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Kidney function profiling and antidiabetic effect of *Vigna radiata* in Alloxan monohydrate induced diabetic rabbits

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Diabetes mellitus (DM) is a metabolic syndrome characterized by hyperglycemia. The medicinal uses of plants have continued to be a good source of natural products for treating various diseases. The current study, concerning to explore and evaluate the antidiabetic effects of *Vigna radiate* for hypoglycemic activities along within the checking of normal level of albumin, globulin and total protein level. *V. radiata* extract at the dose rate of 300 mg/kg significantly ($p<0.05$) decreased blood glucose, albumin, globulin

and total protein level at 168.66 mg/dl, 1.66 g/dl, 2.36 g/dl and 4.03 g/dl respectively at the end of treatment with *V. radiata* extract reflecting its controlling activity of diabetic control.

Keywords: Glucose, *Vigna radiata*, albumin, globulin, total protein

INTRODUCTION

Diabetes mellitus is a hyperglycemia in which metabolic changes occur because of irregularities in insulin release and action. It has just been built up that constant hyperglycemia of diabetes is related with long duration of impairment, malfunctioning and in the end the breakdown of organs, particularly the eyes, kidneys, nerves, heart and veins (Huang *et al*., 2005). It is a commonest endocrine syndrome that influences more than 100 million individuals around the world (around 6% of populace) and in the following 10 years, it might influence around 5 times a bigger number of individuals than it does now. It is the fourth main reason for death in the most advanced nations and there is significant proof that it is pandemic in numerous advanced and recently industrialized countries (Sivaraj *et al*., 2009). *Vigna radiata* L. (Mungbean) generally named as green gram is used as laxative, also used in pregnancy and as aperients (Haq, 1989). Mung bean tannin, protein and other polyphenols are thought to combine with organophosphorus pesticides, arsenic, mercury and other heavy metals enhancing the excretion of sediments from the body. Mung beans have been shown to possess antimicrobial, antioxidant and anti-inflammatory activities. In addition mung beans have antihypertensive, antidiabetic, lipid metabolism accommodation, antihypertensive and antitumor effects (Tang et al. 2014). In this study, the plant was selected for antidiabetic studies and also its effect on some kidney function tests.

MATERIALS AND METHODS

The plant extract was prepared in methanol solvent. Rabbits were divided in to five groups after induction of diabetes with alloxan monohydrate beside the normal group (Romman et al. 2015a).

Selection of Animals

The experimental animal selected were Rabbits (*Oryctolagus cuniculus*). Fifteen rabbits were purchased from local market, weighed between 1 kg to 2 kg. The rabbits were maintained under standard animal house conditions for 4 weeks of acclimatization and fed on natural plant diet.

Administration of Extract

Group A was kept as untreated group. i. e control group.
Group B was treated with glucophage at the dose rate of 10 mg/kg body weight.
Group C was treated with plant extract of *Vigna radiata* at dosage of 100 mg / kg body weight.
Group D was treated with *Vigna radiata* extract at dosage 200 mg/ kg body weight.
Group E was treated with *Vigna radiata* extract at dosage 300 mg/ kg body weight.

Blood Sample Collection

From the marginal veins at the back of ear, blood was obtained in Zero hours, Two hours, four hours, six hours and eight hours simultaneously and was analyzed through Double Beam UV Spectrophotometer.

RESULTS

Group B was given Glucophage (Glibenclamide) for regular 8 hours at the interim of zero hrs, 2 hrs, 4hrs, 6 hrs and 8 hrs (Fig 1). At the last of the process of treatment the glucose, albumin, globulin and total protein level of Group B was recorded as 211 mg/dl, 2.66 g/dl, 3.66 g/dl and 6.33 g/dl respectively (Table. 1).

Group C was kept on *vigna radiata* plant's extract at dosage of 100 mg/dl for continuous 8 hrs at the interim of zero hrs, 2hrs, 4hrs, 6hrs and 8 hrs (Fig 2). At the last of the process of treatment the glucose, albumin, globulin and total protein level of Group C was recorded as 315.66 mg/dl, 4.66 g/dl, 4.13 g/dl and 8.8 g/dl respectively (Table. 2).

