International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 5 Sep-Oct 2023, pp: 01-07 www.ijprajournal.com ISSN: 2249-7781

Study of Effect of Triticum aestivum on Some Biochemical Parameters in Alloxan-inducedMus musculus.

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Submitted: 01-09-2023 Accepted: 11-09-2023

ABSTRACT: The present study was carried out to investigate the effects of onion (Triticum aestivumLinn) juices on biochemical parameters (Blood Glucose, Plasma Protein and Serum Cholesterol). Total 30 Albino mice (Mus musculus) were divided into three different groups: a control group containing 10 individuals and two experimental groups containing 10 individuals in each group. Mice of the experimental group were treated with Alloxan whereas mice of the control group were fed a normal diet and distilled water, with no addition of Triticum extracts to their diet. The first experimental group of mice received freshly prepared aqueous extracts of Triticum aestivum for 28 days and the second experimental group didn't receive Triticum extract although they received a normal diet and distilled water like the control group. Blood glucose, plasma protein and serum cholesterol concentration were determined after 28 days from administration of 1st dosage. Results showed that the Triticum extract had a positive impact on the levels of the monitored biochemical parameters. In the mice from the first experimental group (Alloxan treated with Triticum aestivum) mice, blood glucose, plasma protein and serum cholesterol concentration were found significantly lower in comparison to the second experimental group (only Alloxan treated mice) and the Control group.

Keywords: Triticum aestivum, Alloxan, Blood Glucose, Mice, Plasma protein.

I. INTRODUCTION

Diabetes is a chronic disease that develops when the pancreas does not create enough insulin or when the body is unable to utilise the insulin that is produced (WHO, 2004). Numerous physiological systems, particularly the nerves and blood arteries, can suffer severe damage from hyperglycemia and other related metabolic abnormalities, which can result in blindness, amputation, and kidney failure (WHO, 2004).Numerous model animals have been proposed in previous decadesto study diabetes-related problems. (Etuk, 2010). Use of the urea derivative alloxan is one of the most effective ways to cause diabetes in laboratory animals such mice, rats, rabbits, and dogs (Etuk, 2010 &Iranloyeet al., 2011).

Additionally, during 2021, the prevalence of diabetes in the world, Southeast Asia, and India was 10.5%, 8.8%, and 9.6%, respectively. By 2045, these rates will increase to 12.5%, 11.5%, and 10.9%, respectively (Kumar et al., 2023).The consequences of diabetes medicines on patients are still far from ideal, despite the substantial advancements in diabetes care over the previous 20 years (Inzucchi, 2012).These therapies have a number of drawbacks, such as a decrease in therapeutic effectiveness, toxicity, and side effects. Sulfonylureas, for instance, decrease their effectiveness in 44% of patients after 6 years of therapy. Additionally, it is thought that drugs used to reduce blood sugar cannot regulate hyperlipidemia (Deyet al., 2002). The use of herbal drugs for the treatment of diabetes mellitus that have negligible toxicity and no side effects has recently been shown to be crucial on a global scale (Kooti, 2014).

Compared to nongerminated cereals and their products, wheatgrass is thought to be more nutrient-dense(Benincasa, 2015). Antioxidant substances including vitamin C, flavonoids, and phenolic substances are seldom detectable in dry grains. The amounts of these antioxidant molecules, however, rise during germination as germination time increases and peak after 7 days (Shaa, 2016).

The clinic has a wide variety of hypoglycaemic drugs, however, these drugs have a lot of unwanted side effects. As a result, research into natural diabetes treatment options is currently being prioritised because they are more cost-effective, effective, and have fewer side effects than synthetic medicines (Nasriet al., 2015).

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II. MATERIALS AND METHODS

Plant Material

T. aestivum grass was grown indoors for the purposes of this study. The seeds of T. aestivum were grown after being soaked overnight. Small amounts of water were applied uniformly to the soil, and each day, the grass was allowed to grow for three to four hours in indirect sunlight. The grass is collected and used for additional research on the seventh day.

