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Casuarina Equisetifolia Effect as Antidiabetic and Antihyperlipidemic on Streptozocin Induced Rats with Diabetes

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Abstract

The present study was aimed to evaluate the anti-diabetic-activity potential of Casuarina equisetifolia leaves against streptozotocin (STZ) induced experimental rats. Ethanolic extract of bark of Casuarina equisetifolia(EECE) was administered to streptozotocin induced rats. Glibenclamide was used as a standard drug. Blood glucose levels were determined after oral administration of a dose of Casuarina equisetifolia (400 mg/kg b. wt) in diabetic groups. Blood glucose levels were determined on 0, 7th, 14th and 21st day after oral administration of ethanolic extracts of Casuarina equisetifolia (400mg/kg). An ethanolic extract of equisetifolia was found to reduce blood sugar in streptozotocin induced diabetic rats. Reduction in blood sugar could be seen from 7th day after continuous administration of the extract. The effect of extracts of Casuarina equisetifolia on serum lipid profile like Total cholesterol, triglycerides, low density, very low density and high density lipoprotein were also measured in the diabetic and non diabetic rats. There was significant reduction in Total cholesterol, LDL cholesterol, VLDL cholesterol and improvement in HDL cholesterol in diabetic rats. These results indicated that Casuarina equisetifolia possesses a hypoglycemic and antihyperlipidemic effect.

Keywords: Casuarina Equisetifolia, Antidiabetic, Antihyperlipidemic, Streptozocin Induced Rats

Contents

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1. Introduction

Diabetes is a complex disorder that is characterized by hyperglycemia resulting from malfunction in insulin secretion and insulin action both causing by impaired metabolism of glucose, lipids and protein. The chronic hyperglycemia of diabetes is associated with long term damage, dysfunction and failure of various organs, in diabetic rats the utilization of impaired carbohydrates leads to accelerate lipolysis, resulted in hyperlipidemia recently, some medicinal plants have been reported to be useful in diabetes worldwide and have been used empirically and Antidiabetics and hyperlipidemia remedies. Diabetes is known to cause hyperlipidemia through various metabolic derangements[11]. Among several metabolic derangements insulin deficiency has been known to stimulate lipolysis in adipose tissue and give raise e to hyperlipedimeia.and fatty liver. Thus, in diabetes Hypercholistramia and hyperglycemia often occurs. However searching for new Antidiabetic drugs from natural plants is still attractive because they contain substances which take alternative and save effect on diabetes[16-26]. Most of the plants contain glycosides, alkaloids, terpenoids, flavonoids, carotenoids, etc. That is frequently implicated as having antidiabetic effect.

Casuarina equisetifolia is an herbaceous member of the family casuarnaceae. It is common along the coast on beaches, rocky coasts, hill side and open forest in both wet and dry zones from sea level to mid-mountain. It is native to South-East Asia, Australia and Polynesia. It is also cultivated as an ornamental for wind-breaks, or as a medicinal plant in some tropical countries in South pacific[17]. It Contain Ellagic acid, beta-setosterol, kaempferol and glycosides, quercetin, cupessuflavone, isoquercitrin,several common triterpenoids, trifolin, catechin and epicatechin, cholesterol, stigmasetrol, campestrol, tannin, citrulline and amino acids, hydroquinone, nictoflorin, rutin, trifolin. Phytosterol from the leaves of the plant shows antibacterial activity, hypoglycemic, antifungal, molluscicidal, and cytotoxic. In some countries the plant is used to treat nervous disorders, Diarrhoea and gonorrhea. In some countries it is used to treat coughs, ulcers, stomachaches and constipation. Dysuria and menorrhagia is treated with decoction of leaves[09-16]. An infusion of the leaves is used as an emetic to treat throat infections. However, no simultaneous antidiabetic and hyperlipidemic activity on Casuarina equisetifolia was scientifically available. Therefore, the present study has been carried out to explore the antidiabetic and hyperlipidemic activity of Casuarina equisetifolia.

2. Materials and Methods

Materials:

The bark of Casuarina equisetifolia was collected from in the month of June. The leaf was authenticated by Botany research officer. C.C.R.A.S., Govt.Of India, by carrying out macroscopic and microscopic evaluation[11].