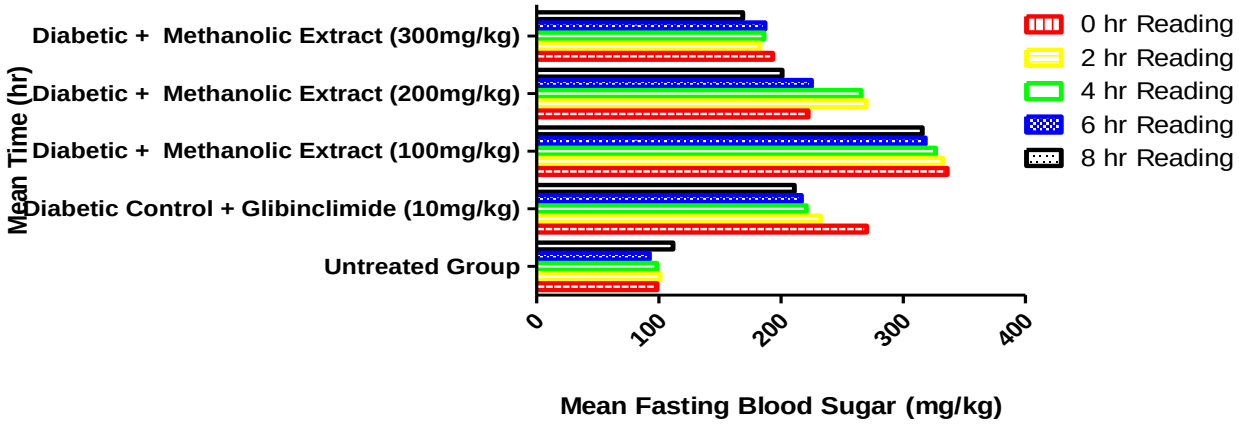

Figure 1: Blood glucose level of Rabbits

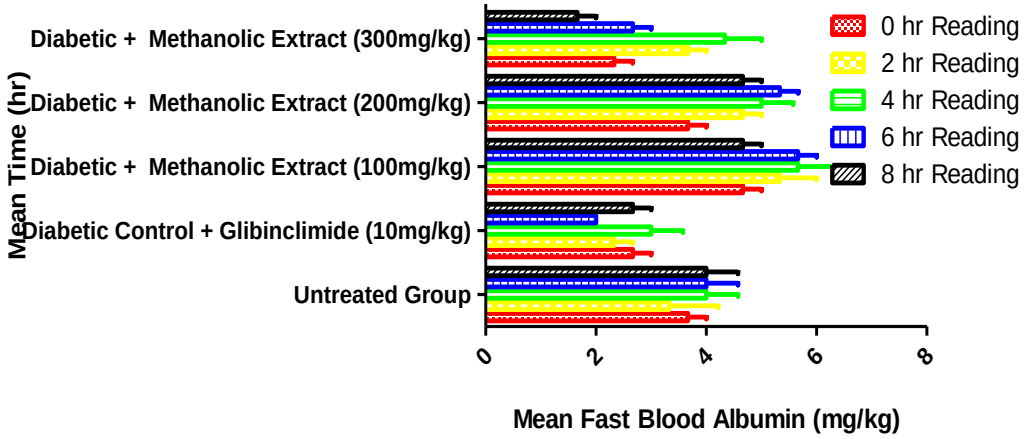

Figure 2: Blood albumin level of Rabbits

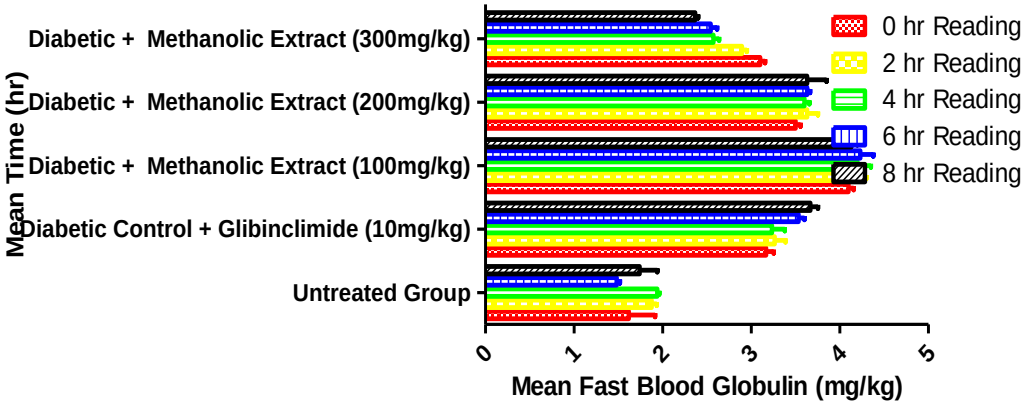

Figure 3: Blood globulin level of Rabbits

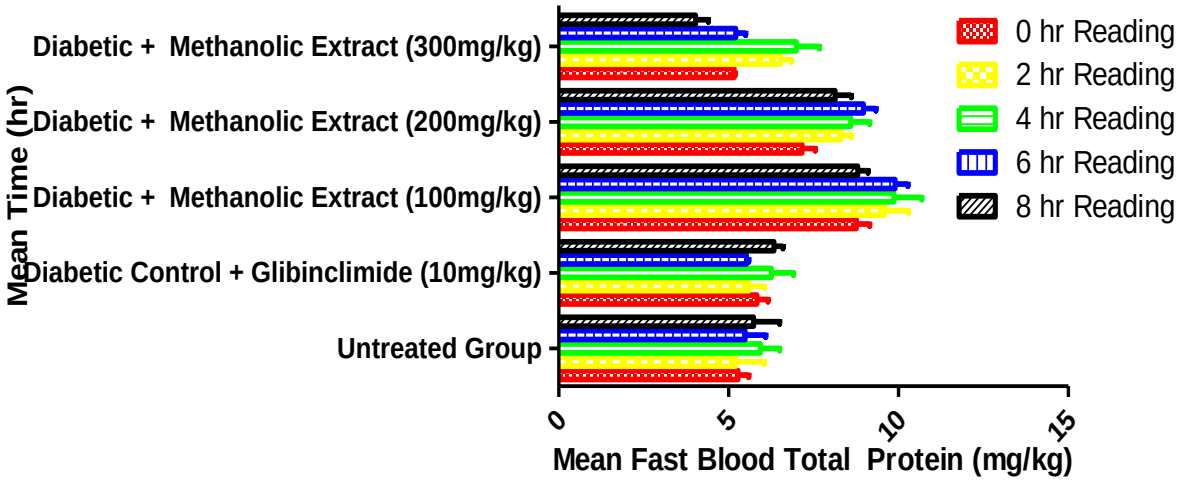

Figure 4: Blood total protein level of Rabbits

Table 1: Blood glucose level (mg/kg) in alloxan induced diabetic rabbits.

	0 hr Reading	2 hr Reading	4 hr Reading	6 hr Reading	8 hr Reading
Untreated Group	67.66	101	98.33	92.33	111.66
Diabetic Control + Glibenclimide (10mg/kg)	270	232.33	220.66	216.66	211
Diabetic + Methanolic Extract (100mg/kg)	336	332.33	326.66	318	315.66
Diabetic + Methanolic Extract (200mg/kg)	222.33	269.66	265.66	225	201
Diabetic + Methanolic Extract (300mg/kg)	193.33	182.66	186	187	168.66

Table 2: Blood albumin level (mg/kg) in alloxan induced diabetic rabbits.

