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Hypoglycemic Activity *Nyctanthes Arbor-Tristis* LINN. IN Alloxan Induced Diabetic Rats

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Abstract

Medical science still faces difficulties in developing side-effect-free medications for diabetes management. This has increased the need for safe and effective natural remedies that may lower blood sugar levels. The purpose of this study is to determine whether or not an ethanolic extract of Nyctanthes arbor-tristis Linn. leaves reduces blood sugar levels in alloxan-induced diabetic albino rats. Nyctanthes arbor-tristis Linn. Ethyl Acetate extract activity was compared to that of the glibenclamide (0.5mg/kg p.o.) standard antidiabetic medication. Normal rats were given oral dosages of an Ethyl Acetate extract of Nyctanthes arbor-tristis Linn. leaf. At a dosage of 200 mg/kg, the Ethyl Acetate extract was significantly (p0.05) hypoglycemic. Leaves extracted with ethyl acetate from the Nyctanthes arbor-tristis linn plant have anti-diabetic effects on a par with those shown in diabetic control mice. Nyctanthes arbor-tristis linn leaf extract in ethyl acetate has been shown to have potent and non-toxic anti-diabetic properties.

Introduction

Herbs have recently gained popularity as both healthful dietary options and potential new medicinal ingredients. Despite limited understanding of the mechanisms by which herbal medicines derived from plant extracts work, they are increasingly being used to treat a wide range of clinical diseases, such as liver disease [1], ischemia, perfusion injury, atherosclerosis, acute hypertension, hemorrhagic shock, diabetes mellitus, and cancer. Herbal treatments for diabetes mellitus have a long history of usage in Indian culture [2].

Over 800 plants with possible anti-diabetic activity are included in the ethnobotanical data [3].

Nyctanthes arbortristis Linn., often known as Harsinghar or Night Jasmine, is a popular herb used for therapeutic purposes. Nyctanthes arbor-tristis is used in Ayurveda, Sidha, and Unani, and is also popular among rural, mostly tribal people in India (Orissa, Chhattisgarh, and Bihar) for the treatment of a wide range of illnesses. The leaves are used to make a juice that is utilized as a diuretic, laxative, diaphoretic, laxative, diaphoretic, and laxative[4- 6]. The spleen may also be enlarged with the help of leaves. This study set out to determine how well an extract of N. arbortristis leaves preserved in Ethyl acetate performed against diabetes brought on by the chemical aloxan in rats.

Materials and Methods

Animals

Albino wistar male rats weighing 150-200g was used for the present study. They were maintained in the animal house of School of pharmacy, Sunrise University, Alwar, for experimental purpose. The animals were maintained under controlled conditions of temperature (23 ± 2 □C), humidity (50 ± 5%) and 12-h light-dark cycles. All the animals were acclimatized for seven days before the study. The animals were randomized into experimental and control groups and housed individually in sanitized polypropylene cages containing sterile paddy husk as bedding. They had free access to standard pellets as basal diet and water ad libitum. Animals were habituated to laboratory conditions for 48 hours prior to experimental protocol to minimize if any of non-specific stress. All the studies conducted were approved by the Institutional Animal Ethical Committee (IAEC) of School of pharmacy, Sunrise University, Alwar,. According to prescribed guidelines of CPCSEA, Government of India.

Plant Material

Leaves of the plant N. arbor-tristis Linn were obtained and identified from authentic sources. The leaves of the Nyctanthes arbor-tristis Linn were collected from Alwar and authenticated by Rajasthan University, Jaipur. The collected leaves were dried in shade, crushed to coarse powder and used for further studies.

Preparation of extract

50g leaves powders were extracted with 400ml of Ethyl Acetate for 18h by hot continuous extraction method. The Ethyl Acetate extract was filtered and partitioned by using petroleum ether to remove impurities .The solvent was evaporated under reduced pressure and dried in vacuum. The dried extract of Nyctanthes arbor-tristis Linn thus obtained was used for the assessment of hypoglycemic activity. The extracts were subjected to preliminary qualitative tests [7-8] to identify the various phytoconstituents present in leaves.

Acute Toxicity Studies

The extract of N. arbor-tristis Linn leaves was found to be safe for further biological studies as toxic effect and lethality was observed up to 2000 mg/ kg per oral in rat. Only the consumption of food was increased by 20% in the dose of 1000 and 2000 mg/kg during 4h but remaining normal afterwards.

