African Journal of Basic & Applied Sciences 3 (5): 201-204, 2011
ISSN 2079-2034

Anti-Asthmatic Potential of *Flacourtia indica* Merr

[1]*Satyanand Tyagi,* [2]*Mahendra Singh,* [3]*Dashrath Singh,*
[3]*Indu Yadav,* [4]*Sunil Singh and* [5]*Mohd Hashim Mansoori*

[1]KNGD Modi Institute of Pharmaceutical Education and Research, Modi Nagar, Uttar Pradesh, India
[2]Quality Assurance Department, Sidmak Laboratories (India) Pvt. Ltd., Selaqui, Dehradun, India
[3]Institute of Bio-Medical Education and Research, Mangalayatan University, Aligarh, Uttar Pradesh, India
[4]Department of Pharmaceutical Chemistry, NRI Institute of Pharmacy, Bhopal, Madhya Pradesh, India
[5]Department of Pharmaceutical Chemistry,
Adina Institute of Pharmaceutical Sciences, Sagar, Madhya Pradesh, India

Abstract: The effects of ethanolic extract of leaves of *Flacourtia indica* (EEFI) on experimental models were evaluated for its antihistaminic activity. Phytochemical screening of the ethanolic extract showed the presence of alkaloids, tannins, saponins, flavonoids, glycosides, phenolic compounds, terpenoids and steroids. Significant increase in preconvulsion time was observed due to pretreatment with *Flacourtia indica* when the guinea pigs were exposed to histamine. This bronchodilating effect of *Flacourtia indica* was comparable to Ketotifen fumarate. Thus, the present study revealed EEFI has significant antihistaminic (H_1 receptor antagonist) activity. The *Flacourtia indica* by virtue of the said action will prove to be very effective in the antihistaminic therapy of asthma. Thus, the antiasthmatic effect produced by ethanolic extract of *Flacourtia indica* suggested that anti-asthmatic activity could be due to its bronchodilator and mast cell stabilizing property. The possible mechanism of action may be blockade of H_1 and Ach receptors leading to inhibitory of smooth muscle to respond histamine and Acetylcholine induced spasm leading to inhibition of bronchoconstriction. It was concluded that apart from the folklore uses of *Flacourtia indica* as antioxidant agents, the ethanolic extract of leaves of the plant *Flacourtia indica* also possess anti-asthmatic activity.

Key words: *Flacourtia Indica* % Anti-Asthmatic % Bronchodilators % Histamine

INTRODUCTION

Bronchial asthma is an inflammatory disorder of the airways characterized by various airway obstruction, airway inflammation and bronchial hyper responsiveness [1] and is a global health problem that results from a complex interplay between genetic and environmental factors [2] Nearly 7-10% of the world population suffers from bronchial asthma. Among several respiratory diseases affecting man, bronchial asthma is the most common disabling syndrome. Despite the availability of a wide range of drugs, the relief offered by them is mainly symptomatic and short lived. Moreover, these drugs produce side effects. Therefore, there is a dire need to identify effective and safe remedies to treat bronchial asthma [3] The current accepted modern medicine or allopathy has gradually developed over the years by scientific and observational efforts of scientists. However, the basis of its development remains rooted in traditional medicine and therapies [4] Asthma is a chronic condition involving the lower respiratory air bassages which become inflamed, lined with excessive amount of mucous, often in response to one or more triggers. These episodes may be triggered by exposure to environmental stimulants such as an allergen, environmental tobacco smoke, cold or warm air, perfume, pet dander, moist air, exercise or exertion or emotional stress [5].

Flacourtia indica Merr. (Family: Flacourtiaceae), commonly known as ‘Baichi’ or ‘Katai’, is an indigenous medicinal plant widely distributed in Bangladesh and India [6] This plant has been reported as an effective remedy for the treatment of a variety of diseases. Fruits

Corresponding Author: Satyanand Tyagi, KNGD Modi Institute of Pharmaceutical Education and Research, Modi Nagar, Uttar Pradesh, India. E-mail: sntyagi9@yahoo.com.

are used as appetizing and digestive, diuretic, in jaundice and enlarged spleen. Barks are used for the treatment of intermittent fever. Roots are used in nephritic colic and gum is used in cholera [6-7] Previous phytochemical investigation on this plant resulted in the isolatation of $-sitosterol (a well-known phytosterol), $-sitosterol-$-D-glucopyranoside, ramontoside, butyrolactone lignan disaccharide [8] and flacourtin [9] Recent report shows the presence of coumarin such as scoparone and aesculetin [10].