	0 hr Reading	2 hr Reading	4 hr Reading	6 hr Reading	8 hr Reading
Untreated Group	3.66	3.33	4	4	4
Diabetic Control + Glibenclimide (10mg/kg)	2.66	2.33	3	2	2.66
Diabetic + Methanolic Extract (100mg/kg)	4.66	5.33	5.66	5.66	4.66
Diabetic + Methanolic Extract (200mg/kg)	3.66	4.66	5	5.33	4.66
Diabetic + Methanolic Extract (300mg/kg)	2.33	3.66	4.33	2.66	1.66

Table 3: Blood globulin level (mg/kg) in alloxan induced diabetic rabbits.

	Blood Globulin level of Rabbits				
	0 hr Reading	**2 hr Reading**	**4 hr Reading**	**6 hr Reading**	**8 hr Reading**
Untreated Group	1.61	1.87	1.94	1.48	1.74
Diabetic Control + Glibenclimide (10mg/kg)	3.16	3.26	3.23	3.53	3.66
Diabetic + Methanolic Extract (100mg/kg)	4.1	4.26	4.2	4.23	4.13
Diabetic + Methanolic Extract (200mg/kg)	3.5	3.63	3.6	3.63	3.63
Diabetic + Methanolic Extract (300mg/kg)	3.1	2.89	2.57	2.54	2.36

Table 4: Total protein level (mg/kg) in alloxan induced diabetic rabbits.