Animals: Male rats of body 180-200g were obtained fromAndhra Pradesh, India. The animals were fed on standard pellet diet and water and libitum[10]. The rats used in the present study were maintained in accordance with guidelines of the CPASEA, India and the study approved by the ethical committee.

Preparation of root extract:

The dried barks were powdered to get a course granule. About 250 g of dried powder was extracted with 90% ethanol by continuous hot percolation, using soxhlet apparatus. Theresulted dark brown extract was concentrated upto100 ml[29]. on Rota vapour under reduced pressure. The concentrated crude extract were lyophilized in to powder and used for the study.

Preliminary phytochemical analysis:

The preliminary phytochemical studies were performed for testing different chemical groups present in ethanolic extract of Casuarina equisetifolia. Phytochemical screening gave positive test for alkaloids[12].

Toxicity studies:

The animals were divided into 6 groups separately and were treated orally with ethanolic extracts of Casuarina equisetifolia at 100, 200 and 400 mg/kg, body weight doses, the animals were continuously observed for 1hr., then frequently for 14days[14]. The parameters observed were grooming hyperactivity, sedation, loss of righting reflex, respiratory rate and convulsion.

Streptozotocin induced diabetic rats:

Streptozotocin was dissolved in ice cold normal saline immediately before use. Diabetes was induced in rats by intraperitonial(i.p) injection of Streptozotocin at a dose of 50mg/kg.48 hours after Streptozotocin administration blood samples were drawn from trail and glucose levels determined to conform diabetes. The rats were divided into 4 groups as follows first group served as normal control, received food and water[17]. Second group served as diabetic control, received 0.5ml of 5% tween 80; third group served as diabetic control, received glibenclamide (0.5mg/kg p.o) and fourth group9diabetic rats) recieved400 mg/kg b.wtof ethanolic extract of Casuarina equisetifolia. The treatment was continued daily for 21 days. Blood group was collected from the tail for glucose estimation, just before drug administration on 7 day, 14 day and 21 day[31].As shown in Table 1.

Biochemical parameters:

Triglycerides, HDL-cholesterol and LDL cholesterol were estimated from the serum by using standard kits[23].

Statistical evaluation:
All the data are presented as mean +- SEM the difference between group were evaluated by one way analysis of variance(ANOVA) followed by the dunnette multiple comparison test's ,0.01 was considered to be significant[22].

3. Results and Discussion

Phytochemical screening:
Phytochemical screening of both the plant extracts revealed that the presence of alkaloids, Phytosterol, carbohydrates and saponins[21].

Toxicity studies:
In performing preliminary test for pharmacological activity in rats, ethanolic extract did not produce any significant change in the behavior or neurological response up to 400 mg/kg body weight. Acute toxicity studies revealed the non-toxic nature of ethanolic extract of Casuarina equisetifolia[15-20]. The result obtained from the LD50 study indicates that ethanolic extract of Casuarina equisetifolia is safer to use in animals even at lower doses of 400 mg/kg p.o.

Antidiabetic effect:
Effect of ethanolic extract of Casuarina equisetifolia on serum glucose levels in diabetic rats was depicted as fallows. In animals treated with STZ (50 mg/kg i.p) (group II), a significant increase in serum glucose levels was observed on 7th, 21st, and 28th day when compared with normal rats (group I). Group III received glibenclamide (0.5 mg/kg p.o) showed decrease in the serum glucose level when compared with diabetic control rats (Group II).

Table 1. Anti-hyperglycemic activity of ethanol extract of Casuarina equisetifolia on STZ Induced diabetic rats[15]

Groups	0day(mg/ml)	After 7 days	After14 days	After21 days	After 28 days
Normal control	62.47+-1.2	96.72+-1.04	86.25+-2.15	80.4+-1.89	68.17+-2.0
Diabetic control	224+-1.2	214.4+-2.4*	211+-1.62*	205.0+-1.41*	203+-3.0*
Glibenclamide (0.5mg/kg)	224.2+-1.86***	184.1+-2.1***	130.4+-1.84***	93.47+-2.1***	93.1+-2.12***
EECE 400mg/kg	234+-1.21***	184.2+-1.18***	131.4+-2.20***	100.2+-2.12***	90.0+-2.1***

After the oral administration of ethanolicextract of Casuarina equisetifolia in diabetic control rats, a significant reduction in the blood glucose levels are observed on 7th,14th, 21st and 28th day compared with diabetic control rats (group II).

