PHARMACOCOGNOSTICAL AND HYPOGLYCEMIC ACTIVITY OF DIFFERENT PARTS OF SOLANUM NIGRUM LINN PLANT

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ABSTRACT

Diabetes is a series of metabolic conditions associated with hyperglycemia and caused by defects in insulin secretion and/or insulin action1-2. The rapidly increasing incidence of diabetes mellitus is becoming a serious threat to mankind health in all parts of the world3-4. Moreover, during the past few years some of the new bioactive drugs isolated from plants showed antidiabetic activity with more efficacy than oral hypoglycemic agents used in clinical therapy. The traditional medicine performed a good clinical practice and is showing a bright future in the therapy of diabetes mellitus5. It has been attributed that the antihyperglycemic effect of these plants is due to their ability to restore the function of pancreatic tissues by causing an increase in insulin output or protecting β-cells and smoothing out fluctuation in glucose levels6-7. In the present study we have screened the aqueous and hydroalcoholic extracts of different parts of Solanum nigrum plant, viz leaf, fruit and stem for hypoglycemic activity in Sprague Dawley rats. Different doses of the extract 200, 400mg/kg body weight were employed to evaluate the Oral Glucose Tolerance with standard Metformin. Results indicated that aqueous extracts of Leaf and fruit possess significant hypoglycemic effect in dose dependent manner, followed by hydroalcoholic extracts. The stem extract of S.nigrum has no profound effects. The ash values were: leaf- 3.928, fruit - 6.723, stem - 11.90, crude fibre leaf - 8.42, fruit - 15.19, and stem - 14.73. Potassium and sodium were analyzed for all the parts which revealed that the leaves have the highest content of 2.6ug/mL & 0.75ug/mL respectively. Further phytochemical analysis was also performed for the different parts. The results suggest the validity of the clinical use of the plant in diabetes mellitus control, after further toxicological and in vivo antidiabetic studies.

Keywords: Solanum nigrum, Hypoglycemic activity, Oral glucose tolerance test, Pharmacognostical activity

INTRODUCTION

Type II diabetes mellitus is a metabolic disorder that is primarily characterized by insulin resistance, relative insulin deficiency and hyperglycemia. It is rapidly increasing in the developed countries and there is also evidence that this pattern will be followed in much of the rest of the parts of the world in coming years. Diabetes affects over 150 million people worldwide and this number is expected to double by 2025. It is associated with factors which directly contribute to cardiovascular disorders including resistance, dislipidemia, atherosclerosis, hypertension8-9, endothelial dysfunction and vascular inflammation10-11. Obesity is another risk factor in the development of diabetes and GHD12. A medicinal plant Galega officinalis led to the discovery and synthesis of metformin13, and is still used for new oral antidiabetic drugs without side effects. Plants are more potent healers because they promote the repair mechanisms in the natural way14. A multitude of herbs, spices and other plant materials have been described for the treatment of diabetes throughout the world15-16-17. The medicinal plants might provide a useful source of new oral hypoglycemic compounds for development of pharmaceutical entities or as a dietary adjunct to existing therapies18. Despite the presence of known antidiabetic medicines in the pharmaceutical market, screening for new antidiabetic sources from natural plants is still attractive because they contain substances that have an alternative and safe effect on diabetes mellitus19.

Solanum nigrum Linn (Solanaceae), fruits, leaves and stem were collected during June-July from Tirunelveli region of Tamilnadu State, India and were identified at C.C.R.A.S. Govt. of India, Tirunelveli, Tamilnadu.

Extraction

The different plant parts were shade dried and powdered coarsely. Aqueous and hydro alcoholic (methanol-water) extracts were prepared by cold maceration method and then filtered and concentrated in vacuo.

Animals

Sprague Dawley rats weighing 250-300g were used. The animals were acclimatized for 10-12 days and were fed with standard pellet diet and water ad libitum. They were housed in polypropylene cages sand maintained under standard environmental conditions. Six animals were used for each test sample. The experimental protocols were subjected to the scrutinization of the Institutional Animal Ethics Committee and were cleared by the same.

Oral glucose tolerance test

The animals were deprived of food for 14 hours before and during the experiment but were allowed free access of water. Seventy two animals were divided into 12 groups of 6 animals each as follows.

GROUP1- Standard metformin treated animals (500mg/kg body weight)

GROUP2- Normal animals

GROUP3- Solanum fruits aqueous extract (200mg/kg body weight) treated animals

GROUP4- Solanum fruits aqueous extract (400mg/kg body weight) treated animals

GROUP5- Solanum leaves aqueous extract (200mg/kg body weight) treated animals

GROUP6- Solanum leaves aqueous extract (400mg/kg body weight) treated animals

GROUP7- Solanum stem aqueous extract (200mg/kg body weight) treated animals

GROUP8- Solanum stem aqueous extract (400mg/kg body weight) treated animals

GROUP9- Solanum stem hydroalcoholic extract (200mg/kg body weight) treated animals

GROUP10- Solanum stem hydroalcoholic extract (400mg/kg body weight) treated animals

GROUP11- Solanum fruits hydroalcoholic extract (200mg/kg body weight) treated animals