Preparation of PlantExtract:

50 gram of fresh wheatgrass were taken for the preparation of wheat grass extract. It was crushed in a stone grinder and the obtained extract was separated from the fibre by squeezing. This process was repeated 2 to 4 times and then a few drops of lemon were used for flavour and palatability (Lekha et al., 2017).

Experimental Animal

Total 30 healthy adult Albino mice of both sexes weighing 20-25gm were used in this study. The animals were kept in animal house of University Department of Zoology, T.M.B.U. Bhagalpur.The animals were housed in standard cages and kept under standard condition. Mice's were acclimatized for a period of 10days days before the experiment given a standard diet and tap water

Induction of Diabetes

Hyperglycaemia was induced by overnight fasted animal by a single intraperitoneal injection of alloxan (60 mg per kg body weight). 48 hour later hyperglycaemia was observed in model animal. Animal with equal or more than 160 mg/dl blood glucose in the fasting state, was selected for the experiment and consider it diabetic mice. (Jhon J. 2017).

Measurement of Body Weight

Body weight was taken to find the effect of plant extract in treated mice (diabetic) in comparison to control mice (diabetic).

Blood Glucose

Blood glucose was estimated by using the o-Toulidine method (Plumer, 1971).

Total serum Cholesterol

The blood sample of treated mice was taken and the total serum cholesterol was determined by Zak's method (Zak, 1953).

Total Plasma Protein

Plasma Protein was estimated by the Lowry's method (Lowry., 1951).

III. RESULT AND DISCUSSION

After the completion of dosages in all groups different tests were done and results were recorded. The average blood glucose level in the control group was found 88.1±4.1. In the diabetic group, the blood glucose level was recorded as 233.9 ±11.60 in the fasting condition. After administration of dosage in this group, the average blood glucose level reduced to 103.6 ± 2.30. The dosage of Triticum aestivum significantly reduced ($p < 0.05$)the blood glucose level in Alloxan-treated diabetic mice. We proposed that Triticum aestivumhas insulin-trophic activity, which facilitates the decrease of blood glucose levels due to its anti-diabetic impact, can be attributed. As seen by the much lower levels of glucose, it is possible that the Triticum aestivum extract-treated groups potentiated the pancreatic release of insulin from islet -cells. Due to increased muscle wasting and protein loss from tissue, Alloxan-induced diabetes induces weight loss in the body (Shirwaikaret al., 2005).

Mice	Control Group Mg/dl	Diabetic Mg/dl	Diabetic Mice Treated with Triticumaestivum Mg/dl
M1	85	196	108
M2	65	215	93
M3	95	296	118
M4	90	276	107
M5	91	235	99
M6	89	175	100
M7	103	209	95
M8	109	256	103

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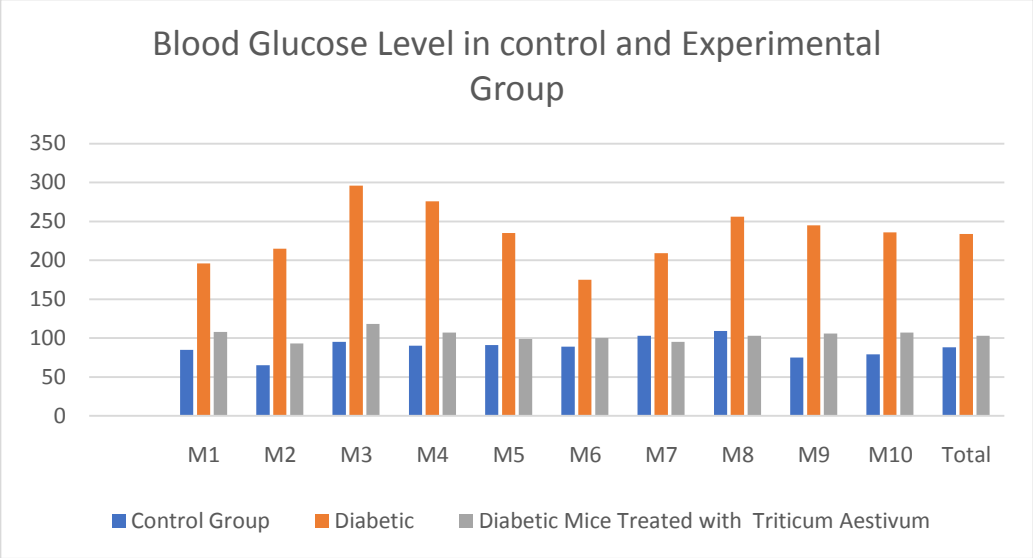
M9	75	245	106
M10	79	236	107
Total	88.1±4.1	233.9±11.60	103.6±2.30

