PHS Scientific House
PHARMAHEALTHSCIENCES

International Journal of Pharma Research and Health Sciences

Available online at www.pharmahealthsciences.net

Original Article

Antidiabetic Activity of *Aerva lanata* Linn Juss by Using Alloxan Induced Diabetic Rats

M Raja [1,*], T Umapoorani [2], N Kanya [3]

[1] Department of pharmaceutics, college of pharmacy, Sri Ramakrishna Institute of Paramedical Sciences, Coimbatore, 641044 .Tamil nadu, India.

[2] Department of Pharmacognosy, College of Pharmacy, Madurai Medical College, Madurai, 625020.Tamilnadu, India.

[3] K M College of pharmacy, Uthangudi,Madurai, 625020.Tamilnadu, India.

ARTICLE INFO ABSTRACT

Received: 04 Aug 2017
Accepted: 27 Aug 2017

Objective: To prescreen the *in vivo* anti diabetic activity of the aerial parts of the plant *Aerva lanata* Family *Amaranthaceae* by using alloxan inducing diabetic rats. **Method:** In the present study to investigate the effect of alcoholic extract of *Aerva lanata* was selected for phytochemical and anti diabetic activity. Anti diabetic activity was determined by reduction of increased blood glucose level alloxan-induced diabetic rat. **Result:** Preliminary phytochemical screening of alcoholic extract of *Aerva lanata*(AEAL) showed the presence of alkaloids,flavonoids,terpinoids,carbohydrates,sterols,tannins,saponins,cardioglycosides,amino acids, proteins, methyl grevillate, lupeol, lupeol acetate benzoic acid and β-sitosteryl acetate. The antidiabetic activity of AEAL determined by using the alloxan induced diabetic rats shows that the effect of decreased the blood glucose level. The reduction of blood glucose level in 2nd week by (P<0.01) significantly. **Conclusion:** *Aerva lanata* have been used in medicine due to various biological activities. This study indicates that the alcoholic extract of *Aerva lanata* possesses potential anti diabetic activity. The presence of alkaloids in alcoholic extraction of the aerial parts of the plants *Aervalanata* appears to contribute to its activity. Further investigation requires to confirm this activity.

Keywords: *Aerva lanata*, Amaranthaceae, Anti diabetic activity, Alloxan induced rats, tolbutamide.

Corresponding author *
M Raja
Department of pharmaceutics, college of pharmacy, Sri Ramakrishna Institute of Paramedical Sciences, Coimbatore, 641044 .Tamil nadu, India
Email- umapooranimpharm@gmail.com

1. INTRODUCTION

Medicinal plants are the most important source of life saving drugs and have been widely used for the treatment of diseases in traditional way for several years. An interaction between ancient medicine and biotechnological tools is to be established towards newer drug development. The interface between cell biology, structural chemistry and *in vitro* assays

IIIIIIII© International Journal of Pharma Research and Health Sciences. All rights reserved

will be the best way available to obtain valuable leads. The value of plants lies in the potential access to extremely complex molecular structure that would be difficult to synthesize in the laboratory In spite of an increasing awareness and expenditure of resources, the incidence of chronic diseases like cardiac, cancer, diabetes etc. has not declined and in fact is rising at an alarming rat.[1] Herbal medicine is based on the premise that plants contain natural substances that can promote health and alleviate illness. Diabetic mellitus is a metabolic disorder characterized by disturbances in carbohydrate, protein, lipid metabolism and by complications like microvascular(retinopathy, neuropathy and nephropathy) and macrovascular (heart attack, stroke and peripheral vascular disease)complications. Currently available synthetic antidiabetic agents produce serious side effects like hypoglycemic coma and hepatorenal disturbances [2].

