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Research Article

Effect of Methanolic Extract of *Mollugo pentaphylla* on Blood Glucose Levels in Streptozotocin Induced Diabetic Rats

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Abstract

This study was designed to investigate the anti diabetic activity of the methanolic extract of the whole plant of *Mollugo pentaphylla* (MEMP) in streptozotocin (STZ) induced diabetic rats. The qualitative chemical tests carried out for the identification of the phyto-constituents present in methanolic extract of *Mollugo pentaphylla* showed the presence of alkaloids, steroids, glycosides, saponins, terpenoids, phenolic compounds, flavonoids, and tannins. All the groups of animals were administered STZ at a dose of 150 mg/kg b.w. i.p. only once before the treatment. It was observed that the blood glucose levels was significantly ($p>0.01$) increased. The animals with a glucose level of more than 200 mg/dl were considered for the experiment. The MEMP at a dose of 200 mg and 400 mg/kg b.w. was administered for 8 days. The effect of MEMP extract on blood glucose level was measured on every 4th day during the treatment. At the same time interval the relative changes in body weights, food and liquid intake were noted. Significant decrease ($p<0.01$) in blood glucose level were observed in MEMP treated animals. The effect of MEMP was found to be similar to that of the standard, glibenclamide at a dose 2 mg/kg, b.w. The results clearly indicate that the methanolic extract of *Mollugo pentaphylla* (MEMP) exhibit significant blood glucose lowering activity in STZ induced diabetic rats.

1. INTRODUCTION

Diabetes mellitus is a metabolic disorder characterized by hyperglycaemia, glycosuria and negative nitrogen balance and it is mainly due to either lack of insulin secretion from beta cells of pancreas or desensitization of insulin receptors for insulin. It is the most prevalent disease in the world affecting 25% of population and afflicts 150 million people and is set to rise to 300 million by 2025[1]. It causes number of complications like retinopathy, neuropathy, and peripheral vascular insufficiencies[2]. Since diabetes mellitus is a multifactorial disease, the treatment is aimed not only at decreasing the blood sugar level to normal limit, but also at correcting the metabolic defects associated with it[3].There is an increasing demand by patients to use the natural products with anti- diabetic ativity[4].During the past decade, traditional systems of medicines have become a topic of global importance[5]. Plant based medicines are gaining prominence in treatment of metabolic diseases like diabetes. Many flavonoids containing plant serve as a hidden wealth of potentially useful natural products for diabetes control[6].
The leaves are employed in the preparation of poultices for sore legs. Decoctions of roots are used to treat eye diseases. The whole plant is used as an antipyretic[7]. However so far, no study has been done to explore the anti-diabetic action of this plant, therefore the present study has been undertaken to evaluate the anti-diabetic effect of *Mollugo pentaphylla* in normal and STZ induced diabetic rats.

2. MATERIALS AND METHODS

2.1 Preparation of the Extract

The entire plant of Mollugo *pentaphylla* was collected from Tirunelveli district, Tamilnadu during the month of July 2008 and was authenticated by a botanist. The dried powdered plant material was extracted with methanol for 72 hours by using soxhlet apparatus. The extract was filtered and concentrated to dryness in vacuum and stored in an air tight container.

2.2 Animals

Wistar albino rats (150- 200g) were used for the study. The animals were fed with commercial pellets and water *ad libitum*. The animals were well acclimatized to the standard environmental conditions of temperature (22^{o}C ± 5^{o}C) and humidity (55 ± 5^{o}C) and 12 hrs light/dark cycle throughout the experimental period.

2.3 Acute Toxicity Studies

The acute oral toxicity study was carried out as per OECD 423 guidelines (OECD, 2001). The study was approved by the Institutional Animal Ethics Commitee (IAEC). No mortality and no signs of toxicity were found even after administration of a limit dose of 200 mg/kg body weight of extract; hence 1/10th of the dose was taken as effective dose. Two doses, 200 and 400 mg/kg were selected for the present study to evaluate antihyperglycemic activity.

2.4 Experimental Protocol

The animals were divided into seven groups of six animals each. Group I served as normal control treated with 5 ml of 5% Tween 80. Group II and III diabetic rats treated with MEMP 200 and 400 mg/kg respectively. Group IV diabetic rats orally treated with Glibenclamide (2 mg/kg body weight). Group V served as diabetic control treated with 5 ml of 5% Tween 80.