MATERIALS AND METHODS

Collection of Plant Materials: *Flacourtia indica* leaves were collected from the roadside location of the Sagar District, Sagar, Madhya Pradesh, India and were authenticated. The leaves of the plant was collected in third week of December 2009 and preserved in herbarium of institution. The leaves were air dried under shade, powdered mechanically and stored in airtight containers.

Preparation of Extracts: *Flacourtia indica* leaves powder about 500 gm was extracted with ethanol by hot extraction process (soxhlet) for 72 h. After completion of the extraction the solvent was recovered by distillation and concentrated under vacuum and resulting semisolid mass was vacuum dried using vacuum evaporator to yield a solid residue (ethanolic extract).

Chemicals: Histamine; Ozone International, Mumbai, Ketotifen; Airyfen Syr. contains 1mg/5ml, Panacea Biotec, New Delhi. All other chemicals used were of analytical grade.

Animals: Guinea pigs of either sex (350-450 g) were selected for the experiment of present study. Six animals were taken in each group and maintained under standard laboratory conditions. They were allowed free access to standard dry pellet diet and water *ad libitum* during the experiment. All experimental procedures were followed in strict accordance with the guideline prescribed by the Committee for the Purpose of Control and Supervision on Experimental on Animals (CPCSEA) and the protocol was approved by the Institutional Animal Ethical Committee.

Evaluation of Anti-Asthmatic Activity

***In vivo* Study**

Histamine-Induced Bronchospasm in Guinea Pigs [11]: The activity was evaluated by using the method histamine-induced bronchospasm in guinea pigs. Guinea pigs of either sex (350-450 g) were selected and randomly divided into four groups each containing six animals. The guinea pigs fasted for 24 h were exposed to an atomised fine mist of 2% histamine dihydrochloride aerosol (dissolved in normal saline) using nebulizer at a pressure of 300 mm Hg in the histamine chamber (24 x 14 x 24 cm, made of perplex glass). Guinea pigs exposed to histamine aerosol showed progressive signs of difficulty in breathing leading to convulsions, asphyxia and death. The time until signs of convulsion appeared is called pre-convulsion time. By observation experience was gained so that the preconvulsion time can be judged accurately. As soon as pre-convulsion time commenced, animals were removed from the chamber and placed in fresh air to recover.

***In vitro* Study**

Isolated Guinea Pig Ileum Preparation [12, 13]: Overnight fasted guinea pigs were sacrificed using cervical dislocation method. Ileum was quickly dissected out and mounted in an organ bath maintained at 30±0.5°C and containing 20 ml Tyrode's solution under basal tension of 500 mg. The solution was continuously bubbled with air. The responses to drug were recorded on student physiograph using isotonic transducer, which exerted a basal tension equivalent to 500 mg load on tissues. The tissues were allowed to equilibrate for 30 minutes, during which, the bathing solution was changed at every 10 minutes. The contractile responses of ileum to Histamine were recorded in presence and absence of EEFI in Table 2.

Statistical Analysis: Results were expressed as Mean ± SEM, statistical significance was calculated by applying t- test. $P<0.05$ was considered as significant.

Table 1: *In vivo* study of EEFI on histamine induced bronchospasm in guinea pigs

Group	Dose	% increase in preconvulsion
Group I	Ketotifen; 1 mg/kg	28.64±3.14
Group II	EEFI; 100 mg/kg, p. o.	30.25± 2.54
Group III	EEFI; 200 mg/kg, p. o.	44.58±1.98
Group IV	EEFI; 400 mg/kg, p. o.	51.91±3.42

Table 2: *In vitro* study of EEFI on histamine induced contraction of isolated guinea pig ileum preparation

	100µg/ml of EEFI		200µg/ml of EEFI		400µg/ml of EEFI	
Dose of Histamine in ml (10 µg/ml)	Control group	Test Group	Control Group	Test Group	Control Group	Test Group
0.2	24.22±1.23	16.38±1.04	34.25±2.54	26.54±2.74	35.55±3.61	26.78±1.24
0.4	40.22±4.57	29.36±3.66	59.64±4.57	34.27±3.66	64.33±3.57	35.28±3.46
0.8	55.19±3.54	35.27±4.41	81.94±4.87	54.22±4.55	82.99±3.47	59.31±1.82
1.6	67.21±4.17	50.45±2.41	93.35±5.01	63.05±3.74	89.24±4.11	70.41±4.64
3.2	74.14±5.24	53.54±2.57	97.29±6.11	65.55±3.47	98.05±4.24	64.59±4.79

