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(Research Article)

Hypoglycemic Activity of Ethanolic Extract of *Solanum nigrum* Linn. Leaves on Alloxan Induced Diabetes Mellitus in Rats

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ABSTRACT

Diabetes is a metabolic disorder associated with hyperglycemia and caused by defect in insulin secretion. Past few year some of the new bioactive drug isolated from plants showed anti-diabetic activity in clinical therapy. Hypoglycemic effect of these plant is due to their ability to restore the function of pancreatic β cells by causing an increase in insulin output or inhibit the intestinal absorption of glucose. Hence treatment with herbal drugs has an effect on protecting β cells and smoothing out fluctuation in glucose level. In present study we have screened alcoholic extracts of *Solanum nigrum* leaves for hypoglycemic effect in Albino rats. Different doses of alcoholic extract 50, 100, 200, 400 mg/kg of body weight were employed to evaluate alloxan induced diabetes with reference to standard Glibenclamide. Results indicated the alcoholic extract of leaves possesses significant hypoglycemic effect in dose dependent manner.

Key Words: *Solanum nigrum*, Hypoglycemic activity, Alloxan induced diabetes mellitus, Pancreatic β cells.

INTRODUCTION

Diabetes is a metabolic disorder associated with hyperglycemia and caused by defect in insulin secretion^{1, 2}. Past few year some of the new bioactive drug isolated from plants showed anti-diabetic activity in clinical therapy. Hypoglycemic effect of these plant is due to their ability to restore the function of pancreatic β cells by causing an increase in insulin output or inhibit the intestinal absorption of glucose. Hence treatment with herbal drugs has an effect on protecting β cells and smoothing out fluctuation in glucose level^{3, 4}.

Type-2 Diabetes Mellitus (DM) is a metabolic disorder characterized by insulin resistance, relative insulin deficiency and hyperglycemia. It is associated with factors which directly contribute to cardiovascular disorder including resistance dislipidemia, atherosclerosis, hypertension^{5, 6} endothelial dysfunction and vascular inflammation^{7, 8}. Obesity is another risk factor for diabetes and CHD⁹. *Solanum nigrum* is well known traditionally used medicinal plant. It is reported to possess hepatoprotective, anthelmintic, antiinflammatory, antimicrobial, antihyperlipidemic, anti-tumour and neuropharmacological properties¹⁰. The leaves of plant reported to contain several phytoconstituents like Quercetin, Flavonoids, Hyperoside¹¹, Sitosterol, Solamargine, Solanigraside, Stigmestrol, Cholesterol¹², Solasodine¹³. Alloxan and its reduced product dialuric acid establish a redox cycle with the formation of superoxide radicals undergo dismutation to hydrogen peroxide. There

after highly reactive hydroxyl radicals are formed by fenton reaction. The action of reaction oxygen species with massive increase in cytosolic Ca^{++} concentration cause rapid destruction of β - cells. Since information on antidiabetic properties of *Solanum nigrum* is lacking, the present study evaluated the protective effect of this plant extract against alloxan induced Diabetes in Albino rats.

MATERIAL AND METHODS

Plant Materials

The mature berries of *Solanum nigrum* were collected in the month of January from village Sarai-Sakhan Dist. Unnao UP and authenticated by Dr. Neelima Sharma from National Vrکشayurveda Research Institute, Jhansi. After authentication fresh mature leaves were collected from well grown plants and cleaned thoroughly to adhere from the leaves under running tap water. The cleaned leaf material were dried under shade. The shade dried leaves were powdered in electrical grinder.

Preparation of Extract

Powdered leaf material was defatted using petroleum ether. Defatted plant material was extracted in Soxhlet apparatus with 95% ethanol and concentrated (Yield: 22.8%).

Animals

Albino rat of both sex weighing between 150-200 gm were used for experiment. They were housed in standard

environment condition like ambient temperature(25⁰C) relative humidity 55% and 12/12 hour light dark cycle.

Screening for Anti-diabetic Activity

The screening for anti-diabetic activity was conducted as per the method described by Dash et al¹⁴. The test sample were suspended in 25% Tween 20 in distilled water. Glibenclamide (2.5 mg/kg) was used as reference sample during the study. All the test samples were administered through oral route.

