



EVALUATE THE HYPOGLYCEMIC ACTIVITY OF TRIGONELLA FOENUM SEED EXTRACT IN ALLAXON INDUCED DIABETIC RATS

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ABSTRACT

In the present study, hypoglycemic effects of aqueous extract of *Trigonella foenum* have been carried out. The aqueous extract at a dose of 1.5ml /100gm body weight for a prolonged period significantly reduced blood sugar levels and rise in liver glycogen content in allaxon induced diabetic rats. Aqueous extract of seeds also showed improvement in the body weight, food and water consumption in allaxon induced diabetic rats. More over prolonged treatment did not show any toxic effect.

KEYWORDS: Hyperglycemia, Allaxon, Diabetes mellitus, Antidiabetic.

INTRODUCTION

Diabetes mellitus has been recognized as clinical syndrome, since ancient times and remains as a crippling global health problem today. Current estimate suggest that approximately more than 150 million people suffer from diabetes mellitus (Muhammad and Ojewole, 2003). Type II diabetes is a heterogeneous disease for which both genetic and environmental are contributing. Diabetes mellitus is one of common metabolic disorder involving pancreas. This disease is considered as one of five leading cause of death. Though many modern medicines are available for the treatment of diabetes mellitus, they do not provide a satisfactory cure. Most of them are having severe side effects also. Because of these reasons demand for herbal formulations with anti diabetic activity is increasing (Kameshwara *et al.*, 2001). From ancient times herbal extracts are used for the treatment of various ailments, including diabetes mellitus (Akash and Okafar 1995 1980, Jia *et al.*, 2003). Many commonly available plants like *Azadirachata indica* (neem), *Momordica charantia* (Bitter gourd), *Syzygium cumini* (Jamun), having hypoglycemic effect many of these are less effective in lowering blood glucose levels in severe diabetes mellitus (Dixit *et al.*, 1986, Nagappa *et al.*, 2003). *Trigonella foenum-graecum*, (leguminaceae) is cultivated commonly in India, Bangladesh and China. Seeds of plants are commonly used as a condiment; more over leaves are also edible. Many reports have shown that *Trigonella foenum* seeds can lower the blood sugar levels experimental animals and diabetics (Khosla *et al.*, 1995). In the present study effort is made to evaluate the hypoglycemic effects *Trigonella foenum* seeds (aqueous extract) on blood sugar, level, muscle and liver glycogen content of both non diabetic and allaxon induced diabetic rats.

MATERIALS & METHODS

Plant material

Seeds of *Trigonella foenum graecum* were obtained commercially from local market of Bhilai (Chhattisgarh). Seeds washed properly with water, dried and finely powdered. The extracts were prepared by dissolving in distilled water, filtered through Whatman's filter paper. Freshly prepared extract was given to experimental animals orally (A dose of 1.5ml of aqueous suspension/100gm body weight).

Animals

Albino rats weighing 250-350gm of both sexes was obtained from a commercial supplier were used for the present study. Before and during the experiments rats were fed with normal diet. The animals were acclimatized for a period of 7days under normal laboratory conditions of temperature and humidity, with free access to food and water. Efforts were made to maintain a fixed starting time for the experiment (10 am). The rats were randomized in to following groups before starting the experiments

Experimental design

Group I Non diabetic control

Group II Diabetic control (Allaxon treated rats)

Group III Non diabetic rats with seed extract.

Group IV Allaxon treated diabetic rats with aqueous seed extract of *Trigonella foenum*. Minimum of five animals were used for the study. Control animals from both group received only distilled water.

Efforts were made to reduce the animal suffering and to reduce the number of animals. All experiments were conducted by following the ethical standards for the investigation in animals, and the study was approved by institutional Animal Ethical committee, for the care and use of animals.

Induction of diabetes in experimental rats:

Rats were made diabetic by single intra peritoneal injection of allaxon hydrate (60 mg/kg body weight.CDH, India). Allaxon was weighed and dissolved in saline just

prior to the injection. Hyperglycemia was observed in rats after 48 hours of injection. Rats with blood glucose level ≥ 180 were selected for the experimental study. Treatment with aqueous extract was started 48 hours of all axon administration.

Collection of blood sample and blood glucose determination:

For monitoring the blood glucose the blood samples were collected from tail tip of rat at the interval of seven days till the end of the experiment. The blood glucose was monitored by using one touch glucometer (One Touch select simple Life Scan India) using glucose test strips. The animals were sacrificed after 7, 15 and 30 days under mild ether anesthesia. Blood samples were collected and preceded for glucose estimation (Nelson and Somogy 1945), muscle and liver tissue were collected and proceeded for glycogen estimation (Mukherjee, 2005).

Body weight of animals belonging to both control and experimental groups were observed daily till the end of

the experiment. Food intake and water consumption rate of both non diabetic and diabetic rats were noted regularly. All values of body weight, blood sugar, muscle and liver glycogen content were expressed as \pm Standard error of mean.