Aerva lanata Juss. (Family: Amaranthaceous) locally known as 'bui' is an erect, prostrate under shrub and occurs throughout India as a common weed in fields and waste places. The plant is diuretic, used in lithiasis. The root is demulcent, diuretic, useful in strangury (slow to be and painful discharge of urine). The roots are used in the treatment of headache. The plant is regarded as a demulcent on the Malabar Coast. It is valued for cough in Ceylon; also as a vermifuge for children. The Meena tribals of the Sawaimadhopur district of Rajasthan give orally the juice of the roots to patients of liver congestion, jaundice, biliousness and dyspepsia. They also give decoction of the whole plant to cure pneumonia, typhoid and other prolonged fevers [3]. Previous chemical investigations have shown the presence of alkaloids, flavonoids, carbohydrates, phosphate, potassium, calcium, magnesium, zinc, ferrous, manganese, tannins, proteins and also contains methyl grevillate, lupeol, lupeol acetate benzoic acid, - sitosteryl acetate [4]. Most of the therapeutic properties of this plant are attributed to alkaloids which has considerable attention due to their pharmacological effects [5].

2. MATERIALS & METHODS

All chemicals and reagents used for this study were of analytical grade and procured from approved organization.

Collection and authentication of the plant *Aerva lanata*

Fresh aerial parts of the plant *Aerva lanata* juss. selected for our study was collected from Uppoor, Ramanathapuram District, Tamil Nadu, India during the month of July 2015 and was authenticated by Dr.Stephen, Department of Botany, American college, Madurai and Dr.Sasikala Director (Retd) of Siddha Central Research Institute, Arumbakkam, Chennai.

PREPARATION OF ETRACTION

The aerial parts of AL were shade-dried at room temperature. The shade-dried roots were coarsely powdered and subjected to extraction with petroleum ether in a Soxhlet apparatus for removal of fats. The defatted marc was subsequently subjected to alcohol extraction . This alcohol extract was utilized for the further investigation.[6,7]

Preliminary phytochemical screening

Preliminary phytochemical screening was carried out using appropriate solvent extract of theplant to identify the presence and absence of various phytoconstituents like alkaloids, carbohydrates, flavonoids, etc., [8, 9]

Determination of total phenolic content

The total phenolic content in AEAL was determined spectrophotometrically by Folin-Ciocalteu method [10].calibrating against gallic acid standards and expressing the results in gallic acid equivalent and defined as mg gallic acid /L.

Determination of total flavonoid content [11]

The flavonoid content of AEAL was estimated by aluminium chloride method. In this method, aluminium chloride complexes with flavonoids of C3-C5 hydroxyl group and to produce intense colour in acidic medium. The intensity of the colour is proportional to the amount of flavonoids and can be estimated as quercetin equivalent at wavelength of 415nm.

Acute toxicity studies [12]

Acute oral toxicity study of AEAL was studied in healthy rats (n=3) according to the guidelines set by Organisation for Economic Cooperation and development (OECD) guidelines . Starting dose was selected to be 2000mg/kg b.w.an finally a dose of 4000mg/kg b.w. was evaluated for toxicity. The animals were observed continuously for 24h for mortality.

Antidiabetic Activity [13]

The animals were divided into four groups of six animals each as follows:

Group I- vehicle control, Normal saline (0.9%W/VNacl);

Group II- Diabetic control;

Group III- Diabetic standard treated, 0.5mg/kg of tolbutamide;

Group IV-Diabetics AEAL 200mg/kg;

Diabetics was induced in all groups except normal control by a single intra peritoneal injection of 60 mg/kg of alloxan dissolved in a freshly prepared 0.1 m citrate buffer (pH 4.5). The animals in the vehicle control (Group I) received normal saline orally (0.9%W/V Nacl). The rats with blood glucose levels above 250mg/dL were considered as diabetic and used in this study. After 72h, the blood was withdrawn by retro orbital puncture under light ether anaesthesia and the blood glucose level was estimated. Serum was separated by centrifugation at 3 000 rpm for about 5 minutes. The clear straw coloured serum was collected and stored at 40C for the measurement of marker enzymes level to assess the liver functions. Blood glucose levels and body weight were measured on day 0, 7 and 14 of the study. Finally on day 14, blood was collected to perform various biochemical parameters.

3. RESULTS

Preliminary phytochemical screening of appropriate solvent extract of the plant showed the presence of alkaloids,

IIIIIIII© International Journal of Pharma Research and Health Sciences. All rights reserved

carbohydrates, tannins, flavonoids and absence of volatile oil, fixed oils.