2.5 Streptozotocin induced Diabetes Mellitus

Diabetes was induced by a single intra peritoneal injection of 150 mg/kg b.wt. of streptozotocin in citrate buffer (pH 4.5). Eight days after injection of STZ, the blood glucose levels of all the rats were determined. The animals which showed 200 mg% of blood glucose level considered for the present study.
Diabetes was confirmed in STZ rats by measuring the fasting blood glucose concentration on 4th day after the injection with STZ. The

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extracts at the dose of 200 and 400 mg/kg b.wt. were administered orally after suspending in 5% Tween 80 solution. The blood samples were collected from retro-orbital plexus and blood glucose levels were determined using glucometer[8].

2.6 Statistical Analysis

The data were expressed as mean ± SEM. The significance of the difference between means of the test groups and control group was analysed by using ONE WAY ANOVA followed by Dunnett'stest[9].

3. RESULTS AND DISCUSSION

Acute effects of *Mollugo pentaphylla* in overnight fasted diabetic rats are presented in Table1. Blood glucose level (BGL) of rats of group II and III were compared with BGL of other rats to confirm that the drug STZ has induced diabetes in experimental animals ($P<0.01$) at all intervals of sampling. It was noticed that the extract of *Mollugo pentaphylla* resulted in reduction of BGL of 387 to 119 mg/dl and 303 to 160 mg/dl respectively, which was as per with glibenclamide the reduced BGL from 336 to 125 mg/dl at the end of 240 minutes.The research envisaged was designed to evaluate anti- diabetic property of methanolic extract of Mollugo *pentaphylla* (MEMP) in STZ induced diabetic rats by virtue of their antioxidant potential. The result of the study demonstrated the benefits of MEMP as per with standard hypoglycaemic drugs by scavenging oxidative free radicals.

Streptozotocin (STZ) is toxic to alpha cells of pancreas and widely used for induction of experimental diabetes mellitus in animals, resulting in the generation of reactive oxygen species[10]. STZ causes a significant increase in the level of blood glucose in animals. The methanolic extract of *Mollugo pentaphylla* significantly decreased the blood glucose level in these animals suggesting that it has antidiabetic properties. The decrease in body weight in diabetic rats is due to excessive breakdown of tissue proteins[11]. Treatment with MEMP improved body weight significantly in a dose dependant manner. Thus the regimen of *Mollugo pentaphylla* may be considered as a potential source of natural antihyperglycemic activity that may have beneficial role in the management of diabetes.

4. CONCLUSION

In conclusion the present study reveals that the *Mollugo pentaphylla* had antihyperglycemic agent. The bioactive component(s) responsible for the observed activity is not precisely known but it may be one or more of the phytochemical constituents established to be present in the whole plant extract. The phytochemical screening of the extract revealed the presence of alkaloids and glycosides in the *Mollugo pentaphylla* plant methanolic extract, which may be the constituents responsible for the activity. Further studies are necessary to isolate the active principle(s) responsible for the activity.

Table 1: Antidiabetic activity of Methanolic extract of *Mollugo pentaphylla* L.

Group	Treatment	Dose	Blood Glucose Levels (mg/dl)				
			0min	30min	60min	120min	240min
1.	Vehicle, 5% Tween80	5 mg/kg	65.5 ± 4.8	58.5 ± 4.1	65.75 ± 1.6	58.75 ± 2.6	61.25 ± 1.7
2.	MEMP	200 mg/kg	303.0 ± 33.1	244.5 ± 34.8*	247.5 ± 30.4*	207.3 ± 34.6*	160.5 ± 31.9**
3.	MEMP	400 mg/kg	387.3 ± 43.7	220.3 ± 40.9*	181.3 ± 39.9**	155.3 ± 38.3**	119.5 ± 44.9**
4.	Glibenclamide	2 mg/kg	336.8 ± 50.9	221.0 ± 43.5*	193.5 ± 29.7*	138.3 ± 16.4**	125.3 ± 38.5**
5.	Diabetic Control	5 mg/kg	470.0 ± 32.1	488.3 ± 24.0	491.0 ± 20.6	476.0 ± 4.4	479.3 ± 7.6

*P<0.05, **P<0.01

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