GROUP12- Solanum fruits hydroalcoholic extract (400mg/kg body weight) treated animals

MATERIAL AND METHODS

Plant

S.linn. Linn is a well known traditionally used medicinal plant. It is reported to possess anthelmintic, anti-inflammatory, antidiabetic antimicrobial, antihyperlipidemic, antitumour and neuro pharmacological properties20. Although literature on the hypoglycemic activity of the plant as a whole is abundant, the comparative efficacy of each part is not known. Hence this study will highlight the hypoglycemic activity and pharmacognostical evaluation of each part of the traditional medicinal plant.
Ash values

Samples were incinerated in a silica crucible at a temperature not exceeding 550°C for 8 hours. Ash was prepared as above, using 25 mL dilute hydrochloric acid the ash from the dish was washed and boiled for 5 minutes, filtered, cooled and weighed.

Water soluble ash

It was determined in a similar way to acid insoluble ash using 25 mL of water in place of dilute hydrochloric acid.

Determination of extractive value

Accurately weighed 5 g of air-dried powdered drug was macerated with 100 mL of 90% of alcohol of the specified strength in a closed flask for 24 h, shaken frequently during first 6 h and allowed to stand for 18 h. It was then filtered rapidly, taking precautions against loss of the solvent and 25 mL of the filtrate were evaporated to dryness in a tared flat-bottomed shallow dish and dried at 100°C to constant weight. The % w/w of alcohol soluble extractive value was calculated with reference to the air-dried drug.

Crude fibre content

Crude fibre was obtained from the loss in weight on ignition of dried residue remaining after digestion of fat-free samples with 1.25% each of sulphuric acid and sodium hydroxide solutions under specified conditions.

% Crude fibre = Loss of weight on ignition x 100
Weight of sample used

Phytochemical Screening

The extracts obtained from the different parts were subjected to preliminary screening to identify the phytoconstituents using different phytochemical tests.

Statistical Analysis

Data is presented as means ± SEM. One way analysis of Variance (ANOVA) with Dunnett’s significance post hoc test was used to compare differences among groups. Each sample treated groups were compared with vehicle treated groups. Data was statistically handled through SPSS software version 10. P value <0.05 were considered statistically significant.

RESULTS AND DISCUSSION

The medicinal value of plants lies in some chemical substances that produce a definite physiological action on the human body. The most important of these bioactive compounds of plants are alkaloids, flavanoids, tannins and phenolic compounds. The preliminary phytochemical screening of fractions of different plant parts of *S. nigrum* aqueous and hydroalcoholic extract revealed the presence of alkaloids and flavonoids, phenolics and macronutrients which may be responsible for the observed hypoglycemic effects of these fractions by possibly stimulating insulin release from pancreatic beta cells.

Total ash and fibre contents were higher in the leaves compared to the fruit and stem. The total ash content of the leaves is similar to the values reported for some commonly consumed leafy vegetables including *Ocimum gratissimum*, *Hibiscus esculenta* and *Ipomea batata*. Ash content of the fruits obtained in the present study is 6.723. This value compares favourably with a reported value of 7.18% for *S. nigrum* from Congo Brazzaville. The acid insoluble ash, water soluble ash and total ash of stem was found to be greater than that obtained from the fruit and leaves. The leaves contained the highest content of crude fibre and the aqueous extractive value was found to be high in fruits (table 2).
access to conventional antidiabetic therapies. The currently especially in developing countries, where many people do not have play an important role in the management of diabetes mellitus, with medicinal properties. Currently, medicinal plants continue to preparations, such as those described in ancient texts like the Vedas and the Bible have been traced to the occurrence of natural products more effective antidiabetic drugs. This study was undertaken to certain drawbacks and therefore there is a need to find safer and available drug regimens for management of diabetes mellitus have

S. nigrum Linn plant and no effects of S. nigrum Linn feeding. The effect of aqueous and stem fed with different extracts of S. nigrum showed significant hypoglycemic activity, which is consonant with the study conducted by earlier researchers. Further it was noticed by other researchers that the chronic administration for longer duration leads to significant decrease in blood sugar compared to control. Thus it can be concluded that Solanum nigrum also has the anti-diabetic property.

CONCLUSION

With the current trend on increasing awareness in traditional medicine, the plant derived agents have been attracting much interest as natural alternatives to synthetic compounds. Scientists are trying to tap the pharmaceutical and food values of these unidentified plants. It is postulated that these plants (traditional medicine) will be a major source of new chemicals and raw materials for the pharmaceutical industry. As many plants found are in the wild regions, there is a need to have them grow at the local level. Also more of these compounds should be subjected to animal and human studies to determine their effectiveness in whole organism systems. In addition, detailed investigations at molecular and cellular levels are necessary to elucidate antimicrobial and other biological activities. This may result in a new era of chemotherapeutic treatment of injection by using plant derived principles.

From this preliminary investigation it has been concluded that the leaves and fruit of S. nigrum have significant hypoglycemic activity, the flavonoids present in the plant might be an active component responsible for this activity. We progress on to isolate the active bio component responsible for the activity.

REFERENCE