Total phenolic content was found to be 22.78 ± 0.56 mg/ml.

Total flavonoid content was found to be10.25 ± 0.06 mg/ml.

In Acute toxicity study the various observations showed the normal behaviour of the treated rats. No toxic effects were observed at a higher dose of 4g/kg body weight. Hence, there were no lethal effects in any of the groups.

Anti diabetic activity shows the results of treatment with alcoholic extracts of aerial parts A.lanata at the dose 200 mg/kg body weight for 1 week exhibited a significant(P<0.01) decrease in the fasting blood glucose in alloxan induced diabetic animals ascompared to diabetic control(Table-1).Blood glucose level of diabetic animals started decreasing from the first week of drug treatment that was continued to maintain till 2nd week, which was comparable to tolbutamide 0.5 mg/kg(Table -1)(Figure-1).

Table 1: Anti Diabetic Activity of *Aerva Lanata*

	Blood glucose (mg/dL)		
Treatment	0 day	1 week	2 week
Normal control	93.09±1.32	97.75±39.1	83.94±8.20
Diabetic control	297.56±7.13	274.82±9.98	261.72±8.22
Standard 0.5 mg/kg	278.99±4.67	232.70±2.89	210.24±4.73
AEAL 200 mg/kg	298.66±7.86	228.99±7.80	193.76±6.66

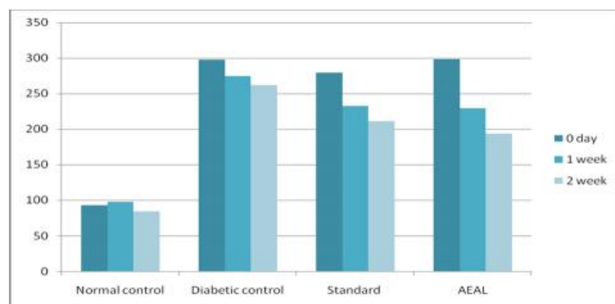

Fig 1: Anti Diabetic Activity of *Aerva Lanata*

4. DISCUSSION

Antimicrobial, Diuretic and Anti-urolithiasis, Antifertility activity, Anti cancer, Hypolipidemic and Anti-diarrhoeal, Antiulcer, Anti asthmatic, Anti-HIV activity, Anthelmintic, Anti inflammatory, Analgesic, Antinociceptive, Anti oxidant, Neproprotective, Anti hepatotoxicity, Cytotoxicity, Acute renal failure and Immunomodulatory [14-17]. Preliminary phytochemical screening of alcoholic extract of Aerva lanata(AEAL) showed the presence of alkaloids,flavonoids, methyl grevillate, lupeol, lupeol acetate benzoic acid, -sitosteryl acetate and tannic acid [18] .

The results of elvated blood glucose level is reduced by alcoholic extact of aerial parts of Aerva lanata .Alkaloids are present in this plant are known to have bioactive antidiabetic activity. The present findings may pave the way for the bioactivity guided fractionation and the isolation of novel lead compounds in Aerva lanata for the antidiabetic activity which will be useful for the design and synthesis of potent antidiabetic and antihyperlipidemic compounds hence beneficial for the patients. However, further studies are underway to isolate the lead molecules responsible for the activity and also to pinpoint on the mechanism of action of the same[19-20].

5. ACKNOWLEDGEMENT

The authors thank all helping hands particularly Dr.Stephen, Department of Botany, American college, Madurai and Dr.Sasikala Director (Retd) of Siddha Central Research Institute, Arumbakkam, Chennai.