RESULTS AND DISCUSSION

Histamine is one of the important mediators of allergy, inflammation and bronchoconstriction, which were released after degranulation of mast cell by an antigen exposure. Targeting histamine, either prevention of its release from mast cell or use of histaminergic receptor antagonist becomes part of antihistaminic therapy in allergic diseases [14]. In vivo study of EEFI has been also shown the significant increase in preconvulsion time due to pretreatment with EEFI at the dose of 100, 200 and 400 mg/kg of bodyweight of guinea pigs, when the guinea pigs were exposed to histamine. The results of EEFI suggested that it is effective in reducing the symptoms of bronchial asthma and also improve the lung function parameters of asthmatic subjects. In vitro study of EEFI has been performed on isolated guinea pig ileum. Results showed the increase in the contractile responses of the tissues significantly at the level of $P<0.05$ when treated with EEFI at the different doses of 100, 200 and 400 µg/ml.

Ethanolic extract of leaves of *Flacourtia indica* proved the anti-asthmatic activity, could be due to its bronchodilator and mast cell stabilizing property. The possible mechanism of action may be blockade of H1 and Ach receptors leading to inhibitory of smooth muscle to respond histamine and Acetylcholine induced spasm leading to inhibition of bronchoconstriction. It has been reported that these patients are resistant to main antibiotics prescribed. It is possible that these patients are suffering from bronchial infection but have been diagnosed, as asthmatic patients because of their symptoms like breathless [15].

In conclusion, the results of present investigation suggested that EEFI have significant bronchodilatory activity against histamine. Thus, it can be concluded that EEFI possess significant antihistaminic (H1 receptor antagonist) activity. However, further studies should be followed to establish molecular characterization of the active principles responsible for its mode of action.

REFERENCES

1. Djukanovic, R, W.R. Roche and J.W. Wilson, 1990. Mucosal inflammation in asthma. Am. J. Respir Crit Care Med., 142: 434-457.
2. Phillip, F., 2003. Gene therapy for asthma. Mol. Ther., 7: 148-152.
3. Govindan, S., S. Viswanathan, V. Vijayasekaran and R. Alagappan, 1999. A pilot study on the clinical efficacy of *Solanum xanthocarpum* and *Solanum trilobat*um in bronchial asthma. J. Ethnopharmacol., 66(2): 205-210.
4. Rana, A.C., 2008. Melia azedarach: A phytopharmacological review. Pharmacog Rev., 2: 173-179.
5. Rang, H.P., M.M. Dale and J.M. Ritter, 2001. Pharmacology. Edn 4, Harcourt Publishers, New Delhi, pp: 340-48.
6. Kirtikar, K.R. and B.D. Basu, 0000. Indian Medicinal Plants, India, Singh and MP Singh Publications, pp: 220.
7. Nazneen, M., M.A. Mazid, J.K. Kundu, S.C. Bachar, M.A. Rashid and B.K. Datta, 2002. Dhaka Univ. J. Biol. Sci., 11(2): 183-187.
8. Satyanarayana, V., G.L. Kurupadanam and G. Srimanaraya, 1991. A butyrolactone lignin disaccharide from Flacourtia ramontchi, Phytochemistry, 30: 1026-1029.
9. Bhaumik, P.K., K.P. Guha, G.K. Biswas and B. Mukherjee, Flacourtin, 1987. A phenolic glucoside ester from Flacourtia indica, Phytochemistry, 26: 3090-3091.
10. Nazneen, M., A. Mazid, J.K. Kundu, S.C. Bachar, F. Begum and B.K. Datta, 2009. Protective effects of Flacourtia indica aerial parts extracts against paracetamol induced hepatotoxiciy in rats, JTUSCI, 2: 1-6.
11. Armitage, A.K., J. Boswood and B.J. Large, 1961. Thioxanthines with potent bronchodilator and coronary dilator properties. Brit J Pharmacol Chem., 16: 59-76.

12. Dhonde, S.M., B.D. Siraskar, M.D. Burande, A.V. Kulkarni, A.S. Kulkarni and S.S. Bingl, 2008. Anti-asthmatic activity of ethanolic extract of stem bark of Bauhinia variegata Linn. Advances in Pharmacology and Toxicol., 9: 131-138.
13. Bahekar, P.C., H.Y. Shaikh, P.B. Nigade and M.M. Ghaisas, 2007. Anti-histaminic activity of aqueous extract of leaves of Mimosa pudica Linn. J. Pharmaceutical Res., 6: 134-138.
14. Vogel, H.G., 2002. Drug Discovery and Evaluation. 2nd ed., Springer-Verlag, New York, pp: 351.
15. Sinha, S., T. Murugesan, M. Pal and B.P. Saha, 2001. Evaluation of anti-tussive activity of Bergenia ciliate Stern Balanites rhizome extract in mice. Phytomedicine, 8: 298-301.