Statistical analysis

All data are expressed as mean \pm SEM. ANOVA test was performed to compare the difference between treatments. Differences were considered statistically significant at $P < 0.05$

RESULTS

Administrations of allaxon (60mg/Kg) led to an increase in blood sugar level, which was maintained for one week. Daily treatment of aqueous seed extract for prolonged period of 30days did not show significant change in the body weight and blood sugar level in non diabetic control rats (Table 1 and figure1).

TABLE 1: Body weight and blood sugar level in non diabetic rat after the treatment with *T. foenum* extarct

NON DIABETIC RATS	control	7days	15days	30 days
BODY WEIGHT (g)	330.00 \pm 1.2	329.0 \pm 0.45	331.20 \pm 0.37	331.20 \pm 0.37
BLOOD SUGAR(mg/100ml)	94.2 \pm 0.58	100.60 \pm 0.49	104.40 \pm 0.40	103.60 \pm 0.68

n=5, Values are \pm SEM

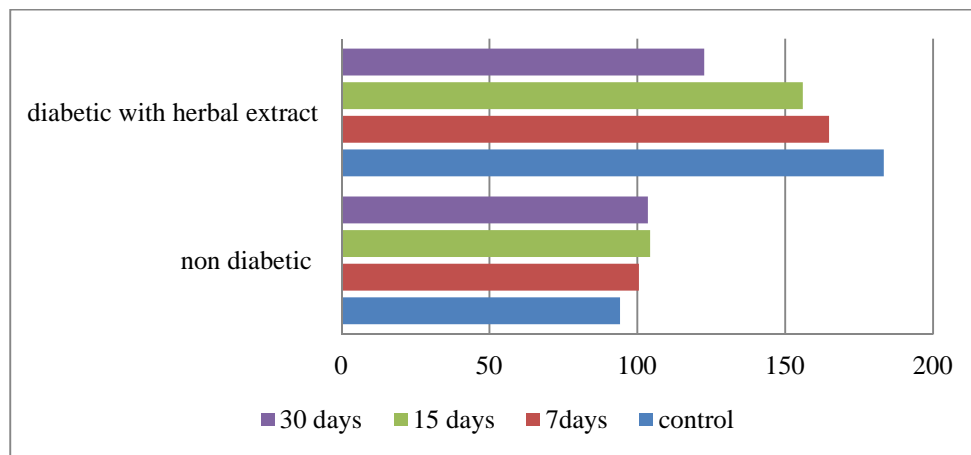


FIGURE 1: Blood sugar with Trigonella foenum extracts (mg/100ml)

Diabetic rats without aqueous extract of *T. foenum* graecum did not show significant changes in the body weight, food and water consumption rate. Diabetic rats (with aqueous extract of Trigonella foenum graecum) showed significant changes in body weight (Table 2 and figure 2). The food and water consumption rate was more in the initial periods of experiment. Both food and water consumption rate decreased during the last part of the experiment.

Blood glucose level of diabetic rats treated with aqueous seed extract of Trigonella foenum showed significant changes (Table 2, Figure 2). Increased blood sugar level was seen in the initial periods of the experiment, but a gradual decrease was observed in blood glucose level of diabetic rats treated with aqueous seed extract of Trigonella foenum when compared with control group of animals (Table 2 and Figure 2).

TABLE 2: body weight and blood sugar level in diabetic rat after the treatment with *T. foenum* extarct

Diabetic Rats	control	7 days	15 days	30 days
Body Weight (g)	294.40 \pm 1.2	297.20 \pm 0.97	296.80 \pm 0.73	302.0 \pm .32
Blood Sugar(mg/100ml)	183.20 \pm 0.97	164.80 \pm 132	156.0 \pm 0.32	122.60 \pm 0.8*

n=5, Values are \pm SEM, *significant at $p < 0.05$

Glycogen content of muscle and liver showed no significant changes in non diabetic control rats during the period of experiments. The glycogen content of the muscle did not show any significant change in diabetic control

rats. There is a significant increase in the muscle and liver glycogen content of diabetic rats treated with *Trigonella foenum* seed extract for 30 days.(Table 3 and 4 and Figure 3 and 4).