6. REFERENCES

1. Dixit S, Ali H. Anticancer activity of Medicinal plant extract - A review. *J Chem & Cheml Sci* 2010; 1: 79-85.
2. Umar A, Ahmed QU, Muhammad BY, Dogarai BB, Soad SZ. Anti-hyperglycemic activity of the leaves of Tetracera scandens Linn. Merr. (Dilleniaceae) in alloxan induced diabetic rats. J Ethnopharmacol 2010; 131(1): 140-145.
3. Krishnamurthi A. The wealth of India. New-Delhi:Council of Scientific and Industrial Research ; 2003; 1: 92.
4. Rajesh R, Chitra K, Padmaa M. Paarakh. In vitro anthelmintic activity of aerial parts of Aerva lanata Linn Juss. Int J Pharm Sci Drug Res 2010; 2(4): 269-271.
5. Paramasivam R, Dominic S, Chinthamony A, Velliyur K & Gopalakrishnan. Cardioprotective effect of aqueous, ethanol and aqueous ethanol extract of *Aerva lanata* (Linn.) against doxorubicin induced cardiomyopathy in rats; Asian Pacific J Tropical Biomedicine (2012); S212-S218.
6. Sethiya NK, Nahata A, Dixit VK, Mishra SH. Cognition boosting effect of Canscora decussata (a South Indian Shankhpushpi). Eur J Integr Med 2012; 4:113–21.
7. Bairwa NK, Sethiya NK, Mishra SH. Protective effect of stem bark of Ceiba pentandra Linn. against paracetamol-induced hepatotoxicity in rats. Phcog Res 2010; 2:26–30.
8. Kokate CK, Gokhale SB, Purohit AP. *Pharmacognosy*. 46thEdn. New Delhi. NiraliPrakashan; 2010.p.A.1-6.
9. Mukherjee PK. Quality control of herbal drugs- An approach to evaluation of botanicals 1stedn New Delhi, Business Horizon; 2012.
10. Siddique, MA, Mujeeb, M, Najim, AK and Akram, M. Evaluation of antioxidant activity quantitative estimation of phenol and flavonoid in different parts of *aeglemarmelos*', Afr. J .Plant. Sci., 2010; 4(1): 1-5.
11. Chang, CC, Yang, MH, Wen, HM and Chern, JC,. Estimation of total flavonoid content in propolis by two complementary colorimetric method', J. Food Drug Analysis 2002; 10(3): 178- 182.

IIIIIIII© International Journal of Pharma Research and Health Sciences. All rights reserved

12. Bala A, Kar B, Haldar PK, Mazumder UK, Bera S. Evaluation of anticancer activity of Cleome gynandra on Ehrlich's ascites carcinoma treated mice. J Ethnopharmacol 2010; 129: 131-134.
13. Liu H, Liu X, Lee J, Liu Y, Yang H, Wang G, et al. Insulin therapy restores impaired function and expression of P-glycoprotein in blood-brain barrier of experimental diabetes. Biochem Pharmacol 2008; 75(8): 1649-1658.
14. Bitasta M, Maddan S. *Aerva lanata* – A blessing of mother nature, Jrnl of Pharmacognosy and phytochemistry 2016; 5(1):92-101.
15. Gajalakshmi S,Vijayalakshmi S, Devi Rajeshwari V, Pharmacological activities of *Aerva lanata* ; A Perspective Review .Int Res Jrnl of pharm 2012; 3 (1)2230-8407.
16. Chowdhury D, Sayeed A, Islam A, Shah Alam Bhuiyan M, Astaq Mohal Khan GR. Anti- microbial activity and cytotoxicity of Aerva lanata. Fitoterapia 2000; 73: 92-94.
17. Deshmukh T, Yadav BV, Badole SL, Bodhankar SL, Dhaneshwar SR. Antihyperglycemic activity of alcoholic extracts of Aerva lanata (L.) Juss Ex schultes leaves in alloxan induced diabeticmice. J Appl Biomed 2008; 6: 81-87.
18. Yadav JP, Saini S, Kalia AN, Dangi AS. Hypoglycemic and hypolipidemic activity of ethanolic extract of Salvodora oleoides in normal and alloxan-induced diabetic rats. Indian J Pharmacol 2008; 40 (1): 23-27.
19. Udupihille M, Jiffry MTM. Diuretic effect of Aerva lanata with water, normal saline and coriander as controls. Indian J Physiol Pharmacol 1986; 30: 91-97.
20. Shirwaikar A, Issac D, Malini S. Effect of Aerva lanata on cisplatin and gentamicin models of acute renal failure. J Ethno pharm Ethno pharmacol 2004; 90: 81-86.

Conflict of Interest: None

Source of Funding: Nil

IIIIIIII© International Journal of Pharma Research and Health Sciences. All rights reserved