Anti-hyperlipidemic activity:
The lipid profile in control and experimental rats depicted in table.2 in STZ induced diabetic rats. The diabetic control rats (group II), showed significant increase in serum triglycerides[31]. Total cholesterol, very low density lipoproteins (VLDL), low density lipoproteins (LDL) and high density lipoproteins (HDL) when compared with normal (Group I). The ethanolic extract showed significantdecrease ($p<0.001$) in total cholesterol, LDL, VLDL, triglycerides and significant increase ($p<0.001$)in HDL when compared with diabetic control group (GroupII)
All these effects were observed on day 14th, 21st, and 28th. The present experimental results shows indicated that ethanolic extract exhibited a potent blood glucose lowering properties in STZ induced diabetic rats[17].

Table.2.Antihyperlipidemic activity of ethanol extract of Casuarina equisetifolia.

Groups	TC	TG	HDLC	LDLC	VLDLC
Normal control	80.41+-1.25	69.2+-0.65	39.63+-0.58	41.0+-2.6	19.63+-0.64
Diabetic control	224+-1.2	216.4+-2.5*	212+-2.23*	210.0+-1.45*	203+-3.10*
Glibenclamide (0.5mg/kg)	232+-1.83***	185.12+-2.64***	130.4+-1.57***	94.32+-2.0	94.0+-2.12***
EECE 400mg/kg	234+-1.1***	191+-1.05	134.42+-1.42***	100.2+-2.01***	90.0+-2.15***

4. Conclusion

We found an elevated blood glucose concentration accompanied by increase in total cholesterol, triglycerides, LDL, VLDL, and decrease in HDL cholesterol in Streptozotocin induced rats as compared to control animals. Oral administration of ethanolic extract of Casuarina equisetifolia normalized the levels of blood glucose. The potent antidiabetic effect of plant extract suggests the presence of potent antidiabetic active principles, which produced ant

hyperglycemic effect in diabetic rats[15]. Reduced insulin secretion and defect in insulin function resulted in enhanced metabolism of lipids from adipose tissue to the plasma. Impairment in insulin sensitivity due to high concentration of lipids in the cells is responsible for the elevated cardiovascular risk in diabetes mellitus[16]. This, the altered lipid and lipoprotein pattern observed in diabetic rats could be due to defect in insulin secretion and/or action. Accumulation of cholesterol and phospholipids in the liver due to elevated plasma free fatty acids has been reported in diabetic rats[21]. The present study, ethanolic extract of Casuarina equisetifolia had significantly decrease in total cholesterol, triglycerides, VLDL and LDLwith increase in HDL,which is having a protective function for the heart compared with diabetic group[25].