Hypoglycemic activity in normal rats

Twenty-four albino rats weighing 150-200g were fasted for 18h and were divided into four groups of six animals in each. The groups included i) (vehicle control) received 5% gum acacia in normal saline, 1ml/200g rat. ii) (Test drug I) received 100mg/kg, p.o. 5% w/v N. arbor leaves extract, and 1ml/200 g rat. iii) (Test drug II) received 200 m/kg, p.o. 10% w/v N. arbor leaves extract, and 1ml/200 g rat. iii) (Standard) received Glibenclamide (0.5 mg/kg p.o. 10% w/v, 1ml/200 g rat). One milliliter of blood from the tail of each rat was collected at ‘0’ hour. At two hours of treatment, blood samples were collected again from the treated animals and blood glucose was estimated by glucose estimated method[9].

Hypoglycemic activity in diabetic rats

Albino rats (n=44) were fasted for 48h. Diabetes was inducing by administering [10-14}] freshly prepared alloxan monohydrate 2.4% in normal saline subcutaneously at a dose of 120 mg/kg, body weight as single dose [11]. After 72h of alloxan, 18 h fasting blood was collected from those that survived (n=34) [12] sugar estimated by glucose oxidase method. Twenty four diabetic rats with blood glucose level of 300-500 mg% were selected and were divided into four groups of six each.

Table 1: Hypoglycemic activity of N. arbor leaves extract in normal rats

Groups	**Fasting**	**2 h after Treatment**
Control (2%gum acacia)	78.05 ± 0.03	71.73 ± 0.05
Test I N. arbor (100mg/kg)	73.55 ± 0.07	60.86 ± 0.05*
Test I*I* N. arbor (200mg/kg)	70.76 ± 0.08	52.63 ± 0.03**
Std Glibenclamide (0.25 mg/Kg)	69.76 ± 0.25	42.45 ± 0.04**

Values are mg (%), mean ± SD, n=6 in each group, *p<0.01, **p<0.001 as compare to respective control.

Table 2: Hypoglycemic activity of N. arbor leaves extract in diabetic rats

Groups	**Fasting**	**2 h after Treatment**
Control (2%gum acacia)	72.33 ± 0.71	71.66 ± 0.55
Test I N. arbor (100mg/kg)	380.16 ± 0.94	190.16 ± 0.75
Test I*I* N. arbor (200mg/kg)	372.33 ± 0.66	176.83 ± 0.91
Std Glibenclamide (0.25 mg/Kg)	352.0 ± 1.59	141.66 ± 1.28

Values are mg (%), mean ± SD, n=6 in each group, *p<0.01, **p<0.001 as compare to respective control.

Results

The N. arbor-tristis Linn leaves Ethyl Acetate extract showed hypoglycemic activity by reducing blood glucose level significantly. It is also much effective when compare with the standard drug Glibenclamide. It reduces blood glucose level after seven days at the 200 mg/kg in rats compare with standard drug. We found that Ethyl Acetate extract of plant N. arbor-tristis Linn leaves is more effective in reducing the blood glucose level compare to the standard drug (Glibenclamide).

The hypoglycemic activity of Ethyl Acetate extract of N. arbor-tristis Linn leaves in normal (non diabetic) and diabetic rats is shown in Table. The test drug, at a dose of 200 mg/kg, p.o. significantly lowered the blood, at 2h. However, the activity of the standard drug, glibenclamide (0.5mg/kg/day), was more pronounced (P<0.001). In alloxan induced diabetic albino rats, N. arbor-tristis Linn at a dose of 100 and 200 mg/kg/day and standard drug glibenclamide (0.5mg/kg/day) for seven days was highly significant (P<0.001) in comparison with control group. However, in diabetic rats the hypoglycemic effect of the test drug at 250 mg/kg was significantly less than the standard drug glibenclamide.

Statistical Analysis

Results are expressed as mean ± SD. The differences between experimental groups were compared by one-way Analysis of Variance (ANOVA) followed by Bonferroni's test. The results were considered statistically significant when P<0.05.

Discussion

The Ethyl Acetate extract of leaves of Nyctanthes arbor-tristis linn exhibited dose-dependent antidiabetic property. The antidiabetic effect of ethanol extract of leaves of Nyctanthes arbor-tristis linn at the dose of 500 mg/kg is even slightly lower than glibenclamide 5mg/kg. Our results are supporting its use as folklore medicine for the treatment of diabetes. Plants may act on blood glucose through different mechanisms, some of them may have insulin-like substances and some may inhibit insulinase activity [15,16]. Stimulation of β-cells to produce more insulin and others may increase β-cells in the pancreas by activating regeneration of pancreatic cells [17].