STUDY ON ALLOXAN INDUCED DIABETIC ANIMALS

The acclimatized animal were kept fasting for 24 hour with water ad libitum and injected intraperitoneally a dose of 120

mg/kg of alloxan monohydrate in normal saline. After 1 hour the animal were provided feed ad libitum. The blood glucose level was checked before alloxanisation and after 24 hour of alloxanisation . Animals were considered diabetic when blood glucose level was raised beyond 200mg/dl of blood. The condition was observed at the end of 72 hour after alloxanisation . The animal were segregated into six group six rat in each group. Group 1 served as solvent control and received only vehicle (2mg/kg) through oral route. Group 2 received glibenclamide (2.5mg/kg). Group 3, 4, 5, 6 received the test extract at dose of 50, 100, 200, 400, mg/kg in a similar manner. Blood glucose level of each rat was estimated at 1, 2, 4, 6, 8 and 10 hour by glucometer respectively.

Table-1: Anti-diabetic activity of ethanolic extract of *Solanum nigrum* in a single dose treated alloxan monohydrate induced hyperglycemic rats in oral route.

Group and Treatment	Blood Glucose Level (mg/dl)*						
	0h	1h	2h	4h	6h	8h	10h
1.Solvent control (Tween+water)	242.50±10.2	243.40±6.08	248.9±6.93	246.52±8.02	250.6±10.8	241.3±10.5	240.7±5.82
2. Glibenclamide (2.5mg/kg)	253.48±6.82	203.60±10.07	168.4±4.68	112.46±8.68	97.8±10.5	85.8±7.05	76.32±5.64
3.EESN # (50mg/kg)	248.64±8.64	246.46±8.52	235.5±10.6	185.75±6.08	162.7±6.85	147.8±5.65	140.7±8.54
4. EESN (100mg/kg)	255.70±5.82	250.60±5.68	233.7±8.58	175.74±12.7	158.3±2.86	138.4±7.32	120.78±5.4
5. EESN (200mg/kg)	244.64±7.85	240.78±10.8	228.5±7.08	160.6±8.42	132.6±7.32	128.5±3.85	115.7±10.5
6. EESN (400mg/kg)	245.78±10.7	238.78±5.85	222.75±6.8	150.74±6.72	120.8±5.84	115.4±7.85	106.8±7.84

*All the values are expressed in Mean±SEM of six animals. One way ANOVA followed by Dunnet’s t- test.

Symbol EESN denotes Ethanolic extract of *Solanum nigrum* leaves.

RESULTS AND DISCUSSION

The preliminary phytochemical investigation report indicated that the ethanolic extract of *Solanum nigrum* leaves contains carbohydrate, polypeptides , saponins , flavonoids ,alkaloids, steroids as phyto constituents but devoid of glycosides. The experimental results (See Table-1) of effect of ethanolic extract of *solanum nigrum* leaves in alloxan monohydrate induced hyperglycemic rats showed that the test extract reduces blood glucose level significantly in dose dependent manner starting from 2h to the end of 10 h of study, while standard drug Glibenclamide showed similar effect during the course of experiment. Alloxan treatment causes permanent destruction of β cells and impairment of renal function and sulfonylureas drugs are known to lower the blood glucose level by stimulating β cells to release insulin¹⁵. However the statically significant anti –hyperglycemic shown by the ethanolic extract of *Solanum nigrum* leaves treated hyperglycemic models might suggest that the effect due to extra pancreatic and intra intestinal action of test extract¹⁶.

CONCLUSION

The objective of the above study was to evaluate hypoglycemic potential of ethanolic extract of *Solanum nigrum* leaves . Results showed that *Solanum nigrum* leaves show hypoglycemic activity due to antioxidant potential of leaves of plant.

Phenolic compound such as tannins , flavonoids, and phenolic acid play a vital role of antioxidant activity of plant. Total flavonoids content of ethanolic extract of leaves of *Solanum nigrum* are found to be 5.86 mg equivalent of quercetin /mg . Hence it is presumed that the antioxidant potential of extract may play significant role for anti-hyperglycemic potential of this plant extract.

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