Table 1: Table shows Blood glucose level in different experiment groups



Diabetes is frequently characterised by a drop in body weight and an increase in food and fluid intake due to the destruction of beta-cells, which may be related to metabolic alterations brought on by an inadequate or absent supply of insulin (Rodríguezet al., 1997). According to the study of Mohan et al. the wheat grass extract exhibited significantantidiabetic activity in STZ-diabetic rats, comparable to theeffect exhibited by standard drug glibenclamide.

After 30 days treatment period, it was observed thatthe animals treated with T. aestivum extract (100 mg/kg)and glibenclamide showed significant decrease in diabetesinduced urine glucose level. In diabetic rats, the administration of Triticum aestivumand glibenclamide considerably ($P<0.05$) returned glucose levels to closer to normal level.

Experimentally generated diabetes mellitus considerably ($P<0.001$) reduced the mobilisation of glucose into the liver and skeletal muscle. With Triticum aestivum&glibenclamide treatment compared to diabetic control, there was a statistically significant increase in liver glycogen content ($P<0.001$). (Mohan, et al., 2013.

Table 2 shows the serum cholesterol level in control, diabetic mice and mice treated with T. aestivum. Mice induced with hyperglycaemia showed high cholesterol levels in their blood serum. In this condition, it is clearly found that diabetes also causes hyperlipidaemia. In this study, it has been statistically proven the result was found significant at $p<0.05$ in the significance test.

Mice	**Control Group Mg/dl**	**Diabetic Mg/dl**	**Diabetic Mice Treated with Triticumaestivum Mg/dl**
M1	119	214	153
M2	156	236	147
M3	176	242	133
M4	179	263	149
M5	153	217	153
M6	146	236	157
M7	187	233	167
M8	189	249	166

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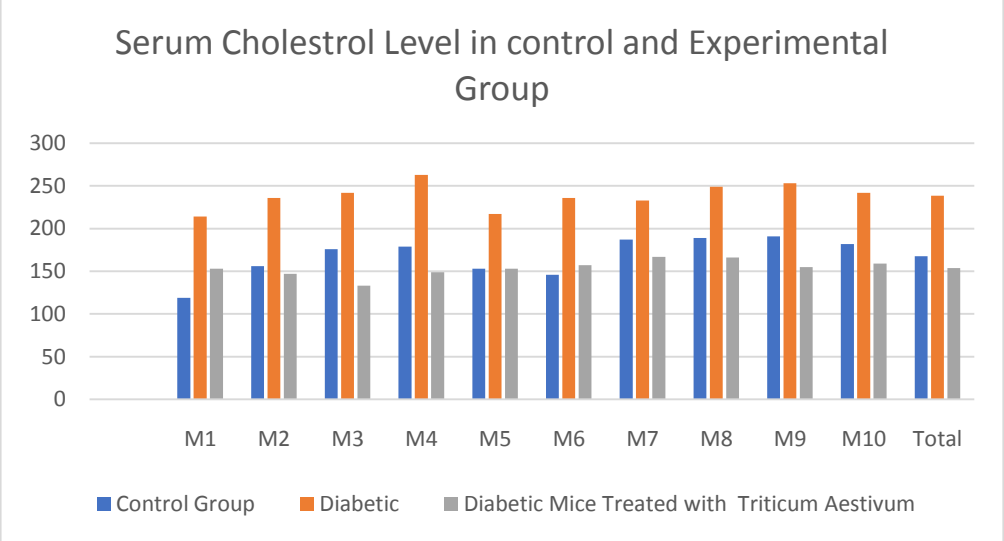
M9	191	253	155
M10	182	242	159
Total	167.8±7.42	238.5±4.77	153.9±3.1

