

BRONCHODILATOR EFFECT OF ALCOHOLIC EXTRACT OF *Euphorbia hirta* Linn

S.Karpagam Kumara Sundari, CT. Kumarappan, A. Jaswanth, RValarmathy.

Department of Pharmacology, Periyar College of Pharmaceutical Sciences, Sathanoor Main
Road, Tiruchirappalli – 600 021, India.

Received: 12.11.2003

Accepted: 12.1.2004

ABSTRACT: The bronchodilator effect of alcoholic extract of *Euphorbia hirta* Linn was evaluated at different doses (50,100 and 200mg/kg.p.o), using histamine aerosol test model. A dose dependent bronchodilator effect was observed in *E. hirta* pretreated animals. The extract of *E. hirta* at a dose of 200mg/kg was found to be more effective in histamine induced broncho constriction and a significant ($p<0.001$) effect was observed.

INTRODUCTION

Bronchial asthma is a hypersensitivity reaction of the lower respiratory system producing obstruction of the airways¹. The tissue injury within the airways wall in asthma is due to the influence of chemical mediators arising from infiltrating inflammatory and resident cell types². Medicinal plants contain a wide range of chemical compounds that could serve as “Leads” for the development of novel anti-asthmatic agents. A vast number of medicinal plants have been used traditionally in the Ayurvedic system of medicine for the management of asthma and have been scientifically proven to have anti-asthmatic agents. A vast number of medicinal plants have been used traditionally in Ayurvedic system of medicine for the management of asthma and have been scientifically proven to have anti-asthmatic properties. These include *Albizia lebbek*³, *Cedrus deodara*⁴, and *Vitex negundo*⁵. *Euphorbia hirta* Linn (Euphorbiaceae) is an erect, long lanceolate leaves and common in waste ground throughout the areas of India. Ayurvedic texts have reported the usefulness of whole

plant to cure asthma and bronchitis⁶. It has depressant action on the heart and relaxes the bronchioles⁷. These traditional literatures prompted us to study the anti-asthmatic effect of *E.hirta*. The bronchodilator effect of ethonolic extract of *E.hirta* was studies on histamine-induced bronchoconstriction in guinea pigs.

MATERIALS AND METHODS

PREPARATION OF EXTRACTS

The whole plant of *E.hirta* were collected from Pudukkottai and confirmed by Dr. K.M. Mathew, The Raphdinat Herbarium, Department of Botany, St, Joseph’s College, Tiruchirappalli. The whole plant were dried in the shade for one month and powdered to get a coarse powder. Then the powder as packed in the soxhlet apparatus and then subjected to continuous hot percolation using ethanol as a solvent, finally it was concentrated under vacuum. The alcoholic concentrate of *E.hirta* was suspended in distilled water using 0.1% sodium

carboxymethyl cellulose and used for experiments.

BRONCHOKILATOR STUDY^{8,9}

Guinea pigs of Pir bright white strain (400-450) were obtained from M/S Venkateswara Enterprises, Bangalore. The animals were housed under standard conditions of temperature and humidity, 12hr/12hr light-dark cycles and fed with leafy vegetables/and carrots and tap water ad libitum. Drugs used were Histamine diphosphate (Sigma Chemical, USA) and Promethazine hydrochloride (Rhone – Poulenc, Mumbai).

Animals were divided into four groups of six animals each. Each animal were served as its own control. Animals belonging to each group were subjected to a histamine aerosol (0.2% Histamine diphosphate in saline) using a glass nebuliser for 2 sec in an airtight Perspex chamber. Aerosolization of the solution was achieved via a compressed air line operating at a pressure of 8 Psi and a flow rate of 5ml/min. After exposure to the histamine aerosol, the animal showed signs of immediate immobilization and bouts of coughing. This was followed by shallow breathing symptoms, after which the animal collapsed, fell on its back and convulsed. The time taken by the animal to fall on its back after exposure to the aerosol was designated as the exposition time. The exposition time for each animal in all the four groups was noted. Once the animal fell on its back, it was immediately taken out of the chamber and exposed to fresh air where the animal returned back to normal.

After 1 hour the animals in the first three groups were administered orally 50,100 and 200 mg/kg p.o. of E. hirta extract respectively. While the fourth group of animals received 300mcg/kg of

Promethazine by oral routs¹⁰. One hour later, the animals were reexposed to the aerosol and exposition time for each animal was noted. The difference in the exposition time before and after extract administration was taken as a measure of the protective effect of the extract. Percent protection afforded by the extract. Percent protection afforded by the extract was calculated by the formula.

$$\text{Percentage Protection} = \frac{\text{Eta-Etb}}{\text{Etb}} \times 100$$

Where 'Eta' is the mean exposition time after treatment with extract and 'Etb' is the mean exposition time before treatment with extract.

RESULTS AND DISCUSSIONS

Results are expressed as mean \pm SEM. Statistical significance between post treatment exposition time and pretreatment exposition time were analyzed using student's t-test¹¹.

Bronchodilator effect of E.hirta was assessed (at doses of 50,100,200mg /kg p.o.,through the inhibition of bronchoconstriction induced by histamine aerosol and the results are presented in Table.1. E.hirta extract at a dose of 50mg/kg did not significantly increase the post treatment exposition time as compared to the pretreatment exposition time. The maximum effect for E.hirta was reached at 200mg/kg, with no further increase in the percentage protection offered.