5. References

1. Babu V, Gangagadevi T, Subramaniam A. Diabetes induced by STZ in rats. Ind J of Pharmacol., 35, **2003**, 290-96.
2. Bajpay A, editor. Ecological Studies of Boerhaavia verticillata poir with special reference to phytochemical and therapeutic importance. Ph.D. Thesis, Banaras Hindu University, Varanasi, India. **1993**.
3. Bhattaram VA, Ceraefe M, Kohlest C, Vest M, Deundorf H. 2Pharmacokinetics and bioavailability of herbal medicinal products. Phytomed., 9, **2002**, 1-36.
4. Chopra RN, Ghosh S, Dey P, Ghosh BN. Pharmacology and therapeutics of Boerhaavia diffusa (punarnava). Indian Medical Gazette., 68, **1923**, 203-208.
5. Dhar ML, Dhar MM, Dhawan BN, Mehrotra BN, and Ray C. Screening of Indian plants for biological activity. Indian Journal of Experimental Biology., 6, **1968**, 232–247.
6. EL-Hazmi MAF, Warsy AS. Obesity, over weight and type II diabetes in Saudi adult patients. Saudi Med J., 20, **1999**, 167-172.
7. Frayn KN, editor. Insulin resistance, impaired postprandial lipid metabolism and abdominal obesity. A deadly triad. Med Princ Pract., 11, **2002**, 31-40.
8. Ghosh M, Razmovski V. Fundamentals of Experimental pharmacology, 2nd ed. Scientific book agency Kolkatta. 1994, 159-158.
9. Granner DK, Granner RK, Mayes PA., Rodwell VW.Hormones of the Pancreas and Gastrointestinal Tract. In: Murray. Harper's Biochemistry, Appleton and Lange, Connecticut, USA, 24, 1996, 586-587.
10. Hardman JG and Limberd LE. Insulin, Oral Hypoglycem -ic Agents and the Pharmacology of the endocrine pancreas. In Good-man and Gilman's: The Pharma-cological basis of Therapeutics. Mcgraw-Hill Company Limited, USA, 10, **2001**, 1383-1399.
11. Hou Z, Zhang Z, Wu H. Effect of Sanguis draxonis (a Chinese traditional herb) on the formation of insulin resistance in rats. Diabetes Res. Clin. Pract.68, **2005**, 3-11.
12. Huang TH, Kota BP, Razmovski V, RoufogalisBD. Herbal or natural medicines as modulators of peroxisome proliferator-activated receptors and related nuclear receptors for therapy of metabolic syndrome.Basic Clin.Pharmacol.Toxicol., 96, **2005**, 3-14.
13. Lopes-Virella, Maria F, Stone P, Ellis S, Colwell JA. Cholesterol determination in HDLs separated by three different methods. Clin Chem., 23, **1977**, 882-4.
14. Lowry OH, Rosenborough NT, Farr AL, Randall JR. Protein measurements with the folin phenol reagent. J Biol Chem., 193, **1951**, 265-75
15. Cambie RC. And Ash J. Fijian Medicinal Plants, CSIRO, Australia, **1994**, 116,117.
16. Behari M and Goyal MM. Acta Cienc. Indica Chem., 12 (1), 1986, 20-22.
17. Nash RJ. et al., Tet. Lett., 35 (42), **1994**, 7849-7852.
18. Goyal MM. and Kumar K. Bangladesh J. Sci. Ind. Res., 22 (1-4), **1987**, 68-71.
19. He X, Jiang N, Li J. and Lan Z. Linchuan Huaxue Yu Gonyue,3 (2), **1983**, 1-13.
20. Prasad V, Gupta SC. Indian J. Exp. Biol., 5 (3), 1967, 192-3.Vol 1, Issue 1, **2011**, 4-8.8
21. Weiner MA. Econ.Bot., 25, **1971**, 437.
22. WhistlerWA. Polynesian Herbal Medicine, Everbest, Hong Kong, **1992**, 134-135.
23. McGowan MW, Joseph DA, Strandbergh DR, Zak B. A peroxidase coupled method for the colorimetric de-termination of serum triglycerides. Clin Chem., 29, **1983**, 538-42.
24. Mitra SK, Gopumadhavan S, Muralidhar TS, Anturlikar SD, Sujatha MB. Effect of a herbomineral preparation D-400 in streptozotocin induced diabetic rats. J. Ethnopharmacol., **1996**, 41-46.

25. Morel DW, Chisolm GM. Antioxidant treatment of diabetic rats inhibits lipoprotein oxidation and cytotoxicity. J. Lipid Res., 30, **1989**, 1827-1834.
26. Oliver Bever B. Oral hypoglycemic action of medicinal plants in tropical West Africa. Cambridge University Press, London, **1986**, 245-267.
27. Rai MK, editor. A review on some antidiabetic plants of India.Ancient Science of Life, 14, **1995**, 42-54.28.Sarti C, Gallagher J. The metabolic syndrome: prevalence, CHD risk, and treatment. J Diabetes Complications, 20, **2006**, 121-132.
28. Scheen, JA, editor. Drug treatment of non-insulin dependent diabetes mellitus in the 1990s. Achievement and future development drugs, 54, **1997**, 355-368.
29. Shukla R, Sharma SB, Puri D, Pabhu KM, Murthy PS. Medicinal plants for treatment of diabetes mellitus. Indian J. Clinical.Biochem., 15, **2006**, 169-177.
30. Trease GE, Evans WC. A Text book of Pharmacognosy. ELSB Baillere Tindal, Oxford, **1987**.