Table 2: Table shows serum Cholesterol level in different experimentaland control groups



Diabetes increases the risk for heart disease and stroke by lowering "good" cholesterol levels while raising triglycerides and "bad" cholesterol levels. This condition is suggested as diabetic dyslipidemia. If any have diabetic dyslipidemia, the lipid profile is changing negatively. Patients are more susceptible to atherosclerosis and early-onset coronary heart disease as a result of this combination.Studies have linked diabetic dyslipidemia, atherosclerosis, and blood vessel disease to insulin resistance, which is a precursor to Type 2 diabetes. Before a diagnosis of diabetes, these conditions can also arisen (American Heart Association, 2023).

Table 3 shows that the plasma protein level control, diabetic mice and mice treated with T. aestivum. The plasma protein level of diabetic mice were decreased significantly ($p<0.05$) in comparison to control group mice. In third group of mice the plasma protein near to normal level after providing the dosage of aqueous extract of T. aestivum. Higher plasma glucose levels, which change blood plasma proteins through a non-enzymatic process known as glycation, are a hallmark of diabetes. 'Advanced glycation end products' (AGEs), which are harmful chemicals, are created when proteins are glycated. It has been discovered that AGE accumulation is accelerated in diabetes and aids in the development of diabetic complications (Bhonsle, et al., 2008 &Bhonsleet al., 2012).

The study of Kothari et al., 2011 also supports that the wheat grass juice significantly reduces serum cholesterol. Kothari suggested et al. that, the levels of total cholesterol, Triglycerides, low-density lipoprotein and very low-density lipoprotein were decreased by 50, 22, 56 and 22 percent in rats treated with grass juice at the dose of 5ml/kg and by 60, 38, 69 and 38 percent inratstreated with wheat grass juice at the dose of 10 ml/kg. Durairaj et al., suggested that wheatgrass treatment significantly reduced the lipidslevels, which could be due to the presence of phenolics, which mighthave decreased the expression of key enzymes involved in lipidsynthesis.

Mice	**Control Group gm/dl**	**Diabetic gm/dl**	**Diabetic Mice Treated with Triticumaestivum gm/dl**
M1	2.16	1.76	1.82
M2	2.01	1.62	1.92
M3	2.07	1.73	1.94

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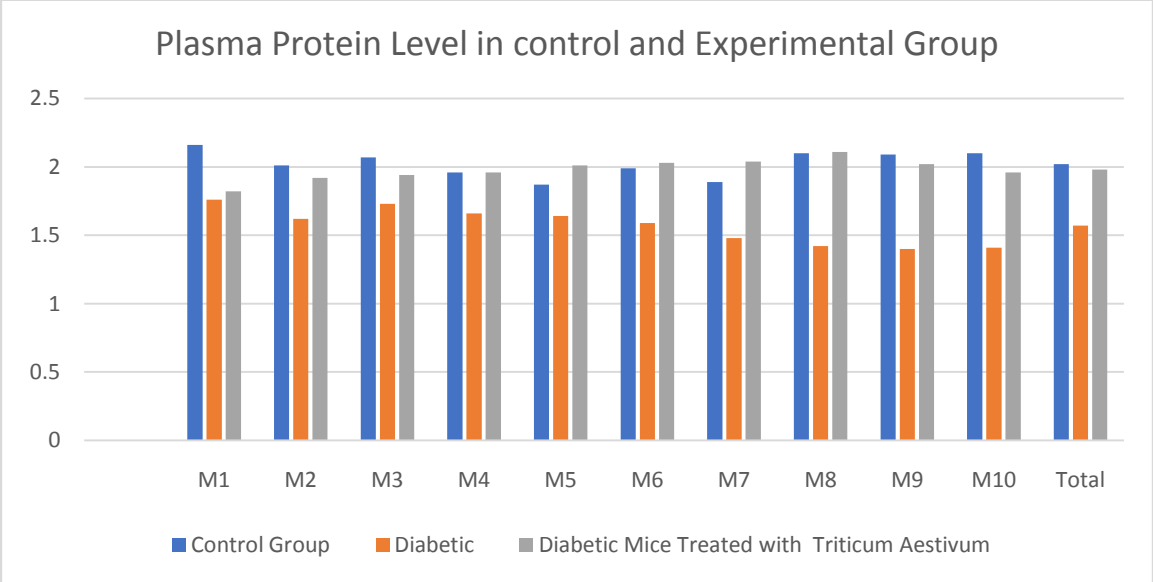
M4	1.96	1.66	1.96
M5	1.87	1.64	2.01
M6	1.99	1.59	2.03
M7	1.89	1.48	2.04
M8	2.10	1.42	2.11
M9	2.09	1.40	2.02
M10	2.10	1.41	1.96
Total	2.02±0.03	1.57±0.04	1.98±0.02