The mechanism of alloxan diabetes has been the subject of many investigations and it is now generally accepted that free radicals are selectively involved in the initiation of the damage that ultimately leads to β cells death. Therefore, the pancreas is especially susceptible to the action of alloxan induced free radical damage. Many substances have been shown to ameliorate the diabetogenicity of alloxan in animals, which protect by reacting with free radicals formed from alloxan during its interaction with β cells, or prevent radical formation [18]. The present finding indicates that administration of Nyctanthes arbor-tristis linn leaves confirms the possibility that the major function of the extract is on the protection of vital tissues including the pancreas, thereby reducing the causation of diabetes in these animals [19]. Therefore, protective effect of Nyctanthes arbor-tristis linn extract on pancreas of alloxan induced diabetic rats could be attributed directly to scavenging activity and for more extent to the regenerative properties of the extract.

References

1. Chattopadhyay R.R. Possible mechanism of hepatoprotective activity of Azadirachta indica leaf extract: Part II. J Ethnopharmacol 2003, 89,217-219.
2. Jeong HG, You HJ, Park SJ, Moon AR, Chung YC, Kang SK and Chun HK. Hepatoprotective effects of 18β-Glycyrrhetinic acid on carbon tetrachloride induced liver injury: Inhibition of cytochrome P450 2E1 expression. Pharm Res 2002, 46(3), 221-227.
3. Alarcon-Aguilara, F.J., Roman-Ramos, R., Perez-Gutierrez, S., Aguilar- Contreras, A., Contreras-Weber, C.C., Flores-Saenz, J.L., Study of the anti-hyperglycemic effect of plants used as antidiabetics. Journal of Ethnopharmacology , 1998,61 (2), 101-110.
4. Nadkarni AK. Indian Materia Medica, Vol.I, 3rd ed. (Popular Prakashan Pvt. Ltd.,) 1982, 857-858.
5. Kirtikar KR, Basu BD. Indian Medicinal Plants, Vol.VII, (Sri Satguru Publications, New Delhi,) 2000, 2110-2113.
6. Wealth of India, A Dictionary of Indian Raw Materials and Industrial Products, Vol.VII, (National Institute of Science Communication, CSIR, New Delhi), 1997, 69-70.
7. Hyoung Lee S.Antioxidant activity of browning reaction products isolated from storage aged orange juice. J Agric Food Chem 1992, 40(4), 550-552.
8. Khandelwal KR. Practical Pharmacogonosy, Techniques and Experiments, Nirali Prakashan, Pune, 2nd Ed, 2000.
9. Barham D, Trinder P. An improved colour reagent for determination of blood glucose by oxidase system. Analyst 1972, 97,142-5.
10. Kokate CK, Plant constituents, Practical Pharmacognosy, 4th ed. Delhi: Vallabh Prakshan; 1994.
11. Shoka AA. Effect of some oral antidiabetic drugs on glucose and mineral metabolism in alloxan diabetic rats pretreated with ethylene diamine tetra acetic acid disodium salt. Indian J Pharmacol 1992, 24, 201-6.
12. Geetha BS, Mathew BC, Augusti KT.Hypoglycemic effects of Leucodelphindin derivative isolated from Ficus bengalensis (Linn).Indian J Physiol Pharmacol 1994, 38, 220-2.
13. Anturlikar SD, Gopumadhavan S, Chauhan BL, Mitra SK, Effects of D-400, a herbal formulation on blood sugar of normal and alloxan induced diabetic rats. Indian J Physiol Pharmacol 1995, 39, 95-100.
14. Ghosh R, Sharatchandra KH, Thokchom IS, Hypoglycemic activity of Ficus hispida (bark) in normal and diabetic albino rats. Indian J Pharmacol 2004, 36, 222-5.
15. Collier E, Watkinson A, Cleland CF, Roth J. J Boil Chem 1987, 262, 6238-7.
16. Chakravarthy BK, Gupta S, Gambhir SS, Gode KD. Indian J Pharmacol 1980, 12,123-8.

17. Bopanna KN, Kannan J, Gadgil S, Balaraman R, Rathod SP. Indian J Pharmacol 1997,29,162-7.
18. Jorn A, Tiedge M, Lenzen S. and Munday r, Effect of superoxide dismutase, catalase, chelating agents agents and free radicals scavenging on the toxicity of alloxan to isolated pancreatic islets in vitro free radic. Biol. Med, 1999, 26, 9-10.
19. Nanu Rathod, Raghuveer I , Chitme H. R and Ramesh Chandra, Free Radical Scavenging Activity of Nyctanthes arbortristis in Streptozotocin-Induced Diabetic Rats Indian J.Pharm. Educ. Res, 2010, 44, 3.