± 2.19	6.29 ± 2.13

SC=Serum cholesterol; SP=Serum Protein; Value are mean  $\pm$  SEM, n=6, p<0.05 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	190 $\pm$ 5.2.01	182 $\pm$ 2.36	132 $\pm$ 1.82	97 $\pm$ 5.02
Diabetic Control	310 $\pm$ 5.2.83	338 $\pm$ 1.84	315 $\pm$ 2.83	298 $\pm$ 3.83
Alloxan+ <i>T. aestivum</i> grass Juice treatment (1000 mg/kg body weight)	191 $\pm$ 1.83	180 $\pm$ 2.63	154 $\pm$ 2.05	101 $\pm$ 2.05
Alloxan+Insulin (Human Mixtard®)	193 $\pm$ 2.83	180 $\pm$ 1.03	190 $\pm$ 2.05	96 $\pm$ 1.02

Value are Mean  $\pm$  S.E.M, n=8, p<0.05 vs diabetic Control.

## 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 running many families in ruler India. This research appears that *T. aestivum* grass works as anti-diabetic agent .we got the unbelievable positive effects of wheat grass juice on experimental diabetic animals. So this grass 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 grass. The treatment of diabetic patient with wheat grass juice will be more beneficial than allopathic treatments.

## 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.

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