Table 3: Table shows Plasma Protein level in different experimentaland control groups



Plasma albumin levels are influenced by things like nutrition, lifestyle, inflammation, illness, medicines, etc. Diabetes causes an insulin shortage, which reduces albumin synthesis and secretion. Thus, it is anticipated that albumin levels will fall in people with diabetes and may have an impact on plasma protein glycation. Glycosylated haemoglobin (HbA1c), a marker of high glucose levels, may also be affected (Bhonsle, et al., 2008 &Bhonsleet al., 2012).

Mice	Control Group Body Weight (gm)	Diabetic Body Weight (gm)	Diabetic Mice Treated with Triticumaestivum Body Weight (gm)
M1	26.16	18.76	22.82
M2	25.01	19.62	24.92
M3	26.07	21.73	25.94
M4	24.96	20.66	23.96
M5	23.87	21.64	22.01
M6	26.99	18.59	26.03
M7	24.89	17.48	24.04
M8	25.10	18.42	25.11
M9	23.09	16.40	24.02
M10	25.10	17.41	24.96
Total	±0.03	1.57±0.04	1.98±0.02

Table 4: Table shows body weight in different experimentaland control groups

The table 4 indicates the body weight among all group's diabetic as well as in control group. Body weight in diabetic induced mice group was reduced significantly. However weight gain has been notedin those mice which had been provided treatment of wheat grass juice. Study of

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Mohan et al., 2013 supports the present study. Study of Mohan et al., shows, diabetes produced significant loss in body weight as compared tonormal rats during the study. Diabetic control rats continuedto lose weight till the end of the study while Triticum aestivumtreated rats at a dose (100 mg/kg body weight) showedsignificant improvement in body weight compared to diabeticcontrol group.

Parameters	Control Group	Diabetic	Diabetic Mice Treated with Triticum aestivum	Test of Significant
Blood Glucose	88.1±4.1	233.9±11.60	103.6±2.30	t-value is 11.01005 The result is significant at $p < .05$
Serum Cholesterol	167.8±7.42	238.5±4.77	153.9±3.1	The t-value is 14.8642 The result is significant at $p < .05$
Plasma Protein	2.02±0.03	1.57±0.04	1.98±0.02	The t-value is -8.2968 The result is significant at $p < .05$

Table 5: Table shows statistical results (the test of significance).

Reduced body weight in diabetic rats may be a result of structural protein breakdown brought on by a lack of carbohydrates for energy metabolism (Pepato, 1996).Wheatgrass treatment significantly increased body weight in diabetic rats, demonstrating that it has the ability to stabilise blood sugar levels and prevent weight loss (Campbell, 2009).

IV. CONCLUSION

Thus, it is concluded that fresh Triticum aestivum grass juice possess hypoglycaemic hypolipidemic effect in diabetes induced mice. Beside this it also increases plasma protein as well as body weight in such mice group.It might be useful with statins for themanagement of hyperglycaemia, dyslipidaemia, low plasma protein etc.

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