	0 hr Reading	**2 hr Reading**	**4 hr Reading**	**6 hr Reading**	**8 hr Reading**
Untreated Group	5.28	1.73	5.94	5.48	5.74
Diabetic Control + Glibenclimide (10mg/kg)	5.83	1.86	6.26	5.53	6.33
Diabetic + Methanolic Extract (100mg/kg)	8.76	3.2	9.86	9.9	8.8
Diabetic + Methanolic Extract (200mg/kg)	7.16	2.76	8.6	8.96	8.13
Diabetic + Methanolic Extract (300mg/kg)	5.16	2.17	6.99	5.21	4.03

Group D was treated with plant extract of *vigna radiata* at dosage of 200 mg/kg for continuous 8 hrs at the interim of zero hrs, 2 hrs, 4hrs, 6 hrs and 8 hrs (Fig 3). At the last of the process of treatment the glucose, albumin, globulin and total protein level of Group D was recorded as 201 mg/dl, 4.66 g/dl, 3.63 g/dl and 8.13 g/dl respectively (Table. 3).

Group E was treated with plant extract at the dose rate of 300 mg/dl for regular 8 hrs. It was given at the interval of zero hrs, 2 hrs, 4 hrs, 6 hrs and 8 hrs (Fig 4). At the last of the process of treatment the glucose, albumin, globulin and total protein level of Group E was recorded as 168.66 mg/dl, 1.66 g/dl, 2.36 g/dl and 4.03 g/dl respectively (Table. 4).

DISCUSSION

The results show that methanolic extract of *Vigna radiata* delivered critical decrease in level of blood glucose with the increase of dosages. The findings additionally revealed that the antidiabetic property of the *Vigna radiata* extract expanded with time, as maximal impact was accomplished at the eighth hours of plant extract administration. This reflects that the constituents which are active in the plant extract of *Vigna radiata* require time to spread at the target site. This pattern has been observed in other plants with antidiabetic property (Sharma *et al*., 2006; Romman et al., 2020b). The *Vigna radiata* extract lowered the elevated sugar level of blood in alloxan-induced diabetic rabbits. The dose rate of 200 and 300 mg/kg treatment, when compared with Glibenclimide 10 mg/kg treatment disclosed the effect. The plant extract indicated quicker activity than the standard used medicine. The findings are in full confirmation with the results of Khatune *et al*. (2016) who concluded antidiabetic properties of ethanol concentrate of *Grewia asiatica* Linn. by using bark in alloxan-initiated diabetic rodents. Nevertheless a noteworthy decrease in blood albumin level and reduction in blood globulin were seen in alloxan prompted diabetic rabbits when contrasted with glibenclamide treated rabbits, when applied methanolic extract of *Vigna radiata* and thus the total protein level was decreased. The findings indicate that methanolic extract of *Vigna radiata* may significantly reduce blood albumin and globulin level, total protein and blood sugar level. In 2008 a study was conducted in which the extracts of mung bean sprout and extracts of seed coat were fed to type 2 diabetic mice to assess

antidiabetic property. These two extracts were utilized for 5 weeks, orally to mice. The *Vigna radiata* sprout extracts (2 g/kg) as well as seed coat extracts (3 g/kg) reduced blood glucose, blood urea nitrogen (BUN), glucagon plasma C-peptide, triglycerrides and total cholesterol (Yao *et.al*., 2008; Bilqees et al., 2017; Shiheng et al., 2017).

CONCLUSION

As a result of this study it was confirmed that *Vigna radiata* has the ability to reduce the level of glucose in blood.

It was further exposed that the plant extract of *Vigna radiata* has also its duel effect on controlling of albumin, globulin and total protein.

CONFLICT OF INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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AUTHOR CONTRIBUTIONS

RB and MR designed and performleed the experiments and also wrote the manuscript. RB performed animal treatments, flow cytometry experiments, tissue collection, and data analysis. RP, SJ, SW, AAKK, WK, SU, MS, SB, KS, FH, SSS, AH, NU, MA, SF, MI, ZU, NM, RA, HAJ, MA, IH, AR, SZ, SU, MI designed experiments and reviewed the manuscript. All authors read and approved the final version.

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