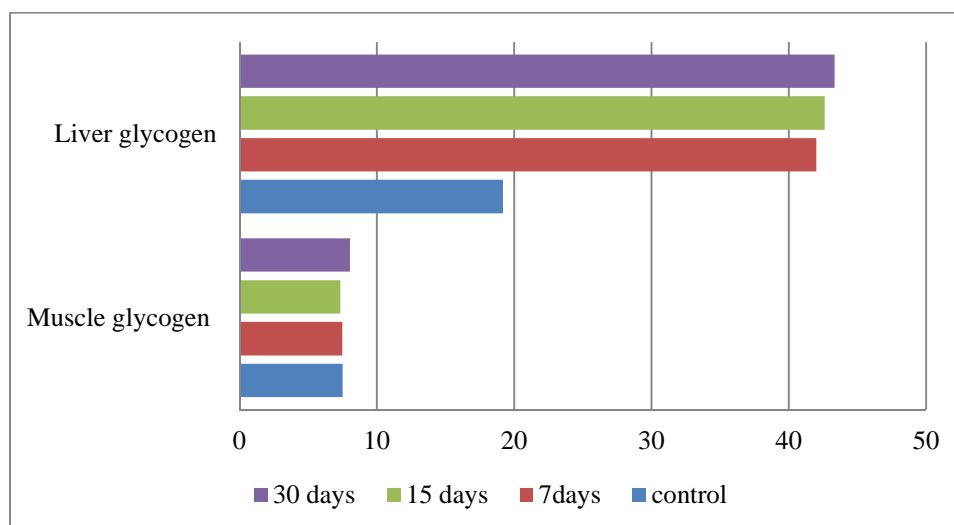


FIGURE 2: Muscle and Liver glycogen (mg/100mg)

TABLE 3: Muscle and liver glycogen content in control and experimental animals treated with *T. foenum* seed extract

	Control	7days	15days	30days.
Muscle glycogen(mg/100g)	7.50±0.i0	7.46±0.024	7.32±0.050	*8.04±0.11
Liver glycogen (mg/100g)	19.18±0.32	42.0±0.31	42.60±0.73	*43.2±0.40

n=5, Values are ±SEM, *significant at p <0.05

DISCUSSION

In the present study allaxon has been used to induce diabetes in rats, following previous authors (Kumar *et al.*, 2006, Sumona and Suryawanshi (2001). The administration of allaxon resulted in the steady increase of blood sugar level during the initial periods of experiment. These observations are similar to earlier workers finding Kameshwara *et al.* (1997, 2001). It has been reported by earlier workers that allaxon act through streakier reaction on pancreatic beta cells. This led to the destruction of beta cells and affecting the secretion of insulin (Rerup1970, Nakabow *et al.*, 1978). There were significant decreases in blood glucose level of diabetic rats treated with seed extract of *T. foenuem* seed extract. The effect was more profound in the later period of the experiment. These findings were similar to the findings of Mohamed and EL-Shorbagi (1993). They reported that Lupin seed powder produced a hypo glyceemic effect in diabetic rats. According to Nerway *et al.* (2002) and Kencht *et al.* (2006) *L. termis* contain saponins, alkaloids and tannins. Saponins have hypoglycemic activity. This may be due to inhibition of liver gluconeogenesis or glycolysis (Kencht *et al.*, 2006). The hypoglycemic effect shown by .T.foenum extract may be due to the presence of saponins as suggested by Valette *et al.* (1984). They suggest that the hypoglycemic activity of *T. foenum* seed may be due the presence of proteins or may be due to inhibition of intestinal glycosidase. In the present study hyperglycemia reported after allaxon injection, may be due to destruction of pancreatic beta cells. This destruction may not be permanent as it was reported by earlier workers (Khosla *et al.*, 1995, Shanmugasundaram *et al.*, 1990). Treatment of

diabetic rats with aqueous seed extract of *Trigonella foenum* resulted in an increase in glycogen content in liver. This may be due to an increase in glucose uptake by the tissues following administration of herbal extracts increased glycogen synthesis or a combination of both, probably mediated through the action of insulin (Rajasekaran *et al.*, 2001, Vats *et al.*, 2004). As it was reported by earlier workers that the increase may also due to inhibitory action of gluconeogenic enzyme (Moorthy *et al.*, 1989). The number of functionally active beta cells in the pancreas is of decisive importance for the development course and outcome of diabetes. As it was suggested by earlier workers that alloxan may not be destructing the complete pancreatic beta cells. (Chakravarty *et al.*, 1982, Dixit *et al.*, Nagappa *et al.*, 1986), the results of present study on the blood glucose level support such possibility. As shown in the table 1 and 2. The oral administration of aqueous extract of seed of *T. foenum* graecum has brought the blood glucose to normal level. It may be due to the regeneration of beta cells and causing secretion of insulin by pancreatic cells.

CONCLUSION

The administration of aqueous seed extract of *T. foenum* has resulted in increase in the body weight of allaxon induced diabetic rats. This action may be due to the correction in carbohydrate metabolism. The administration of seed extract resulted in reducing the blood sugar level in allaxon induced diabetic rats The blood glucose level and glycogen content of allaxon treated rats showed significant changes after a prolonged treatment with aqueous seed extract of *Trigonella foenum*.

This study indicates that seed extract is having hypoglycemic effect. Further investigations are essential to determine the dose and duration of administration of the extract.

RECOMMENDATIONS

Since allopathic medicines used in the treatment of diabetes are having side effects, so herbal preparations can be used for the treatment of type II diabetes.

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