The mean increase in exposition time against histamine challenge was significantly ($P < 0.001$) increased with increasing doses of ethanol extract of E.hirta and offered dose dependent protection 43.08% (100mg/kg) and 80.66% (200mg/kg). Whereas known anti-

histaminic drug¹² Promethazine hydrochloride (300mcg/kg,p.o) also inhibited histamine induced bronchoconstriction in guinea pigs and offered 100% of protection against histamine challenge.

Bronchial asthma is characterized by wide spread narrowing of the bronchial tree due to contraction of smooth muscle and releases series of chemical mediators including histamine, leukotrienes¹³ etc.

Histamine when inhaled has been shown to induce bronchoconstriction by direct H1 receptor activation¹⁴ and also by a neurally mediated bronchoconstrictor effect via vagal reflexes. Histamine has shown to activate action potentials in the intrapulmonary vagal afferents. E.hirta was found to be significantly inhibiting the histamine

induced bronchospasm in a dose dependent manner; it could have an H₁ blocking effect.

Thus our studies provide the experimental evidence for the presence of bronchodilator effect of E.hirta by oral route and open a new avenue for future exploration of herbal medicines for the treatment of asthma. Further studies may help to establish the bronchodilator activity in other tissues and also identity the active principle responsible for the action.

ACKNOWLEDGEMENT

The authors wish to thank our president K. Veeramani, Periyar Maniammai Institute of Science and Technology, Chennai, and our principal Dr. K. Ruckmani, Periyar College of Pharmaceutical Sciences, for providing facilities.

REFERENCE

1. Kaliner, M. Mast cell mediators and asthma, chest., 91,1715-65 (1987)
2. Djukanoric, R. Roche, W.R. Wilson, JW.Beasley, C.R. Janson, H.M. Stuiter, H.J. and Devries, K.Bronchoalveolar eosinophilia during allergen induced late asthmatic reactions, Ann. Res Respir Dis., 131,373 (1990).
3. Tirpathi, R.M. Sen, P.C. and Das, P.K. Studies on the mechanism of action of *Albizzia lebbeck* an Indian indigenous drug used in the treatment of atopic allergy, J.Ethnopharmacol., 1,385-395,(1979).
4. Shinde, U.A. Phadke,, A.S. Kulkarni, K.R. Nair, A.M. Mungantiwar, A.A. Dikshit, V.J. and Saraf, M.N. Mast cell stabilizing and lipoxygenase inhibiting activity of Cedrus deodara (Roxb) wood oil, Indian J.Exp. Biol., 37(3), 258-261, (1999).
5. Nair, A.M. and Saraf, M.N. Inhibition of antigen and compound 48/80 induced contractions of guinea pig trachea by the ethanolic extract of leaves of *Virtex negundo* Linn, Indian J. Pharmacol., 27, 230-233, (1995).
6. Kirtikar, K.R. and Basu, B.D. "Indian Medicinal)Plants", 2nd Edn, Lalit Mohan Basu., Allahabad, 723, (1956).

7. The Wealth of India, "Raw Materials", Council of Scientific and Industrial Research (CSIR), New Delhi, 225, (1969).
8. Anilkumar, D. and Ramu, P. Effect of methanolic extract of *Benincasa hispida* against histamine and acetylcholine induced bronchospasm in guinea pigs, Indian J. Pharmacol., 34,365-366, (2002).
9. Rasmi Singh, Amarnath, G. Gupta, P.P. Shukla, M, Khare, S.K. and Kundu, B. Anti-allergic/anti-asthmatic effect of novel antiallergic hexapeptide-95/220 in various experimental models, Indian J. Exp. Biol., 39,871-877, (2001).
10. Gokhale, A.B. and Saraf, M.N. Bronchoprotective effect of ethanolic extract of *Tephrosia purpurea* *invivo*, Indian Drugs., 37(7), 346-347, (2000).
11. Abraham, E. Deodhar, M.M. Natu, M.V.A comparative study of the bronchodilator activity of the calcium antagonists on histamine induced bronchospasm in guinea pigs, Indian J. Pharmacol., 24,231-232, (1992).
12. Ghosh, M.N. "Fundamentals of Experimental Pharmacology", Singha.J. (Ed), Calcutta Scientific Book Agency,. Calcutta, 177-82, (1984).
13. Abe, T. Yoshida, K. Omata, I. Segawa, Y.Mastuda, K.and Nagai, H. Effects of ZCR 2060 on allergic airway inflammation and cell activation in guinea pigs, J. Pharm. Pharmacol., 46,876 (1994).
14. Babe, K.S. and Serafin, W.E. "Goodman and Gilman's The Pharmacological basis of Therapeutics". In; Histamine, Bradykinin and their antagonists, Hardman, J.G. Limdird, L.E. Molinoff, P.B. Ruddon, R.N. and Gilman, A.G. (eds), 9th Edn, Mc GrawHill, New York, 587-588 (1996).

Table – 1

Bronchodilator effect of *Euphorbia hirta* Linn on Histamine induced Bronchoconstriction.

Treatment	Pre-Treatment Exposition in seconds \pm SEM	Post-Treatment Exposition in seconds \pm SEM	Percentage Protection
E.hirta (50mg/kg, p.o)	107.0 \pm 1.53	128.33 \pm 2.58	19.93%
E.hirta (100mg/kg, p.o)	108.33 \pm 1.05	155.0 \pm 1.53	43.08%
E.hirta (200mg/kg, p.o)	109.5 \pm 1.23	197.83 \pm 1.84*	80.66%
Promethazine (300mg/kg, p.o)	110.0 \pm 1.29	237.0 \pm 1.59*	100%

N=6; Results are expressed as mean \pm SEM

* Indicates significant difference between pretreatment and post treatment time using Student's – 't', P<0.001.